Yashwantrao Chavan Maharashtra Open University, Nashik – 422 222

1.1.1: Learning Outcomes Curriculum Framework (LOCF) Document.

Sr. No	Name of Program	Program Learning Outcomes	Program Specific Learning Outcomes	Name of Course with code	Course Learning Outcomes
01	B. A.	**After learning this program, learner will able to:** Acquire information and knowledge in literature, languages and Social Sciences.	**After learning this program, learner will able to:** **1.** Understand micro and macroeconomics and economic development of India. **2.** Understand economic theory of agriculture and agro-industries in rural development. **3.** Understand prose, poetry, literature and languages in communication.	1. ECO218: Micro-Economics (Anshlaxyi Aartha shashtra)	**After learning this course, learner will be able to:** 1. Understand Micro Economics in terms of the meaning, nature, scope and importance; economic problems, methods and policies; demand and supply theory, income inequality, nature of market system, type, pricing, equilibrium of industry; and the government intervention in the economy.
				2. ECO219 :Macro Economics (Samagralaxyi Aarthashashtra)	1. Comprehend Macro Economics in terms of the concept, meaning, nature, scope, importance, theory; price index, value of money, banking system as well as income, employment, and investment.
				3. ECO275 : Economic Development of India (Bharatacha Aarthik Vikas)	1. Get acquainted with economic development of India with reference to the development index, planning and problems in economy, issues in human resource, role of agriculture and industry in economic development, and inherent problems; labor market in India; financial and trade policy and structural changes in economy.
				4. ECO276 : Public Finance (Sarvajanik Vitta vyavhar)	1. Get introduced to public finance, public revenue, public expenditure, public debt, federal fiscal system; meaning of budget, concept, type; policy and its impact on economy.
				5. ECO277 : (International Economic) Aantarrashtriya Aarthashashtra	1. Get acquainted with International Economics with reference to the theory of international trade, terms of trade, balance of payments, international trade policy, international finance; nature, function, role and importance of international organization, international monetary system, exchange rate, policies.

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				6. ECO278 : Economic Theory of Agricultural Industries and service sector (Krishi Udyog va Seva kheshtrache Aarthik Sidhant)	1. Understand the economic theory of agriculture, industry and service sector; agricultural productivity, marketing of agricultural products, agricultural financing, pricing, industrialization, industrial finance, sick industry; service sector, meaning, scope, significance, and its contribution in socio-economic development of the region.
				7. ECO279 :Consumer protection (Grahak Saurakshan)	1. Describe consumer protection in terms of concepts and meanings; rights and duties of consumer; consumer movement practices; consumer issues and solutions; pricing policy, marketing, advertising, publicity, and the consumer.
				8. ECO309 : Rural Development (Gramin Vikas)	1. Discuss rural development in terms of problems faced by general and special groups in rural India; rural government organizations, approaches of government; non-governmental and charitable organizations in rural development, their role, coordination and collective movements of the victims.
				9. ENG214 : How to Read a Short Story	1. Get oriented with the English literature in the most popular forms; inculcate life values and sharpen aesthetic sensibilities through great literary works; discuss the form with close text reading; analyze and appreciate the genre of short story.
				10. ENG215 : How to Read a Novel	1. Get acquainted with the tools of analysis of a novel as a competent reader; learn definition and five elements of novel and ways of interpretations of a fiction.
				11. ENG255 : Indian Writing In English	1. Understand the tradition of Indian writing in English, including fictional prose, non -fictional prose and poetry; and get to know the Indianness in the Indian writing in English.
				12. ENG256 : Understanding Drama	1. Get introduced to the theory and history of drama, definition and elements, sub genres and major periods and movements of drama and theatre; and study Indian dramatist Girish Karnad and western dramatist William Shakespeare.
				13. ENG257 : Understanding Prose	1. Get acquainted with the history of English prose, all forms of prose writings, and development of English prose from its conception to the present times, relate the development of English thought; scientific and other writings.
				14. ENG258 : Understanding	1. Get introduced to the tradition of poetry writing from nineteenth century to the present times viz. Romantic Poetry,

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				Poetry	Victorian Poetry, and the Modern Poetry,
				15. ENG259 : Communication Skills in English	1. Use English language effectively for different purposes in various formal and informal situations; writing for business purposes, and hone their communicative competence.
				16. ENG306 : Structure of Modern English	1. Explain the concept of language along with its nature and function; get introduced to phonological, morphological and syntactical system of English language through Phonetics and Phonology; grammar of English words, phrases and sentence.
				17. EVS201 : Environment Studies	1. Understand eco-systems; importance and conservation of biodiversity and wildlife; protection of Earth's protective layer, environmental issues such as pollution; increase awareness regarding environmental crisis such as natural and manmade disasters.
				18. GKN101 : Foundation Course of General Knowledge & Social Awareness	1. Get aware of the history and process of developments in the field of science and technology, environment, health, communication revolution and biotechnology and various other sectors.
				19. HEN101 : Foundation Course of Hindi & English Language	1. Get introduced to the Hindi and English language skills and basic structural paradigms related with these languages.
				20. HIN212 : Hindi : Fictional writing in Hindi (Kathanpar Sahitya)	1. Get introduced to the structure and form of Hindi literary genres such as plays, stories and novels, and read, appreciate and analyze selected texts of the said genres.
				21. HIN213 : Hindi : Prose Writing in Hindi (Kathetar Sahitya)	1. Get acquainted with non-fictional prose in Hindi literature, such as biographies, reportage, diaries and travelogues.
				22. HIN260 : Poetry: nature and Analysis (Kavita : Swaroop Aur Vivechan)	1. Understand the definition and structure of Hindi poetry and get acquainted with medieval and modern Hindi poetry.
				23. HIN261 :Literature and Criticism: nature and Analysis (Sahitya Aur Sameeksha : Swaroop Aur Vivechan)	1. Get acquainted with various literary theories regarding Hindi literature; and get acquainted with the critical views of important critics of Hindi literature.
				24. HIN262 : Renaissance in Hindi Literature (Hindimain Navjagaran)	1. Get introduced to Hindi language script and its different dialects; know about the origin of Hindi language and its different dimensions in different periods.

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				25. HIN263 : Structure of Hindi Language (Hindi ka Bhasha Vaidnyanik Adhyayan)	1. Get acquainted with official use of Hindi language, its use in formal and informal settings such as letters, interviews and advertisements in Hindi; build capacity to use Hindi in government and non-government offices, get acquainted with Hindi vocabulary used in different fields.
				26. HIN264 : Hindi for Practical Purpose (Prayojan mulak Hindi)	1. Understand the theory and practice of translation, various types of translations and of different genres of Hindi literature, and get acquainted with features of translation in different fields.
				27. HIN307 :Translation: Nature and Analysis (Anuvad : Swaroop Aur Vivechan)	1. Describe the nationalist movement, British administration and constitutional progress in India.
				28. HIS220 : History of Modern India (Aadhunik Bharatcha Itihas)	1. Discuss American, French and Russian Revolution and also define Industrial Revolution and Nationalism.
				29. HIS221 : : History of Modern World (Aadhunik Jagacha Itihas)	1. Illustrate Political, Economic and Socio-cultural progress in Ancient India.
				30. HIS280 : Ancient India : Beginning to Yadava Period (Prachin Bharat : Prarambh te Yadavkal)	1. Get acquainted with the history of medieval period; sultanate age, Bahamani and Vijay agar Empire, Mughal Empire.
				31. HIS281 : Medial India (1206 to 1857) (Madhyayugin Bharat (1206 te 1857)	1. Discuss the status of woman in Ancient, Medieval and Modern India.
				32. HIS282 : Development of Women in India (Bharatiya Stri jivanachi Vatchal)	1. Describe the history of south Asian countries (India, Pakistan, Bangladesh, Nepal, Bhutan, Sri Lanka, Maldives) and discuss the SAARC Organization.
				33. HIS283 : History of SARC countries (SAARC Deshancha Itihas)	1. Illustrate Indian cultural heritage, describe religious differences and get an idea of direction of social reconsolidation in India.
				34. HIS285 : Unity of Diversity (Vividhatetil Ekata)	1. Define British colonialism, describe socio-cultural Renaissance in colonial Maharashtra and explain the participation of Maharashtra in the National Movement.
				35. HIS310 : History of Social Transformation in Maharashtra	1. Get introduced to the theoretical perspectives of humanities, get acquainted with performing arts, experimental and

Sr. No	Name of Program	Program Learning Outcomes	Program Specific Learning Outcomes	Name of Course with code	Course Learning Outcomes
				(Aadhunik Maharashtratil Parivartanacha Itihas)	instrumental arts.
				36. HUM101 : Foundation Course of Humanities	1. Understand linguistic theory and practice, use of language, nature and practice of linguistic creativity of Marathi language.
				37. MAR102 : Foundation Course of Marathi Language	1. Explain the nature, and structure of short stories and novels; and critically appreciate and analyze the given short stories and novels written in Marathi.
				38. MAR210 : Study of Literary Genres (Vangmaya prakarancha Aabhyas)	1. Get acquainted with the new literatures and the post-independent literature viz. Dalit, Rural, and feminist writings in Marathi.
				39. MAR211 : Post Independence Literary Movements (Swatantryottar Vangamayin Pravah)	1. Understand the nature of poetry and drama, critically appreciate and analyze various poems and plays written in Marathi.
				40. MAR250 : Lirerary Genres (Vangamaya Prakar)	1. Gets an idea of the mediaeval literature, Mahanubhav literature, Saint literature, Panditi, Shahiri and Bakhar literature.
				41. MAR251 : Medial Literary Movements (Madhyayugin Vangamayin Pravaha)	1. Get acquainted with the nature and concept of Enlightenment literature in Marathi, Ideological writings during the Enlightenment period, and explain feature writings in Marathi.
				42. MAR252 : Enlitenment Literature in Marathi (Prabodhanpar Sahitya)	1. Discuss the origin, development and nature of Children's literature; describe short stories for children, novels for children, plays for children and biography writings for children in Marathi.
				43. MAR253 : Literature for Lildrens (Balsahitya)	1. Get specific skills related to different type of content writing to be used in different type of media.
				44. MAR254 : Writing Skills for Media (Prasar Madhyamansathi Lekhan kaushallya)	1. Illustrate the folk literature, modern literature, and research methodology to study the folk and modern literature in Marathi.
				45. MAR305 : Folk Literature (Loksahitya)	1. Explain the study skills viz. listening, reading, writing, note taking, note making, using libraries and references etc.
				46. OPN101 : Foundation Course of Self Study Skills	1. Understand the political scenario in India, describe democratic process and political process in India.
				47. POL224 : Political process in India (Bharatiya	1. Discuss the fundamental rights, second and third generation rights, right to employment, rights of the tribal, peasants and

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				Rajkaranachi Prakriya)	landless laborers.
				48. POL225 : Our Rights and their Fulfillment (Aaple Hakka Aani Tyanchi Paripurti)	1. Explain the relation between individual, society and the State; Describe the political concepts and political behavior of the individual.
				49. POL286 : Nature of Political science (Rajyashatrache Swaroop)	1. Discuss the constitution and federal system of the State; explain important concepts and issues in political science viz. party system, election system, and three branches of the government i.e. legislature, executive and judiciary.
				50. POL287 :Political Structure (Rajkiya Sanrachana)	1. Discuss different Indian political ideologies postulated in different by various ages in India.
				51. POL288 : Political Heritage in India (Aadhunik Bharatatil Rajkiya Varsa)	1. Understand different theories and nature of international relations; get acquainted with the transition in international relations.
				52. POL289 : International Relations and Politics (Aantarrashtriya Sambandha Va Rajkaran)	1. Get acquainted with the western classical and modern political ideologies.
				53. POL290 : Western Political Thinking (Paschimatya Rajkiya Vichar Pravah)	1. Describe the nature and scope of public administration and different aspects of administrative system and local self-government.
				54. POL311 : Public Administration (Lok Prashasan)	1. Understand various psychological concepts such as attention, memory, thought process, motivation and emotion.
				55. PSY216 :I and my behavior (Me Aani Maze Vartan)	1. Get acquainted with the intellectual, social, and emotional development of the child from pregnancy to pre-school.
				56. PSY217 : Child Nourishment and Child Development (Balsangopan Ani Balvikas)	1. Describe the nature of communication and human exchange as well as adjustment, problems and personal development
				57. PSY270 :Human Transaction and Adjustment (Manavi Vinimaya Va Samayojan)	1. Explain the psychological concepts like social psychology, socialization, language and communication, attitude, social behavior, community, leadership etc.

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				58. PSY271 : I and my Social behavior (Me Aani Maze Samajik Vartan)	1. Get introduced to the concept of mental health, nutrition, development, and developmental disorders etc.
				59. PSY272 :Mental Health (Mansik Swasthya)	1. Discuss the nature of personality, the process of development and self-awareness as well as the psychological problems and mental health.
				60. PSY273 : Personality Development (Vyaktimattva Vikas)	1. Get introduced to the concepts of family, marital guidance, marital problems and treatment as well as marital adjustment.
				61. PSY274 : Marital Adjustment Counselling (Vaivahik Samayojan Ani Margadarshan)	1. Gets acquainted with research, collection of data and processing, psychoanalysis and statistics, psychological experiments and tests.
				62. PSY308 :Experimental Method: Statistics, psychological Experiments (Prayogik Padhati : Sankhiki Va Manasshastriya Prayog)	1. Describe the foundations of social sciences like history, political science, sociology and psychology. The learner will also know about the communication revolution and foundations of biotechnology.
				63. SOC101 : Foundation Course of Social Sciences	1. Explain the process, components and consequences of social movements; describe social movements and issues like un touchability, Dalits, farmers, peasants' rights, and movements.
				64. SOC222 : Social Change and Social Movements (Samajik Parivartan Ani Samajik Chalvali)	1. Describe the Indian social structure and its different aspects like family, caste, tribal communities, economy and politics.
				65. SOC223 : Indian Society (Bharatiya Samaj)	1. Explain the concepts relating to environment; discuss various issues and problems relating to the environment and society at local and global level.
				66. SOC291 : Environment and Society (Paryavaran Va Samaj)	1. Understand about nature and scope of the rural sociology in which learner will be knowing about caste system, economy, rural politics and rural culture in detail.
				67. SOC292 : Rural Sociology (Gramin Samajshastra)	1. Understand the origin of sociology, and get introduced to the contribution of Emilie Durkheim, Karl Marx and Max Weber in the theories of sociology.
				68. SOC293 : Classical Thinkers in Sociology	1. Explain different aspects of industrial sociology viz.

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				(Samajshastrache Abhijat Wicharwant)	industries, bureaucracy, workers and management and industrial relations and worker's welfare.
				69. SOC294 : industrial Sociology (Audhyogik Samajshastra)	1. Describe different aspects related to population studies, family health and related issues.
				70. SOC295 : Population Studies (Loksankhya Shikshan)	1. Discuss the process of old age, issues and problems relating to old age, and adjustment.
				71 SOC312 : Process aging (Vayowardhan Prakriya)	1. Understand Micro Economics in terms of the meaning, nature, scope and importance; economic problems, methods and policies; demand and supply theory, income inequality, nature of market system, type, pricing, equilibrium of industry; and the government intervention in the economy.
02	B. A. (Mass Communication and Journalism	**After learning this program, learner will able to:** Understand principles and Practices in mass communication and practical journalism as a profession.	**After learning this program, learner will able to :** 1. Develop capacity of critical and analytical power to work with print and electronic media, become well-trained and skilled human resource for print and other media sectors 2. Acquainted with practical input such as survey, collection of news items and writing analytical report on the theme. 3. Develop skills of translating news report, write script for radio or television.	1. EVS201 : Environment Studies	**After learning this course, the learner will be able to:** 1. Understand eco-systems; importance of conservation of biodiversity and wildlife; protection of Earth's protective layer, and understand environmental issues such as pollution; increase awareness regarding environmental crisis such as natural and manmade disasters.
				2. GKN101 : Foundation Course of General Knowledge & Social Awareness	1. Get aware of the history and process of developments in the field of science and technology, environment, health, communication revolution and biotechnology and various other sectors.
				3. HEN101 : Foundation Course of Hindi & English Language	1. Get introduced to the Hindi and English language skills and basic structural paradigms related with these languages.
				4. HUM101 : Foundation Course of Humanities	1. Get introduced to the theoretical perspectives of humanities; get acquainted with performing arts, experimental and instrumental arts.
				5. MAR101 : Marathi	1. Understand linguistic theory and practice, use of language, nature and practice of linguistic creativity of Marathi language.
				6. MCJ201 : News Paper Business & Journalism	1. Understand the skills required for the profession of journalism and mass communication; get acquainted with important aspects related to newspaper and media industry.
				7. MCJ202 : Various Areas of News	1. Understand media theories; get introduced to the areas where news can be built, viz cooperative sector, sports, commerce and agriculture.
				8. MCJ203 : Modern Maharashtra	1. Get acquainted with administration, economy, renaissance movement, literature and journalism in Maharashtra.

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				9. MCJ204 : Modern India	1. Get introduced to varied fields such as politics, foreign relations, international politics, economy, geo-politics, socio-politics and culture of modern India.
				10. MCJ205 : Writing Skills for Print Media	1. Write news item, editorial, column, readers' letters; get translation skills and techniques.
				11. MCJ206 : Audio Video Media Nature & Skills	1. Get the skills required in media about radio, television, documentaries; voice culture, and other techniques and presentation skills.
				12. MCJ301 : Mass Communication & Development Communication	1. Get introduced to mass communication, development communication; nature and impact of communication revolution.
				13. MCJ302 : Indian Constitution & Governance	1. Get introduced to the Indian Constitution, Indian polity, administrative structure and its working pattern in India.
				14. MCJ303 : Journalism: Laws & Ethics	1. Understand laws and regulations related to mass media sector, human rights and journalistic ethics.
				15. MCJ304 : Journalism & Related Work Areas	1. Get introduced to advertising, public relations and photo journalism.
				16. MCJ305 : Editing: Nature & Skills	1. Get editing skills for newspaper, periodicals and books.
				17. MCJ306 : Computer Application & Printing Techniques In Media	1. Use computer skills useful for printing; execute pagination, graphics, design and various other printing techniques useful in the publishing and the news paper industry.
				18. OPN101 : Foundation Course of Self Study Skills	1. Explain the study skills viz. listening, reading, writing, note taking, note making, using libraries and references etc.
				19. SOC101 : Foundation Course of Social Sciences	1. Know about the foundations of social sciences like history, political science, sociology and psychology. The learner will also know about the communication revolution and foundations of biotechnology

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03	B. Com. (English / Marathi Medium)	**After learning this program, learner will able to :** Understand commerce, business, trading and able to make profit-loss analysis	**After learning this program, learner will able to :** 1. Understand commerce, business and trading. 2. Develop understanding in Economics and Business, Management. 3. Understand business organization and business practices. 4. Understand business laws in trading and payments.	1. COM 106 : Commerce	**After learning this course, the learner will be able to:** 1. Understand the definition of economics, nature of economics & inter-relationship between economics and commerce
				2. COM 107 : Elements of Statistics	1. Understand the elements of statistics, nature of statistics and its significance in daily life.
				3. COM 208 : Accountancy Part-I	1. Understand system of accounting and bank reconciliation statement
				4. COM 209 : Accountancy Part-II	1. Understand the types of investment accounts, Information about brokers accounts and writing of investment account.
				5. COM 210 : Business Law	1. Understand evolution of Indian Contract Act and its importance, importance of Contract in daily transactions and legal relationship.
				6. COM 211 : Office Management	1. Understand different functions of the office and its importance in an organization and appreciate types of relationships between the functional departments or divisions in the organization.
				7. COM 212 : Business Organization and Administration	1. Understand commercial organization, partnership firms, co-operative organization and public and government enterprises
				8. COM 220 : Indian Economic Environment	1. Understand Indian economic environment and its management, relationship between man and environment.
				9. COM 221 : Costing, Auditing & Taxation	1. Understand concept and objects of Auditing, scope and advantages of auditing.
				10. COM 222 : Human Resource Management	1. Understand concept of Human Resource Management and personal management in the Organization.
				11. COM 306 : Banking & Finance-I	1. Understand concept of bank, functions of bank and origin of word bank and evolution of banking system. business
				12. COM 307 : Banking & Finance-II	1. Understand concept and nature of money market, Importance, Limitations of Indian money market and suggestions for the improvement of Indian money market.
				13. ECO 201 : Business	1. Understand meaning and difference between plant, firm and

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				Economics	industry and nature of production process
				14. ENG 102 : English for Business	1Understand to have interaction in English language in business.
				15. EVS201 : Environment Studies	1. Understand role of nature and biodiversity conservation in natural resources management for equitable use of natural resources for sustainable development.
				16. GKN 101 : General Knowledge and Social Awareness	1. Explain the concepts of civilization, culture and religion, understand various concepts of philosophy and spiritual values in religion
				17. MGM 105 : Management Science	1. Understand meaning of Business and business management and types of administration and management in Business.
				18. MGM 224 : Managerial Economics	1. Explain the definitions and nature of Managerial Economics and branches of managerial economics.
				19. MGM 225 : Business Communication	1. Explain importance of business communications and process of communication in business.
				20. MGM 308 : Marketing Management-I	1. Understand concept and importance of market and marketing in modern society.
				21. MGM 309 : Marketing Management-II	1. Understand the importance of advertisement for sale promotion and types of advertosement.
				22. OPN101 : Foundation Course of Self Study Skills	1. Understand and develop skills useful in business environment.
04	B. Com. (Co-operative Managem	**After learning this program, the learner will able to :** 1.Understand nature and	**After learning this program, the learner will able to :** 1. Train people in Cooperative management sector.	1. COM106 : Commerce (Vanijya shatra)	**After learning this course, the learner will be able to:** 1. Acquisition of knowledge of the basic principles of business Economics and how cooperative can be a very effective alternative to the existing system to achieve individual and social welfare by eliminating the tendency, scope of exploitation.

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	ent)	practices in Cooperative Management and create skilled manpower in Cooperative Management.	2. Acquire knowledge of Co-operative Management in agro based industries and Co-operation. 3. Apply quantitative and qualitative knowledge for planning their future business.	2. COM211 : Office Management (Karyalyin Vyvastapan)	1. Ability to manage and administer office, Ability to handle and use of model technique of computer in office administration and management.
				3. COM220 :Economic Environment in India (Bharatiya Aarthik Paryavaran)	1. Ability to train people for creation of beautiful economic environment 2. Capacity to guide people to how people can mould themselves to create favorable economic environment
				4. COM221 :Cost Accounting Audit and Taxation (Parivaya Ankekshan ani Kar Aakarni)	1. Ability to calculate different type of cost. 2. Ability to access the real cost of economic activity. 3. Ability to access tax and payment methods.
				5. COM222 :Human Recourse Management (Manav Sansadhan Vyvastapan)	1. Ability to assign manpower and duties as per their skills, ability. 2. Ability to train manpower. 3. Capacity to select manpower for the required job
				6. ECO201 :Professional Economics (Vyvsaik Aarthshastra)	1. Acquisition of knowledge of the basic principles of business Economics and how cooperative can be a very effective alternative to the existing system to achieve individual and social welfare by eliminating the tendency, scope of exploitation.
				7. EVS201 :Environmental Studies (Paryavaran Abhyas)	1. Explain Aesthetic/Recreational value of nature, need for public awareness 2. Explain Natural resources and associated problems, Non-renewable resources, renewable resources 3. Explain What can you do to save electricity?, Understanding ecosystems, Resource utilization 4. Explain Causes effect and control of water pollution, Air pollution, and noise pollution 5. Understand about environment and green practices to be followed.
				8. HEN101 : Foundation Course in Hindi and English (Hindi Va Engraji Bhashancha Adhishtan Abhyaskram)	1. Development of knowledge of Hindi and English language from communication point of view. 1. Development of writing skills in Hindi and English language. 2. Development of expression skills and listening skills in Hindi and English language.

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				9. MGM218 : cooperatives : Principle and Practices (Sahakar : Tattve ani Karyapadhati)	1. Acquisition of knowledge of cooperative principle and functions. 2. Capacity building in contributions in cooperative banking society or any other activity being run on Cooperative basis 3. Capacity building to motivate other to use Cooperative principle in day to day life, business or economic activity to benefit individuals and Society at large.
				10. MGM219 :Cooperative Management and Administration (Sahakari Vyvastapan Va Prashasan)	1. Capacity buildings to contribute in the establishment of a cooperative society. 2. Capacity building to provide services on professional basis in establishing cooperative society undertakings activity by providing knowledge of legal issues Cooperative laws sub law. 3. Ability to contribute professionally in the management and administration of cooperative society or activity
				11. MGM220 :Cooperative Laws and Other Laws (Sahakari Kayada Va Itar Kayade)	1. Ability to provide knowledge in establishing cooperative society from legal point of view. 2. Ability to contribute in the management and administration of a cooperative society. 3. Ability to contribute professionally in the management and administration of cooperative society or in activity.
				12. MGM221 :Cooperative Accounting , banking and Auditing (Sahakari Jamakharch: Banking Va Lekhaparikshan)	1. Ability to write accounts of a cooperative society or a bank 2. Ability to guide professionally as to how accounts can be maintained of a cooperative bank or an activity. 3. Capacity buildings to undertake the task of accounts writing, auditing accounts maintaining of a cooperative society.
				13. MGM222 : Case Study and Project Report (Sthiti: Abhyas v Prakalp Ahaval)	1. Ability to assign manpower and duties as per their skills, ability. 2. Ability to train manpower. 3. Capacity to select manpower for the required job
				14. MGM225 :Business Communication (Vyavsaya Sadnyapan)	1. Ability to make effective business communication. 2. Ability to access Jorge and make people understand importance of business communication. 3. Ability to contribute professionally in effective business communication.

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				15. MGM230 : Dairy Cooperative Farming (Sahakari Dugdha Vyavsaya)	1. Capacity to unite farmers engaged in livestock farming 2. Capacity to initiate activity of milk collection and distribution. 3. Ability to undertake Cooperative activity and small scale basis
				16. MGM231 : Cooperative Banking Sahakari Banking	1. Ability to work in a cooperative society. 2. Ability to work as small savings daily collects in Cooperative Bank. 3. Ability to write books of accounts, daily correspondence and administration of a cooperative bank or a society.
				17. MGM235 :Apex Cooperative Bodies (Shikhar Sahakari Sanstha)	1. Ability to work in primary agriculture cooperative society. 2. Ability to people to be member of cooperative society and advantages of it 3. Capacity to write accounts work as recovery officer in a Cooperative Bank Society 4. Ability to write people and convey them important of cooperative principles to initiate an activity based on the Cooperative principle.
				18. MGM240 :Cooperative Farming and Agribusiness (Sahakari Krushi Vyavsaya)	1. Ability to demonstrate how agriculture can be very successful business if run on Cooperative basis. 2. Ability to contribute professionally in agriculture society seeds pesticides and stores. 3. Ability to unite, train farmers for Cooperative activity
				19. MGM308 :Marketing Management 1 (Vipanan Vyvastapan-1)	1. Ability to undertake marketing of products. 2. Ability to work in an industry in the marketing division. 3. Ability to guide in marketing of a goods or products
				20. MGM309 : Marketing Management 2 (Vipanan Vyvastapan-2)	1. Ability to undertake marketing of products. 2. Ability to work in an industry in the marketing division. 3. Ability to guide in marketing of a goods or products
05	B.C.A. (Bachelor of Computer	**After completing this program, the learner will able to :** 1. Acquire knowledge and	**After completing this program, the learner will able to :** 1. Train a person in computer basics and Information	1.AEC001 : English Communication	After completing this course, the learner will be able to: 1.Communicate effectively and appropriately in real life situation and integrate the use of four language skills a) Reading b) Writing c) Listening d) Speaking

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	Applications)	skills in using information technology in office communication and business.	Technology. 2. Enable the students to acquire knowledge of software development.. 3. Increase employability of learners in Information Technology sector.	2.CMP201 : Programming Expertise in C	1. Understand algorithms, computing problems and use of programming concepts to develop logical solutions.
				3.CMP202 : Data Structures Through C	1. Understand algorithms, data structures with its applications and implement learned algorithm design techniques and data structures to solve problems.
				4.CMP203 : OOPs and C++	1. Develop algorithms for solving problems by using modular programming concepts and explore and apply tools and best practices in object-oriented programming to provide analytical and logical solutions.
				5. CMP204 : Office Tools	1. Efficiently Use office tools like Microsoft word, excel, PowerPoint etc. in implementing better documentation and presentations and Perform basic office duties and responsibilities.
				6.CMP205 : Software Engineering	1. Develop the software projects or prototypes by understanding the requirements and will be efficient in using the software design and coding techniques along with project management.
				7.CMP206 : Principles of Data Base Management System	1. Construct an Entity-Relationship (E-R) model from specifications and to transform to relational model, understand SQL databases and database transaction management and use these applications of database systems
				8.CMP207 : Computer Fundamentals	1. Identify and analyze common types of computing problems & apply logic to develop solutions using programming in day to day Applications.
				9.CMP209 : Data Communication and Networking	1. Gain fundamental knowledge on data communication and the design of computer networks and network security and use these tools and techniques in network development, administration.
				10. CMP211 : Visual Programming	1. Understand interface design (GUI) concepts, event based programming and use them to code visual programs by using Visual Basic work environment.
				11. CMP212 : Building Web Portals through ASP.NET	1. Understand .Net Framework and ASP.Net controls and use them to Develop dynamic web applications, create and consume web services.
				12. CMP213 : Programming	1. Understand .Net Framework and C# controls and use them to

Sr. No	Name of Program	Program Learning Outcomes	Program Specific Learning Outcomes	Name of Course with code	Course Learning Outcomes
				Excellence Through C#	Develop dynamic web applications, create and consume web services.
				13. CMP214 : Enterprise Solutions using J2EE	1. Design and develop dynamic, database-driven application using J2EE and will be able to connect to any JDBC-compliant database, and perform hands on practice with a database to create database-driven connectivity.
				14. CMP215 : Data Structures through C++	1. Gain knowledge of various methods used in data structures, Apply and implement learned algorithm design techniques, Object orientated concepts and data structures to solve problems.
				15. CMP216 : Distributed Computing through COM/DCOM	1. Understanding Distributed Computing, COM and Distributed component object model architecture and its applications and uses in network integration and security management.
				16. CMP217 : DirectX Game Programming	1. Understand the process of game designing and development /programming and writing APIs and SDK' using game development tools based on MFC and DirectX from windows.
				17. CMP218 : Writing Windows Device Drivers	1. Gain knowledge of the basic fundamentals of writing a Windows *device driver* and Design, develop, and deploy hardware and device drivers for Windows PCs and other devices.
				18. CMP220 : Programming Excellence through VB.NET	1. Understand .Net Framework and VB.Net controls and use them to Develop dynamic web applications, create and consume web services.
				19. CMP221 : Statistical Techniques	1. Choose and apply appropriate numerical methods and statistical techniques to obtain approximate solutions to difficult mathematical problems.
				20. CMP223 : Computer Organization	1. Understand and use computer systems and its components, storage /I/O devices and their working and PC troubleshooting.
				21. CMP226 : Enterprise Resource Planning (ERP)	1. Understand and use computer systems and its components, storage /I/O devices and their working and PC troubleshooting.
				22. CMP227 : E-Commerce	1. Demonstrate an understanding of basic Business models, retailing in E-commerce by analyzing branding and pricing strategies, using and determining the effectiveness of market

Sr. No	Name of Program	Program Learning Outcomes	Program Specific Learning Outcomes	Name of Course with code	Course Learning Outcomes
					research and use of E-payment systems and its applications.
				23. CMP230 : Communication skills and Technical writing	1. Develop/Improve Visual Communication Skills, Writing Skills, conversational skills and research skills. Develop professional work habits, including those necessary for effective collaboration and cooperation with other students, instructors and Service Learning contact representatives.
				24. CMP242 : Humanities and Social Obligations	1. Understand the role of individuals and institutions within the context of society and Apply knowledge and experience to foster personal growth and better appreciate the diverse social world in which we live.
				25. CMP247 : JAVA	1. Understand the concept of OOP ,Create Java application programs using sound OOP practices, Use testing and debugging tools to automatically discover errors of Java programs as well as use versioning tools for collaborative programming/editing.
				26. CMP248 : Linux	1. Understand Linux operating systems, its installation , different tools using in Linux system administration and management and handle Microsoft network, mail server and web servers
				27. CMP250 : Mathematics for computers	1. Choose and apply appropriate numerical methods to obtain approximate solutions to difficult mathematical problems and demonstrate working of various numerical methods and their applications.
				28. CMP255 : Operating Systems	1. Identify basic components of operating system, operating system installation, Understanding and simulate activities of various operating system components, Memory /process , I/O devices management , scheduling algorithms and their working , create and use different file systems.
				29. CMP256 : Oracle	1. Understand and implement basis of programming, management, and security issues of working with PL/SQL program units, use of built-in packages that come with Oracle, the creation of triggers, and stored procedure features and creating and handling of databases.
				30. CMP258 : Professional Development	1. Develop professional work habits, including those necessary for effective collaboration and cooperation with other students, instructors and Service Learning contact representatives.

Sr. No	Name of Program	Program Learning Outcomes	Program Specific Learning Outcomes	Name of Course with code	Course Learning Outcomes
				31. CMP259 : Project	1. Apply and extend technologies and concepts learned throughout the program to develop/design applications, product prototype and understand and make use of software development life cycle and project management.
				32. CMP262 : Study Skills	1. Provides information, techniques, strategies and skills helpful in becoming more efficient in note taking, textbook reading, and taking exams. It helps students in identification of preferred learning style and development of skills in scheduling study time, library research, memory strategies and critical thinking.
				33. CMP263 : System Analysis & Design	1. Understanding and implementing the requirements analysis, gathering and documentation concepts and use Software development life cycle processes to design systems/products.
				34. CMP332 : Quantitative Aptitude	1. Apply Quantitative/Logical/verbal/probabilistic reasoning to draw conclusions or make decisions and communicate their rationale based on understanding, analysis, and critique of self-created or reported statistical information and statistical summaries and Compete in various competitive exams like CAT, CMAT, GATE, GRE, GATE, UPSC, GPSC etc.
				35. CMP400 : Environmental Studies	1. Understand environment and its various components, related issues and problems, identifying and solving them and using experiences and acquired knowledge to save the environment for future generations.
				36. CMP401 : Cloud computing	1. Understand core concepts of cloud storage and demonstrate their use in storage systems and Analyze various cloud programming models and apply them to solve problems on the cloud.
				37. CMP402 : Mobile Application Development	1. Understand Mobile application development for the Android Operating System using XML, java and developing simple applications that could run on Android phones and tablets. Also helps students understand Android application development phases, terminologies, application design, and coding.
				38. CMP403 : Software Testing	1. Ability understand and identify various software testing problems, and solve these problems by designing and selecting

Sr. No	Name of Program	Program Learning Outcomes	Program Specific Learning Outcomes	Name of Course with code	Course Learning Outcomes
					software test models, criteria, strategies, and methods.
				39. CMP501 : Mathematics	1. Choose and apply appropriate numerical methods to obtain approximate solutions to difficult mathematical problems and demonstrate working of various numerical methods and their applications.
				40. CMP502 : Problem Solving Using Computers	1. Identify and analyze common types of computing problems & apply logic to develop solutions using programming in day to day Applications.
				41. CMP503 : Programming Using C++	1. Develop algorithms for solving problems by using modular programming concepts and build object models and design software solutions using object-oriented principles and strategies
				42. CMP504 : Statistics	1. Choose and apply appropriate numerical methods and statistical techniques to obtain approximate solutions to difficult mathematical problems.
				43. CMP505 : Data Structure Using C++	1. Gain knowledge of various methods used in data structures, Apply and implement learned algorithm design techniques, Object orientated concepts and data structures to solve problems.
				44. CMP506 : Computer Networks	1. Gain fundamental knowledge on data communication and the design of computer networks and network security and use these tools and techniques in network development, administration.
				45. CMP507 : Operating System	1. Identify basic components of operating system, operating system installation, Understanding and simulate activities of various operating system components, Memory /process , I/O devices management , scheduling algorithms and their working , create and use different file systems.
				46. CMP508 : Web Technologies	1. Develop web pages and web application using HTML, JavaScript, CSS, PHP and use Web Application Terminologies, Internet Tools, E – Commerce and other web services.
				47. CMP509 : Database Management System	1. Construct an Entity-Relationship (E-R) model from specifications and to transform to relational model, understand SQL databases and database transaction management and use

Sr. No	Name of Program	Program Learning Outcomes	Program Specific Learning Outcomes	Name of Course with code	Course Learning Outcomes
					these applications of database systems.
				48. CMP510 : Computer System Architecture	1. Understand and use computer systems and its components , storage /I/O devices and their working and PC troubleshooting
				49. CMP511 : Software Engineering	1. Develop the software projects or prototypes by understanding the requirements and will be efficient in using the software design and coding techniques along with project management.
				50. CMP512 : Java	1. Understand the concept of OOP ,Create Java application programs using sound OOP practices, Use testing and debugging tools to automatically discover errors of Java programs as well as use versioning tools for collaborative programming/editing.
				51. CMP513 : E Commerce Technologies	1. Demonstrate an understanding of basic Business models, retailing in E-commerce by analyzing branding and pricing strategies, using and determining the effectiveness of market research and use of E-payment systems and its applications.
				52. CMP514 : Advance Java	1. Design the application of Databases in the Java programming through JDBC and dynamic web application development using Servlet and JSP
				53. CMP515 : Linux Administration	1. Understand Linux systems, its installation , different tools using in Linux system administration and management and handle Microsoft network, mail server and web servers
				54. CMP516 : Android Programming	1. Understand mobile computing, Android architectures working, its applications and use different tools to design, develop and deploy application in actual android device.
				55. CMP517 : PHP Programming	1. Understand and use PHP, SQL and PHP frameworks, content management using WordPress and develop web applications using these tools.
				56. CMP701 : Lab: Mathematics	1. Choose and apply appropriate numerical methods to obtain approximate solutions to difficult mathematical problems and demonstrate working of various numerical methods and their applications.
				57. CMP702 : Lab: Problem Solving Using Computers	1. Develop logical solutions and create programs, applications in C.

Sr. No	Name of Program	Program Learning Outcomes	Program Specific Learning Outcomes	Name of Course with code	Course Learning Outcomes
				58. CMP703 : Lab: Programming Using C++	1. Develop logical solutions and create programs, and object oriented applications in C++
				59. CMP704 : Lab: Statistics	1. Choose and apply appropriate numerical methods and statistical techniques to obtain approximate solutions to difficult mathematical problems.
				60. CMP705 : Lab: Data Structure Using C++	1. Apply and implement learned algorithm design techniques, Object orientated concepts and data structures to solve problems/ create different applications.
				61. CMP706 : Lab: Computer Networks	1. Use different computer network tools to establish networks, managing the network administration and its security.
				62. CMP707 : Lab: Operating System	1. Operating system installation, demonstration and use of various memory management and process scheduling techniques, create and use different file system.
				63. CMP708 : Lab: Web Technologies	1. Develop web pages and web application using HTML, JavaScript, CSS, PHP and use Web Application Terminologies, Internet Tools, E – Commerce and other web services.
				64. CMP709 : Lab: Database Management System	1. Create and use different types of databases and their applications , managing database transactions and security
				65. CMP710 : Lab: Computer System Architecture	1. Demonstrate PC Troubleshooting and use of different Maintenance Tools.
				66. CMP711 : Lab: Software Engineering	1. Develop the software projects or prototypes and use software testing and debugging tools.
				67. CMP712 : Lab: Java	1. Create Java application programs using sound OOP practices, Use testing and debugging tools to automatically discover errors of Java programs as well as use versioning tools for collaborative programming/editing.
				68. CMP713 : Lab: E Commerce Technologies	1. Perform market research and develop strategies, risks assessment and solution development.
				69. CMP714 : Lab: Advance Java	1. Design the application of Databases in the Java programming through JDBC and dynamic web application development

Sr. No	Name of Program	Program Learning Outcomes	Program Specific Learning Outcomes	Name of Course with code	Course Learning Outcomes
					using Servlet and JSP
				70. CMP715 : Lab: Linux Administration	1. Perform Linux installation and troubleshooting, using different administration /management tools and handle Microsoft network, mail server and web servers
				71. CMP716 : Lab: Android Programming	1. Gain knowledge of mobile computing, Android architectures working, its applications and use different tools to design, develop and deploy application in actual android device.
				72. CMP717 : Lab: PHP Programming	1. Understand and use PHP, SQL and PHP frameworks, content management using Word Press and develop web applications using these tools.
				73. CMP801 : Project-BCA	1. Apply and extend technologies and concepts learned throughout the program to develop/design applications, product prototype and understand and make use of software development life cycle and project management.
				74. ENV121 : Environmental Studies	1. Understand environment and its various components, related issues and problems, identifying and solving them and using experiences and acquired knowledge to save the environment for future generations.
				75. ICT151 : IT And E-Learning Skills	1. Analyze the information, by identifying its different components and use different resources of e-learning like LMS,OERs, MOOC, Mobile , productivity tools etc.
				76. OPN272 : Financial And Investment Skills	1. Select and employ base level tools for financial analysis, analyze companies for investment purposes, develop portfolio strategies for individual and institutional investors and analyze the relevant legal issues involved in civil and criminal matters affecting business.
				77. OPN273 : Personality And Career Skills	1. Acquire Soft skills and develop pleasant and appealing personality traits as self-confidence, positive attitude, emotional intelligence, social grace, flexibility, friendliness and effective communication skills which will help them acquire good career opportunities and use the learned concepts of time/stress/workflow management in work and personal life.
06	B. Ed.	**After learning this**	**After learning this program,**	1. EDU101-Student & their	**After learning this course, the learner will be able to:** 1. Academic psychology can be used in teaching.

Sr. No	Name of Program	Program Learning Outcomes	Program Specific Learning Outcomes	Name of Course with code	Course Learning Outcomes
	(Bachelor of Education)	**program, the learner will able to :** 1.Understand psychological basis of education in development of children and their testing, guidance and counseling	**the learner will able to :** 1. Understand the developmental Processes and needs of children and adolescents and role in facilitating development 2. Familiarizes with psychological Principals in curriculum transactions and Psychological testing, guidance and counseling 3. Acquaint with professionalization of teacher education	Development	
				2. EDU102-Learning & Teaching	1. Teaching can be done by considering the teaching and the psychology of the teacher.
				3. EDU103-Language of Curriculum, school Faculty & interaction of subject	1.While teaching, the correlation between the curriculum, syllabus and textbook of a particular subject can be explained.
				4. EDU 421Evaluation & Assessment	1.Students can be accurately assessed.
				5. EDU 405 – Pedagogy of School subject: Marathi	1.Marathi subject can be taught according to the content.
				6. EDU 406 - Pedagogy of School subject: Hindi	1.Hindi subject can be taught according to the content.
				7. EDU 407 – Pedagogy of School subject: English	1.English subject can be taught according to the content.
				8. EDU 408Pedagogy of School subject: Sanskrit	1.Sanskrit subject can be taught according to the content.
				9. EDU 409 Pedagogy of School subject: History	1.History subject can be taught according to the content.
				10. EDU 410 – Pedagogy of School subject: Geography	1.Geography subject can be taught according to the content.
				11. EDU 411 - Pedagogy of School subject: Mathematics	1.Mathematics subject can be taught according to the content.
				12. EDU 412 - Pedagogy of School subject: Science	1.Science subject can be taught according to the content.
				13. EDU 413 – Pedagogy of School subject: Economics	1.Economics subject can be taught according to the content.
				14. EDU 414 – Pedagogy of	1.Accountancy subject can be taught according to the content.

Sr. No	Name of Program	Program Learning Outcomes	Program Specific Learning Outcomes	Name of Course with code	Course Learning Outcomes
				School subject: Accountancy	
				15. EDU 441- Art & Craft	1.Will use art in education.
				16. EDU 491- Reading & Reflection	1.Will make the right interpretation of the reading.
				17. EDU 492- Self invention	1.Will recognize themselves.
				18. EDU 422 - Immerging Indian society & Education	1.The role of Indian education experts in education will be clear.
				19. EDU 423 – Gender, school & society	1.Education can inculcate values and culture.
				20. EDU 424 – Knowledge & curriculum	1.Curriculum, syllabus and textbook compatibility can be verified.
				21. EDU 425 - Inclusive Education	1.Special children's disabilities can be considered in the teaching process.
				22. EDU 426 – Education Technology	1.The tools of educational technology can be managed by making proper use of them in teaching.
				23. EDU 427 – Child & Child Education	1.Study methods in child psychology can be used.
				24. EDU 428 – Education & Self help Group	1.Empower women on the basis of self-help groups.
				25. EDU 429 – Value Education	1.Explain the relationship between values and education.
				26. EDU 430 – English for Primary teachers	1.Understand that words behave in a variety of ways in the act of communication
				27. EDU 433 – Communication Modes in Education	1.Content can be communicated effectively.
				28. EDU 434 – Primary Education	1.The nature of primary education can be explained.

Sr. No	Name of Program	Program Learning Outcomes	Program Specific Learning Outcomes	Name of Course with code	Course Learning Outcomes
				& their responsibilities	
				29.435 UDE – Secondary Education & their responsibilities	1.The nature of secondary education can be explained.
				30. EDU 436 – Changing role of Teachers & their actions	1.Will do action research.
				31. EVS – 201 Environment Education	1.Protect and nurture the environment.
				32. EDU 494- Application of information communication technology in Education	1.They can use information communication technology in education.
				33.EDU 442- Reflection on school activities	1.Will meditate on your every action.
07	B. Lib. & I. Sc. (Bachelor of Library and Information Science)	**After learning this program, the learner will able to :** 1.Train and develop skills in management of institutional library and provide library services to learners	**After learning this program, the learner will able to :** 1. Develop capacities for the effective administration and management of the library. 2. Develop skills and techniques to select categories for books. 3. Provide effective library services	1. LIB001 : Library & Society	**After learning this course, the learner will be able to:** 1. Understand the Role of library, types of Libraries and their Functions, Laws of Library, Concept of Resource sharing and User study, Library Legislation Library Associations, Schemes and Progrmmes.
				2. LIB002 : Library Management	1. Understand the basics of management and its application in library management, Accessioning, Circulation and Maintenance of documents, Selecting and acquiring of documents and collection development, Library usage and maintenance of the library and prepare budgeting and stock verification.
				3. LIB003 : Library Classifications	1. Understand library classification, aims, and features; Various concepts and theories/ principles in library classification, Schemes of Classification, Characteristics, Merits and Demerits and Various standards in document description, Various facets of Notation and Call Number, the basic subject and their kinds, the Postulates and Principles of Classification.

Sr. No	Name of Program	Program Learning Outcomes	Program Specific Learning Outcomes	Name of Course with code	Course Learning Outcomes
				4. LIB004 : Library Cataloguing	1. Get knowledge of book classification (class numbers for documents with simple, compound and complex subject), class numbers by using the standard subdivisions/common isolates/auxiliary tables, compilation of book numbers and capacity to use index of the classification scheme and Steps in Practical Classification etc.
				5. LIB005 : Reference Service & Sources	1. Understand the concept of library catalogue, various concepts and theories in cataloguing, the Main and Added entries of library catalogue, various Inner and Outer forms of library catalogue, various approaches of acquiring subject headings, the concept of co-operative and centralized cataloguing, the normative principles of cataloguing, the concept and importance of bibliography, the Information Retrieval, Trade bibliography and bibliographic control, various catalogue entries for simple, complex, various authorships, editorial publications, serial publications and corporate body documents and catalogue entries for non-print materials.
				6. LIB006 : Information Service	1. Get practical knowledge about cataloguing, use the catalogue codes and standards, the concept of library catalogue, main and added entries of library catalogue, various inner and outer forms of library catalogue, various approaches of deriving subject headings, prepare catalogue entries for various types of information sources, subject headings using various methods and tools and AACR-2 in detail.
				7. LIB007 : Computer Application in Libraries	1. Understand Reference Service, Information Sources, theories and philosophy of reference service, concept of user education, kinds and nature of reference service in different types of libraries, concept of classification of reference sources and their evaluation, reference questions and their information sources with bibliographical description, expertise in providing reference services to users of a library and write reference project.
08	B. Sc. (Compute	**After learning this program, the learner will**	**After learning this program, the learner will able to :**	1. CMP400 : Environmental Studies	**After learning this course, the learner will be able to:** 1. Understand environment and its various components, related issues and problems, identifying and solving them and using

Sr. No	Name of Program	Program Learning Outcomes	Program Specific Learning Outcomes	Name of Course with code	Course Learning Outcomes
	r System Administration)	**able to :** 1.Understand computer and computer network technology in communication and in business management.	1. Develop skills relevant to computer networking and work places. 2. Able to create conductive environment for online Learning. 3. Apply the knowledge and skills in business operations.		experiences and acquired knowledge to save the environment for future generations.
				2. CSA101 : Introduction to IT Hardware	1. Provide the participant much needed knowledge of computer hardware and networking.
				3. CSA102 : Troubleshooting IT Hardware	1. Identify and rectify the on board computer hardware, software and network related problems.
				4. CSA103 : Building and Maintaining a Small Office Network	1. Know how interconnect more than one computer to form a network to communicate and transfer data.
				5. CSA104 : Troubleshooting IT Network	2. Know how to troubleshoot and solve Networking Problem including Passive and Active Components.
				6. CSA105 : IT Skills - Basics	1. Developed a product or process by applying knowledge of programming, web, database, human computer interaction, and networking and security tools.
				7. CSA111 : Business Communication - 1	1. Provide an overview of Prerequisites to Business Communication, to provide an outline to effective Organizational Communication, to underline the nuances of Business communication.
				8. CSA112 : Introduction To IT Hardware	1. Explains the relationships between the components of a computer and how data are transferred among the components. Identify the peripheral devices outside computer. Uses computer using input devices, such as keyboard and mouse. Transfers data outside the computer using output devices, such as screen and printer.
				9. CSA113 : Introduction to IT Networks	1. Explains the computer networks, relationships between the components of network and how data flows in network and also use of different network management and security tools.
				10. CSA114 : IT Skills - Basics	1. Developed a product or process by applying knowledge of programming, web, database, human computer interaction, networking and security tools
				11. CSA115 : Troubleshooting It	1. Identify and rectify the on board computer hardware, software and network related problems.

Sr. No	Name of Program	Program Learning Outcomes	Program Specific Learning Outcomes	Name of Course with code	Course Learning Outcomes
				Hardware	
				12. CSA116 : Troubleshooting It Network	1. Know how to troubleshoot and solve Networking Problem including Passive and Active Components.
				13. CSA117 : Lab: IT Skills - Basics	1. Developed a product or process by applying knowledge of programming, web, database, human computer interaction, and networking and security tools.
				14. CSA201 : Computer Security basics	1. Focuses on the models, tools, and techniques for enforcement of security. Students will learn security from multiple perspectives
				15. CSA202 : Securing workstations and Basic Security Practices	1. Develop basic understanding of security, cryptography, system attacks and defenses against them
				16. CSA203 : Desktop Operating systems	1. Understand the basic components of computer operating Systems, and the interactions among the various components.
				17. CSA204 : Managing and maintaining Desktop OS	1. Manage the resources of a computer system , keep track of who is using which resource, granting resource requests, and mediating conflicting requests from different programs and users., provide efficient and fair sharing of resources among users and programs.
				18. CSA205 : Mini Project -1	1. Apply and extend technologies and concepts learned throughout the program to develop/design applications, product prototype and understand and make use of software development life cycle and project management
				19. CSA211 : Computer Security Basics	1. Focuses on the models, tools, and techniques for enforcement of security. Students will learn security from multiple perspectives
				20. CSA212 : Desktop Operating Systems	1. Understand the basic components of computer operating Systems, and the interactions among the various components.
				21. CSA213 : Managing And Maintaining Desktop OS	1. Manage the resources of a computer system , keep track of who is using which resource, granting resource requests, and mediating conflicting requests from different programs and

Sr. No	Name of Program	Program Learning Outcomes	Program Specific Learning Outcomes	Name of Course with code	Course Learning Outcomes
					users., provide efficient and fair sharing of resources among users and programs.
				22. CSA214 : Lab: Computer Security Basics	1. Develop basic understanding of security, cryptography, system attacks and defenses against them
				23. CSA215 : Lab: Desktop Operating Systems	1. Operating system installation, demonstration and use of various memory management and process scheduling techniques, create and use different file system
				24. CSA216 : Lab: Managing And Maintaining Desktop Os	1. Manage the resources of a computer system, keep track of who is using which resource, granting resource requests, and mediating conflicting requests from different programs and users. Provide efficient and fair sharing of resources among users and programs.
				25. CSA301 : Configuring Windows 7	1. Identify and resolve desktop application issues related to configurations , Identify the cause and resolve network configuration issues, Manage and maintain systems and PCs that run Windows 7, Support mobile and remote users, Identify the cause and resolve security configuration issues
				26. CSA302 : Configuring and maintaining Windows 7	1. Provides students with the knowledge and skills to successfully administer, maintain, and troubleshoot Windows 7 computers.
				27. CSA303 : Configuring Windows Server 2008	1. Manage and protect data access and information, simplify deployment and management of the enterprise's identity infrastructure, and provide more secure and traceable access to data.
				28. CSA304 : Configuring and maintaining Windows server 2008	1. Manage and protect data access and information, simplify deployment and management of the enterprise's identity infrastructure, and provide more secure and traceable access to data in windows server 2008
				29. CSA305 : Business Communication: Level 1	1. Provide an overview of Prerequisites to Business Communication, To provide an outline to effective Organizational Communication, To underline the nuances of Business communication.
				30. CSA311 : Business Communication - 2	1. Acquire effective business communications skills, research approaches and information collection, developing and

Sr. No	Name of Program	Program Learning Outcomes	Program Specific Learning Outcomes	Name of Course with code	Course Learning Outcomes
					delivering effective presentations, effective interpersonal communications.
				31. CSA312 : Configuring Windows 7	1. Identify and resolve desktop application issues related to configurations , Identify the cause and resolve network configuration issues, Manage and maintain systems and PCs that run Windows 7, Support mobile and remote users, Identify the cause and resolve security configuration issues
				32. CSA313 : Managing And Maintaining Windows 7	1.Provides students with the knowledge and skills to successfully administer, maintain, and troubleshoot Windows 7 computers.
				33. CSA314 : Configuring Windows Server 2008	1. Trains the candidates to manage and protect data access and information, simplify deployment and management of the enterprise's identity infrastructure, and provide more secure and traceable access to data.
				34. CSA315 : Lab: Configuring Windows 7	1. Identify and resolve desktop application issues related to configurations , Identify the cause and resolve network configuration issues, Manage and maintain systems and PCs that run Windows 7, Support mobile and remote users, Identify the cause and resolve security configuration issues
				35. CSA316 : Lab: Managing And Maintaining Windows 7	1.Understand and demonstrate administration duties, maintain, and troubleshoot Windows 7 computers.
				36. CSA317 : Lab: Configuring Windows Server 2008	1.Trains the candidates to configure windows server 2008, manage and protect data access and information and provide more secure and traceable access to data.
				37. CSA401 : Windows Server 2008 Active Directory, Configuring	1.Includes Installation and Configuration of Active Directory on Windows Server.
				38. CSA402 : Configuring and Maintaining Windows Server 2008 AD	1.Includes Configuration and maintenance activities of Active Directory on Windows Server 2008.
				39. CSA403 : Windows Server 2008 Network Infrastructure,	1. Learn how to Configure IP addressing, routing, and IPsec. Configure name resolution by using Domain Name System

Sr. No	Name of Program	Program Learning Outcomes	Program Specific Learning Outcomes	Name of Course with code	Course Learning Outcomes
				Configuring	(DNS) with windows server, Monitor and manage a network infrastructure with Windows Server 2008.
				40. CSA404 : Configuring and Maintaining Windows Server 2008, NIS	1. Learn how to Manage remote and wireless network access., Configure Network Access Protection (NAP), Configure file and print services with Windows Server 2008., Monitor and manage a network infrastructure
				41. CSA405 : Mini Project -2	1. Apply and extend technologies and concepts learned throughout the program to develop/design applications, product prototype and understand and make use of software development life cycle and project management.
				42. CSA411 : IT Infrastructure Support Services	1. Understand and learn process of infrastructure support and the tools/services used perform duties like provide day-to-day support to employees. This includes desktop support and project support for multiple sites throughout the organization. Responsible for deploying, maintaining, and repairing the computer and network infrastructure of ICL.
				43. CSA412 : Configuring Windows Server 2008 Active Directory	1.Includes Installation and Configuration of Active Directory on Windows Server.
				44. CSA413 : Configuring Windows Server 2008 Network Infrastructure	1. Learn how to Configure IP addressing, routing, and IPsec., Configure name resolution by using Domain Name System (DNS).,Configure remote and wireless network access., Configure Network Access Protection (NAP), Configure file and print services., Monitor and manage a network infrastructure
				45. CSA414 : Managing And Maintaining Windows Server 2008 Network Infrastructure	1. Learn how to Manage remote and wireless network access., Configure Network Access Protection (NAP), Configure file and print services with Windows Server 2008., Monitor and manage a network infrastructure
				46. CSA415 : Lab: Configuring Windows Server 2008 Active Directory	1.Includes Installation and Configuration of Active Directory on Windows Server.

Sr. No	Name of Program	Program Learning Outcomes	Program Specific Learning Outcomes	Name of Course with code	Course Learning Outcomes
				47. CSA416 : Lab: Managing And Maintaining Windows Server 2008 Active Directory	1. Acquire the skills of management and maintenance process Directory on Windows Server like Active Directory Organization,Monitor Active Directory with Premium Tools and Use Security Groups to Apply Permissions to Resources.
				48. CSA417 : Lab: Managing And Maintaining Windows Server 2008 Network Infrastructure	1. Learn how to Configure IP addressing, routing, and IPsec., Configure name resolution by using Domain Name System (DNS).,Configure remote and wireless network access., Configure Network Access Protection (NAP), Configure file and print services., Monitor and manage a network infrastructure
				49. CSA501 : Red Hat Linux Basic Administration	1.Learn designed for IT professionals working to become full-time enterprise *Linux* system administrators.
				50. CSA502 : Configuring and maintaining Red Hat Linux Systems	1.Understand Red Hat Linux operating systems, and demonstrate different tools to maintenance and management
				51. CSA503 : Red Hat Linux Advanced Administration	1. Install Red Hat Linux interactively, Control common system hardware; administer Linux printing sub system Create and maintain the Linux file system, Perform user and group administration, Integrate a workstation with an existing network, Configure a workstation as a client to NIS, DNS, and DHCP services, Back up file systems to tape and tar archive, Manipulate software packages with RPM, Perform performance, memory, and process mgmt. Configure basic host security.
				52. CSA504 : Administering Red Hat Linux Systems	1. Demonstrate duties like Installation of Red Hat Linux interactively, Control common system hardware; administer Linux printing sub system and Create and maintain the Linux file system
				53. CSA505 : Business Communication: Level 2	1. Allow students to acquire effective business communications skills, research approaches and information collection, developing and delivering effective presentations, effective interpersonal communications.
				54. CSA511 : Soft Skills Part I	1.Acquire Soft skills and develop pleasant and

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					appealing personality traits as self-confidence, positive attitude, emotional intelligence, social grace, flexibility, friendliness.
				55. CSA512 : Red Hat Linux Basic Administration	1. Understand Red Hat Linux operating systems, its installation, different tools using in Linux system administration and roles and responsibilities of system administrator.
				56. CSA513 : Configuring And Maintaining Red Hat Linux Systems	1. Understand Red Hat Linux operating systems, and demonstrate different tools to maintenance and management
				57. CSA514 : Red Hat Linux Advanced Administration	1. Understand Red Hat Linux operating systems and demonstrate the use of different tools to handle Microsoft network, mail server and web servers
				58. CSA515 : Lab: Administering Red Hat Linux Systems-1	1. Demonstrate and implement red hat Linux installation and administration activities such as
				59. CSA516 : Lab: Administering Red Hat Linux Systems-2	1. Demonstrate roles and responsibilities of system administrator.
				60. CSA517 : Lab: Administering Red Hat Linux Systems-3	1. Demonstrate how to administrate Microsoft network, mail server and web servers on red hat Linux systems.
				61. CSA601 : Introduction to Ethical Hacking and Advanced Security Practices	1. Understand an insight into ethical hacking and its functions. Give the scoop into what are the foundations, processes and outcomes from Ethical Hacking and common attacks that demand this skill to be acquired.
				62. CSA602 : IT information Security Administration skills	1. Understand and demonstrate roles and responsibilities of IT administrator and use of different tools for providing information security. Provide day-to-day support to employees includes desktop support Responsible for deploying, maintaining, and repairing the computer and network infrastructure and providing resolution to security issues.
				63. CSA603 : Project	1. Apply and extend technologies and concepts learned throughout the program to develop/design applications, product prototype and understand and make use of software development life cycle and project management.

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				64. CSA611 : Soft Skills Part II	1. Acquire effective soft skills like critical thinking and communication skills which will help them acquire good career opportunities and use the learned concepts of time/stress/workflow management in work and personal life
				65. CSA612 : Ethical Hacking	1. Understands the security holes in the systems, use of different hacking tactics and its functions, critical risk assessment and find solutions to prevent any kind of penetrations or security breaches
				66. CSA613 : Advanced Security Practices	1. Develop basic understanding of security, cryptography, system attacks and defenses against them
				67. CSA614 : Lab: Ethical Hacking	1. Demonstrate the use of different tools learned in theory to protect system/organization from hacking and penetration attempts.
				68. CSA615 : Lab: Advanced Security Practices	1. Plan, perform and evaluate security tests from a variety of perspectives, Analyze a given set of security policies and procedures, along with security test results, to determine effectiveness and Help the organization build information security infrastructure.
				69. CSA616 : Project	1. Apply and extend technologies and concepts learned throughout the program to develop/design applications, product prototype and understand and make use of software development life cycle and project management.
				70. ENV121 : Environmental Science	1. Understand environment and its various components, related issues and problems, identifying and solving them and using experiences and acquired knowledge to save the environment for future generations.
09	B. Sc. (Media Graphics & Animation)	**After learning this program, the learner will able to :** 1.Understand power of media graphics and animation industry and create design	**After learning this program, the learner will able to :** 1. Develop skilled manpower for product design from the initial concept to the delivery of projects.	1. BMG101 : Introduction to Computers & Internet	**After learning this course, the learner will be able to:** 1. Operate computers and internet successfully
				2. BMG102 : Drawing and Sketching	1. Draw and sketch components required in creation of media graphics and animation.
				3. BMG103 : Color Theory	1. Use the knowledge of color theory required in creation of media graphics and animation.

Sr. No	Name of Program	Program Learning Outcomes	Program Specific Learning Outcomes	Name of Course with code	Course Learning Outcomes
		and deliver products within limited budget.	2. Educate and train a person in animation, photo editing and website design. 3. Inculcate technical and commercial skills in order to deliver projects within the budgetary provision.	4. BMG104 : Typography	1. Use typography required in creation of media graphics and animation.
				5. BMG105 : Computer Graphics Part-I:Adobe Photoshop	1. Use adobe Photoshop required in creation of media graphics and animation.
				6. BMG106 : Computer Graphics Part-II: Adobe Illustrator	1. Use adobe Photoshop illustrator required in creation of media graphics and animation.
				7. BMG107 : Technical and Creative Writing	1. Do technical and creative writing required in creation of media graphics and animation
				8. BMG108 : Introduction to Multimedia and its Application	1. Apply the knowledge of multimedia and application required in creation of media graphics and animation
				9. BMG109 : Developing Presentations	1. Use the knowledge of developing presentations required in creation of media graphics and animation
				10. BMG110 : Design Principles	1. Use adobe Photoshop illustrator required in creation of media graphics and animation
				11. BMG111 : Print Media Part-I:Coral Draw	1. Use the knowledge of coral draw in print media
				12. BMG112 : Print Media Part-II: Quark Express	1. Use the knowledge of quark express in print media
				13. BMG201 : Introduction to Web Development	1. Develop the web
				14. BMG202 : HTML	1. Develop HTML
				15. BMG203 : Computer Animation: Introduction to Flash	1. Use the knowledge of flash required in creation of media graphics and animation
				16. BMG204 : Content Digitization	1. Use the knowledge of content digitization required in creation of media graphics and animation
				17. BMG205 : Content Authoring on Web using Macromedia	1. Use the knowledge of content authoring on web using Macromedia Dreamweaver

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				Dreamweaver	
				18. BMG206 : Developing Dynamic Web pages using Java and VB Scripts	1. Develop dynamic web pages using Java and VB Scripts
				19. BMG207 : Video-Production Basics	1. Create basic video production.
				20. BMG208 : Story Boarding	1. Create story boarding
				21. BMG209 : Visual Communication	1. Create visual communication
				22. BMG210 : Audio Editing: Sound Forge	1. Do audio editing using sound forge
				23. BMG211 : Video-Editing: Adobe Premier	1. Do video editing using adobe premier
				24. BMG212 : Advance Video Effects	1. Do advance video effects.
				25. BMG301 : Animation Principles	1. Use the knowledge of animation principles required in creation of media graphics and animation
				26. BMG302 : Introduction to Maya	1. Use the knowledge of Maya
				27. BMG303 : Character Set up & Animation in Maya	1. Use character set up and animation in Maya
				28. BMG304 : Advanced Maya	1. Use the knowledge of advanced Maya required in creation of media graphics and animation
				29. BMG305 : Introduction to 3DS Max	1. Use the knowledge of 3DS max required in creation of media graphics and animation
				30. BMG306 : Advanced 3DS Max	1. Use the knowledge of advanced 3DS max required in creation of media graphics and animation

Sr. No	Name of Program	Program Learning Outcomes	Program Specific Learning Outcomes	Name of Course with code	Course Learning Outcomes
				31. BMG307 : Character Animations	1. Create character animations
				32. BMG308 : CG Film Making	1. Create CG Film making
				33. BMG309 : Project Work	1. Use the knowledge which he/she learnt through B Sc MGA programme
				34. BMG310 : Environment Science	1. Apply the knowledge of environment science in his profession and daily life.
10	B.Sc. (Physics, Chemistry, Mathematics)	**After learning this program, the learner will able to :** 1. Understand the basic concepts of Physics, Chemistry and Mathematics and their significance in day to day life.	**After learning this program, the learner will able to :** 1. Prepare students with clear understanding of important basic concepts and principles of Physics, Chemistry, Mathematics and their relevance in day to day life 2. Expose students to current trends in research about Physics, Chemistry, Mathematics 3. Impart important skills which are essential for success in world of work	1. AEC111 : English Communication	**After learning this course, the learner will be able to:** 1. Communicate effectively with others.
				2. AEC211 : Environmental Science	1. Understand importance of environment so as to protect and preserve environment
				3. S34121 : Physics - 01	1. Understand the Laws of motion and apply them in calculations of the motion of simple systems.
				4. S34122 : Physics - 01 Practical	1. Conduct practical activities related Newton's laws and based on Physics-01
				5. S34221 : Physics - 02	1. Understand the different concept of Electrostatics.
				6. S34222 : Physics - 02 Practical	1. Correlate their physics theory concepts through practical.
				7. S34321 : Physics - 03	1. Understand the different concept of Thermodynamics.
				8. S34322 : Physics - 03 Practical	1. Conduct practical activities on the different concept of Thermodynamics
				9. S34421 : Physics - 04	1. Explain the concept of Fluids and Sound.
				10. S34422 : Physics - 04 Practical	1. Demonstrate practical skills during conduct of practical activities
				11. S34521 : Physics - 05	1. Explain the operation of logic gates.
				12. S34522 : Physics - 05 Practical	1. Conduct practical activities based on Physics 05

Sr. No	Name of Program	Program Learning Outcomes	Program Specific Learning Outcomes	Name of Course with code	Course Learning Outcomes
				13. S34621 : Physics - 06	1. Explain the concept and application of Microcontroller.
				14. S34622 : Physics - 06 Practical	1. Demonstrate quantitative problem solving skills
				15. S37131 : Chemistry - 01	1.Define atomic number and atomic mass numberand discovery of electron, proton and neutron and their characteristics..
				16. S37132 : Chemistry - 01 Practical	1.Conduct the practical activities based on Chemistry 01
				17. S37231 : Chemistry - 02	1.Understand the law of thermodynamics, electrolytes, aromatic hydrocarbon and properties of alcohol and calculate the percentage of ionic character of molecules.
				18. S37232 : Chemistry - 02 Practical	1.Demonstratethe practical activities based on Chemistry 02
				19. S37331 : Chemistry - 03	1.Apply concepts and principles associated with chemical energy, chemical kinetics and electron transfer reactions.
				20. S37332 : Chemistry - 03 Practical	1.Demonstrate competence required for the practical skills and techniques used in physical and organic chemistry and analysis of experimental results
				21. S37431 : Chemistry - 04	1.Understand and explain the structure and bonding in molecules / ions and predict the structure of molecules / ions.
				22. S37432 : Chemistry - 04 Practical	1.Demonstrate competence required for the practical skills and techniques to understand fundamentals of the chemistry of the main group elements, and important real world applications of many of these species.
				23. S37531 : Chemistry - 05	1. Understand principles of coordination chemistry to explain how nature tailors properties of metal centers for specific applications.
				24. S37532 : Chemistry - 05 Practical	1. Demonstrate the practical activities based on Chemistry 05
				25. S37631 : Chemistry - 06	1.Acquire the competence to think of chemistry as a sustainable activityand public awareness in evolution,
				26. S37632 : Chemistry - 06	1. Conduct practical activities based on Chemistry 06

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				Practical	
				27. S41141 : Mathematics - 01	1.Explain the concept of function.
				28. S41142 : Mathematics - 01 Practical	1. Apply theorems on limit, differentiation to solve the problems.
				29. S41241 : Mathematics - 02	1. Explain and Convert separable and homogeneous equations to exact differential equations by integrating factors.
				30. S41242 : Mathematics - 02 Practical	1. Describe first order and higher order differential equation, partial difference equation.
				31. S41341 : Mathematics - 03	1. Explain the concept convergence of a sequence.
				32. S41342 : Mathematics - 03 Practical	1. Understand the problems of set theory, problems of convergence, sequences and series.
				33. S41441 : Mathematics - 04	1.Understanding of the idea of a group, a ring and an integral domain, and be aware of examples of these structures in mathematics.
				34. S41442 : Mathematics - 04 Practical	1. Explain problems in group theory and ring theory.
				35. S41541 : Mathematics - 05	1. Understand algebraic and geometric representations of vectors in R^n and their operations, including addition, scalar multiplication and dot product.
				36. S41542 : Mathematics - 05 Practical	1. Define problems of vector spaces and matrices.
				37. S41641 : Mathematics - 06	1.Describing and understanding of the several errors and approximation in numerical methods.
				38. S41642 : Mathematics - 06 Practical	1. Apply various numerical methods to solve problems.
				39. SEC311 : IT and ELearning Skills	1.Develop IT and ELearning skills required in day to day life and in education.
				40. SEC411 : Research Methodology	1. Describe various aspects of research at basic level.

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				41. SEC511 : Financial and Investment Skills	1. Develop an understanding of financial investments, instruments, and markets.
				42. SEC611 : Personality and Career Skills	1.Explain how to acquire necessary skills, both in and out of class, for your career goals.
11	B. Ed. (Special Education	**After learning this program, the learner will able to :** 1.Understand process of human development, Indian education system and acquire skills in assessing educational needs of children with disabilities.	**After learning this program, the learner will able to :** 1. Acquire knowledge & skills about human development, contemporary Indian education, and pedagogy of various school subjects and assessment for learning. 2. Acquire knowledge & skills about nature and educational needs of children with disabilities as well as of few select specific disabilities. 3. Develop conceptual understanding of education provisions and skills for working with children with various disabilities in Special and inclusive settings.	1. EDU281 : Human Growth and Development	**After learning this course, the learner will be able to:** 1. Explain the process of stage wise development, critically analysis of developmental variations, influencing factors with special focus on infancy, childhood adolescence.
				2. EDU282 : Contemporary India and Education	1.Explain and analyse the Philosophies of education, role of educational system, concept of diversity and challenges faced by the Contemporary Indian Education in global context.
				3. EDU283 : Learning, Teaching and Assessment	2.Comprehend the theories of learning, the learning process, the stages of teaching and learning and the role of teacher and assessment in teaching learning process in order to introduce dynamic assessment scheme
				4. EDU291 : Inclusive Education	1.Develop an understanding about inclusive education and addressing diversity in the mainstream classroom. It is also formulated in a way that the learners will know the pedagogical practices and recognises ways in which different stakeholders can collaborate for the success of inclusive education.
				5. EDU292 : Introduction to Sensory Disabilities	1.Name the different types of sensory impairments and describe the subtypes, nature, characteristics & assessment, as well as impact of sensory disabilities and explain the issues & ways to address challenges in educating students with sensory disabilities
				6. EDU293 : Introduction to Neuro Developmental Disabilities	1.The course integrates relevant subject matter in the areas of Learning Disability, intellectual Disability and Autism Spectrum Disorder.
				7. EDU294 : Introduction to Locomotor and Multiple Disabilities	1.Develop understanding about planning effective educational programme and functional activities for students with loco-motor and multiple disabilities.

Sr. No	Name of Program	Program Learning Outcomes	Program Specific Learning Outcomes	Name of Course with code	Course Learning Outcomes
				8. EDU301 : Guidance and Counseling	1.Apply the skills of guidance and counselling in classroom situations, describe the process of development of self-image and self-esteem.and appreciate the types and issues of counselling and guidance in inclusive settings
				9. EDU302 : Early Childhood care and Education	1.Provide an insight into developmental milestones of typical children and enable them to understand deviations and strategies to address them.
				10. EDU303 : Application of ICT in Classroom	1.Includes uses of all kinds of media and computer in order to give hands on experience of applying ICT in various learning environments as well to familiarize the student teacher with different modes of computer based learning.
				11. EDU304 : Adult Education	1.Know the meaning, nature, scope and various educational institutes offering adult education and their relevance for adult with Disabilities.
				12. EDU305 : Self Help Group and Education	1.Acquaint knowledge about developing self help groups as an organization and its working for the person with disabilities.
				13. EDU309 : Braille And Assistive Devices	1.Familiarizes the student-teachers with the importance and operational aspects of Braille, which has stood the test of time and competition for the last about 185 years. It also introduces them to basic devices used for teaching blind and low vision children.
				14. EDU311 : Orientation and Mobility	1.Describe the nature and scope of O&M as also the O&M related responsibilities of the special teacher, acquire basic knowledge of human guide techniques, describe pre-cane and cane travel skills and devices, get acquainted with the importance and skills of training in independent living for the visually impaired.
				15. EDU312 : Communication Options : Oralism /oral Rehabilitation and Auditory Verbal Approach	1.Discuss the Aural Oral Options with reference to persons with hearing impairment in the context of India, the relevant issues like literacy, inclusion and training with reference to Oralism /Oral Rehabilitation and exhibit beginner level hands on skills in using these options.
				16. EDU314 : Augmentative and	1.The student-teachers will be equipped with a basic knowledge of AAC, AAC systems, AAC assessment, programme

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				Alternative Communication	planning and strategies
				17. EDU321 : Assessment and Identification of Needs (HI)	1.Acquire knowledge and explain the need and techniques for early identification audio-logical assessment, communicative, language and speech related assessment and needs of children with hearing loss.
				18. EDU321 HI : Assessment And Identification of Needs (HI)	1.Develop capacities of learners to design curriculum keeping in view the special needs of children with hearing impairment. Learners are expected to go beyond the 3Rs with broad understanding of 21st century learning. The learner would also develop requisite skills of developing literacy skills of reading and writing as well as appreciate need and decide suitable adaptation to be undertaken for curricular transactions.
				19. EDU322 : Curriculum Designing Adaptation And Evaluation(HI)	1. Understand specialised techniques for developing listening, speaking, communication and linguistic skills to children with hearing impairment for themto access knowledge.
				20. EDU323 : Intervention and strategies	1. Acquire knowledge of technology so that the same could be used effectively for children with hearing impairment.
				21. EDU324 : Technology and Disability	1. Explain psycho social development of early childhood and role of family, understand the family needs and find self-ready to support families for empowering the child with disability and ensure family involvement in educational programs.
				22. EDU325 : Psychosocial and Family Issues	1. Reflect upon current level of literacy skills of the self. Show interest and begin working upon basic skills required to be active readers and independent writers
				23. EDU326 : Reading and Reflecting on Text	1. Exhibit Basic understanding in art appreciation, art expression and art education and plan and implement facilitating strategies for students with and without special needs.
				24. EDU327 : Drama And Art in Education	1. Explain the concept and relevance of research in education and special education.
				25. EDU328 : Basic Research and Statistics	1. Acquaint knowledge about various types of schools for Children with and without disability It will also helpful to

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				26. EDU332 : Cross Disability and Inclusion	enhance knowledge about the similarities and differences between teaching strategies used at these various types of schools e.g. special school for various disabilities and inclusive school set up.
				27. EDU332.1 HI : Cross Disability And Inclusion (HI)	
				28. EDU332.1 ID : Cross Disability And Inclusion (ID)	
				29. EDU332.1 MR : Cross Disability And Inclusion (MR)	1.Acquaint knowledge about various types of schools for Children with and without disability It will also helpful to enhance practical knowledge about the similarities and differences between teaching strategies used at these various types of schools e.g. special school for various disabilities and inclusive school set up.
				30. EDU332.1 VI : Cross Disability And Inclusion (VI)	
				31. EDU332.2 : Cross Disability And Inclusion	
				32. EDU332.2 : Cross Disability And Inclusion (HI)	
				33. EDU332.2 : Cross Disability And Inclusion (ID)	
				34. EDU332.2 : Cross Disability And Inclusion (MR)	1.Grasp and exhibit their knowledge about classroom planning, teaching, assessment and other curricular activities.
				35. EDU332.2 : Cross Disability And Inclusion (VI)	
				36. EDU333 : Disability Specialization	1.Grasp and exhibit their knowledge about classroom planning, teaching, assessment and other curricular and extracurricular activities.
				37. EDU333.1 : Disability Specialization	1.Acquaint knowledge about other than specialization of disability. It will also helpful to enhance practical knowledge about the similarities and differences between teaching strategies used at these various types of schools e.g. special school for various disabilities and inclusive school set up.

Sr. No	Name of Program	Program Learning Outcomes	Program Specific Learning Outcomes	Name of Course with code	Course Learning Outcomes
				38. EDU333.2 : Disability Specialization	1. Gain and execute knowledge about inclusive school teaching strategies
				39. EDU335 : Main Disability Special School (pract. related to area C)	1. Help the student-teachers to generate their student's interest for learningscience and develop a scientific attitude. It is designed to equip the student-teachers to teach science using innovative methods, techniques and teaching learning material to students with & without disabilities.
				40. EDU335 : Main Disability Special School(pract. related to area C	1. Explain and describe the nature of Mathematics, aims, objectives, planning, methods, and assessment of teaching Mathematics at school level.
				41. EDU336 : Other disability Special School	1. Explain the scope of history for development of competencies in designing lesson plans methodologies and evaluations tools at secondary level and also modify and adapt content-area curricula, materials and techniques for students with disabilities.
				42. EDU337 : Inclusive School	1. Explain the scope of Geography for development of competencies in designing lesson plans methodologies and evaluations tools at secondary level and also modify and adapt content-area curricula, materials and techniques for students with disabilities.
				43. EDU341 : Pedagogy of teaching Science	1. Not applicable for B.Ed. Spl. Ed.
				44. EDU342 : Pedagogy of teaching Mathematics	1. Enable the student-teachers to gain a strong knowledge base in nature of Marathi language & literature, Instructional planning and evaluation. It will help in applying theory to practice to design own materials and plan lessons in preparation for teaching real classes at secondary level
				45. EDU343 : Pedagogy of teaching History	1. Enable the student-teachers to gain a strong knowledge base in nature of Hindi language & literature, Instructional planning and evaluation. It will help in applying theory to practice to design own materials and plan lessons in preparation for teaching real classes at secondary level

Sr. No	Name of Program	Program Learning Outcomes	Program Specific Learning Outcomes	Name of Course with code	Course Learning Outcomes
				46. EDU344 : Pedagogy of teaching Geography	1. Enable the student-teachers to gain a strong knowledge base in nature of English language & literature, Instructional planning and evaluation. It will help in applying theory to practice to design own materials and plan lessons in preparation for teaching real classes at secondary level
				47. EDU345 : Pedagogy of teaching Economics	1.Describe the needs and develop skills to assess children with visual impairment and multiple disabilities
				48. EDU346 : Pedagogy of teaching Marathi	1.Describe the needs and develop skills to assess children with visual impairment and multiple disabilities
				49. EDU347 : Pedagogy of teaching Hindi	1.Provide basic understanding of the concept from approaches to curriculum development to the final assessment of curriculum in regards of Visual Impairment.
				50. EDU348 : Pedagogy of teaching English	1.Explain various theoretical perspectives related to intervention & teaching strategies, techniques of teaching, developing TLM and describe the process of assessment visual efficiency and classroom management for children with low vision.
				51. EDU351 : Identification Of Children With Visual Impairment and Assessment Of Needs (VI)	1.Acquaint the student-teachers with various devices for making the teaching learning process for important school subjects meaningful, exciting and rewarding for all Concerned.
				52. EDU351 VI : Identification of Children With Visual Impairment And Assessment of Needs (VI)	1.Get insight into the plethora of emotions the family goes through at the birth of a special child, the challenges they face throughout the life of the visually impaired, and the roles and responsibilities of the family and the community
				53. EDU352 : Curriculum Adaptation and Strategies for Teaching Expanded curriculum	1.Comprehend historical perspective, nature and needs and characteristics of persons with Intellectual Disability and understand various procedures, areas and approaches of assessment and their relevance.
				54. EDU353 : Intervention and strategies	1.Comprehend historical perspective, nature and needs and characteristics of persons with Intellectual Disability and understand various procedures, areas and approaches of assessment and their relevance.
				55. EDU354 : Technology and	1.Understand nature of curriculum, principles and steps of curriculum designing, domains and curriculum evaluation.

Sr. No	Name of Program	Program Learning Outcomes	Program Specific Learning Outcomes	Name of Course with code	Course Learning Outcomes
				Education of Visually Impaired	Acquire knowledge about curriculum domains at secondary, prevocational and vocational level and understand its implications.
				56. EDU355 : Psychosocial and Family Issues	1.Understand basic of learning and teaching and acquire competency to select and demonstrate appropriate teaching strategies for teaching in different curriculum areas.
				57. EDU361 ID : Assessment And Identification of Needs (ID)	1.Comprehend role of technology in educating children with ID and acquire knowledge about its various approaches and modes. Apply technology for developing lesson plan and adapted assistive devices.
				58. EDU361 MR : Assessment And Identification of Needs (MR)	1.Develop insight into various Psycho-social issues and their impact on rehabilitation on PwID, misconception and social practices and develop based approach and realize importance of family involvement in rehabilitation process by forming parents self help group and parent association
				59. EDU362 : Curriculum Designing Adaptation And Evaluation	1.Acquaint the student-teachers with various devices for making the teaching learning process for important school subjects meaningful, exciting and rewarding for all Concerned.
				60. EDU363 : Intervention And Strategies	1.Get insight into the plethora of emotions the family goes through at the birth of a special child, the challenges they face throughout the life of the visually impaired, and the roles and responsibilities of the family and the community
				61. EDU364 : Technology And Disability	1.Comprehend historical perspective, nature and needs and characteristics of persons with Intellectual Disability and understand various procedures, areas and approaches of assessment and their relevance.
				62. EDU365 : Psychosocial And Family Issues	1.Comprehend historical perspective, nature and needs and characteristics of persons with Intellectual Disability and understand various procedures, areas and approaches of assessment and their relevance.
12	M. A.	**After learning this**	**After learning this program, the**		**After learning this course, the learner will be able to:** 1.Describe Meaning & Scope of Philosophy, Contribution of

Sr. No	Name of Program	Program Learning Outcomes	Program Specific Learning Outcomes	Name of Course with code	Course Learning Outcomes
	(Education)	**program, the learner will able to :** 1.Understand and explain western and Indian philosophy in education as well as effects of education on social change.	**learner will able to :** 1. Explain the Western and Indian Philosophy in Education. 2. Describe the effect of education on social change. 3. Enhance the knowledge of various discipline of Psychology in Education	1. EDU-521 Philosophical Perspectives in Education	Thinkers, Various cults, Education, Values& Culture.
				2. EDU-522 Social Culture Perspectives in Education	1.Explain Meaning ,Scope of Educational Sociology, Western Thinker's Educational Theory ,Indian Society and New approach of Education
				3. EDU-523 Research Methods	1. Use Research : Tools, Problem, Proposal, Study of related material , and apply Scientific Research Methods, Nature of Research, Writing of Research Proposal ,Historical Method, Descriptive Survey Method, Writing of Research Report .
				4. EDU-524 Use Of Statistics in Research	1.Analyze Fundamental statistics and Advance statistics
				5. EDU-525 Psychological Perspectives of Education	1.Illustrate Educational Psychology, Nature, Scope& learning Methods, Growth and Development, Learning.
				6. EDU-526 Psychological Perspectives in personality	1.Intelligence, Creativity, Personality, Psychology of teaching and teachers, Indian psychology.
				7. EDU-527 Instructional System Design	1. System approach for education, Education, Instruction and Training, Structure of learning.
				8. EDU-528 Instructional Designs in Distance Education	1.Distinguish understand models for Instructional design, Instructional Design, Settings Objectives & Curriculum.
				9. EDU-531 Assessment in Education	1. Illustrate assessment in education, Education & Approaches of examinations, Foundation of educational assessment, Educational Measurement, Types of examinations and test, Test, Techniques& Principals of Grading System, Mastery Learning and testing.
				10. EDU-532 Evaluation in Education	1.Development of test, test and question segregation, Test score and meaning, Evaluation, Purpose and objectives, Models of Evaluation Important subject of Evaluation.
				11. EDU-533 Communication Modes in Education	1. Analyze communication process, Effective and Educational communication, Instructional types in higher education, and direct methods of instructional.

Sr. No	Name of Program	Program Learning Outcomes	Program Specific Learning Outcomes	Name of Course with code	Course Learning Outcomes
				12. EDU-534 Communication Modes in Distance Education	1. Develop educational audio programme, Instructional videos & programme learning, printed instructional material in education.
				13. EDU-535 Educational Management	1. Use Educational management & administration, Decision making competency, Leadership, Resource Management.
				14. EDU-536 Educational Administration	1. Apply organization, Supervision and control and conduct Administrative research and Change with planning and discuss about Educational system in India& administrative structure.
				15. EDU-537 Educational Planning	1. Describe educational Planning, Multilevel and micro level educational planning in India, system of educational finance.
				16. EDU-538 Educational Planning	1. Discuss national educational policy, Economics of Education, Financial Management and Statistic for educational planning.
				17. EDU-539 Adult Education	1. explain psychological characteristics of adult learners, Aspects of adult teaching in continue education, communication in continue education,
				18. EDU-540 Continuing Education	1. describe nature, scope and importance of continue education, Administrative and management of continue education
				19. EDU-541 Non-Formal Education	1. Recognized concept of Non-formal education, contribution of great Thinkers, Experiments of Non-formal education of developmental countries Problems of Literacy and primary education in India.
				20. EDU-542 Role of Non-Formal Education	1. explain role of Non -formal education of Government & non Government Institutions, learning, teaching techniques and evaluation, Financial aspect of Non- formal education
13	M. A. (English)	**After learning this program, the learner will able to :** 1. Understand theories of language evolution and demonstrate abilities in creative writing in english	**After learning this program, the learner will able to :** 1. Understand evolution theory of English language and nature of British drama and Novel. 2. Enable learners obtain expertise in English communication.	1. ENG401 : British Poetry	**After learning this course, the learner will be able to:** 1. Understand the theme, structure and style in British poetry
				2. ENG402 : British Drama	1. Understand the theme, structure and style in British Drama
				3. ENG403 : British Novel	1. Demonstrate the awareness of evolution theory of language by varied culture
				4. ENG404 : Aspects Of Language	1. Develop the students' abilities in grammar, oral skills, reading, writing and study skills

			3. Provide opportunity to learners to studying latest development in the English language and communication.	5. ENG405 : Literary Criticism And Theory	1. Apply critical and theoretical approaches to the reading and analysis of literary and cultural texts in multiple genres.
				6. ENG406 : American Literature	1. Demonstrate improvement in critical writing and critical thinking skills through interpretation and comparative analysis of literary texts
				7. ENG407 : New Literatures In English	1. Know the process of beginning and growth of English language
				8. ENG408 : Contemporary Indian Literature In English Translation	1. Know about various innovative ways of using English language in verbal and non- verbal communications
				9. ENG409 : English Studies In India	1. Develop and integrate the use of the four language skills i.e. Reading, to Listening, Speaking and Writing;
				10. ENG521 : Literature in English - Poetry- I	1. Identify a variety of forms and genres of poetry from diverse cultures and historic periods
				11. ENG522 : Literature in English - Novel- I	1. know literary form and structure in shaping a text's meaning

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				12. ENG523 : Basic Concepts In Linguistics - I	1. Explain the basic concepts of language and linguistics research
				13. ENG524 : Indian English Novel - I	1. Understand the need of wiping out social evils to dream of a healthy society
				14. ENG525 : 19th Century American Literature - I	1. Identify strengths, limitations, and cultural assumptions of various literary forms practiced in America through the nineteenth century.
				15. ENG526 : British Literature from Chaucer to the End of the 17th Century - I	1. Understand gradual changes from reason to emotion in British literature
				16. ENG541 : Literature in English - Poetry- II	1. Recognize poetry from a variety of cultures, languages and historic periods
				17. ENG542 : Literature in English - Novel- II	1. Analyze novels for their structure and meaning, using correct terminology
				18. ENG543 : Basic Concepts in Linguistics - II	1. Analyze linguistic data in ways that aim to address theoretical and empirical issues in the study of language.
				19. ENG544 : Indian English Novel - II	1. Introduce novel as a literary genre
				20. ENG545 : 19th Century American Literature - II	1. expose the students to the literature produced in America in the 19th century
				21. ENG546 : British Literature from Chaucer to the End of the 17th Century - II	1. Understand gradual changes from reason to emotion in British literature.
				22. ENG547 : Communication Skills	1. understand the different aspects of communication using the four macro skills – LSRW (Listening, Speaking, Reading, Writing)
				23. ENG548 : Journalism And Mass Communication	1. Gain conceptual and theoretical knowledge of Journalism and Mass Communication, and learn to think critically about issues and topics of the subject.

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				24. ENG551 : Literature in English: Drama - I	1. Explore how writers use the resources language as a creativity to explore the entire range of human experience through dramas as a literary form.
				25. ENG552 : Critical Theories - I	1. update their knowledge of current literary issues and critical theories
				26. ENG553 : Modern and Postmodern British Literature - I	1. Describe the relationships between various movements such as Modernism and Postmodernism and the literature of the period.
				27. ENG554 : Indian English – Poetry –I	1. Develop a skill to appreciate the Indian English poetry.
				28. ENG555 : 20th Century American Literature - I	1. Display a working knowledge of the cultural and historical contexts of 20th century American literature
				29. ENG556 : British Literature from Pope to the End of the 19th Century - I	1. identify and analyze the socio-economic-political contexts that inform the literature of the period from Pope to the End of the 19th Century
				30. ENG561 : Literature in English: Drama - II	1. Interpret literary texts in English by nurturing and utilizing their ability to understand drama in a skilled, knowledgeable, and ethical manner
				31. ENG562 : Critical Theories - II	1. Explore possible applications of critical theory to various literary texts
				32. ENG563 : Modern and Postmodern British Literature - II	1. Appreciate Modern and Postmodern British Literature as writing built on the intersecting lines of theoretical inferences
				33. ENG564 : Indian English - Poetry - II	1. Identify a variety of forms and genres of poetry from diverse cultures and historic periods
				34. ENG565 : 20th Century American Literature - II	1. Discuss key concepts of ethnic diversity and cultural inclusion
				35. ENG566 : British Literature from Pope to the End of the 19th Century - II	1. Identify and describe distinct literary characteristics of the British literature driven by reason, intellect, correctness and satirical spirit.

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14	M. B.A.	**After learning this program, the learner will able to :** 1. Able to practice professionalism in business management and entrepreneurship development.	**After learning this program, the learner will able to :** 1. Impart knowledge and skills in different functional areas of management 2. Prepare young graduates for acquiring competence in management profession 3. Create and nurture entrepreneurial acumen among young graduates	1. MBA 101:Accounting and finance for managers	**After learning this course, the learner will be able to,** 1. Define accounting and realize its importance. 2. Distinguish between Financial, Cost and Management Accounting. 3. Relate Finance Function and accounting. 4. Get an Overview about auditing and internal control
				2.MBA 102: Business Environment	1. What is business environment and why is it importance to foresee, the same is the objectives that would be achieved through this unit.
				3.MBA 103: Economics for Managers	1. Define economics. 2. Mangerial Economics. 3. Understand basic concepts of economics
				4.MBA 104:Management Processes & Organizational Behavior	1. Introduce and define the concept of management. 2. Understand the nature and importance of management. 3. Explain the various managerial roles. 4. Describe the levels of management
				5.MBA 105:Research Methodology & Communications	1. Understand the research process. 2. Examine the Characteristics of good research. 3. Present important research concepts. 4. Provide a short detail of the language of research.
				6.MBA 201:Business Ethics &Corporate Governance	1 Define ethics and business ethics. 2. Identify the six basic stages of moral development. 3. Describe the significance of business ethics and its issues
				7.MBA 202:Quantitative Techniques in Management	1.Understand basic structure of LP problem 2. Know the properties of LP model. 3. Know the Application areas of Linear Programming 4. Understand Formulation of LP Model.
				8.MBA 203: Production and Operations Management	1 Basic meaning of operations Management. 2. System perspective of operations Management. 3. Functions of Operations Management. 4. Challenges of Operations Management.
				9.MBA 204:Marketing Management	1.Define Marketing 2. Describe Marketing Planning and process. 3. Explain Marketing Mix. 4. Explain concept of Customer Relationship Management and

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					Holistic Marketing Dimensions.
				10.MBA 205:Human Resource Management	1. Understand the Concept of Human Resource Management. 2.Identify the nature and scope of HRM 3. Understand the Objectives and importance of HRM. 4. Illustrate the various functions of HRM.
				11.MBA 301:Strategic Management	1. State the meaning, nature and importance of strategic management. 2.Explain the dimension and benefits of strategic management 3. Identify the risks involved in strategic management
				12.MBA 302: International Business and International trade	1. Understand basic concepts related to international trade. 2.Explain the phenomenon of globalization along with its drivers and implications for international business.....
				13.FMG 301:Corporate Finance	1. Explain the meaning, nature of corporate finance. 2. Understand the importance of corporate finance. 3. Explain the Functions of corporate finance
				14.FMG 302:Indian Financial System & Management Of Financial Institution	1.Understand the concept, features and role of finance in an economy. 2.Describe the meaning, objectives and functions of the Financial System. 3. Learn the Structure of the Indian Financial system.
				15.FMG 303: Management Of Financial Services	1. Understand the concept of financial services. 2. Explain the nature of financial services. 3.Be aware about advantages of financial services
				16.FMG 304:Security Analysis & Portfolio Management	After completing this course, the learner will be able to, 1. Understand the concept of Security Analysis. 2. Understand the concept of Portfolio Management. 3. Learn the Investment Process. 4. Analyse the types of investments
				17.MKG 301:Marketing Research	1.Get familiar with the meaning of marketing research and its objective. 2.In addition, the objective is to make you understand the process of marketing research and how it helps in decision making process

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				18.MKG 302:Advertising And Sales Promotion	1.Familiarize the learners with the concept of integrated marketing communication. 2.Foster the learning ,how communication change the customer perception about company products
				19.MKG 303: Industrial Marketing	1. Explain why study industrial management. 2.Explain the concept, meaning and importance of industrial marketing. 3. Explain about product and industrial product
				20.MKG 304:Services Marketing	1. Understand the basic concept of services. 2. Identify the basic differences between goods and services. 3. Understand the characteristics of services. 4. Understand the need to study service marketing
				21. HRM 301: Organisational Change And Development.	1. Overview of Organizational development. 2. Nature, scope and objectives of organizational development. 3Values, assumptions and belief in organizational development. 4.Theories of organizational development
				22.HRM 302:Human Resource Planning	1.Overview of human resource planning 2.Nature, scope and objectives of human resource planning 3. Features need and factors affecting human resource planning. 4. The process and significance of strategic planning.
				23.HRM 303:Managing Interpersonal & Group Processes	1.Describe concepts and definitions related to Formation of Groups. 2.Understand how these groups are development and how Groups within an organization can be managed. 3.Describe the impact and their implications in various processes within the organization and their linkages with performance of organizations.
				24.HRM 304: International Human Resource Management	1.Describe Concepts and definitions related to international Human Resource Management. 2.Differentiate between International Human Resource Management and Domestic Human Resource Management. 3. Describe Challenges faced by organizations in managing people in the context of International operation & business
				25.MMG 301:Manufacturing	1. Know the needs of Business Strategy. 2. Understand type of Business strategy

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				Strategy	
				26.MMG 302:Supply Chain Management	1. Understand physical distribution and logistics. 2. Know about development of supply chain management. 3. Know about future of supply chain management
				27.MMG 303:World Class Manufacturing	1. What strategy really is? 2. Asserting the strategy. 3.Becoming strategic, focused and holistic 4.Creating strategic resonance via strategic operations management 5. Changing role of strategy in different manufacturing era.
				28.MMG 304:Production Planning And Control	1.Know about operation management 2. Know about productivity. 3.Understabd increase in productivity,
				29.MBA 401:Business Laws	1. Understand the meaning of law. 2. Explain the sources of business law in India
				30.MBA 402:Management Information System	1.Understanding information and its dimensions 2. Exploring the evolution of information system. 3. Knowing the applications of IS. 4. Understanding the role of IS in business.
				31.FMG 401:Taxation	1. Difference between direct Tax and Indirect Tax. 2. Basic Concepts and Definitions under the Income Tax Act. 3. Determination of Residential status of an Assesse.
				32.FMG 402:Banking and Bank Finance	1. Understand the concept and characteristics of a business. 2. Explain the classification of business activities. 3. Define various types of industry
				33.FMG 403:International Finance	1.Understand International Business and International Financial Management. 2. Elucide the reasons for the progression of Multinational firms. 3. Describe the role of Multinational Financial manager
				34. FMG 404: Management Control System.	1.Understanding meaning and purpose of management control systems. 2. Define elements of control system. 3. To analyze need for control in organizations.
				36.MKG 402: Sales And	1. Differentiate between marketing and sales, understand the

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				Distribution Management	relationship of sales with other environment and marketing variables. 2. Describe sales-related marketing policies and explain the changing role of personal selling
				37.MKG 403:Retail Marketing	1.Understand the meaning and concept of retailing along with its functions and an over view of retail market
				38.MKG 404:Rural Marketing	1. Define rural marketing. 2. Discuss about the nature and characteristics of rural market. 3. Describe the challenges and opportunities of rural market
				39.MKG 405: International Marketing	1.Understand the concept of international marketing in view of various changes that have taken place as a result of globalization. 2.Explain the process, scope, opportunities and challenges of the International marketing. 3. State the various trade theories prevalent in international market and their implications
				40.HRM 401: Industrial Relations & Labour Legislation	1.Describe the concept of Industrial Relations with respect to the Indian scenario. 2. Define Industrial Relations, Nature & Objectives of IR. 3. Explain parties to IR, Actors in the system. 4. Explain significance of IR.
				41.HRM 402:Management Of Training And Development	1.Understand the importance of training & Development for any organization. 2.Describe how training, Development, Education and teaching differ. 3. Understand basic principles of learning and how does it differ in case of Adult Learning
				42.HRM 403:Human Resource Development	1.Recognize the function of HRD as a sub system of larger HRM system of an Organization. 2.Interpret the role of HRD with respect to strategic direction of the firm. 3. Identify the Components of HRD system
				43.HRM 404:Performance and Reward Management	1. The meaning and characteristics of performance management. 2. Objectives of performance management. 3. Principles of performance management.

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					4. Performance appraisal to performance management.
				44.MMG 401:Total Quality Management & Six Sigma	1. Understand Quality assurances. 2. Understand Deming view. 3. Know about Quality management.
				45.MMG 402:Project Management	1. Understanding what is project. 2. Know about various project management approaches. 3. Know about roles of a project manger.
				46.MMG 403: Enterprise Resource Planning	1. Understand fundamentals of ERP. 2. Know about characteristics and advantages of ERP. 3. Know about challenges in ERP Implementation
				47.MMG 404:Services Operations Management	1.Understanding how and why services are important for Indian Economy. 2.Define "Service" 3.Define Operations" 4. Describe key challenges faced by service operations manager.
				48.MKG401:Consumer Behavior	1.Evolution of marketing concept, tools for implementing marketing strategies. 2. Value delivered to consumer and their retention. 3. Role of internet and other technologies. 4.Describe customer value, customer satisfaction and customer retention.
15	M. Com.	**After learning this program, the learner will able to :** 1.Understand basic concepts and practices in accounting, auditing and taxation, banking and money management.	**After learning this program, the learner will able to :** 1. Understand basic concepts of accounting, auditing and taxation. 2. Provide opportunity to those who are already employed in different professions to improve their chances of progressing to higher positions in their job.	1. ACG101 : Advanced Accounting-I	**After learning this course, the learner will be able to:** 1. Understand the accounting procedure involved for amalgamation absorption and external reconstruction.
				2. ACG102 : Advanced Accounting-II	1. Understand the basic principles of consolidation.
				3. ACG201 : Auditing-I	1. Understand the concept of audit.
				4. ACG202 : Auditing-II	1. Understand the concept and basic elements of the auditor's report.
				5. ACG301 : Direct Taxes	1. Understand basics of Income Tax& To understand A.Y. & P.Y.

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			3. Orient every student to cope up with the latest developments in contemporary, national and global level through effective transaction of the curricular and co-curricular aspects.	6. ACG302 : Indirect Taxes	1. Know Authority Structure of Excise and Custom and understand basics of Custom.
				7. BEG101 : Business Entrepreneurship-I	1. Learn about the concept of entrepreneurship.
				8. BEG102 : Business Entrepreneurship-II	1. Be aware about the background for understanding entrepreneurship in Indian society.
				9. BEG201 : Business Entrepreneurship-III	1. Understand the meaning of industrialization and Explain the need for industrialization.
				10. BEG202 : Business Entrepreneurship-IV	1. Learn why and how a small business must create a competitive advantage In the market.
				11. BEG301 : Business Entrepreneurship-V	1. Explain the association of strategy with small business and Appreciate various types of co-operative strategies for growth and expansion.
				12. BEG302 : Business Entrepreneurship-VI	1. Understand the difficulties of corporate entrepreneurship and Explain the top five pitfalls of succession in a family Business.
				13. BFG101 : Financial Markets and Institutions in India-I	1. Understand the structure of Indian financial system, share market and role of commercial banks.
				14. BFG102 : Financial Markets and Institutions in India-II	1. Understand the structure of cooperative banking system in India.
				15. BFG201 : Money, Central Banking in India and International Financial Institutions-I	1. Understand the evolution, measurement and functions of money.
				16. BFG202 : Money, Central Banking in India and International Financial Institutions-II	1. Understand the types and role of financial institute.

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				17. BFG301 : Banking Laws And Operations-I	1. Understand the features of Indian Banking System.
				18. BFG302 : Banking Laws And Operations-II	1. Understand the concept of Paying Banker & Collecting Banker.
				19. CAG101 : Advanced Cost Accounting-I	1. Understand the concept of cost, costing, cost accounting and cost accountancy.
				20. CAG102 : Advanced Cost Accounting-II	1. Understand amount of remuneration is calculated under time rate method and piece rate method.
				21. CAG201 : Advanced Cost Accounting-III	1. Advantages and limitations of job costing; and, Documents which are prepared and used in job costing.
				22. CAG202 : Advanced Cost Accounting-IV	1. Understand meanings and definitions of budget, budgeting and budgetary control.
				23. CAG301 : Cost And Management Audit- I	1. Understand the concept of Cost Audit and understand cost auditor role and the responsibilities which a cost auditor.
				24. CAG302 : Cost And Management Audit-II	1. Know the concept and definition & meaning of propriety audit, of management audit.
				25. CMP204 : Office Tools	1. Provide hands-on use of Microsoft Office applications Word, Excel, Access and PowerPoint.
				26. COM111 : Management Accounting-I	1. Explain the meaning and of management accounting.
				27. COM112 : Management Accounting-II	1. Understand the concept of budget and budgetary control.
				28. COM231 : Business Economics-I	1. Understand the different approaches of consumer choice under risk.
				29. COM232 : Business Economics-II	1. Understand the market structure and degree competition.
				30. COM331 : Strategic	1. Understand business policy implementation in organization.

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				Management-I	
				31. COM332 : Strategic Management-II	1. Explain the concepts of business and environment.
				32. COM431 : Corporate Finance And Laws-I	1. Describe the origin of SEBI describe the composition of SEBI board.
				33. COM432 : Corporate Finance And Laws-II	1. Understand The meaning and basic characteristics of company.
				34. COM433 : Research Methodology-I	1. Compare pure science research with social science research.
				35. COM434 : Research Methodology-II	1. Understand the meaning and scope of a research paper, project and review.
				36. GEN101 : English	1. Ability to communicate correctly and effectively within and about the disciplines.
				37. GEN103 : French	1. Know about the French- speaking countries in the world Learn about the people and their life of these countries.
				38. GEN104 : Arabic	1. Know the Arabic language and Learn about the people and their life of these countries.
				39. GEN105 : German	1. Know the German language and Learn about the people and their life of these countries.
				40. GEN121 : Cyber Security	1. Analyze and resolve security issues in networks and computer systems to secure
				41. GEN203 : Value Education	1. Be able to determine the quality of the values.
				42. GEN204 : Communication Skills	1. Communicate effectively in English.
				43. GEN401 : Yoga	1. Enable the student to have good health.
16	M. Lib. & I. Sc.	**After learning this program, the learner will able to:** 1. Manage institutional	**After learning this program, the learner will able to:** 1. Develop capacities for the effective administration and	1. LIB010 : Document Description, Processing,	**After learning this course, the learner will be able to:** 1.Get aware of information storage and retrieval, different ways in which information can be repackaged, various strategy and techniques of information searching, designing & developing IR Thesaurus, different types of abstracts and indexes.

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		library and library services including cataloguing, storage and retrieval services to learners.	management of the library. 2. Develop skills and techniques to select appropriate categories for books. 3. Provide effective library services.	Retrieval & Dissemination (Theory)	
				2. LIB011 : Management of Libraries & Information Centers (Theory)	1. Get familiarize with the basic concepts of management, basics of library administration & management, functions of management and their application to librarianship, documentation centers and systems their activities and techniques, Concept of System Analysis, Management of Change, Total Quality Management (TQM) & Marketing of Library Information Services, Library housekeeping operations, Financial management, Recent trends in library management.
				3. LIB012 : Library & Information Science: Research Methodology (Theory)	1.Understand the research process, various research methods, Application of Research Methodology in Library and Information Science and get introduced to research skills, use of various Data collection tools and statistical techniques for research.
				4. LIB013 : Library & Information Science: Current Trends (Theory)	1.Know the recent trends in Library and Information Science (LIS), the technological aspects introduced in library filed the changing methods of retrieving information from various repositories and all the new aspects of LIS.
				5. LIB201 : Academic & Research Libraries Theory)	1.Get skills in managing Academic and Research Libraries, Its Functions, Collection Development, Library Committees, Staffing pattern, Continuing education programme, the research library services management and Introduction of few Research libraries.
				6. LIB202 : Library Services & Programmes (Theory)	1.Get familiar with Public Libraries, School Libraries, Archives, Museums, and their Services and Programmes.
				7. LIB203 : Management of Non Book Material (Theory)	1.Know skills in managing Non Book materials, its forms, printed non-book material, non-print material, its organization, standards and catalogue entries.
				8. LIB301 : Application of Information Technology in Libraries & Information	1.Introduce the concept and use of ICT and its application in Libraries and Information Centers, Skills in planning and implementation of library automation, Digital library, Use of

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				Centers (Theory)	e-documents, Resource Sharing Networks and current trends in the use of ICT etc.
				9. LIB301 : Application of Information Technology in Libraries & Information Centers (Practical)	1.Get hands on training on library software's, Software for University Libraries (SOUL) in detail, Internet searching skills and techniques, various communication mediums etc.
				10. LIB302 : Project	1.Get introduced the Research Methodology, Statistical techniques in LIS research and Style of writing a research report.
17	M. Sc. (Environmental Science)	**After learning this program, the learner will able to :** 1.Understand role and importance of nature and environment in maintaining	**After learning this program, the learner will able to :** 1. Educate him about the environment and natural resources. 2. Create awareness about	1. S27011 : Environmental Science and Ecology	**After learning this course, the learner will be able to:** 1. Understand scope of environmental Science and ecology.
				2. S27012 : Environmental Engineering	1.Explain various water treatments.
				3. S27013 : Natural Resources	1.Understand various environmental Resources.

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		sustenance of food chain for human living.	various environmental problems and environmental legislation 3. Carry out problem based and need based research in natural resources management	and Their Conservation	
				4. S27014 : Lab Activities on S27011, S27012 and S27013	1.Perform various lab activities and Test the results.
				5. S27021 : Pollution and Health and Hazards	1.Explain impact of various types of pollution on human and Environmental health.
				6. S27022 : Environmental Statistics & Computer Application	1.Understand basics of statistics and its Use in research.
				7. S27023 : Environmental Pollution and Control	1.Understand different types of Pollution.
				8. S27024 : Lab Activities on S27021, S27022 and S27023	1.Perform various lab activities and test The results.
				9. S27031 : Environmental Monitoring and Energy Studies	1.Explain environmental quality Aspects and its assessment.
				10. S27032 : Natural Resources and Instrumentation	1.Explain natural resources and Environmental chemistry.
				11. S27033 : Environmental Microbiology, Toxicology and Chemistry	1.Understand and explain environmental microbiology and Toxicology.
				12. S27034 : Lab Activities on S27031 and S27033	1.Perform various lab activities and test The results.
				13. S27041 : Environmental Education, Policies and Legislation	1.Understand policies and acts regarding protection of the Environment.
				14. S27042 : Environmental Management - Land, Soil and	1.Classify types of land, soil, water, etc. and explain their conservation

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				Water	
				15. S27043 : Environmental Geo-science	1.Discuss various aspects of Earth And atmosphere.
				16. S27044 : Project - Work	1.Construct and present the project Work.
18	M. Sc. (Mathematics)	**After learning this program, learner will able to:** 1.Understand advance concepts in mathematics and mathematical research.	**After learning this program, the learner will able to :** 1.Understand basic concepts and principles of mathematics and their relevance in day today life 2.Develop problem solving skills in mathematics. 3.Exposure to students to tackle current trends in mathematical research.	1. S24011 : Algebra - I	**After learning this course, the learner will be able to:** 1.Apply facility in working with matrices, a concept that finds a large number of applications in real life including the graphs and networks.
				2. S24012 : Advanced Calculus	1.Explain the basic principles of multi-variable calculus with proofs.
				3. S24013 : Real Analysis	1. Understand thorough foundation of Riemann integration theory and convergence of sequence and series of functions.
				4. S24014 : Differential Equations	1. Express the existence-uniqueness theorem of differential equations.
				5. S24015 : Classical Mechanics	1. Understand the linear equations, vector spaces, matrices, linear transformations, determinants etc.
				6. S24021 : Linear Algebra	1. Analyze the solution set of a system of linear equations.
				7. S24022 : General Topology	1. Understand fundamental concepts and methods in general topology.
				8. S24023 : Complex Analysis	1. Understand and evaluate partial derivatives and integrals of multivariable functions.
				9. S24024 : Numerical Analysis	1. Find solutions of algebraic or transcendental equations using an appropriate numerical method.
				10. S24025 : Differential Geometry	1. Describe curves and surfaces and label their equations.
				11. S24031 : Functional Analysis	1.Recognize the fundamental properties of normed spaces and of the transformations between them.
				12. S24032 : Advanced Discrete Mathematics	1.Explain various important concepts such as logic and proofs, sets and functions, probability, recursion, graph theory, matrices, Boolean algebra and other important discrete math

Sr. No	Name of Program	Program Learning Outcomes	Program Specific Learning Outcomes	Name of Course with code	Course Learning Outcomes
					concepts.
				13. S24033 : Number Theory	1. Interpret the concepts of divisibility, prime number, congruence and number theorems.
				14. S24034 : Integral Equations	1. Classify and solve integral equations.
				15. S24035 : Operation Research –I	1.Use operational research tools in a wide range of applications
				16. S24041 : Measure and Integration	1.Define and understand basic notions in abstract integration theory, integration theory on topological spaces and the n-dimensional space
				17. S24042 : Partial Differential Equations	1. Solve linear Partial Differential with different methods.
				18. S24043 : Riemannian Geometry -I	1. Compare and contrast the methods introduced in the course.
				19. S24044 : Riemannian Geometry – II	1. Apply the basic principles of Riemannian geometry and work manifolds, tangent spaces and curvature.
				20. S24045 : Operation Research –II	1. Apply formulation and solution techniques of classic linear optimization, simplex algorithm, classic network models and matrix games problems at end of the class.

Programme and Course Outcome

Master of Arts Hindi M51

Master of Arts Hindi FIRST YEAR

Programme learning Outcome	**After completing this program, the learner will be able to improve their knowledge and skill: get a sound base in language and get exposure to a wide range of literary genres: acquire linguistic competence as well as develop confidence in critical and analytical abilities; and get an opportunity to work in electronic media, translation services etc.**	
Course Code	**Course Name**	**Course Outcome**
101	Hindi Sahitya Ka Etihas	• Concept of History of Hindi Literature from the beginning period i.e. (Adikaal). • Understanding the basis of the classification of Hindi literature. • Ability to understand the development of the Hindi language and literature • Time framing ability of Aadikaleen and Bhaktikaleen Hindi Literature. • Understanding the features of Adikal, Bhakti Kal, and Ritikal in the context of the socio-cultural and political conditions of that period.
102	Katha Sahitya	• Understanding the development of Hindi novels and short stories. • To provide knowledge about Hindi novels,their origin, and development. Contribution of Premchand through his novels and also his knowledge about novel writing. • Ability to think about Hindi novels and short stories.
103	Kathettar Gadhy Sahitya	• Understanding of Hindi essays. • To provide knowledge about the literary form of 'Biography' (Jeevani).The aims, objectives, and significance of Biography.Its origin and development as well. • To provide knowledge about the literary form 'Auto-biography'.The aims, objectives, and features of Auto-biography. • To provide knowledge about the literary form of Sketch like 'Ghesa'written by Mahadevi Varma and 'Ramkali' by Shreeram Sharma.
104	Hindi Sahitya Ka Vimarsh	• To Provide knowledge about Hindi Sahityain'StreeVimarsh'. • The objective of this paper is to help students to

		acquire knowledge about the 'StreeVimarsh'and'Dalit Vimarsh'.
201	Hindi Sahitya Ka Etihas(Adhunik kaal)	• To provide knowledge about 'Adikal ki Prusthbhumi', 'Adikalkepramukhkavi', 'Adikal ki Bhumika', 'Rachnayein' and 'Adikal ki pramukh kavya prabrutiyan'. • To provide knowledge about the 'Adhunikkal'. • Concept of History of Hindi Literature of the modern era (Aadhunikkaal). • Understanding the History of Hindi literature of the modern era (Aadhunikkaal). • Differentiation and departure points of modern Hindi literature. • Time framing ability of modern Hindi Literature.
202	BhashaVigyan	• Understanding Hindi Language & Linguistics. • Differentiation and departure points of Hindi Language& Linguistics. • Ability to think about Hindi Language & Linguistics. • To provide knowledge about 'Bhasha ki ParibhashaEbam Swaroop',and 'Bhasha ParibartankeKaran'. • The objective of this paper is to help students to acquire Fundamentalknowledge about the definition and significance of Linguistics.
203	Adhunik kavya	• Understanding of the development of Modern Hindi Poetry. • Differentiation and departure points of Modern Hindi Poetry. • Ability to think about Modern Hindi Poetry (Aadhunik Hindi Kavya)
204	Rajbhasha Hindi	• The paper onfunctional Hindi aims to prepare the students for professional purposes. • It primarily deals with Hindi as an official language as stated in the Indian Constitution.In addition, the paper will also help students to understand various rules regarding Hindi as an official language.

M.A. HINDI SECOND YEAR

Course Code	Course Name	Course Outcome
301	Kavyashstra	• To provide knowledge about the Kavya Lakhyan, Kavya Prayojan and Kavya Hetu. • To provide knowledge about Ras Siddhant, AlankarSiddhant, AlankarVargikaran. • To provide knowledge about DhvaniSiddant,VakroktiSiddhant. • Understanding the development of Indian & Western poetries. • Differentiation and departure points of Indian & Western poetries. • Ability to think about the development of Indian & Western poetries.
302	BhartiySahitya	• Understanding of the development of Indian literature & comparative literature. • Differentiation and departure points of Indian literature. • Ability to think about Indian literature & translation.
303	Hindi Alochana	• This paper will help the students to acquire knowledge about Hindi Alochana. • To provide knowledge about Acharya Ramchandra Shukla. • To provide knowledge about 'Rambilash Sharma ka MarxwadiSamiksha'and'Dr.NamwarSingh ka MarxwadiAlochana'. • To provide knowledge about 'Acharya HazariPrasadDiwedi ki EtihasikDrishtiEvam AlochanaGranthKabir'.
304	Hindi Web Sahitya	• This paper is to help students to acquire knowledge about computers. • Apart from this, basic information about the origin of computers,creation of websites and structure of portals etc.
401	JansancharLekhan	• Students will be able to understand different types of communication media andtheir uses, for instance- Cinema as a medium of communication. • Reflect critically upon the historical development of networked digital media. • Analyse and critically appraise public debates around networked digital media.

		• Create critical insights into how social media are used in key social contexts. • understand the techniques of scriptwriting. • understands the importance of Advertisement. • enriches the creativity of the student. • opens career options in the field of script writing & advertisement.
402	Natak Aur Rangamanch	• To provide knowledge about the 'HindiNatakaur Rangmanch ka Parichay', 'BharatiyaRangmanch'. • Understand Hindi Drama and imbibe the emergence of drama in Hindi literature through different schools and types of Drama and know the History and Influence of theatre in Hindi literature through various structural aspects and stylistic features of drama such as mythical plays, symbolic plays, ballads etc. • Understand the Emergence of modern Hindi Drama and the role of the dramatist BharatenduHarischandra.
403	Sahitya Aur Cinema	• Understand the development of Hindi Cinema from early times to contemporary times. • Critically evaluateHindifilms. • Understands the development of world cinema & Hindi cinema • Evaluate films with respect tothe story, screenplay, dialogue, cinematography,editing, acting, and direction.
404	AnuvadAdhyayan	• To provide knowledge about the meaning, scope and nature of translation. • To provide knowledge about the steps of translation and the theory of translation. • To provide knowledge about the types of translation (Anuvad) like Literary Translation, Official or Technical Translation. • To provide knowledge about translation with practical translation of paragraph from English to Hindi. (Official-matters only).

Subject – Economics Course Outcomes

Programme and Course Outcome Master of Arts- Economics (M52) Master of Arts Economics First Year		
Programme Outcome	**The learners would have developed clear Understanding of important basic concepts and principles of Economics and their relevance in the lif, they would have developed independent thinking, they would be exposed to the current trends in research in economics, and would be able to integrate theory with practice. Thus the horizon of their knowledge would be expanded and hence they would be employable or take their own vocation and contribute in the development of the state and the nation.**	
Course Code	**Course Code**	**Course Outcomes**
Fundamental Economic Theory	ECO 111	Through this course, students will be able to understand the fundamental theories of economics, microeconomics analysis- Part 1&2 and macroeconomics theories and Policies.
Economics of development and planning.	ECO 112	Through this course, students will understand the concept of economic development, its problems and measures. They will also understand the theories of development, economic planning, and the components of the development process.
Agriculture Economics	ECO113	Through this course, students will be introduced to agricultural economics, the Indian agricultural sector, marketing of the agricultural products, and financial aid for agriculture.
Industrial Economics	ECO114	Through this course, students will be introduced to Indian Industrial Economics, the policies related to India's Industrial Policy, Industrial Organisation, and the prominent businesses in India.
Labour Economics	ECO211	Through this course, students will be introduced to the nature of the labour market, labour resources and employment creation, labour wage fixation, labour welfare economics and globalization.
Economics of Transportation and Communication	ECO212	Through this course, students will be introduced to the economics related to transportation and communication, road transportation and railway transportation,

		water transportation and air transportation, and communication and economic development.
Welfare Economics	ECO213	Through this course, students will be introduced to the orthodox economist and welfare economist, neo-conservative economist and welfare economist, and the modern flow of welfare economics.
Demography	ECO214	Through this course, students will be introduced to population and development, population theories and problems, changes in population and environment, population study and human resources.
Public Economics	ECO311	Through this course, students will be introduced to public economics, taxation, India's fiscal policy and union government's budget, and fiscal federalism.
International Trade and Finance	ECO312	Through this course, students will be introduced to international trade theories, trade policies, the balance of payments and exchange rate, international trade and financial order.
Economics Growth and Development	ECO313	Through this course, students will be introduced to the basic concepts and issues in economic development, economic growth from a historical perspective, poverty-inequality and development, and growth models: the post-Keynesian phase.
The Development of Economic Thought	ECO314	Through this course, students will be introduced to classical economics, Marxian-Neoclassical Economics and After, Twentieth Century Economics and After, Indian Economic Thought.
OR Introduction to Econometrics	ECO314	Through this course, students will be introduced to Introduction to Econometrics-1, Introduction to Econometrics-2, problems with CLRM, and Advance Topics in Econometrics.
Indian Economic Policy	ECO411	Through this course, students will be introduced to the Economic Development and Nature of Indian Economy, Problems of the Indian Economy, the Agriculture-Industry and Service Sector in the Indian Economy, Banking- Public Finance and Foreign Trade.
Research Methods in Economics	ECO412	Through this course, students will be introduced to the Introduction to Research Methodology, Research Problems and Research Design, Sample Design and Data Collection, Data Processing and Analysis of Data.
Financial Economics	ECO413	Through this course, students will be

		introduced to the Finance and Financial System, Time and Resource allocation and valuation of securities, money and payment system, risk management- asset pricing and portfolio theory.
Behavioural Economics	ECO414	Through this course, students will be introduced to the Foundation of Behavioural Economics, Decisions under Judgement, and Behavioural Insights to Social Uncertainty, Behavioural and Experimental Economics: An Assessment.
Urban Economics	ECO414	Through this course, students will be introduced to Urbanization: Concepts, Ideas, Genesis and Trends, Urban Growth: Theories, Processes and Sources, Urban Infrastructure, Governance and Planning, and Indian Urban Reality.

Programme and Course Outcome

Master of Arts- Public Administration (M53)

Master of Arts- Public Administration (M53)

Programme learning Outcome	**After completing this programe, the learners would be ready for the variety of public sector roles, have thorough knowledge and skills about the public management policies and systems, and thus have capacity to integrate theory and practice of public administration. The learner would have understanding and knowledge of constitutional and democratic values and would contribute in building harmonious Society. The learner would be sensitive to perform leadership roles, and have an informed intervention in the governance. The learner would be equipped with administrative ethics and would be future responsible civil servant, and would be aware of the issues and concerns of the public thus help reduce corruption in the administration.**	
Course Name	**Course Code**	**Course outcomes**
Lokprashasanache Siddhant va Vichar	PAD101	Through the course of 'Lokprashasanache Siddhant va Vichar', students will be able to the theory and thoughts of public Administration. To acquaint with the theories, approaches, concepts and principles of Public Administration
Bhartiya Sanvidhan va Prashasan	PAD102	This course intends to familiarize students with the nature of the Indian Constitution,Form and organs of Government, Federalism, Decentralization and Devolution
Bhartiya Shasan aani Prashasan	PAD103	The course attempts to make the students understand the system of Indian Administration and Governance. Students will be able to understand the basic Structure, Function and Behavior of Indian Administration.
Manav ani Vittiya Sansadhan Vyavasthapan	PAD104	Through the course of 'Manav ani Vittiya Sansadhan Vyavasthapan, students will be able to personal administration system and financial administration system and also management.
Bhartatil Lokseva	PAD105	The course attempts to make the students understand the historical background, system of Indian public services, rules and law of Indian public services and also problems and solutions.
Samkalin Lokprashasan	PAD106	This course attempts to develop a better understanding of theoretical as well as practical aspects of comparative public administration. In this, students will be taught concepts, approaches,

		machinery of planning, role of civil society, people's participation and so on.
Sthanik Shasan aani Prashasan	PAD107	Through the course students will be able to the evolution of rural governance, constitutional provisions and its working along with issues and challenges related to rural governance and administration.
Lokprashasanatil Navpravah aani Aavahane	PAD108	Through the course students will be able to understand New Concept and new trends in public Administration like new public administration and public choice theory and so on.
Sanshodhan Paddhati	PAD201	The course attempts to make the students understand the advances in the field of Research Methodology; and develop research methodological skills for undertaking research in social sciences in general and in a discipline in particular.
Maharashtra Prashasanachi Rupresha	PAD202	The course attempts to make the students understand the system of revenue administration, polish administration, various administrative and research institute in Maharashtra state,
Bhartatil Lokshahi va Vikas	PAD203	This course intends to acquaint the student with contemporary political concepts, approaches along with changing dynamics of democracy which are essential for understanding of new development in political theory
Sarvjanik Dhoran	PAD204	The course attempts to make the students understand the Policy formulation, Policy Implementation and Evaluation of Public Policy along with various issues and challenges related to Public Policy.
Lokprashasanatil Pravah	PAD205	Through the course students will be able to understand the concept of E- Governance, Understand the technical, legal and institutional framework supporting e-governance implementation in India, environment administration and also international administration.
Bhartatil Gramin Vikas Prashasan	PAD206	Through the course students will be able to understand the concept of rural development, machinery and aspects of rural development and also issues and challenges.
Tulnatmak va Vikas Prashasan	PAD207	Through the course students will be able to develop a better understanding of theoretical as well as practical aspects of comparative public administration. In this, students will be taught concepts, approaches, concepts, debates, machinery

		of planning, role of civil society, people's participation and so on.
Samajik Kalyan prashasan va Aarthik Prashasan	PAD208	Through the course students will be able to concepts and law, various schemes and social welfare administration and also new economic policy and administration.

Programme and Course Outcome Master of Arts- Marathi (M54) Master of Arts- Marathi First Year		
Programme Outcome	**After completing this programme, the learner will be able to improve their knowledge and skill: get a sound base in language as well as get exposure to a wide range of literary genres: acquire linguistic competence and develop confidence in critical and analytical abilities: get acquainted with linguistic usage in governmental administration, build capacity to work in the field of electronic media, reporting, translator, interpreter, public relations, service industry and travel and tourism etc.**	
Course Name	**Course Code**	**Course Outcomes**
M A First Year Semester 1		
Sahityavichar- Bhaag 1	121	Through the course of 'Sahityavichar- Bhaag 1', students would be able to understand the concept of language, culture and the creation of literature.
Sahitya Abhyaas Paddhati	122	Through the course of 'Sahitya Abhyaas Paddhati', students would be able to understand the various ways of studying literature
Madhyayugin Vangmay acha Ithihas	123	Through the course of 'Madhyayugin Vangmay acha Ithihas', students would be able to understand the history of middle-age literature.
Vyavasyik Lekhan	124	Through the course of 'Vyavasyik Lekhan', students would be able to understand the concept of commercial writing.
M A First Year Semester 2		
Sahityavichar- Bhaag 2	221	Through the course of 'Sahityavichar- Bhaag 2', students would be able to understand the concept of language, culture and the creation of literature in detail.
Vangmay Prakaar	222	Through the course of 'Vangmay Prakaar', students would be able to understand various types of literature.
Adhunik Vangmayacha Ithihas	223	Through the course of 'Adhunik Vangmayacha Ithihas', students would be able to understand the history of modern literature.

Sanhita Sampadan Ani Granthanirmiti	224	Through the course of 'Sanhita Sampadan Ani Granthanirmiti', students would be able to understand the concept of editing and production of the books in detail.
M A Second Year Semester 3		
Bhasha Vidnyaan	321	Through the course of 'Bhasha Vidnyaan', students would be able to understand the science of social language and descriptive language.
Taulanik Sahitya Abhyaas	322	Through the course of 'Taulanik Sahitya Abhyaas', students would be able to understand the comparative literature study.
Loksahitya	323	Through the course of 'Loksahitya', students would be able to understand the concept of folklore and its types.
Marathi Rangabhoomi	324	Through the course of 'Marathi Rangabhoomi', students would be able to understand Marathi theatre and its types like music theatre, Dalit theatre and others.
M A Second Year Semester 4		
Bhashecha Upayojanalakshi Abhyaas	421	Through the course of 'Bhashecha Upayojanalakshi Abhyaas', students would be able to understand the applied study of language
Sahityatil Pravah-Bhaag 1	422	Through the course of 'Sahityatil Pravah- Bhaag 1', students would be introduced to Rural literature, Dalit literature and Feminist literature.
Sahityatil Pravah-Bhaag 2	423	Through the course of 'Sahityatil Pravah- Bhaag 2', students would understand science fiction, children's literature and popular literature.
Saunshodhan Sashtra	424	Through the course of 'Saunshodhan Sashtra', students would understand the research methodology, its types and various areas.

Programme and Course Outcome Master of Arts- Urdu (M44) Master of Arts Urdu		
Programme Outcome	**After completing this program, the learner will be able to improve their knowledge and skills, get a sound base in language and get exposure to a wide range of literary genres, acquire linguistic competence as well as develop confidence in critical and analytical abilities and get an opportunity to work in electronic, translation services etc.**	
Name of the Course	**Course Code**	**Course outcome**
Tareekh-e-Urdu Zaban-o-Adab	MUR101	History of Urdu Language and Literature After reading this course, the learners will be able to discuss the history, beginning and evolution of Urdu language and its linguistic background, besides an overview of the gradual evolution of Urdu language in the Deccan and North India. will be able to take
Urdu Ghazal	MUR102	Urdu Ghazal: After studying this course, the learners will be familiar with the art and introduction of Ghazal, the most popular genre of Urdu poetry, but will also be able to know about the important poets of Ghazal's early period, ancient times and modern times.
Urdu Masnavi	MUR103	Urdu Masnavi: After studying this course, learners will be able to know the art and introduction of the most useful genre of Urdu Masnavi, besides the gradual evolution of Urdu Masnavi in the Deccan and North India, they will also be able to know the important Urdu Masnavis.
Urdu Drama	MUR104	Urdu Drama: After studying this, the learners will be able to know about the art and introduction of drama, then the tradition of drama in Urdu, besides the important dramatists of Urdu, they will also be able to know about the important plays of Urdu.
Classici Adab	MUR201	Classical Literature: After studying this course, learners will be able to discuss classicism in the context of East and West, Eastern poetry, classical literature in Urdu and important classical texts in Urdu.
Afsanvi Adab	MUR202	Fictional Literature: After reading this course, the learners will not only be familiar with the art and tradition of fictional literature, but will also be able to get information about important Urdu novels

		and fictions in addition to Urdu narrative, novelization and fiction writing.
Urdu Nazm	MUR203	Urdu Poem: After studying this course, the learners will not only be able to know about the art of poetry, but will also be able to get information about the beginning and evolution of Urdu poetry, as well as important Urdu poems.
Film aur Awami Adab	MUR204	Film and Popular Literature: After studying this course, learners will be able to study film studies, from film script to screen, film, literature and society and also gain knowledge about the tradition of popular literature.
Urdu Qaseeda	MUR301	Urdu Qaseeda : After studying this course, learners will be able to know about the art and introduction of qasida, besides know about Urdu qasida writing in Deccan and North India and famous Urdu qasida.
Urdu Marsiya	MUR302	Urdu Elegy: After studying this course, learners will be familiar with the art and introduction of Elegy, besides, they will be familiar with the tradition of Elegy in Urdu, important Urdu elegists and important Urdu elegies.
Ghair Afsanvi Nasr	MUR303	Non-Fiction Prose: After studying this course, learners will be familiar with biography and autobiography as well as travelogues and letters, as well as sketching and light essay, as well as detailed information about diary and reportage.
Zara-e- Ablagh Aur Tarjuma Nigari	MUR304	Mass Media and Translation: After studying this course, the learners will be able to define and explain the tradition of mass media, besides they will be aware of the principles and rules of translation along with print media and electronic media.
Tanqeed -o- Tahqeeq	MUR401	Criticism and Research: After studying this course, learners will be able to know about Urdu criticism, critical theories, major critics of Urdu and the art and principles of Urdu research.
Tanz-o- Mazah	MUR402	Humour and Staire : After studying this course, the learners will be able to explain the introduction and tradition of humor and Staire in addition to getting information about humor and Staire in Urdu poetry and Urdu prose and important humorous texts will be able to.

Tahreekaat-o- Rujhanaat	MUR403	Movements and Trends: After studying this course, the learners will be able to explain the difference between movement and trend and also discuss Aligarh movement and progressive movement as well as Halqa-e- Arbab-e- Zauq and Modernism.
Khusoosi Mutala	MUR404	Special Study: After studying this course, the learners will be able to cover the entire works of Maulana Abul Kalam Azad and Shamsur Rehman Farooqui apart from the famous Urdu scholars Mir Taqi Mir and Mirza Asadullah Khan Ghalib.

SCHOOL OF ARCHITECTURE, SCIENCE AND TECHNOLOGY

YASHWANTRAO CHAVAN MAHARASHTRA OPEN UNIVERSITY

Detail Syllabus:

V134: M. Sc. (Botany) {2021 Pattern}

2021

AST, YCMOU, Nasik – 422 222, MS, India

CONTENTS

M. Sc. (Botany) {2021 Pattern}

Basic Information

Programme Objective and Scope

This programme is designed to achieve following objectives and scope.

Mission: The 'M.Sc. Botany' Program aims to develop understanding about basic facts, concepts, principles and procedures of required in the field of Botany and explore solutions to everyday real life problems by pursuing further research

Objectives:The 'M.Sc. (Botany)' Program will

- Provide a strong foundation for better understanding of the value of flora and its relevance to the society and our environment
- Develop a thirst to preserve the natural resources and environment.
- Provide a strong foundation for a better understanding of current advances in Botany and its practical significance.
- Expose students to current trends in research about Botany.
- Understand the scope and significance of the discipline.
- Imbibe love and curiosity towards nature through the living plants.
- In order to make students open-minded and curious, we try our best to enhance and develop a scientific attitude.
- We make the students fit for the society by enabling them to work hard.
- Make the students exposed to the diverse life forms.
- Make them skilled in practical work, experiments, laboratory equipment and to interpret correctly on biological materials and data.
- Develop interest in Biological research.
- Encourage the students to do research in related disciplines.
- Develop a thirst to preserve the natural resources and environment.
- Develop the ability for the application of acquired knowledge in various fields of life so as to make our country self-sufficient
- Appreciate and apply ethical principles to biological science research and studies

Scope of the programmes: After successful completion of this programme, students may get opportunities in various fields/sectors to work as

- Career opportunities in both private and government sector/ in India and abroad
- Job opportunities in sectors like Seed& bio-fertilizer industries, Indian Forest Services, Germplasm Conservation Laboratories, Botanical Consultant & Developer, Plant Scientist, Pharmacologist, Mycologist, etc
- Inculcation of research attitude
- Inculcation of entrepreneurship
- Perceive higher education and research in the same or allied fields like veterinary science
- The graduates can go for many fields in botany such as Plant **Taxonomy, Ethnobiology, Pathology, Palaeobolagy and Palynology, Plant cytology, Plant geneticists, Plant ecology, Plant Scientists and Weed Scientists etc.**
- Candidates who have advanced qualifications can pursue either an academic career in institutions as **lecturers and professors or a scientific career** in various scientific positions such as Plant Scientists, Weed Scientists etc.
- They can also go and work **as Researchers and as administrators.**
- They have also the option in **Botanical Survey of India** and other **Government departments.**

Employment Areas in Private Sector:

- Drug Companies
- Nurseries
- Biotechnology Firms
- Food Companies
- Oil Industry
- Fruit Growers
- Seed Companies
- Chemical Companies
- Lumber or Paper Companies
- Biological Supply Houses

Employment Areas in Government Sector:

- National Park Service
- Departments of Environmental Protection
- Departments of Conservation and Land Management
- Departments of Agriculture and Water)
- Animal and Plant Health Inspection Services
- Nature Conservancy
- Public Health Service
- Environmental Protection Agency
- Smithsonian Institute
- Department of Agriculture
- Medical Plant Resources Laboratory
- Forest Service

MODE OF EDUCATION

This Programme will be offered in Open and Distance Learning (ODL) Mode as defined in "UGC Open and Distance Learning Programmes and Online Programmes Regulations, 2020" published in the gazette notification by dated 4th Sept 2020 by the UGC as specified below.

> *"Open and Distance Learning Mode means a mode of providing flexible learningopportunities by overcoming separation of teacher and learner using a variety of media, including print, electronic, online and occasional interactive face-to-face meetings with the learners or Learner Support Services to deliver teaching-learning experiences, including practical or work experiences"*

MODE OF EXAMINATION

Continuous Assessment is conducted at recognized learner support centres/ study centres and End Examination for all type of courses is conducted at recognized Exam Centres of the University under supervision.

BASIC INFORMATION

1. **Mode of Education**: Open and Distance Learning (ODL) Mode
2. **Minimum Programme Duration**: 2 years/ 4 semesters after Candidates with B.Sc. with Botany at FY and SY/ B.Sc. (Agri) or Equivalent pass
3. **Learner Support Centers/ Study Centers:** University approved/ recognized Senior Science Colleges/ Institutes
4. **Medium of Instruction**: English
5. **Attendance**: Minimum 80% attendance for all type of courses.
6. **Minimum Programme Duration**:2 years after Graduation
7. **Teaching-Learning**: 36 working weeks per year

8. **Total Teaching-Learning Support:** 960 Hours in each year
9. **Total Courses:** 16 courses (subjects) at year 01-02
10. **Total Credits:** 48 Credits. As per UGC norms 1 Credit means 30 hours of study efforts required to gain learning of particular content of each credit.
11. **Year Credits**: 24 Credits in each year (16 credits for Theory and 08 credits for Practical).
12. **Total Courses and Credit Points:**

Year	Theory	Practical	Credits
01	4	4	24
02	4	4	24
Total credits			**48**

13.Passing: Minimum 40% or better marks

14. Credit Transfer:

15. **Continuous Assessment:** Continuous Assessment conducted for Continuous evaluation during teaching-learning for 20%Weightage
16. **End Exam:** End Examination conducted for Summative evaluation of the student for80% Weightage
17. **Degree Certification:** Aggregate performance and Class in the programme reported on the basis of performance.
18. **Curriculum Design:** Student centric curriculum is designed to enable professional ability, employability and skill enhancement.
19. **Approval/Equivalence Status**: UGC Approved. UGC-DEB Approval is available on UGC Website

ELIGIBILITY AND FEES

Admission Eligibility	**Certification Eligibility**	**Fees and Deposit / Year** UF is payable for a year to the university at the time of online admission
Candidates with B.Sc.with B.Sc. with Botany at FY and SY/ B.Sc. (Agri) or Equivalent pass	Min 40% or better marks, in all Theory type of courses, with total 48 credits at Year 01 to 02	**Description** / **INR ₹** University Fee (UF) — 8000 Study Center/ Learner Support Center Fee (SCF) — 12,000 **Total ≈** — **20000** **Refundable LD** (Payable only when student choose to avail Library Facility at the SC) — 1,500

PROGRAMME STRUCTURE

V134:M.Sc.(Botany){2021 Pattern}				
Course → Year↓	Course 01, 4 CR, T	Course 02, 4 CR, T	Course 03, 4 CR, T	Course 04, 4 CR, T
Year 01 24CR	**BNY011:** Biology and Diversity of Viruses, Bacteria, and Fungi	**BNY012:** Biology and Diversity of Algae, Bryophyta and Pteridophyta	**BNY013:** Gymnosperms, Taxonomy of Angiosperms and Anatomy	**BNY014:** Biochemistry and Plant Physiology
	Course 05, 2 CR, P	Course 06, 2 CR, P	Course 07, 2 CR, P	Course 08, 2 CR, P
	BNY015: Biology and Diversity of Viruses, Bacteria, and	**BNY016:** Biology and Diversity of Algae, Bryophyta and	**BNY017:** Gymnosperms, Taxonomy of Angiosperms and Anatomy	**BNY018:** Biochemistry and Plant Physiology

	Fungi	Pteridophyta		
Year 02 24CR	Course 01, 4 CR, T	Course 02, 4 CR, T	Course 03, 4 CR, T	Course 04, 4 CR, T
	BNY021: Cell Biology, Genetics, Biostatistics and Ecology	**BNY022:** Medicinal Plants and Embryology of Angiosperm	**BNY023:** Applied Mycology and Plant Pathology	**BNY024:** Plant Molecular Biology and Biotechnology
	Course 05, 2 CR, P	Course 06, 2 CR, P	Course 07, 2 CR, P	Course 08, 2 CR, P
	BNY025: Cell Biology, Genetics, Biostatistics and Ecology	**BNY026:** Medicinal Plants and Embryology of Angiosperm	**BNY027:** Applied Mycology and Plant Pathology	**BNY028:** Plant Molecular Biology and Biotechnology

TEACHING-LEARNING SCHEME:

Description	**Total 8 (Twelve) Theory Courses in Programme** **Total 8 (Eight)Practical Courses in Programme**
Face-to-face Counselling Sessions for interaction, problem solving and conduction of practical activities at Study Centre	**12 hrs each of 01 clock hour duration for each Theory Course of 4 Credits, Study Hours – 60**
	12 hrs each of 02 clock hour duration for each Practical/ Activity Course of 2 Credits, Study Hours – 60
Delivery of Information	**08**Books in SLM format: **30**Hours/ for each **08**WorkBooks in SLM format: **60**Hours/ for each
Self-Study, Learning Evaluation and Feedback	(1) Solving Problems, Self-Tests, SAQs and Exploring more Details on Text-Book: **30** Hours
Total Study Hours	(8 x 60 = **480** Hours + 8 x 60 = **480** Hours) = 960 Hours

YEARS AND COURSES

SN	Code	Name	CA	EE	TM	Type	CR	Min %
I Year:24 Credits								
01	BNY011	Biology and Diversity of Viruses, Bacteria, and Fungi	20	80	100	T	4	40%
02	BNY012	Biology and Diversity of Algae, Bryophyta and Pteridophyta	20	80	100	T	4	40%
03	BNY013	Gymnosperms, Taxonomy of Angiosperms and Anatomy	20	80	100	T	4	40%
04	BNY014	Biochemistry and Plant Physiology	20	80	100	T	4	40%
05	BNY015	Biology and Diversity of Viruses, Bacteria, and Fungi	10	40	50	P	2	40%
06	BNY016	Biology and Diversity of Algae, Bryophyta and Pteridophyta	10	40	50	P	2	40%
07	BNY017	Gymnosperms, Taxonomy of Angiosperms and Anatomy	10	40	50	P	2	40%
08	BNY018	Biochemistry and Plant Physiology	10	40	50	P	2	40%
II Year:24 Credits								

SN	Code	Name	CA	EE	TM	Type	CR	Min %
09	BNY021	Cell Biology, Genetics, Biostatistics and Ecology	20	80	100	T	4	40%
10	BNY022	Medicinal Plants and Embryology of Angiosperm	20	80	100	T	4	40%
11	BNY023	Applied Mycology and Plant Pathology	20	80	100	T	4	40%
12	BNY024	Plant Molecular Biology and Biotechnology	20	80	100	T	4	40%
13	BNY025	Cell Biology, Genetics, Biostatistics and Ecology	10	40	50	P	2	40%
14	BNY026	Medicinal Plants and Embryology of Angiosperms	10	40	50	P	2	40%
15	BNY027	Applied Mycology and Plant Pathology	20	80	100	P	4	40%
16	BNY028	Plant Molecular Biology and Biotechnology	10	40	50	P	2	40%

GRADING SYSTEM

1. "**Absolute Grading**": the marks are converted to grades based on pre-determined class intervals.
2. "**Letter Grade**": It is an index of the performance of students in a said programme. Grades are denoted by letters O, A+, A, B+, B, C, P and F.
3. "**Grade Point**": It is a numerical weight allotted to each letter grade on a 10-point scale. Grade Point shall be "0 (Zero)" for Letter Grade "Ab" and "F". The marks scored by the examinee shall be converted into grade points by dividing the marks scored in the aggregate and dividing the resulting number by maximum marks, multiplying the result by ten, retaining the integer part (ignore the fractional part). Thus if a person has secured 56 marks out of 100 marks in aggregate for a course, we get (56/100) x 10 which is 5.6. Ignoring the fraction, we get 5 as the grade point.

Letter Grade	Grade Point	Class
O	10	Outstanding
A+	9	Excellent
A	8	Very Good
B+	7	Good
B	6	Above Average
C	5	Average
P	**4**	**Pass**
F	**0**	**Fail**
Ab	**0**	**Absent**

4. "**Credit Point**": It is the product of grade point and number of credits for a course.
5. "**Semester Grade Point Average (SGPA)**": It is a measure of performance of work done in a semester. It is ratio of total credit points secured by a student in various courses registered in a semester and the total course credits taken during that semester. It shall be expressed up to two decimal places.
6. "**Cumulative Grade Point Average (CGPA)**": It is a measure of overall cumulative performance of a student over all semesters. The CGPA is the ratio of total credit points secured by a student in various courses in all semesters and the sum of the total credits of all courses in all the semesters. It is expressed up to two decimal places.
7. "**Transcript or Grade Card or Certificate**": Based on the grades earned, a grade certificate shall be issued to all the registered students after every semester. The grade certificate will display the course

details (code, title, number of credits, grade secured) along with SGPA of that semester and CGPA earned till that semester.

EVALUATION PATTERN

SN	Type of Course	Continuous Assessment	End Examination
1	Theory (T)	"Continuous Assessment (**CA**)" of total **20** 4SAQs,eachof5marks,1 SAQ on **each** CR in a **Single attemptonly**	"End Examination (**EE**)" of total **80** Marks and **16** "Short Answer Questions (SAQs)"**each** of **05** marks(**4 out of 5SAQs on eachCredit**),during**150**Minutes
2	Practical (P)	Student is required to submit "Activity Report" of total 10 Marks and total 2 Activities, each of 5 Marks on **each** CR in a **Single Attempt only**	External and internal examiners shall assess each student based on for total 40 Marks: Conduct of One Randomly Selected Practical Activity – 10Marks Viva-Voice –10Marks Journal (Workbook) - 10 Marks and Report of Practical Activity –10Marks **Duration**: 120 minutes

Evaluation Pattern Of Practical Type Courses of 2 CR

SN	Description	Internal Examiner	External Examiner	Total Marks
	Duration of End Exam: 120 minutes(2hrs)		**Batch size: ≈ 15students**	
a	Actual Conduct of 1 randomly selected practical activity	04 Marks	06 Marks	10
b	Viva-Voice	03 Marks	07 Marks	10
c	Workbook	04 Marks	06 Marks	10
d	Report of Practical Activity with Diagram,synoptic Answers, Graph/Observation and Conclusion	04 Marks	06 Marks	10
Total		**15 Marks**	**25 Marks**	**40 Marks**

1. **Separate and independent passing @ 40% in EE and (CAT+EE) shall be essential for Theory and Practical component of each course.** "CA, EE and Total marks" shall be separately reported for each course in the transcript or mark-statement.
2. **Only 1 attempt** for EE for **each course** shall be allowed in **each semester**.
3. **Only best of past performance shall be reported in transcript or mark statement**.
4. **Total student evaluation for**
   a. **Each** year shall be for **600** marks
   b. **Each** regularPG degree shall be for **1200** marks.

SUCCESSFUL COMPLETION OF COURSE OR PROGRAMME

1. "Successful Completion of the Course" means - either course is exempted or student gets minimum specified or better grade, either in end examination of that course or by credit transfer. A student obtaining grade "F" shall be considered failed and will be required to reappear in the examination. The student obtained minimum "P" (Pass) letter grade required for successful completion of the each course.
2. "Successful Completion of the Programme" means – all courses at all semesters are successfully completed and the student obtained "P" (Pass) letter grade for all courses at all semesters along with minimum specified SGPA and CGPA.

YEAR I

BNY011: BIOLOGY & DIVERSITY OF VIRUSES, BACTERIA & FUNGI

PROGRAMME INFORMATION

SN	Description	Details
1	University	Yashwantrao Chavan Maharashtra Open University Nasik - 422 222, Maharashtra, India Website: http://www.ycmou.ac.in/and http://ycmou.digitaluniversity.ac/
2	School	School of Architecture, Science and Technology
3	Discipline	Science
4	Level	PG
5	Course Used in	V134: M.Sc.(Botany)

COURSE INFORMATION

Sem	Code	Course Name	CR	CST	ST	CA	EE	TM	Type
01	BNY011	Biology and Diversity of Viruses, Bacteria and Fungi	4	8	120	20	80	100	T

PRESUMED KNOWLEDGE AND LEARNING OBJECTIVES

Presumed Knowledge	Learning Objectives
For successful completion of this course, student should have successfully complete: • B.Sc. with BOTANY or equivalent from a recognized University/Board.	After successful completion of this course, student should be able to • Study General Characters and Classification of Viruses • Know Economic Importance of Bacteria • Study General Characters, Reproduction and Classification of Fungi • Define Fungi in Industry, Agriculture and Forestry

UNITS

UN	Name of the Unit	CSs	Questions
01-01 01-02 01-03 01-04 01-05	**General Characters and Classification of Viruses** **Chemistry and Ultrastructure of Viruses** **Isolation and Purification of Viruses** **Replication and Transmission of Viruses** **General Account of Plant, Animal and Human Viral Diseases**	CR 01	Student is required to answer 4 of 5 SAQ, eachof 5 marks, on eachCR
02-01 02-02 02-03 02-04	**General Account and Classification of Eubacteria, Archaebacteria and Cynobacteria** **Ultrastructure, Nutrition and Reproduction of Bacteria** **Economic Importance of Bacteria** **Mycoplasma**	CR 02	Student is required to answer 4 of 5 SAQ, eachof 5 marks, on eachCR
03-01 03-02 03-03 03-04 03-05	**General Characters and Classification of Fungi** **Ultrastructure of Cell and Cell Wall Composition** **Nutrition in Fungi** **Reproduction in Fungi** **Heterothallism, Heterokaryosis and Parasexuality**	CR 03	Student is required to answer 4 of 5 SAQ, eachof 5 marks, on eachCR

04-01 04-02 04-03 04-04 04-05 04-06	**Mastigomycotina and Zygomycotina** **Ascomycotina, Basidiomycotina, Deuteromycotina** **Fungi in Industry** **Fungi in Agriculture and Forestry** **Fungi as Human and Animal Parasites (Medical Mycology)** **Fungi as Food**	**CR 04**	Student is required to answer 4 of 5 SAQ, **each**of 5 marks, on **each**CR

DETAILED SYLLABUS

UN	Detailed Syllabus of the Unit	CR
1-1	**GENERAL CHARACTERS AND CLASSIFICATION OF VIRUSES:-**Historical Account, Occurrence, Morphology, Components of Viruses, Nomenclature, Classification.	CR 01
1-2	**CHEMISTRY AND ULTRASTRUCTURE OF VIRUSES:-**Introduction,Chemistry of Viruses, Ultra structure of TMV, Ultra structure of T_4 Bacteriophage, Ultra structure of HIV.	
1-3	**ISOLATION AND PURIFICATION OF VIRUSES:-**Isolation of Viruses, Purification of viruses, Criteria for Purity and Preservation.	
1-4	**REPLICATION AND TRANSMISSION OF VIRUSES:-**Introduction, Replication of Bacteriophages, , Replication of TMV, Transmission of Viruses.	
1-5	**GENERAL ACCOUNT OF PLANT, ANIMAL AND HUMAN VIRAL DISEASES:-**Introduction, Plant Diseases Caused by Viruses, Important Virus Families and Viruses, Viral Diseases of Animals, Viral Diseases of Humans.	
2-1	**GENERAL ACCOUNT AND CLASSIFICATION OF EUBACTERIA, ARCHAEBACTERIA AND CYNOBACTERIA: -**Introduction,Description Bacteria and Nomenclature, Classification, Size of Bacteria, Staining Reactions, Colony Formation, Gram Negative Eubacteria, Gram Positive Eubacteria, Eubacteria Lacking Cell Walls, Archaebacteria,Cynobacteria.	CR 02
2-2	**ULTRASTRUCTURE, NUTRITION AND REPRODUCTION OF BACTERIA:-** Nutrition, Reproduction in Bacteria	
2-3	**ECONOMIC IMPORTANCE OF BACTERIA:-**Role of Bacteria in Industry, Role of Bacteria in Medicine, Biogeochemical Cycle, Biofertilizers, Sewage Treatment, Biopesticides, Bacterial Insecticides, Biological Control, Biodegradation, Harmful Activities of Bacteria.	
2-4	**MYCOPLASMA:-**Characteristics Features of Mycoplasma, Economic importance of Mycoplasma, Conclusion	
3-1	**GENERAL CHARACTERS AND CLASSIFICATION OF FUNGI:-**Vegetative Structure, Reproduction, Classification of Fungi, Recent Trends in Classification, Origin and Phylogency of Fungi.	CR 03
3-2	**ULTRASTRUCTURE OF CELL AND CELL WALL COMPOSITION:-**Ultrastructure of Fungal Cell, Cell Wall Composition	
3-3	**NUTRITION IN FUNGI:-**Nutrition, Necrotrophs and Biotrophs, Nutritional requirements and Physiology of Fungi, Growth Requirements, Hyphal Growth.	
3-4	**REPRODUCTION IN FUNGI: -**Reproduction, Vegetative Reproduction, Asexual Reproduction, Asexual Fruiting Structures, Sexual Reproduction, Parasexuality and Heterokaryosis, Heterothallism, Taxonomic Implications in Sexual Reproduction, Sex Hormones in Fungi, Life Cycles in Fungi.	
3-5	**HETROTHALLISM, HETROKARYOSIS AND PARASEXUALITY:-**Heterothallism, Heterokyrosis, Parasexuality.	
4-1	**MASTIGOMYCOTINA AND ZYGOMYCOTINA:-**Mastigomycotina, Zygomycotina.	CR 04
4-2	**ASCOMYCOTINA, BASIDIOMYCOTINA, DEUTEROMYCOTINA:-**Ascomycotina, Basidiomycotina, Deuteromycotina.	
4-3	**FUNGI IN INDUSTRY:-**Production of Alcohols, Production of Antibiotics, Production of Organic acids.	
4-4	**FUNGI IN AGRICULTURE AND FORESTRY:-** Fungi as Plant Parasites, Mycorrhizae, Biofertilizers, Phosphate Solubilizers, Plant Growth Promoting Rhizobacteria, Microbial Decomposition and Recycling of Agricultural Wastes, Vermicomposting, Biofertilizer Availability, Need for an Integrated Organizational Structure, Fungi as Biocontrol Agents.	
4-5	**FUNGI AS HUMAN AND ANIMAL PARASITES (MEDICAL MYCOLOGY):-** Superficial Infections, Systemic Infections or deep seated Mycoses, Intermediate Infections.	
4-6	**FUNGI AS FOOD:-**Mushrooms, Fungal Protein.	

LEARNING RESOURCE DETAILS

LR Code	Title Author	Edition Year	ISBN Publisher
Course Website Link for (1) Mobile and Online Lectures, (2) Discussion Forum for online interaction and (3) Self-Test for each CR Block, Continuous Assessment Test and End Examination			
CW-BNY011			
Text-Books			
BNY011-T01	Biology & Diversity of Viruses, Bacteria and Fungi i. Prof. B. Badraiah, ii. Prof. G. Bhagyanarayana, iii. Prof. K. V. Mallaiah, iv. Prof. K. Murugesan, v. Dr. A. Nagamani	2007	BRAOU, Hyderabad
Reference-Books: Explore additional details and reinforce learning, with this optional learning resource!			
CD / DVD: Explore additional details and reinforce learning, with this optional learning resource!			
BNY011 -CD1			
Web Links: Explore additional details and reinforce learning, with this optional learning resource!			
BNY011-WL1			

BNY012: BIOLOGY & DIVERSITY OF ALGAE, BRYOPHYTA & PTERIDOPHYTA

PROGRAMME INFORMATION

SN	Description	Details
1	University	Yashwantrao Chavan Maharashtra Open University Nashik - 422 222, Maharashtra, India Website: http://www.ycmou.ac.in/and http://ycmou.digitaluniversity.ac/
2	School	School of Architecture, Science and Technology
3	Discipline	Science
4	Level	PG
5	Course Used in	V134: M.Sc.(Botany)

COURSE INFORMATION

Sem	Code	Course Name	CR	CST	ST	CA	EE	TM	Type
01	BNY012	Biology and Diversity of Algae, Bryophyta and Pteridophyta	4	8	120	20	80	100	T

PRESUMED KNOWLEDGE AND LEARNING OBJECTIVES

Presumed Knowledge	Learning Objectives
For successful completion of this course, student should have successfully completed: B. Sc. with BOTANY or equivalent from a recognized University/Board.	After successful completion of this course, student should be able to • Study General Characteristics and Classification of Algae • Study General Characteristics and Classification of Bryophyta • Study General Characteristics and Classification of Pteridophyta

UNITS

UN	Name of the Unit	CSs	Questions
01-01 01-02 01-03 01-04 01-05	General Characteristics and Classification Thallus Organization in Algae Reproduction and Life Cycles of Algae Life Histories of Some Genera of Chlorophyta – I Life Histories of Some Genera of Chlorophyta – II	CR 01	Student is required to answer 4 of 5 SAQ, each of 5 marks, on each CR
02-01 02-02 02-03 02-04 02-05	General Characters of Cyanophyta General Characters of Some Genera Of Xanthophyta and Bacillariophyta General Characters and Life Histories of Some members of Phaeophyta General Characters and Life Histories of Rhodophyta Economic Importance of Algae	CR 02	Student is required to answer 4 of 5 SAQ, each of 5 marks, on each CR

03-01 03-02 03-03 03-04 03-05	General Characters, Classification, Distribution and Economic Importance of Bryophytes Marchantiales, Jungermanniales Anthoceratales and Sphagnales The Evolution of Gametophyte Evolution of Sporophyte	CR 03	Student is required to answer 4 of 5 SAQ, each of 5 marks, on each CR
04-01 04-02 04-03 04-04 04-05	General Characters and Classification of Pteridophytes Structure and Life Histories of *Psilotum, Lycopodium, Selaginella and Equisetum* Telome Theory and Stelar Evolution Heterospory and Seed Habit Fossil Pteridophytes*(Rhynia, Psilophyton* and *Calamites*)	CR 04	Student is required to answer 4 of 5 SAQ, eachof 5 marks, on eachCR

DETAILED SYLLABUS

UN	Detailed Syllabus of the Unit	CR
1-1	**GENERAL CHARACTERISTICS AND CLASSIFICATION:**-General Characters, Classification of Algae, Distribution of Algae.	CR 01
1-2	**THALLUS ORGANIZATION IN ALGAE:**- Types of Thalli	
1-3	**REPRODUCTION AND LIFE CYCLES OF ALGAE:**-Reproduction, Life Cycles in Algae.	
1-4	**LIFE HISTORIES OF SOME GENERA OF CHLOROPHYTA – I:**- *Chlamydomonas*, *Volvox*, *Chlorella*, *Scenedesmus*.	
1-5	**LIFE HISTORIES OF SOME GENERA OF CHLOROPHYTA – I:**-*Ulva*, *Enteromorpha*, *Oedogonium*, *Cosmarium*, *Caulerpa*.	
2-1	**GENERAL CHARACTERS OF CYANOPHYTA:-** Distribution, Position of Algae in Plant Kingdom, Range of Plant Body, *Spirulina*,*Lyngbya*, *Tolypothrix*.	CR 02
2-2	**GENERAL CHARACTERS OF SOME GENERA OF XANTHOPHYTA AND BACILLARIOPHYTA:-** *Xanthophyta*, *Vaucheria*, *Bacillariophyta*, *Navicula*, *Cyclotella*.	
2-3	**GENERAL CHARACTERS AND LIFE HISTORIES OF SOME MEMBERS OF PHAEOPHYTA:-** Distribution, Position of Algae in Plant Kingdom, Range of Plant Body, *Ectocarpus*, *Laminaria*, *Sargassum*.	
2-4	**GENERAL CHARACTERS AND LIFE HISTORIES OF RHODOPHYTA:-** Distribution, Position of Algae in Plant Kingdom, Range of Plant Body, *Poriphyra*, *Gelidium*, *Gracilaria*.	
2-5	**ECONOMIC IMPORTANCE OF ALGAE:**- Algae in Industry, Algae in Agriculture, Algae as Food, Algae as Fodder, Algae in Medicine, Algae in Oil, Gas, Energy and Chemicals, Algae in Sewage Treatment, Algae in Experimental Works, Algae in Water Supplies, Algae in Waste Land Reclamation, Algae in Bio-fouling, Algae as Indicators of Pollution, Toxicity, Algae in Parasitism, Single Cell Protein, Biofertilizers.	
3-1	**GENERAL CHARACTERS, CLASSIFICATION, DISTRIBUTION AND ECONOMIC IMPORTANCE OF BRYOPHYTES:** General Characters, Classification,Distribution, Economic Importance.	CR 03
3-2	**MARCHANTIALES, JUNGERMANNIALES:-**Marchantiales, Jungermanniales, Pellia.	
3-3	**ANTHOCERATALES AND SPHAGNALES:-**Anthoceratales, *Anthoceros*,Sphagnales, Sphagnum.	
3-4	**THE EVOLUTION OF GAMETOPHYTE:-**Retrogressive Evolution Theory, Progressive Evolution Theory.	
3-5	**EVOLUTION OF SPOROPHYTE:-**Theory of Sterilization, Reduction Theory.	
4-1	**GENERAL CHARACTERS AND CLASSIFICATION OF PTERIDOPHYTES:-**General Characters,	CR 04

	Relationship with their Relatives, Abnormalities in the Life Cycle of Pteridophytes, Classification.
4-2	**STRUCTURE AND LIFE HISTORIES OF PSILOTUM, LYCOPODIUM, SELAGINELLA AND EQUISETUM:-** *Psilotum*, *Lycopodium*, *Selaginella*, *Equisetum*.
4-3	**TELOME THEORY AND STELAR EVOLUTION:-**Telome Theory, Stelar Evolution.
4-4	**HETEROSPORY AND SEED HABIT:-**Importance of Heterospory, Origin of Heterospory, Heterospory and Seed Habit.
4-5	**FOSSIL PTERIDOPHYTES (RHYNIA, PSILOPHYTON AND CALAMITES):-** *Rhynia*, *Psilophyton*, *Calamites*.

LEARNING RESOURCE DETAILS

LR Code	Title Author	Edition Year	ISBN Publisher
Course Website Link for (1) Mobile and Online Lectures, (2) Discussion Forum for online interaction and (3) Self-Test for each CR Block, Continuous Assessment Test and End Examination			
CW-BNY012			
Text-Books			
BNY012-T01	Biology & Diversity of Algae, Bryophyta&Pteridophyta i. Dr. B. DigamberRao, ii. Dr. NirmalaBabuRao, iii. Prof. B. Rajkumar, iv. Dr. N. Saradamani, v. Dr. M. Venkaiah, vi. Prof. R. R. VentakataRaju	2007	Dr. B. R. Ambedkar Open University, Hydrabad
Reference-Books: Explore additional details and reinforce learning, with this optional learning resource!			
BNY012 –RB1			
BNY012 –RB2			
BNY012 –RB3			
BNY012 –RB4			
BNY012 –RB5			
CD / DVD: Explore additional details and reinforce learning, with this optional learning resource!			
BNY012 -CD1			
Web Links: Explore additional details and reinforce learning, with this optional learning resource!			
BNY012-WL1			

BNY013: GYMNOSPERMS, TAXONOMY OF ANGIOSPERMS & ANATOMY

PROGRAMME INFORMATION

SN	Description	Details
1	University	Yashwantrao Chavan Maharashtra Open University Nashik - 422 222, Maharashtra, India Website: http://www.ycmou.ac.in/and http://ycmou.digitaluniversity.ac/
2	School	School of Architecture, Science and Technology
3	Discipline	Science
4	Level	PG
5	Course Used in	V134: M.Sc.(Botany)

COURSE INFORMATION

Sem	Code	Course Name	CR	CST	ST	CA	EE	TM	Type
01	BNY013	Gymnosperms, Taxonomy of Angiosperms and Anatomy	4	8	120	20	80	100	T

PRESUMED KNOWLEDGE AND LEARNING OBJECTIVES

Presumed Knowledge	Learning Objectives
For successful completion of this course, student should have successfully complete: • B.Sc. with Botany or equivalent from a recognized University/Board.	After successful completion of this course, student should be able to • Study Distribution, General Characteristics, Classification and Economic Importance of Gymnosperms • Origin and Phylogeny of Angiosperms • Identify Primary structure of root, stem and leaf

UNITS

UN	Name of the Unit	CSs	Questions
01-01 01-02 01-03 01-04 01-05	Distribution, General Characteristics, Classification and Economic Importance of Gymnosperms Morphology and Anatomy of Cycadales, Ginkgoales, Coniferales, Taxales and Gnetales Reproductive Structure of Cycadales, Ginkgoales, Coniferales, Taxales and Gnetales Development of Male and Female Gametophytes Fossil Gymnosperms	CR 01	Student is required to answer 4 of 5 SAQ, eachof 5 marks, on eachCR
02-01 02-02 02-03 02-04	Fossil gymnosperms Origin and phylogeny of angiosperms Plant nomenclature Systems of classification	CR 02	Student is required to answer 4 of 5 SAQ, eachof 5 marks, on eachCR
03-01 03-02 03-03 03-04	Recent trends in plant taxonomy Biosystematics General account-ranales, centrospermae, amentiferae General account -tubiflorae, helobiales and poales	CR 03	Student is required to answer 4 of 5 SAQ, eachof 5 marks, on eachCR

04-01 04-02 04-03 04-04 04-05 04-06 04-07 04-08	Flora and vegetation of Andhra Pradesh Herbarium methodology Biodiversity and conservation Apical meristems of root and shoot Tissues and tissues system Primary structure of root, stem and leaf Secondary growth Wood anatomy	CR 04	Student is required to answer 4 of 5 SAQ, eachof 5 marks, on eachCR

DETAILED SYLLABUS

UN	Detailed Syllabus of the Unit	CR
1-1	**DISTRIBUTION, GENERAL CHARACTERISTICS, CLASSIFICATION AND ECONOMIC IMPORTANCE OF GYMNOSPERMS:** Introduction, Characteristics features of Gymnosperms, Antiquity and Origin of Gymnosperms, Fossil History of Gymnosperms of India, Distribution of Indian Gymnosperms, Indian work on Gymnosperms, General Characters of Gymnosperms, Economic Importance, Classification of Gymnosperms, Primitive and Advanced Characters of Gymnosperms, Living Fossils.	
1-2	**MORPHOLOGY AND ANATOMY OF CYCADALES, GINKGOALES, CONIFERALES, TAXALES AND GNETALES:** Introduction, Morphology and Anatomy of Vegetative Structures of Cycadales, Morphology and Anatomy of Vegetative Structures of Ginkgoales, Morphology of Vegetative Structures of Coniferales, Morphology of Vegetative Structures of Taxales, Anatomy of Coniferales and Taxales with special reference to wood structure, Morphology and Anatomy of Vegetative Structures of Gnetales.	CR 01
1-3	**REPRODUCTIVE STRUCTURES OF CYCADALES, GINKGOALES, CONIFERALES, TAXALES AND GNETALES:** Introduction, Male cones, Female cones, Pollination and Post Pollination in Gymnosperms.	
1-4	**DEVELOPMENT OF MALE AND FEMALE GAMETOPHYTES(CYCADALES, GINKGOALES, CONIFERALES, TAXALES AND GNETALES):**-Introduction, Development of Male Gametophyte, Development of Female Gametophyte, Archegonia in Gymnosperms, Pollination and Fertilization in Gymnosperms, Embryogeny, Seed Structure in Gymnosperms.	
2-1	**FOSSIL GYMNOSPERMS (PTERIDOSPERMALES, BENNETTITALES, PENTOXYLALES AND CORDAITALES):-** Introduction, Pteridospermales, Bennettitales, Pentoxylales, Cordaitales.	
2-2	**ORIGIN AND PHYLOGENY OF ANGIOSPERMS:-**Introduction,Historical Account, Features Of Protoangiosperms, Hypothetical Primitive Angiosperm, Time And Place Of Origin, Diversification Of Protoangiosperms, Significance, Are Angiosperms Monophyletic Or Polyphyletic?, Conclusion, Future Studies.	CR 02
2-3	**PLANT NOMENCLATURE:-**Introduction, History Of Plant Nomenclature, Binominal Nomenclature, International Code Of Botanical Nomenclature (ICBN) .	
2-4	**SYSTEMS OF CLASSIFICATION:-**Introduction, Bentham And Hooker's System, EnglerAnd Prantl'sSystem, Hutchinson's System, Takhtajan'sSystem, Cronquist'sSystem, Dahlgern'sSystem, Thorne's System.	
3-1	**RECENT TRENDS IN PLANT TAXONOMY(ANATOMY, PALYNOLOGY, EMBRYOLOGY, CYTOLOGY, CHEMOTAXONOMY, NUMERICAL TAXONOMY AND MOLECULAR TAXONOMY):-** Introduction, Anatomy In Relation To Taxonomy, Embryology In Relation To Taxonomy, Palynology, Cytology In Relation To Taxonomy, Chemotaxonomy, Numerical Taxonomy.	
3-2	**BIOSYSTEMATICS:-** Introduction, Methods Of Study Of Biosystematics, Mechanism Of Study Of Biosystematics, Objectives Of Biosystematics Categories, Recognition And Classificationof Ecotypes, Ecotype And Taxonomy, Coenospecies, Comparium (Syngamodeme), Deme Terminology, Role Of Biosystematics, Species Concepts- Types Of Concepts.	CR 03
3-3	**GENERAL ACCOUNT OF RANALES, CENTROSPERMAE AND AMENTIFERAE:-**Introduction, Ranales, Centrospermae, Amentiferae.	
3-4	**GENERAL ACCOUNT OF ORDERS TUBIFLORAE, HELOBIALES AND POALES:-**Introduction, Tubiflorae, Helobiales, Poales, Comparative Account Of The Families Of The Orders Of Tubiflorae, Helobiales And Poales.	
4-1	**FLORA AND VEGETATION OF ANDHRA PRADESH:-**Introduction, Flora Of Andhra Pradesh, Vegetation Types Of Andhra Pradesh.	CR 04
4-2	**HERBARIUM METHODOLOGY:-**Introduction, Functions Of A Herbarium, Kinds Of Herbaria, Important Herbaria Of The World And India, Making Herbarium, Arrangement And Maintenance	

	Of Herbarium.	
4-3	**BIODIVERSITY AND CONSERVATION:-**Introduction, Nature And Value Of Biodiversity, Biodiversity At Global And National Levels, Biogeographic Zones Of India, Threats To Biodiversity, Conservation Of Biodiversity.	
4-4	**APICAL MERISTEMS OF ROOT AND SHOOT:-** Introduction, Characteristics Of Meristmatic Tissue, Classification Of Meristems, Vegetative Shoot Apex, Reproductive Shoot Apex, Root Apex.	
4-5	**TISSUES AND TISSUE SYSTEMS:-**Introduction, Parenchyma, Collenchyma, Sclerenchyma, Xylem, Phloem, Transfer Cells, Secretory Cells And Tissues, Tissue Systems.	
4-6	**PRIMARY STRUCTURE OF ROOT, STEM AND LEAF:-**Introduction, Primary Structure Of Root, Primary Structure Of Stem, Root Stem Transition, Primary Structure Of Leaf.	
4-7	**SECONDARY GROWTH:-**Introduction, Secondary Growth, Anomalous Secondary Growth In Stems, Anomalous Secondary Growth In Monocot Stems, Anomalous Secondary Growth In Dicotyledonous Roots.	
4-8	**WOOD STRUCTURE:-** Introduction, Macroscopic Characteristics Of Wood, Softwoods(Conifer Wood) And Hardwoods(Dicotyledon Wood), Components Of Wood, Axial And Ray Systems, Sectioning Planes Of Wood, Distribution Patterns Of Vessels: Diffuse Porous And Ring Porous Woods, Axial Wood Parenchyma, Distribution Patterns Of Axial Wood Parenchyma, Ray System, Cellular Organization Of Rays, Sapwood And Heartwood, Storied And Non Storied Woods, Reaction Wood, Growth Rings (Annual Rings), Dendrochronology, Secretory Structures Of Wood, Characteristics Features Of Wood, Salient Features Of Some Woods.	

Learning Resource Details

LR Code	Title Author	Edition Year	ISBN Publisher
Course Website Link for (1) Mobile and Online Lectures, (2) Discussion Forum for online interaction and (3) Self-Test for each CR Block, Continuous Assessment Test and End Examination			
CW-BNY013			
Text-Books			
BNY013-T01	Gymnosperms Taxonomy Of Angiosperms And Anatomy- i. Dr. H. Ramakrishnan, ii. Dr.B. Ravi Prasad Rao, iii. Dr. S.R. Shanmukharao, iv. Dr.S. Swarupa Rani, v. Prof. V.N.R. Verma, vi. Dr. K. Vijaya Kumar, vii. Dr. K. Yashodhara	2007	BRAOU, Hyderabad
Reference-Books: Explore additional details and reinforce learning, with this optional learning resource!			
BNY013 –RB1			
CD / DVD: Explore additional details and reinforce learning, with this optional learning resource!			
BNY013 -CD1			
Web Links: Explore additional details and reinforce learning, with this optional learning resource!			
BNY013-WL1			

BNY014: BIOCHEMISTRY & PLANT PHYSIOLOGY

PROGRAMME INFORMATION

SN	Description	Details
1	University	Yashwantrao Chavan Maharashtra Open University Nashik - 422 222, Maharashtra, India Website: http://www.ycmou.ac.in/and http://ycmou.digitaluniversity.ac/
2	School	School of Architecture, Science and Technology
3	Discipline	Science
4	Level	PG
5	Course Used in	V134: M.Sc.(Botany)

COURSE INFORMATION

Sem	Code	Course Name	CR	CST	ST	CA	EE	TM	Type
01	BNY014	Biochemistry and Plant Physiology	4	8	120	20	80	100	T

PRESUMED KNOWLEDGE AND LEARNING OBJECTIVES

Presumed Knowledge	Learning Objectives
For successful completion of this course, student should have successfully complete: • B.Sc. with Botany or equivalent from a recognized University/Board.	After successful completion of this course, student should be able to • Study Principles of thermodynamics • Define Plant water relations • Study Photosynthesis and respiration process

UNITS

UN	Name of the Unit	CSs	Questions
01-01 01-02 01-03 01-04 01-05 01-06 01-07 01-08	**Principles Of Thermodynamics** **Enzymes** **Carbohydrates** **Lipids** **Amino Acids** **Proteins** **Nucleic Acids** **Structure And Function Of Membranes**	CR 01	Student is required to answer 4 of 5 SAQ, eachof 5 marks, on eachCR
02-01 02-02 02-03 02-04	**Plant Water Relations** **Mineral Nutrition** **Photosynthesis-I** **Photosynthesis-II**	CR 02	Student is required to answer 4 of 5 SAQ, eachof 5 marks, on eachCR
03-01 03-02 03-03 03-04	**Respiration-I** **Respiration-II** **Nitrogen And SulphurMetabolism** **Plant Growth Regulators**	CR 03	Student is required to answer 4 of 5 SAQ, eachof 5 marks, on eachCR
04-01 04-02 04-03 04-04	**Mechanism Of HormonalRegulation Of Plant Growth And Development** **Physiology Of Flowering And Vernalisation** **Seed Dormancy And Germination** **Stress Physiology**	CR 04	Student is required to answer 4 of 5 SAQ, eachof 5 marks, on eachCR

DETAILED SYLLABUS

UN	Detailed Syllabus of the Unit	CR
1-1	**PRINCIPLES OF THERMODYNAMICS:**-Introduction, First Law Of Thermodynamics, Internal Energy, Enthalpy, Second Law Of Thermodynamics, Entropy, Heat Of Reaction.	
1-2	**ENZYMES:**-Introduction, Properties Of Enzymes, Co-Factors Of Enzymes, Nomenclature And Classification Of Enzymes, Catalysis And Energy Of Activation, Mechanism Of Enzyme Action, Michaelis- Menten Kinetics, Factors Affecting Rate Of Enzyme Reaction, Enzyme Regulation, Enzyme Inhibition, Isozymes Allosteric Enzymes.	
1-3	**CARBOHYDRATES:-**Introduction, Classification, Structural Aspects Of Monosaccharides, Glycosides, Oligosaccharides, Polysaccharides, Functions Of Carbohydrates, Glycoproteins.	
1-4	**LIPIDS:-**Introduction, Functions Of Lipids, Classification Of Lipids, Lipid Mobilization- Conversion Of Lipids To Carbohydrates, B-Oxidation, Glyoxylate Cycle, Fatty Acid Biosynthesis, Assembly Of Glycerolipids.	CR 01
1-5	**AMINO ACIDS:-**Introduction, General Structure And Properties, Peptide Bonds, Classification, Biosynthesis Of Amino Acids: G.S, GOGAT, Regulation.	
1-6	**PROTEINS:-**Introduction, Classification Of Proteins, Structure Of Proteins, Isolation And Purification Of Proteins, Procedure Of Column Chromatography.	
1-7	**NUCLEIC ACIDS:-**Introduction,Classification And Chemical Composition, Nucleic Acides And Nucleiosides, DNA- Chemistry And Structure, RNA-Chemistry And Structure, Composition Of DNA And RNA, DNA-Replication And Transcription, Mechanism Of Protein Synthesis.	
1-8	**STRUCTURE AND FUNCTION OF MEMBRANES:-** Introduction, Chemical Composition Of Membranes- Lipids, Chemical Composition Of Membranes-Proteins, Structure- Earlier Membrane Models, Structure- Fluid Mosaic Model, Functions Of Membranes.	
2-1	**PLANT WATER RELATIONS:-**Introduction, Plant Cell Water Relations, SPAC Concept, Structure Of Stomata And The Mechanism Of Their Movement.	
2-2	**MINERAL NUTRITION:-**Introduction, Mineral Nutrients, Ion Uptake.	
2-3	**PHOTOSYNTHESIS-I :-** Introduction, History Of Photosynthesis, Light Energy And Photosynthesis, Light Absorption, Structure Of Chloroplast, Mechanism Of Light Reactions, Cyclic Electron Transport, ATP Synthesis In Chloroplasts, Use Of Inhibitors And Electron Acceptors.	CR 02
2-4	**PHOTOSYNTHESIS-II:-**Introduction, Photosynthetic Carbon Reduction, Photorespiration And Its Significance, Carbon Reduction In C_4Plants, Crassulacean Acid Metabolism (CAM), Synthesis Of Starch And Source.	
3-1	**RESPIRATION-I:-**Introduction, Respiratory Quotient, Structure Of Mitochondria, Overview Of Respiration, Glycolysis, Pentose Phosphate Pathway.	
3-2	**RESPIRATION-II:-**Introduction, Fate Of Pyruvate, Fermentation, Aerobic Respiration, Electron Transport System And Oxidative Phosphorylation, Plant Mitochondria Possess Additional Electron Transport-Enzymes, Cyanide Resistant Respiration.	CR 03
3.3	**NITROGEN AND SULPHUR METABOLISM:-**Introduction, Biological Nitrogen Fixation, Nitrate Reduction, Biosynthesis Of Proteins, Uptake And Reduction Of Sulphate.	
3.4	**PLANT GROWTH REGULATORS:-**Introduction, Functions Of Plant Growth Regulators, Applications Of Plant Growth Regulators.	
4-1	**MECHANISM OF HORMONAL REGULATION OF PLANT GROWTH AND DEVELOPMENT:-** Introduction, Hormone Receptors, Second Messengers, Amplification Of Protein Kinases, Model For Hormone Action.	
4-2	**PHYSIOLOGY OF FLOWERING:**-Introduction, Photoperiodism, Phytochrome, Vernalization.	CR 04
4-3	**SEED DORMANCY AND GERMINATION:**- Introduction, Seed Germination, Process Of Imbibition, Formation Or Activation Of Enzyme Systems, Metabolism Of Storage Products, Mobilization Of	

	Reserve Food Material, Seed Dormancy, Coat Imposed Dormancy, Requirement Of Light, Temperature, Germination Inhibitors, Hormones.	
4-4	**STRESS PHYSIOLOGY:**-Introduction, Water Deficit/Drought Stress, Temperature Stress, Salt Stress, Heavy Metal Stress.	

LEARNING RESOURCE DETAILS

LR Code	Title Author	Edition Year	ISBN Publisher
Course Website Link for (1) Mobile and Online Lectures, (2) Discussion Forum for online interaction and (3) Self-Test for each CR Block, Continuous Assessment Test and End Examination			
CW-BNY014			
Text-Books			
BNY014-T01	Biochemistry & Plant Physiology i. Prof. S. Gangadharrao, ii. Prof. G. Rama Gopal, iii. Prof. S. Seetaramarao, iv. Dr. I. Subrahmanyam, v. Dr. B. Sujatha, vi. Dr. J. Ushakumari, vii. Dr. S. VasanthaPillai	2007	BRAOU, Hyderabad
Reference-Books: Explore additional details and reinforce learning, with this optional learning resource!			
BNY014 –RB1			
BNY014 –RB2			
BNY014 –RB3			
BNY014 –RB4			
CD / DVD: Explore additional details and reinforce learning, with this optional learning resource!			
BNY014 -CD1			
Web Links: Explore additional details and reinforce learning, with this optional learning resource!			
BNY014-WL1			

BNY015: BIOLOGY & DIVERSITY ÔF VIRUSES, BACTERIA & FUNGI (PRACTICAL)

PROGRAMME INFORMATION

SN	Description	Details
1	University	Yashwantrao Chavan Maharashtra Open University Nashik - 422 222, Maharashtra, India Website: http://www.ycmou.ac.in/and http://ycmou.digitaluniversity.ac/
2	School	School of Architecture, Science and Technology
3	Discipline	Science
4	Level	PG
5	Course Used in	V134: M.Sc.(BOTANY)

COURSE INFORMATION

Sem	Code	Course Name	CR	CST	ST	CA	EE	TM	Type
01	BNY015	Biology and diversity of Viruses, Bacteria and Fungi	2	8	120	10	40	50	P

PRESUMED KNOWLEDGE AND LEARNING OBJECTIVES

Presumed Knowledge	Learning Objectives
For successful completion of this course, student should have successfully complete: • B. Sc. with BOTANY or equivalent from a recognized University/Board.	After successful completion of this course, student should be able to • Methods of Sterilization • Preparation of Media • Culturing Methods • Staining Techniques-

UNITS

UN	Name of the Unit	CSs	Questions
01-01	**Methods of Sterilization**	CR 01	Student is required to answer 4 of 5 SAQ, eachof 5 marks, on eachCR
01-02	**Preparation of Media**		
01-03	**Culturing Methods**		
01-04	**Staining Techniques**		
01-05	**Symptoms of Some Viral and Mycoplasmal Diseases**		
01-06	**Models of Bacteriophage and HIV**		
01-07	**Tansmission of Virus Diseases**		
01-08	**Isolation and Enumeration of Bacteria from Soil and Water**		
01-09	**Observation of Symptoms of Plant Diseases Caused by Bacterial Pathogens**		
02-01	**Isolation of Fungi From Soil ,Water, Litter and Air**	CR 02	Student is required to answer 4 of 5 SAQ, eachof 5 marks, on eachCR
02-02	**Identification of Fungal Cultures Slides and Specimens-I**		
02-03	**Identification of Fungal Cultures Slides and Specimens-II**		
02-04	**Identification of Fungal Cultures Slides and Specimens-III**		
02-05	**Mycorhizal Colonization in Roots of Parthenium and Tagetes**		

02-06 02-07 02-08 02-09 02-10	**Morphology of Plant Pathogens** **Study of Symptoms of Fungal Diseases** **Morphology of ButtonOyster,paddy Straw Mushrooms and Amanita** **Identification of Ectomycorhizal Fungi** **Genetics of Fungi(*Neurosporaascus*)**		Student is required to answer 4 of 5 SAQ, **each**of 5 marks, on **each**CR

DETAILED SYLLABUS

UN	Detailed Syllabus of the Unit	CR
01-01	**Methods Of Sterilization-**In This Unit You Will Study Various Methods Of Sterilization.	
01-02	**Preparation Of Media-**In This Unit You Will Study The Preparation Of Different Media For Cutting The Microorganism	
01-03	**Culturing Methods-**In This Unit You Will Study About The Use And Care Of Microscope And Various Types Of Culturing Methods.	
01-04	**Staining Techniques-**In This Unit You Will Study About The Acidic And Basic Dyes And Various Staining Techniques	
01-05	**Symptoms Of Some Viral And Mycoplasmal Diseases-**In This Unit You Will Study The Symptoms Caused By Some Viral And Mycoplasmal Diseases, Their Causal Organisms, Control Measures Etc.	
01-06	**Models Of Bacteriophage And HIV-**In This Unit You Will Study The Models Of Bacteriophage And HIV	CR 01
01-07	**Transmission Of Virus Diseases-** In This Unit You Will Study Various Types Of Viral Transmission Such As Mechanical, Grafting, Dodder, Seed Or Pollen, Insets, Fungi, Etc.	
01-08	**Isolation And Enumeration Of Bacteria From Soil And Water-**In This Unit You Will Study Isolation And Enumeration Of Bacteria From Soil And Water By Serial Dilution Plate Method.	
01-09	**Observation Of Symptoms Of Plant Diseases Caused By Bacterial Pathogens-**In This Unit You Will StudySymptoms Of Plant Diseases Caused By Bacteria	
02-01	**Isolation Of Fungi From Soil ,Water, Litter And Air-**In This Unit You Will Study The Procedures Of Isolation Of Fungi From Soil ,Water, Litter And Air	
02-02	**Identification Of Fungal Cultures Slides And Specimens-I-**In This Unit You Will Study The Morphology Of The Fungal Organism *Achlya*, *Allomyces*, *RhizopusMucor*, *Pilobolus*, *Emericella*, *Erysiphae*,*Chaetomium*,*PeosporaAnd Caviceps.*	
02-03	**Identification Of Fungal Cultures Slides And Specimens-II-**In This Unit You Will Study The Occurrence, Morphology, And AscocarpStructure Of *Peziza*, *Morchella*, *Cyathus*, *Polyporus*, *Amanita*, *Ganoderma*, *Lycoperdon.*	
02-04	**Identification Of Fungal Cultures Slides And Specimens-III-**In This Unit You Will Study The Cultural And Identification Characters Of Some Common Soil Fungi Viz., *Alternaria*, *Aspergillus*, *Colletotricum*, *Curvalaria*, *Drechslera*, *Fusarium*, *PenicilliumAnd Phoma.*	CR 02
02-05	**Mycorhizal Colonization In Roots Of PartheniumAnd Tagetes-**In This Unit You Will Study The Root Sample Of AMFungi Based On Clearing And Staining Of The Root Samples.YouWill Also Calculate The Percentage Of VAM Infection In Roots Of PartheniumAnd TagestesAnd AM Fungal Spore Count Will Be Recorded.	
02-06	**Morphology Of Plant Pathogens-** In This Unit You Will Study Some Important Pathogenic Fungi,Their Symptoms And Fungal Morphology Through Transverse Section Of Infected Plant Parts.	
02-07	**Study Of Symptoms Of Fungal Diseases-**In This Unit You Will Study The Host Range Of White Rust, Symptoms Caused By Fungal Organisms Albugo, Downy Mildrew Of Grapes Etc.	
02-08	**Morphology Of ButtonOyster,Paddy Straw Mushrooms And Amanita-**In This Unit You Will StudyThe Morphology Of Mushrooms Like Button Oyster,Paddy Straw Mushrooms And	

	Amanita.	
02-09	**Identification Of Ectomycorhizal Fungi**-In This Unit You Will Study The Occurrence, Important And Morphological Identification Characters Of EctomycorrhizalFungi.	
02-10	**Genetics Of Fungi (*Neurosporaascus*)** -In This Unit You Will Study The Habit And The Identification Characters Of AM Fungi.	

LEARNING RESOURCE DETAILS

LR Code	Title Author	Edition Year	ISBN Publisher
Course Website Link for (1) Mobile and Online Lectures, (2) Discussion Forum for online interaction and (3) Self-Test for each CR Block, Continuous Assessment Test and End Examination			
CW-BNY015			
Text-Books			
BNY015-T01	Laboratory Manual and Record-Biology and Diversity of Viruses, Bacteria, and Fungi i. Prof. B. Badraiah ii. Prof. G. Bhagyanarayana iii. Prof. K.V. Mallaiah iv. Prof. K.Murugesan v. Dr. A.Nagamani vi. Dr. K.V.B.R.Tilak	2008	BRAOU, Hyderabad
Reference-Books: Explore additional details and reinforce learning, with this optional learning resource!			
BNY015 –RB1			
BNY015 –RB2			
BNY015 –RB3			
BNY015 –RB4			
CD / DVD: Explore additional details and reinforce learning, with this optional learning resource!			
BNY015 -CD1			
Web Links: Explore additional details and reinforce learning, with this optional learning resource!			
BNY015-WL1			

BNY016: BIOLOGY & DIVERSITY OF ALGAE, BRYOPHYTA & PTERIODOPHYTA (PRACTICAL)

PROGRAMME INFORMATION

SN	Description	Details
1	University	Yashwantrao Chavan Maharashtra Open University Nashik - 422 222, Maharashtra, India Website: http://www.ycmou.ac.in/and http://ycmou.digitaluniversity.ac/
2	School	School of Architecture, Science and Technology
3	Discipline	Science
4	Level	PG
5	Course Used in	V134: M.Sc.(BOTANY)

COURSE INFORMATION

Sem	Code	Course Name	CR	CST	ST	CA	EE	TM	Type
01	BNY016	Biology and Diversity of Algae, Bryophyta and Pteriodophyta	2	8	120	10	40	50	P

PRESUMED KNOWLEDGE AND LEARNING OBJECTIVES

Presumed Knowledge	Learning Objectives
For successful completion of this course, student should have successfully complete: • B.Sc. with BOTANY or equivalent from a recognized University/Board.	After successful completion of this course, student should be able to study- • Preparation of Cultures Media for Micro Algae • Preparation of Herbarium for Macro Algae

UNITS

UN	Name of the Unit	CSs	Questions
01-01	***Nostoc,Lyngbya, Spirulina and Tolypothrix***	CR 01	Student is required to answer 4 of 5 SAQ, eachof 5 marks, on eachCR
01-02	***Clamydomonas, Volvox, Chlorella and Ulva***		
01-03	***Enteromorpha,Oedogonium,Cosmarium and Caulerpa***		
01-04	***Ectocarpus, DIctyota and Sargassum***		
01-05	***Gelidium, Gracilaria, Cyclotella, and Navicula***		

01-06 01-07 01-08 01-09	**Collection and Identification of Algae in and Around Local Area** **Observation of Algal Blooms and Bioindicators of Water Quality** **Preparation of Cultures Media for Micro Algae** **Preparation of Herbarium for Macro Algae**		Student is required to answer 4 of 5 SAQ, **each** of 5 marks, on **each** CR
02-01 02-02 02-03 02-04 02-05	***Marchantia, and Targionia,*** ***Plagiochasma and Fimbriaria*** ***Pelia and Porella*** ***Anthoceros and Notothylas*** ***Funaria and Polytrichum***	**CR 02**	Student is required to answer 4 of 5 SAQ, **each** of 5 marks, on **each** CR
02-06 02-07 02-08 02-09 02-10	***Lycopodium and Selaginella*** ***Psilotum and Isoetes*** ***Osmunda and Gleichenia*** ***Ophioglossum and Adiantum*** ***Marsilea, Salvinia and Azolla***		Student is required to answer 4 of 5 SAQ, **each** of 5 marks, on **each** CR

DETAILED SYLLABUS

UN	Detailed Syllabus of the Unit	CR
01-01	***Nostoc, Lyngbya, SpirulinaAnd Tolypothrix*-**In This Unit You Will Study The Characters For The Identification Of *Nostoc*,*Lyngbya*, *Spirulina*And *Tolypothrix*	**CR 01**
01-02	***Clamydomonas, Volvox, Chlorella*And *Ulva*-**In This Unit You Will Study The Habit, Habitat, Structure And Reproductive Characters Of *Camydomonas*, *Volvox*, *Chlorella* And *Ulva*	
01-03	***Enteromorpha,Oedogonium,Cosmarium*And *Caulerpa*-** In This Unit You Will Study The Habit, Habitat, Structure And Reproductive Characters Of *Enteromorpha*,*Oedogonium*,*Cosmarium*And*Caulerpa*	
01-04	***Ectocarpus, Dictyota* And *Sargassum*-**In This Unit You Will Study The Habit, Habitat, Structure And Reproductive Characters Of*Ectocarpus*, *Dictyota* And *Sargassum*	
01-05	***Gelidium, Gracilaria, Cyclotella*, And *Navicula*-**In This Unit You Will Study The Habit, Habitat, Structure And Reproductive Characters Of*Gelidium*, *Gracilaria*, *Cyclotella*, And *Navicula*.	
01-06	**Collection And Identification Of Algae In And Around Local Area-**In This Unit You Will Study The Collection And Indentification Of Locally Available Fresh Water Algae.	
01-07	**Observation Of Algal Blooms And BioindicatorsOf Water Quality-**In This Unit You Will Study About Algal Blooms And BioindicatorsOf Water Quality.	
01-08	**Preparation Of Cultures Media For Micro Algae-**In This Unit You Will Study Preparation Of Culture Media For Micro Algae	
01-09	**Preparation Of Herbarium For Macro Algae-**In This Unit You Will Study The History Of Herbarium, Importance Of Herbarium Preparation And Preservation Of Herbarium.	
02-01	***Marchantia,* And *Targionia*-**In This Unit You Will Study The Classification, Identification And Life Cycle Of *Marchantia*And *Targionia*.	**CR 02**
02-02	***Plagiochasma*And *Fimbriaria*-** In This Unit You Will Study The Classification, Morphology, And Life Cycle Of *Plagiochasma*And *Fimbriaria*	
02-03	***Pelia*And *Porella*-**In This Unit You Will Study The Classification, Morphology, And Life Cycle Of *Plagiochasma*And *Fimbriaria*	
02-04	***Anthoceros*And *Notothylas*-**In This Unit You Will Study Morphology Of *Anthoceros*And *Notothylas*Besides T.S. Of Thallus, Antheridia, Archegonia, SprophyteAnd L.S. Of Sporophyte.	
02-05	***Funaria*And *Polytrichum*-**In This Unit You Will Study The Morphology And Anantomy Of T.S. Of Stem, T.S. Of Lef, Antheridia, ArchegoiaAnd L.S. Of Capsule Of *Funaria*And *Polytricum*.	
02-06	***Lycopodium*And *Selaginella*-**In This Unit You Will Study The External Morphology Of The	

	Sporophte, Anatomy Of Stem, Leaf Andl.S. Of SrobillusOf LycopodiumAnd Selaginella.	
02-07	***Psilotum*And *Isoetes*-**In This Unit You Will Study The External Morphology Of The Sporophytic Plants, Anatomy Of Rhizome, Stem, Leaf And Sporangia Of *Psilotum*And *Isoetes*.	
02-08	***Osmunda*And *Gleichenia*-**In This Unit You Will Study The Morphology, Anatomy And Reproductive Characters Of *Osmunda*And *Gleichenia*	
02-09	***Ophioglossum*And *Adiantum*-**In This Unit You Will Study The External Morphology Of The *Ophioglossum*And *Adiantum*Besides T.S. Root ,T.S. Rhizome, T.S. Of Petiole And Fertile Spike Of *Ophioglossum*And T.S. Rhizome, T.S. Petiole, Structure Of Sporangia And ThallusOf *Adiantum*.	
02-10	***Marsilea*-**In This Unit You Will Study The Morphology And Anatomy Of The Rhizome, Petiole SporocarpOf *Marsilea*	
02-11	***Salvinia*And *Azolla*-**In This Unit You Will Study The External Morphology Of The Sporophyte, Anatomy Of Vegetative And Reproductive Parts Of *Salvinia*And *Azolla*.	

Learning Resource Details

LR Code	Title Author	Edition Year	ISBN Publisher
Course Website Link for (1) Mobile and Online Lectures, (2) Discussion Forum for online interaction and (3) Self-Test for each CR Block, Continuous Assessment Test and End Examination			
CW-BNY016			
Text-Books			
BNY016-T01	Laboratory Manual and Record-Biology and Diversity of Algae, Bryophyta and Pteridophyta i. Dr. Nirmala Babu Rao ii. Prof. B. Rajkumar iii. Dr. N. Saradamani iv. Dr. M.V enkaiah v. Prof. R. R .Ventakata Raju	2009	BRAOU, Hyderabad
Reference-Books: Explore additional details and reinforce learning, with this optional learning resource!			
BNY016 –RB1			
BNY016 –RB2			
BNY016 –RB3			
BNY016 –RB4			
CD / DVD: Explore additional details and reinforce learning, with this optional learning resource!			
BNY016 -CD1			
Web Links: Explore additional details and reinforce learning, with this optional learning resource!			
BNY016-WL1			

BNY017: GYMNOSPERMS, TAXONOMY & ANATOMY OF ANGIOSPERMS (PRACTICAL)

PROGRAMME INFORMATION

SN	Description	Details
1	University	Yashwantrao Chavan Maharashtra Open University Nashik - 422 222, Maharashtra, India Website: http://www.ycmou.ac.in/and http://ycmou.digitaluniversity.ac/
2	School	School of Architecture, Science and Technology
3	Discipline	Science
4	Level	PG
5	Course Used in	V134: M.Sc.(BOTANY)

COURSE INFORMATION

Sem	Code	Course Name	CR	CST	ST	CA	EE	TM	Type
01	BNY017	gymnosperms, taxonomy and anatomy of angiosperms	2	8	120	10	40	50	P

PRESUMED KNOWLEDGE AND LEARNING OBJECTIVES

Presumed Knowledge	Learning Objectives
For successful completion of this course, student should have successfully complete: • B.Sc. with BOTANY or equivalent from a recognized University/Board.	After successful completion of this course, student should be able to study • Zamia and Ginkgo • Thuja and Pinus • Araucaria and Taxus • Ephedra and Gnetum

UNITS

UN	Name of the Unit	CSs	Questions
01-01 01-02 01-03 01-04	***Zamia* and *Ginkgo*** ***Thuja* and *Pinus*** ***Araucaria* and *Taxus*** ***Ephedra* and *Gnetum***	CR 01	Student is required to answer 4 of 5 SAQ, eachof 5 marks, on eachCR
01-05 01-06 01-07 01-08	***Lyginopteris*** ***Medullosa*** ***Ptilophylum* and *Glassopteris*** ***Pentoxylon***		

02-01 02-02 02-03 02-04 02-05 02-06 02-07	**Study Of The Locally Available Plants And Recording Of The Intraspecific Variation** **Description And Identification At Family, Genus And Species Levels Using Floras-I** **Description And Identification At Family, Genus And Species Levels Using Floras-II,** **Identification Of Key Characters In A Group Of Species Of A Genus** **Construction Of Indented And Bracketed Keys For The Given Material** **Nomentclatural Problems** **Herbarium Techniques**	**CR 02**	Student is required to answer 4 of 5 SAQ, **each**of 5 marks, on **each**CR
02-08 02-09 02-10 02-11 02-12	**Study Of MeristematicAnd Permanent Issues And Tissue Systems** **Secondary Growth In Roots And Stems** **Leaf Anatomy** **Anomalous Secondary Growth** **Wood Structure**		Student is required to answer 4 of 5 SAQ, **each**of 5 marks, on **each**CR

DETAILED SYLLABUS

UN	Detailed Syllabus of the Unit (Application Oriented problems)	CR
01-01	***Zamia*And *Ginkgo*-** In This Unit, You Will StudyThe Morphology And Anatomy Of Vegetative And Reproductive Structures Of *Zamia*And *Ginkgo*	CR 01
01-02	***Pinus*And *Thuja*-**In This Unit, You Will StudyThe Morphology And Anatomy Of Vegetative And Reproductive Structures *Pinus*And *Thuja*	
01-03	***Araucaria* And *Taxus*-**In This Unit, You Will StudyThe Morphology, Anatomy And Of Reproductive Structures *Araucaria*And *Taxus*	
01-04	***Ephedra*And *Gnetum*-**In This Unit, You Will StudyThe Morphology And Anatomy Of Vegetative And Reproductive Structures *Ephedra*And *Gnetum*	
01-05	***Lyginopteris*-**In This Unit, You Will StudyThe Morphology, Anatomy And Of Reproductive Structures Of Fossil Plants *Lyginopteris*	
01-06	***Medullosa*-**In This Unit, You Will StudyThe Morphology Of *Medullosa*Stem And Leaf And The Anatomy Of *Medullosa* Stem.	
01-07	***Ptilophylum*And *Glassopteris*-**In This Unit, You Will StudyThe Morphology Of The Fossil Leaf Form *Ptilophylum*Cutchense And *Glassopteris*	
01-08	***Pentoxylon*-**In This Unit, You Will Study And Observe The Fossil Specimens Of Leaf, Stem, Seed-Bearing And Pollen- Bearing Organs Of *Pentoxylon*.	
02-01	**Study Of The Locally Available Plants And Recording Of The Intraspecific Variation-** In This Unit, You Will Study Different Technical Terms,Understand Them, In Order To Describe An AngiospermicPlant	CR 02
02-02	**Description And Identification At Family, Genus And Species Levels Using Floras-I-** In This Unit, You Will Study The Vegetative And Floral Characters Of *Cleome Viscosa*(Capparidaceae), *CorchorusAestuans* (Tiliaceae) *TribulusTerrestris* (Zygophyllaceae), *TephrosiaPurpurea* (Leguminaceae), *MollugoNudicaulis* (Aizoaceae) *TridaxProcumbens*(Asteraceae), *CatharanthusRoseus* (Apocynaceae)	
02-03	**Description And Identification At Family, Genus And Species Levels Using Floras-II-** In This Unit You Will Study The Vegetative And Floral Characters Of *EvolvulusAlsinoides* Of The Family Convolvulaceae. *TecomaStans* Of The Family Bignoniaceae, *LeucasAspera* Of The Family Lamiaceae, *AchyranthusAspera* Of The Family Amaranthaceae, *Euphorbia Heterophylla* Of The Family Euphorbiaceae, *Allium Cepa* Of The Family LiliaceaeAnd *ChlorisBarbata* Of The Family Poaceae.	
02-	**Identification Of Key Characters In A Group Of Species Of A Genus**-In This Unit, You Will Study	

04	The Identification Of Genus, Deciduous Plants Without Leaves And Apetalous Plants Without Perianth.	
02-05	**Construction Of Indented And Bracketed Keys For The Given Material-** In This Unit, You Will Study The Construction Of Indented And Bracketed Keys For The Given Material.	
02-06	**Nomenclatural Problems-**In This Unit, You Will Study The Practical Application Of Principles, Rules And Recommendations Of The ICBN.	
02-07	**Herbarium Techniques-** In This Unit, You Will Study And Know, What Is Herbarium Is, Besides You Know Methods To Collect, Preserve, Mounting, Labeling Of Plant Collected Etc.	
02-08	**Study Of MeristmaticAnd Permanent Issues And Tissue Systems-** In This Unit You Will Study Various Tissues Systems Of Plants With The Help Of Freshly Prepared Sections As Well As Permanent Slides.	
02-09	**Secondary Growth In Roots And Stems-**In This Unit You Will Study The Normal Secondary Growth Of A Dicot Root And Dicot Stem.	
02-10	**Leaf Anatomy-** In This Unit You Will Study The Leaf Anatomy Of Some Plants.	
02-11	**Anomalous Secondary Growth-**In This Unit You Will Study The Primary And Anomalous Secondary Structures Of Some Plants.	
02-12	**Wood Structure-**In This Unit You Will Study Of Different Woods.	

LEARNING RESOURCE DETAILS

LR Code	Title Author	Edition Year	ISBN Publisher
Course Website Link for (1) Mobile and Online Lectures, (2) Discussion Forum for online interaction and (3) Self-Test for each CR Block, Continuous Assessment Test and End Examination			
CW-BNY017			
Text-Books			
BNY017-T01	Laboratory manual and record -Gymnosperms Taxonomy and Anatomy of Angiosperms i. Dr. H. Ramakrishna ii. Dr. B. Ravi Prasad Rao iii. Dr. S.R. Shanmukha Rao iv. Dr. S .Swarupa Rani v. Prof. Y. N. R .Varma vi. Prof. S. Venkata Ratnam vii. Dr. K. Vijaya Kumar viii. Dr. K. Yashodhara	2009	BRAOU, Hyderabad
Reference-Books: Explore additional details and reinforce learning, with this optional learning resource!			
BNY017 –RB1			
BNY017 –RB2			
BNY017 –RB3			
BNY017 –RB4			
CD / DVD: Explore additional details and reinforce learning, with this optional learning resource!			
BNY017 -CD1			
Web Links: Explore additional details and reinforce learning, with this optional learning resource!			
BNY017-WL1			

BNY018: BIOCHEMISTRY & PLANT PHYSIOLOGY (PRACTICAL)

SN	Description	Details
1	University	Yashwantrao Chavan Maharashtra Open University Nashik - 422 222, Maharashtra, India Website: http://www.ycmou.ac.in/and http://ycmou.digitaluniversity.ac/
2	School	School of Architecture, Science and Technology
3	Discipline	Science
4	Level	PG
5	Course Used in	V134: M.Sc.(BOTANY)

COURSE INFORMATION

Sem	Code	Course Name	CR	CST	ST	CA	EE	TM	Type
01	BNY018	BIOCHEMISTRY AND PLANT PHYSIOLOGY	2	8	120	10	40	50	P

PRESUMED KNOWLEDGE AND LEARNING OBJECTIVES

Presumed Knowledge	Learning Objectives
For successful completion of this course, student should have successfully complete: • B.Sc. with BOTANY or equivalent from a recognized University/Board.	After successful completion of this course, student should be able to study • Estimation of Amino acids by NInhydrin Method • Determination of Iodine Number of Edible Oils • Separation of Chloroplast Pigments by Solvents Extraction Method

UNITS

UN	Name of the Unit	CSs	Questions
01-01 01-02 01-03 01-04	**Estimation of Fructose by Resorcinal Method** **Estimation of Aminoacids by Ninhydrin Method** **Estimation of Protein by Biuret Method** **Separation and Identification of Aminoacids by using TLC Method**	CR 01	Student is required to answer 4 of 5 SAQ, eachof 5 marks, on eachCR
01-05 01-06 01-07 01-08	**Determination of Amylase Activity** **Determination of Catalase Activity** **Estimation of Reducing Sugars** **Determination of Iodine Number of Edible Oils**		
02-01 02-02 02-03 02-04 02-05 02-06	**Determination of Water Potential using Gravimetric Method** **Effects of Temperature on Membrane Permeability** **Determination of Total and TitrableAcivity** **Determination of Stomata Frequency and Index** **Stomatal Response to Promoters and Inhibitors** **Separation of Chloroplast Pigments by Solvents Extraction Method**	CR 02	Student is required to answer 4 of 5 SAQ, eachof 5 marks, on eachCR

02-07 02-08 02-09 02-10 02-11 02-12 02-13	**Determination of Absorption Spectra of Chlorophylls** **Estimation of Chlorophyll-a, Chlorophyll-b and Total Chlorophyll in Leaves of C_3 and C_4 plants** **Determination of Rate of Respiration of Germinating seeds by Continuous Current Method** **Estimation of Nitrogen by Micro-Kjeldahl's Method** **Estimation of Indole Acetic Acid(IAA),** **Determination of Seeds Viability**		

DETAILED SYLLABUS

UN	Detailed Syllabus of the Unit	CR
01-01	**Estimation Of Fructose By Resorcinal Method-**ToEstimate Fructose Content In The Test Solution Of Solution Of Unknown Concentration Using Resorcinol Method.	
01-02	**Estimation Of AminoacidsBy Ninhydrin Method-**ToEstimate The Content Of Aminoacids By Ninhydrin Method.	
01-03	**Estimation Of Protein By Biruet Method-**To EstimateOf Protein By Biruet Method	
01-04	**Separation And Identification Of AminoacidsBy Using TLC Method-** In This Experiment, You Will Learn How To Separate And To Indentify The Aminoacids Present In The Mixture By Using Thin Layer Chromatography.	CR 01
02-01	**Determination Of Amylase Activity-** To Learn The Effects Of Substrate Concentration On The Activity Of The Enzyme Amylase	
02-02	**Determination Of Catalase Activity-**To Determine The Activity Of The Enzyme Catalase In The Given Plant Material.	
02-03	**Estimation Of Reducing Sugars-**In This Unit You Will Learn To Estimate The Content Of Reducing Sugars In The Given Fruit.	
02-04	**Determination Of Iodine Number Of Edible Oils-** To Determine The Iodine Number Of The Given Oil.	
03-01	**Determination Of Water Potential Using Gravimetric Method-**To Estimate The Water Potential Of The Given Plant Material By Using A Gravimetric Method.	
03-02	**Effects Of Temperature On Membrane Permeability-**To Demonstrate The Effect Of Temperature On Membrane Permeability	
03-03	**Determination Of Total And Titrable Acidity-**To Estimate The Total And Titrable Acidity In The Given Leaf Material.	
03-04	**Determination Of Stomata Frequency And Index-**To Determine The Stomatal Frequency And Index Of Selected Leaves In A Given Plant Species.	
03-05	**Stomatal Response To Promoters And Inhibitors-** ToStudy The Stomatal Opening And Closing Mechanism In Response To Promoters And Inhibitors.	
03-06	**Separation Of Chloroplast Pigments By Solvents Extraction Method -** To Separate The Chloroplast Pigments Into Four Groups By Solvent Extraction Method.	
04-01	**Determination Of Absorption Spectra Of Chlorophylls-** In This Unit You Will Determine The Absorption Of Spectra Of The Chlorophylls.	CR 02
04-02	**Estimation Of Chlorophyll-A, Chlorophyll-B And Total Chlorophyll In Leaves Of C_3And C_4 Plants-** To Estimate The Chlorophyll A, Chlorophyll-B And Total Chlorophyll Content In Leaves Of C_3And C_4 Plants	
04-03	**Determination Of Rate Of Respiration Of Germinating Seeds By Continuous Current Method-**To Determine The Rate Of Respiration Of Plant Materials Like Germinating Seeds By Continuous Current Method	
04-04	**Estimation Of Nitrogen By Micro-Kjeldahl's Method-**To Estimate The TotalNitrogen Content Of The Selected Plant Samples By Micro-Kjeldahl's Method	
04-05	**Estimation Of Indole Acetic Acid(IAA)-**To Prepare Standard Graph Of IndoleAcetic Acid And To Calculate The Amount Of IAA Present In The Given Unknown Sample**.**	
04-06	**Determination Of Seeds Viability-**To Determine The Viability Of A Given Seed Sample Using TriphenylTetrazolium Chloride (TTC) Solution.	

LEARNING RESOURCE DETAILS

LR Code	Title Author	Edition Year	ISBN Publisher

Course Website Link for (1) Mobile and Online Lectures, (2) Discussion Forum for online interaction and (3) Self-Test for each CR Block, Continuous Assessment Test and End Examination			
CW-BNY018			
Text-Books			
BNY018-T01	Laboratory manual and record- Biochemistry and Plant Physiology i. Prof. S. GangadharRao ii. Prof. G. RamaGopal iii. Dr. I. Subrahmanyam iv. Dr. B. Sujatha v. Dr. J. Usha kumara vi. Dr. S. Vasantha Pillai	2008	BRAOU, Hyderabad
Reference-Books: Explore additional details and reinforce learning, with this optional learning resource!			
BNY018–RB1			
BNY018 –RB2			
BNY018 –RB3			
BNY018 –RB4			
CD / DVD: Explore additional details and reinforce learning, with this optional learning resource!			
BNY018 -CD1			
Web Links: Explore additional details and reinforce learning, with this optional learning resource!			
BNY018-WL1			

YEAR II

BNY021: CELL BIOLOGY, GENETICS, BIOSTATISTICS & ECOLOGY

PROGRAMME INFORMATION

SN	Description	Details
1	University	Yashwantrao Chavan Maharashtra Open University Nashik - 422 222, Maharashtra, India Website: http://www.ycmou.ac.in/and http://ycmou.digitaluniversity.ac/
2	School	School of Architecture, Science and Technology
3	Discipline	Science
4	Level	PG
5	Course Used in	V134: M.Sc.(BOTANY)

COURSE INFORMATION

Sem	Code	Course Name	CR	CST	ST	CA	EE	TM	Type
01	BNY021	Cell Biology, Genetics, Biostatistics & Ecology	4	8	120	20	80	100	T

PRESUMED KNOWLEDGE AND LEARNING OBJECTIVES

Presumed Knowledge	Learning Objectives
For successful completion of this course, student should have successfully complete: • B.Sc. with Botany or equivalent from a recognized University/Board.	After successful completion of this course, student should be able to know • Brief overview of Mendelian Inheritance • Application of computers in biology • Cell cycle and apoptosis

UNITS

UN	Name of the Unit	CR	Questions
01-01 01-02 01-03 01-04 01-05	**Principles And Application Of Light, Phase Contrast, Fluorescence And Electron Microscopy** **Ultra Structure And Function Of Plant Cell And Organelles** **Chromosome** **Special Types Of Chromosomes** **Cell Cycle And Apoptosis**	CR 01	Student is required to answer 4 of 5 SAQ, eachof 5 marks, on eachCR
02-01 02-02 02-03 02-04 02-05	**DNA** **Genetic Code** **Brief Overview Of Mendelian Inheritance** **Chromosomal Aberrations** **Mutations**	CR 02	Student is required to answer 4 of 5 SAQ, eachof 5 marks, on eachCR
03-01 03-02	**Mean Variance** **Application Of Computers In Biology**	CR 03	Student is required to answer 4 of 5 SAQ, eachof 5 marks, on eachCR

04-01 04-02 04-03 04-04 04-05 04-06 04-07 04-08	**Principles, Concepts And Levels Of Ecology** **Community Characteristics** **Biodiversity** **Ecosystem** **Global Biogeochemical Cycles Of C, N_2, P And S** **Climate, Soil, Vegetation Pattern Of India** **Climate Change And Greenhouse Gases** **Environmental Pollution**	**CR 04**	Student is required to answer 4 of 5 SAQ, **each**of 5 marks, on **each**CR

DETAILED SYLLABUS

UN	Detailed Syllabus of the Unit	CR
1-1	**PRINCIPLES AND APPLICATION OF LIGHT, PHASE CONTRAST, FLUORESCENCE AND ELECTRON MICROSCOPY:-**Introduction, Light Microscope, Phase Contrast Microscope, Fluorescence Microscope, Electron Microscope.	**CR 01**
1-2	**ULTRA STRUCTURE OF A CELL AND ITS ORGANELLES:-** Introduction, Cell Wall, Plasma Membrane, Lysosomes, Endoplasmic Reticulum, Peroxisomes, Glyoxysomes, Golgi Apparatus, Vacuoles, Mitochondria, Chloroplasts, Ribosomes, Plasmodesmata.	
1-3	**CHROMOSOME:-**Introduction, Morphology Of Chromosomes, Chemical Composition, Models Of DNA Folding, Euchromatin And Heterochromatin.	
1-4	**SPECIAL TYPES OF CHROMOSOMES:-** Introduction, Salivary Gland Chromosomes, Lampbrush Chromosomes, B- ChromosomesOr Accessory Chromosomes.	
1-5	**CELL CYCLE AND APOPTOSIS:-** Introduction, Cell Cycle, Control Of The Cycle, Mechanism Of Cell Cycle Control, Checkpoints, Reasons For PCD, Changes In Cells Involved In PC, Genes Controlling Apoptosis, Mechanism Of Apoptosis, Regulation Of Apoptosis, Signals For Apoptosis, Cell Survival Signals.	
2-1	**DNA:-**Introduction, Important Features Of DNA, The Chemistry Of DNA, The Watson- Crick Model Of DNA, Replication Of DNA, Genetic Recombination In Bacteria.	**CR 02**
2-2	**GENETIC CODE:-**Introduction, Transcription, The Genetic Code, Mechanism Of Protein Synthesis.	
2-3	**BRIEF OVERVIEW OF MENDELIAN INHERITANCE:-**Introduction, Mendel's Experiments, Modification Of 3:1 Phenotypic Ratio, Linkage, Chromosome Mapping.	
2-4	**CHROMOSOMAL ABERRATIONS:-**Introduction, Numerical Aberrations, Structural Aberrations.	
2-5	**MUTATIONS:-** Introduction, Brief History Of Mutations, Types Of Mutations, Mutation Rates And Frequencies, Discovery Of Mutagenesis, Nature Of Mutagens, Detection Of Mutations, Molecular Basis Of Gene Mutations, Frame Shift- Mutations, Insertion Mutations, Deletion Mutations, Spontaneous Gene Mutations, Induced Mutations, Physical Mutagens, Chemical Mutagens, DNA Repair Systems, Some Useful Mutagens.	
3-1	**MEAN VARIANCE:-**Introduction, Probability, Chi- Square Test, Numerical Descriptive Measures, Students 'T' Test, Analysis Of Variance.	**CR 03**
3-2	**APPLICATIONS OF COMPUTERS IN BIOLOGY:-**Introduction, Use Of Word And Power Point In The Preparation And Presentation Of Documents, Use Of Internet And World Wide Web, Basic Concepts Of Bioinformatics.	
4-1	**PRINCIPLES, CONCEPTS AND LEVELS OF ECOLOGY:-**Introduction, Basic Concepts Of Ecology, Levels Of Organization, Community Dynamics.	**CR 04**
4-2	**COMMUNITY CHARACTERISTICS: -**Introduction,Raunkiaer's Concept Of Life Forms, Braun BlanquetScheme, Plant Communities.	
4-3	**BIODIVERSITY:-** Introduction, Biodiversity- Concept, Value Of Biodiversity, Biodiversity At International An National Level, Threats To Biodiversity, Conservation Of Biodiversity, Sustainable Development.	

4-4	**ECOSYSTEM:-**Introduction, Ecosystem Structure, Ecosystem Organization, Functioning Of Ecosystems, Ecological Efficiency.	
4-5	**GLOBAL BIOGEOCHEMICAL CYCLES:-** Introduction, Biogeochemical Cycles- Global, Carbon Cycle, Nitrogen Cycle, Phosphorous Cycle, Sulphur Cycle.	
4-6	**CLIMATE, SOIL, VEGETATION PATTERN OFINDIA :-**Introduction, Climatology, Phytogeography, Climate, Soil And Vegetation Types Of India.	
4-7	**CLIMATE CHANGE AND GREEN HOUSE GASES:-**Introduction, Climate Change, The Greenhouse Effect, The Greenhouse Gases, Sources, Trends And Roles, The Ozone Layer, The Ozone Hole, Consequences Of Climate Change.	
4-8	**ENVIRONMENTAL POLLUTION: -**Introduction, Types Of Pollution, Air Pollution, Water Pollution, Soil Pollution, Noise Pollution.	

LEARNING RESOURCE DETAILS

LR Code	Title Author	Edition Year	ISBN Publisher
Course Website Link for (1) Mobile and Online Lectures, (2) Discussion Forum for online interaction and (3) Self-Test for each CR Block, Continuous Assessment Test and End Examination			
CW-BNY021			
Text-Books			
BNY021-T01	CELL BIOLOGY, GENETICS, BIOSTATISTICS & ECOLOGY i. Prof. B.Subba Rao ii. Prof. M. Singara Charya iii. Prof. Mary Esther Cynthia iv. Prof. N.Ramaswamy v. Dr. B. Venkateshwar Rao vi. Dr. V.Rattan Kumar vii. Dr. Saraswati Rao viii. Dr. S.K.Balachander	2009	BRAOU, Hyderabad
Reference-Books: Explore additional details and reinforce learning, with this optional learning resource!			
BNY021 –RB1			
BNY021 –RB2			
BNY021 –RB3			
BNY021 –RB4			
BNY021 –RB5			
BNY021 –RB6			
BNY021 –RB7			
BNY021 –RB8			
CD / DVD: Explore additional details and reinforce learning, with this optional learning resource!			
BNY021 -CD1			
Web Links: Explore additional details and reinforce learning, with this optional learning resource!			
BNY021-WL1			

BNY022: MEDICINAL PLANTS & EMBRYOLOGY OF ANGIOSPERMS

PROGRAMME INFORMATION

SN	Description	Details
1	University	Yashwantrao Chavan Maharashtra Open University Nashik - 422 222, Maharashtra, India Website: http://www.ycmou.ac.in/and http://ycmou.digitaluniversity.ac/
2	School	School of Architecture, Science and Technology
3	Discipline	Science
4	Level	PG
5	Course Used in	V134: M.Sc.(BOTANY)

COURSE INFORMATION

Sem	Code	Course Name	CR	CST	ST	CA	EE	TM	Type
01	BNY022	MEDICINAL PLANTS AND EMBRYOLOGY OF ANGIOSPERMS	4	8	120	20	80	100	T

PRESUMED KNOWLEDGE AND LEARNING OBJECTIVES

Presumed Knowledge	Learning Objectives
For successful completion of this course, student should have successfully complete: • B.Sc. with Botany or equivalent from a recognized University/Board.	After successful completion of this course, student should be able to study • Conservation of medicinal plants • Structure of anther and development of male gametophyte • Structure of ovule and development of female gametophyte

UNITS

UN	Name of the Unit	CSs	Questions
01-01 01-02 01-03 01-04 01-05 01-06 01-07 01-08	**Role Of Plants In Medicine, Origin And Development And Different Systems Of Medicine.** **General Account Of Phytochemistry Of Medicinal Plants** **Morphology, Active Principles And Medicinal Value-I** **Morphology, Active Principles And Medicinal Value-II** **Cultivation Of Medicinal Plants** **Pharmacognosy And Adulteration Of Plant Drugs** **Ethno botany- History, Scope And Importance** **Conservation Of Medicinal Plants**	CR 01	Student is required to answer 4 of 5 SAQ, each of 5 marks, on each CR
02-01 02-02 02-03 02-04	**Structure Of Anther And Development Of Male Gametophyte** **Structure Of Ovule And Development Of Female Gametophyte** **Fertilization** **Sexual Incompatibility**	CR 02	Student is required to answer 4 of 5 SAQ, each of 5 marks, on each CR
03-01 03-02 03-03 03-04	**Development Of Endosperm** **Development Of Embryo** **Apomixes** **Polyembryony**	CR 03	Student is required to answer 4 of 5 SAQ, each of 5 marks, on each CR

04-01 04-02 04-03 04-04	**Parthenocarpy** **Experimental Embryology** **Applications Of Embryology In Taxonomy, Agriculture And Horticulture** **Principles And Applications Of Palynology**	**CR 04**	Student is required to answer 4 of 5 SAQ, **each** of 5 marks, on **each** CR

DETAILED SYLLABUS

UN	Detailed Syllabus of the Unit	CR
1-1	**Role Of Plants In Medicine, Its Origin And Development And Different Systems Of Medicine:-** Role Of Plants In Medicine, Origin Of Medicine, Origin And Development Of Traditional System Of Medicine.	CR 01
1-2	**GENERAL ACCOUNT OF PHYTOCHEMISTRY OF MEDINAL PLANTS:-**Introduction, Classification Of Crude Drugs Based On Phytochemicals, Phytochemicals Or Chemical Compounds Of Plant Origin, Chemodemes Or Chemical Races, Importance Of Phytochemicals In Modern Medicine.	
1-3	**MORPHOLOGY, ACTIVE PRINCIPLES AND MEDICINAL VALUE-I:-**Introduction, *Rauvolfia Serpentine*, *Chlorophytum Borvilianum*, *Withania Somnifera*, *Cassia Angustifolia*.	
1-4	**MORPHOLOGY, ACTIVE PRINCIPLES AND MEDICINAL VALUE-II:-** *Emblica Officinalis*(*Phyllanthus emblica*), *Phyllanthus amarus*(*Phyllanth Usniruri*), Gymnema *Sylvestre*, *Curcuma Longa* (Turmeric), *Zingiber Offinale*(Ginger).	
1-5	**CULTIVATION OF MEDICINAL PLANTS:-**Introduction, *Aloe Barbadensis*, *Coleus Forskohlii*, *Andrographis Paniculata*.	
1-6	**PHARMACOGNOSY AND ADULTERATION OF PLANT DRUGS:-**Introduction, History Of Pharmacognosy, Definition And Scope Of Pharmacognosy, Pharmacognostic Studies Of A Crude Drug, Adulteration Of Plant Drugs.	
1-7	**ETHNOBOTANY- HISTORY, SCOPE AND IMPORTANCE:-**Introduction, History Of Ethnobotany, Scope: Ethnobotany- An Interdisciplinary Approach, Importance Of Ethnobotany.	
1-8	**CONSERVATION OF MEDICINAL PLANTS:-**Introduction, Importance Of Plant Medicine, Demands For Herbal Medicines, Medicinal Plant Diversity And Exploitation, Medicinal Plants Conservation.	
2-1	**STRUCTURE OF ANTHER AND DEVELOPMENT OF MALE GAMETOPHYTE:-**Introduction, Anther Structure, Microsporogenesis, Development Of Male Gametophyte.	CR 02
2-2	**STRUCTURE OF OVULE AND DEVELOPMENT OF FEMALE GAMETOPHYTE:-** Introduction, Types Of Ovules, Ovule Intiation, Integuments, Aril, Arillode And Sarcotesta, Endothelium, Operculum, Caruncle Or Strophiole, Coma, Obturator, Nucellus, Pseudo- Embryo Sac, Hypostase And Epistase, Megasporogenesis, Functioning Megaspore, Megaspore Haustoria, The Female Gametophyte, Types Of Embryo Sacs, Monosporic Types, Bisporic Embryo Sacs, Tetrasporic Embryo Sacs, Aberrant And Unclassified Types, Ultrastructure Of Embryo Sac, Synergids, Egg, Central Cell, Antipodals, Embryo Sac Haustoria, Nutrition Of Embryo Sac.	
2-3	**FERTILIZATION:-** Introduction, Pollen Stigma Interaction, Style, Entry Of Pollen Tube Into Embryo Sac, Pollen Tube Discharge, Mechanism Of Nuclear Fusion.	
2-4	**SEXUAL INCOMPATIBILITY:-**Introduction, Factors That Regulate Recombination In Plants, Self Incompatibility, Incompatibility Mechanisms, Establishment Of Inbleeding, Advantages And Biological Significance Of Self Incompatibility, Methods To Overcome Self Incompatibility.	
3-1	**DEVELOPMENT OF ENDOSPERM:-**Introduction, Development Of Endosperm, Nuclear Type, Cytology Of Endosperm, Aleurone Tissue, Functions Of Endosperm.	CR 03
3-2	**DEVELOPMENT OF EMBRYO:-**Introduction, Zygote, Embryogenesis In Dicots, Embryogenesis In Monocots- Grass, Suspensor.	
3-3	**APOMIXIS:-**Introduction, Classification, A Kind Of Vegetative Reproduction, Agamospermy, Embryo And Endosperm Development, Genetics Of Apomixes, Detection Of Apomixes, Significance Of Apomoxis.	
3-4	**POLYEMBRYONY:-**Introduction, Classification, True Polyembryony, False Polyembryony, Twins And Triplets, Induction Of Polyembryony, Causes Of Polyembryony, Applications Of Polyembryony.	
4-1	**PARTHENOCARPY:-**Introduction, GeneticalParthenocarpy, Environmental Parthenocarpy, Chemically Induced Parthenocarpy, Methods Of Application, Use Of Synthetic Compounds To Induce Parthenocarpy, Role Of Ovules In Parthenocarpy, Imporatance Of Parthenocarpy.	CR 04
4-2	**EXPERIMENTAL EMBRYOLOGY:-**Introduction, Infrastructure Requirments, Anther Culture, Ovary	

	And Ovule Culture.
4-3	**APPLICATIONS OF EMBRYOLOGY IN TAXONOMY, AGRICULTURE AND HORTICULTURE:-** Introduction, Applications Of Embryology In Solving Taxonomic Problems, Applications Of Embryology In Agricultural Practices, Applications Of Embryology In Horticultural Practices, Applied Aspects Of Pollen.
4-4	**PRINCIPLES AND APPLICATIONS OF PALYNOLOGY:-**Introduction**,** Pollen Development, Pollen Disposal, Chemical Composition Of Pollen And Spores, Pollen And Spore Morphology, Morphological Characters And Their Terminology, Palynology And Taxonomy, Exine Sculpturing, Aeropalynology, Geopalynology, Melittopalynology, Pollen And Spore Allergy, Medicinal Properties Of Pollen And Spores, Forensic Palynology.

LEARNING RESOURCE DETAILS

LR Code	Title Author	Edition Year	ISBN Publisher
Course Website Link for (1) Mobile and Online Lectures, (2) Discussion Forum for online interaction and (3) Self-Test for each CR Block, Continuous Assessment Test and End Examination			
CW-BNY022			
Text-Books			
BNY022-T01	Medicinal plants and embryology of angiosperms i. Prof. T.V.V.Seetarami Reddy ii. Prof. K.Laksminarayana iii. Prof. V.S.Raju iv. Prof. K.C.Naidu v. Prof.R.R.Venkata Raju vi. Prof.Shyamala Ravi Shankar vii. Dr. B.K.Vijay Kumar	2009	BRAOU, Hyderabad
Reference-Books: Explore additional details and reinforce learning, with this optional learning resource!			
BNY022 –RB1			
BNY022 –RB2			
BNY022 –RB3			
CD / DVD: Explore additional details and reinforce learning, with this optional learning resource!			
BNY022 -CD1			
Web Links: Explore additional details and reinforce learning, with this optional learning resource!			
BNY022-WL1			

BNY023: APPLIED MYCOLOGY & PLANT PATHOLOGY

Programme Information

SN	Description	Details
1	University	Yashwantrao Chavhan Maharashtra Open University Nashik - 422 222, Maharashtra, India Website: http://www.ycmou.ac.in/and http://ycmou.digitaluniversity.ac/
2	School	School of Architecture, Science and Technology
3	Discipline	Science
4	Level	PG
5	Course Used in	V134: M.Sc.(BOTANY)

Course Information

Sem.	Code	Course Name	CR	CST	ST	CA	EE	TM	Type
01	BNY023	Applied Mycology and Plant Pathology	4	8	120	20	80	100	T

Presumed Knowledge and Learning Objectives

Presumed Knowledge	Learning Objectives
For successful completion of this course, student should have successfully complete: • B.Sc. with Botany or equivalent from a recognized University/Board.	After successful completion of this course, student should be able to know • Mushroom cultivation • Fungi as biopesticides

Units

UN	Name of the Unit	CSs	Questions
01-01 01-02 01-03 01-04 01-05 01-06	**General Account And Diversity Of Fungi** **Fungal Taxonomy** **Mycorrhizae** **Edible Mushrooms: Medicinal And Nutritional Value** **Mushroom Cultivation** **Fungi As Biopesticides**	CR 01	Student is required to answer 4 of 5 SAQ, eachof 5 marks, on eachCR
02-01 02-02 02-03 02-04 02-05	**Scope And Techniques Of Fungal Biotechnology** **Fungal Enzymes And Metabolites** **Industrial Production Of Penicillin, Citric Acid And Alcohol** **Fungi In Relation To Pollution** **Fungi As Biodegradation**	CR 02	Student is required to answer 4 of 5 SAQ, eachof 5 marks, on eachCR
03-01 03-02 03-03 03-04 03-05	**History And Concepts Of Plant Pathology** **Classification And Symptomatology Of Fungal, Bacterial, Viral,** **PhytoplasmalAnd Nematode Diseases** **Host- Pathogen Interaction- I** **Host- Pathogen Interaction- II** **Control Of Plant Diseases**	CR 03	Student is required to answer 4 of 5 SAQ, eachof 5 marks, on eachCR
04-01 04-02 04-03 04-04	**Plant Diseases Caused By Bacteria, Viruses, Phytoplasma And Spiroplasmas** **Plant Diseases Of Cereals, Pulses And Oil Seeds** **Plant Diseases Of Fruits And Vegetables** **Plant Diseases Of Cash Crops And Plantation Crops**	CR 04	Student is required to answer 4 of 5 SAQ, eachof 5 marks, on eachCR

DETAILED SYLLABUS

UN	Detailed Syllabus of the Unit	CR
1-1	**GENERAL ACCOUNT AND DIVERSITY OF FUNGI:-** Introduction, Importance Of Fungi, Thallus Organization In Fungi, HyphalSeptation, Cell And Cell Wall Structure, Fungal Tissues, Fungal Nutrition, Reproduction In Fungi, Life Cycles In Fungi, Systematic Position And Classification, Fungal Diversity, Fungi In Extreme Environments.	CR 01
1-2	**FUNGAL TAXONOMY:-**Introduction, Nomenclature, Criteria For Classifications, Types Of Classifications.	
1-3	**MYCORRHIZAE:-**Introduction, Types Of Mycorrhizae, Isolation And Multiplication Of Mycorrhizae. Role Of Mycorrhizae In Plant Growth, Applications Of Mycorrhizae.	
1-4	**EDIBLE MUSHROOMS: MEDICINAL AND NUTRITIONAL VALUE:-**Introduction, Edible Mushrooms, Medicinal Importance Of Mushrooms, Nutritional Value Of Mushrooms.	
1-5	**MUSHROOM CULTIVATION:-**Introduction, Cultivation Of *AgaricusBisporus*, Cultivation Of *Pleurotus*Spp., Cultivation Of *Volvariella Volvaceae*.	
1-6	**FUNGI AS BIOPESTICIDES:-**Introduction, Fungi As Biocontrol Agents For Nematodes, Fungi As Biocontrol Agents For Insect Pests, Fungi As Biocontrol Agents For Weeds, Fungi As Biocontrol Agents For Diseases.	
2-1	**SCOPE AND TECHNIQUES OF FUNGAL BIOTECHNOLOGY:-**Introduction, Scope Of Fungal Biotechnology, Techniques Of Fungal Biotechnology.	CR 02
2-2	**FUNGAL ENZYMES AND METABOLITES:-**Introduction, Fungal Enzymes, Vitamins, Proteins From Fungi, Organic Acids, Amino Acids, Lipids, Alcohols.	
2-3	**INDUSTRIAL PRODUCTION OF PENICILLIN, CITRIC ACID AND ALCOHO:-**Introduction, Production Of Antibiotics, Production Of Organic Acids, Production Of Alcohol.	
2-4	**FUNGI IN RELATION TO POLLUTION:-**Fungi As Pollution Indicators, Role Of Fungi In Detoxification, Bioremediation Of Waste Water And Sewage Treatment.	
2-5	**FUNGI IN BIODEGRADATION:-**Introduction, Biodegradation Of Xenobiotics, Biodegradation Of Oil Spills (Hydrocarbons), Litter Decomposition.	
3-1	**HISTORY AND CONCEPTS OF PLANT PATHOLOGY:-**Introduction, Concept, Classification Of Plant Disease, History.	CR 03
3-2	**CLASSIFICATION AND SYMPTOMATOLOGY OF FUNGAL, BACTERIAL, VIRAL, PHYTOPLASMA AND NEMATODE DISEASES:-** Introduction, Classification Of Plant Diseases, Symptoms Of Fungal Plant Diseases, Symptoms Of Bacterial Plant Diseases, Symptoms Of Viral Plant Diseases, Symptoms Of Phytoplasmal Diseases, Symptoms Of Nematode Diseases.	
3-3	**HOST- PATHOGEN INTERACTION-I :-**Introduction, Adhesion, Entry, Establishment, Barriers (Physical) Elictors, Signal Molecules And Signal Transduction, Symptom Production.	
3-4	**HOST- PATHOGEN INTERACTION-II :-**Introduction, Recognition, Barriers (Chemical), Diseases Syndrome, Physiological Changes Due To Infection.	
3-5	**CONTROL PLANT DISEASES:-**Introduction, Phytosanitation, Cultural Methods, Chemical Control, Disease Resistance, Biological Control.	
4-1	**PLANT DISEASES CAUSED BY BACTERIA, VIRUSES AND SPIROPLASMAS:-**Introduction, Bacterial Diseases, Viral Diseases, Plant Diseases Caused By Spiroplasmas (Mycoplasma).	CR 04
4-2	**PLANT DISEASES OF CEREALS, PULSES AND OIL SEEDS:-**Diseases Of Cereals, Diseases Of Pulses, Diseases Of Oil Seeds.	
4-3	**PLANT DISEASES OF FRUITS AND VEGETABLES:-**Introduction, Plant Diseases Of Fruits, Plant Diseases Of Vegetables.	
4-4	**PLANT DISEASES OF CASH CROPS AND PLANTATION CROPS:-**Introduction, Plant Diseases Of Cash Crops, Plant Diseases Of Plantation Crops.	

LEARNING RESOURCE DETAILS

LR Code	Title Author	Edition Year	ISBN Publisher
Course Website Link for (1) Mobile and Online Lectures, (2) Discussion Forum for online interaction and (3) Self-Test for each CR Block, Continuous Assessment Test and End Examination			
CW-BNY023			
Text-Books			
BNY023-T01	Applied mycology and plant pathology i. Prof.B.P.R.Vittal ii. Prof. S.Ram Reddy iii. Prof. K.V.B.R.Tilak iv. Prof. B.Bhadraiah v. Prof.A.Janaki Bai vi. Prof.Rana Kauser vii. Prof. M.Madhusudan Rao viii. Prof. K.Satya Prasad	2009	BRAOU, Hyderabad
Reference-Books: Explore additional details and reinforce learning, with this optional learning resource!			
BNY023 –RB1			
BNY023 –RB2			
BNY023 –RB3			
BNY023 –RB4			
CD / DVD: Explore additional details and reinforce learning, with this optional learning resource!			
BNY023 -CD1			
Web Links: Explore additional details and reinforce learning, with this optional learning resource!			
BNY023-WL1			

BNY024: PLANT MOLECULAR BIOLOGY & BIOTECHNOLOGY

PROGRAMME INFORMATION

SN	Description	Details
1	University	Yashwantrao Chavan Maharashtra Open University Nashik - 422 222, Maharashtra, India Website: http://www.ycmou.ac.in/and http://ycmou.digitaluniversity.ac/
2	School	School of Architecture, Science and Technology
3	Discipline	Science
4	Level	PG
5	Course Used in	V134: M.Sc.(BOTANY)

COURSE INFORMATION

Sem	Code	Course Name	CR	CST	ST	CA	EE	TM	Type
01	BNY024	Plant Molecular Biology and Biotechnology	4	8	120	20	80	100	T

PRESUMED KNOWLEDGE AND LEARNING OBJECTIVES

Presumed Knowledge	Learning Objectives
For successful completion of this course, student should have successfully complete: • B. Sc.with botany or equivalent from a recognized University/Board.	After successful completion of this course, student should be able to know • Molecular markers • Cryopreservation of plant cells and tissues and germplasm storage • Protoplast culture and somatic hybridization

UNITS

UN	Name of the Unit	CR	Questions
01-01 01-02 01-03 01-04 01-05 01-06	**Genome** **Genome organization in higher plants** **Chloroplast and mitochondrial genomes** **Structure and organization of eukaryotic genes** **Gene expressions in eukaryotes** **Regulation of gene expression in eukaryotes**	CR 01	Student is required to answer 4 of 5 SAQ, each of 5 marks, on each CR
02-01 02-02 02-03 02-04 02-05 02-06	**Restriction endonucleases** **Modifying enzymes used in molecular cloning** **Cloning vectors** **Genomic and cDNA libraries** **Polymerase chain reaction** **Molecular markers**	CR 02	Student is required to answer 4 of 5 SAQ, each of 5 marks, on each CR
03-01 03-02 03-03 03-04	**Introduction to plant tissue culture and *in vitro* morphogenesis** **Anther, pollen and ovule culture** **Cryopreservation of plant cells and tissues and germplasm storage** **Protoplast culture and somatic hybridization**	CR 03	Student is required to answer 4 of 5 SAQ, each of 5 marks, on each CR
04-01 04-02 04-03 04-04	**Transgenic plants** **Plant genomics and proteomics** **Plants metabolomics** **Intellectual property rights and biosafety**	CR 04	Student is required to answer 4 of 5 SAQ, each of 5 marks, on each CR

DETAILED SYLLABUS

UN	Detailed Syllabus of the Unit	CR
1-1	**GENOME:-** introduction, concepts of genome organization, chromosome structure and organization, genome and gene organization, C-value paradox, kinetics of DNA reassociation, other important aspects of genome.	
1-2	**GENOME ORGANIZATION IN HIGHER PLANTS:-**definition and scope, techniques to study genome, genome organization, genome size and ploidy status, genome packaging, DNA kinetics, non-repetitive DNA, application of genome study.	
1-3	**CHLOROPLAST AND MITOCHONDRIAL GENOMES:-** introduction, genome organization of chloroplast, tobacco chloroplast genome organization, gene content, classification of plastids genomes, evolutionary changes, genome sequencing, applications, mitochondrial genome, genome organization of mitochondria, genome rearrangement, genome size, genetic map of the wheat mitochondrial genome, gene content, mitochondrial plasmid, cytoplasmic male sterility, evolutionary Mosaic.	CR 01
1-4	**STRUCTURE AND ORGANIZATION OF EUKARYOTIC GENES:-**introduction, organization of eukaryotic chromosome, eukaryotic gene structure, organization of eukaryotic genes.	
1-5	**GENE EXPRESSION IN EUKARYOTES:-**introduction, the central dogma of molecular biology, eukaryotic transcription, eukaryotic translation.	
1-6	**REGULATION OF GENE EXPRESSION IN EUKARYOTES:-**introduction, types of regulation of gene expression in eukaryotes.	
2-1	**RESTRICTION ENDONUCLEASES:-** introduction, types of restriction endonucleases, nomenclature of restriction endonucleases, recognition site, type-II restriction endonucleases, applications.	
2-2	**MODIFYING ENZYMES UESD IN MOLECULAR CLONING:-**introduction, ligases, kinases and phosphates, polymerases, terminal transferase, nucleases, methylases, RecAprotein and AgarACE(..) Enzyme.	
2-3	**CLONING VECTORS:-**introduction (vectors and gene cloning vectors), plasmids, cosmid vectors, bacteriophage vectors (M 13 and (((phage vectors), yeast artificial chromosomes (YAC vectors), bacterial artificial chromosomes (BAC Vectors).	CR 02
2-4	**GENOMIC AND cDNA LIBRARIES:-** introduction, construction and screening of genomic and cDNA libraries, colony hybridization for screening of libraries, cloning, cDNA libraries, applications of cDNA libraries, construction of DNA libraries with different vectors, genomic library $_{vs}$cDNAlibrary.	
2-5	**POLYMERASE CHAIN REACTION:-**introduction, principle, procedure, stages of PCR, applications of PCR, PCR variants.	
2-6	**MOLECULAR MARKERS:-**introduction, types of markers, properties of ideal DNA markers, applications of molecular markers, development of molecular markers in crop improvement programmes in India.	
3-1	**INTRODUCTION TO PLANT TISSUE CULTURE AND *IN VITRO* MORPHOGENESIS:-** introduction, totipotency and its expression *in vitro*, factors affecting *in vitro* morphogenesis, application of totipotency, production of synthetic seeds and their applications, limitations of synthetic seeds, stages of micropropagation, importance of micropropagation, limitations of micropropagation, future perspectives.	
3-2	**ANTHER, POLLEN AND OVULE CULTURE:-** introduction, induction of haploids, procedure of anther, pollen and ovule culture, merits and demerits of anther, pollen and ovule culture, factors affecting *in vitro* androgenesis, factors affecting *in vitro* gynogenesis, identification of haploids, diploidization to raise homozygous diploids, application of anther, pollen and ovule culture in crop improvement, limitations in exploiting anther, pollen and ovule culture in crop improvement, future perspectives.	CR 03
3-3	**CRYOPRESERVATION OF PLANT CELLS AND TISSUES AND GERMPLASM STORAGE:-**introduction, methods of *in vitro* conservation, cryopreservation facilities in India, future perspectives.	
3-4	**PROTOPLAST CULTURE AND SOMATIC HYBRIDIZATION:-**introduction, isolation of protoplasts,	

	culture of protoplasts, fusion of protoplasts (somatic hybridization).	
4-1	**TRANSGENIC PLANTS:-** introduction, genetic engineering techniques, achievements and advantages of transgenic plants, risks and controversies of transgenic plants.	CR 04
4-2	**PLANT GENOMICS AND PROTEOMICS:-**introduction, genomics research, proteomics research, practical applications of genomics and proteomics.	
4-3	**PLANT METABOLOMICS:-**introduction, metabolomics, the metablome, metabolites, secondary metabolites, analytical technologies for analysis of secondary metabolites, metabolomics and system biology, metabolomics and bioinformatics tools.	
4-4	**INTELLECTUAL PROPERTY RIGHTS AND BIOSAFETY:-** introduction, history of intellectual property rights, branches of intellectual property, intellectual property organizations,intellectual property rights and convention of biological diversity, biosafety, history of biosafety, fields of biosafety application, Indian institute that deal with biosafety, biosafety norms.	

LEARNING RESOURCE DETAILS

LR Code	Title Author	Edition Year	ISBN Publisher
Course Website Link for (1) Mobile and Online Lectures, (2) Discussion Forum for online interaction and (3) Self-Test for each CR Block, Continuous Assessment Test and End Examination			
CW-BNY024			
Text-Books			
BNY024-T01	Plant molecular biology and biotechnology i. Prof.B.Pratibha Devi ii. Prof. A. Sadanandam iii. Prof. Prabha Nallari iv. Prof. Sudhakar v. Dr.G.Padmaja vi. Dr. S.Karnakar Reddy vii. Dr.Parveen Jahan viii. Dr. T.Srivalli ix. Dr. M.Srikanth Reddy x. Mrs. T.Leela	2009	BRAOU, Hyderabad
Reference-Books: Explore additional details and reinforce learning, with this optional learning resource!			
BNY024–RB1			
BNY024 –RB2			
BNY024 –RB3			
BNY024 –RB4			
CD / DVD: Explore additional details and reinforce learning, with this optional learning resource!			
BNY024 -CD1			
Web Links: Explore additional details and reinforce learning, with this optional learning resource!			
BNY024-WL1			

BNY025: LABORATORY MANUAL: CELL BIOLOGY, GENETICS, BIOSTATISTICS &ECOLOGY (PRACTICAL)

Programme Information

SN	Description	Details
1	University	Yashwantrao Chavan Maharashtra Open University Nashik - 422 222, Maharashtra, India Website: http://www.ycmou.ac.in/and http://ycmou.digitaluniversity.ac/
2	School	School of Architecture, Science and Technology
3	Discipline	Science
4	Level	PG
5	Course Used in	V134: M.Sc.(BOTANY

Course Information

Sem	Code	Course Name	CR	CST	ST	CA	EE	TM	Type
01	BNY025	Cell biology, genetics, biostatistics and ecology	2	8	120	10	40	50	P

Presumed Knowledge and Learning Objectives

Presumed Knowledge	Learning Objectives
For successful completion of this course, student should have successfully complete: • B.Sc. with botany or equivalent from a recognized University/Board.	After successful completion of this course, student should be able to study • Karyotype Analysis • Evaluation of life form classes of local flora

Units

UN	Name of the Unit	CSs	Questions
01-01	**Observation of cell and cell organelles**	CR 01	Student is required to answer 4 of 5 SAQ, eachof 5 marks, on eachCR
01-02	**Squash preparation of Onion root Tips to study mitosis**		
01-03	**Smear preparation of Maize or onion flower Buds to study Meiosis**		
01-04			
01-05	**Karyotype Analysis**		
01-06	**Problems of Monohybrid Cross**		
01-07	**Problems of Dihybrid Cross**		
01-08	**Problems of Trihybrid Cross**		
	Genetic Mapping in Eukaryotes		

02-01	**Designing of Experiments and Random Sampling**		
02-02	**Problems on Means and Variations**		
02-03	**Problems on F-Ratio and Critical Differences(CD)**		
02-04	**Problems on Chi- Square Test**		
02-05	**Problems on ANOVA**		
02-06	**Determination of Minimum size Quadrats by species Area curve**		
02-07	**Determination of quantitative characters by random quadrat methods**	**CR 02**	Student is required to answer 4 of 5 SAQ, **each** of 5 marks, on **each** CR
02-08	**Evaluation of life form classes of local flora**		
02-09	**Morphology and anatomy of common hydrophytes and xerophytes**		
02-10	**Interpretation of environmental data and climatogram and plotting techniques**		
02-11	**Mechanical analysis of soil, soil Ph, Soil moisture and water holding capacity.**		
02-12	**Estimation of chlorides, carbonates, Bicarbonates and dissolved oxygen in Clean and polluted water, BOD, COD**		

DETAILED SYLLABUS

UN	Detailed Syllabus of the Unit	CR
1-1	**Observation of cell and cell organelles**-to study the cell and its organelles(as observed under Electron microscope with the aid of photographs)	CR 01
1-2	**Squash preparation of Onion root Tips to study mitosis**- To observe different mitotic stages in the root tips of *Allium cepa* L. (2n=16)	
1-3	**Smear preparation of Maize or onion flower Buds to study Meiosis**- to observe different meiotic stages in pollen mother cells of onion flower buds.	
1-4	**Karyotype Analysis**-to observe chromosome morphology in the karyotype of onion and construct an Idiogram.	
1-5	**Problems of Monohybrid Cross** –To apply the knowledge of single gene inheritance to solve practical problems.	
1-6	**Problems of Dihybrid Cross**- To apply the knowledge of double gene inheritance to solve practical problems.	
1-7	**Problems of Trihybrid Cross**- To apply the knowledge of three gene inheritance to solve practical problems.	
1-8	**Genetic Mapping in Eukaryotes**- To construct genetic maps using trihybrid test cross method.	
2-1	**Designing of Experiments and Random Sampling**-To draw random sampling using Random Number Table.	CR 02
2-2	**Problems on Means and Variations**- to calculate the mean, variance, and standard deviation**.**	
2-3	**Problems on F-Ratio and Critical Differences(CD)**- to decide whether variances of two data are equal or not by mean of "F"- test, and also to decide whether the mean values representing two data are equal or not by means of "t"- test	
2-4	**Problems on Chi- Square Test**- To enable the significance of differences between observed and expected frequencies.	
2-5	**Problems on ANOVA**-To partition the total variance into different constituent factors and also into two constituent factors	
2-6	**Determination of Minimum size Quadrats by species Area curve-** To determine the minimum size of the quadrat by species area curved method.	
2-7	**Determination of quantitative characters by random quadrat methods --** To determine the quantitative characters viz. frequency, density and abundance by random quadrat . to determine the basal cover of particular plant species, to determine the important value index, to determine the relative cover of the species by random quadrat method, to determine the similarity and dissimilarity index by random quadrat method.	
2-8	**Evaluation of life form classes of local flora-** To prepare frequency diagram of plant community by Raunkiaer method and preparation of biological spectrum.	
2-9	**Morphology and anatomy of common hydrophytes and xerophytes-** To identify the given specimen as a hydrophytes or xerophyte basing on its morphological and anatomical characters.	
2-10	**Interpretation of environmental data and climatogram and plotting techniques-** In this unit you will study about various methods followed to study the vegetation of a given area.	
2-11	**Mechanical analysis of soil, soil Ph, Soil moisture and water holding capacity-** To study the soil texture, Ph, soil moisture content and its water holding capacity.	
2-12	**Estimation of chlorides, carbonates, Bicarbonates and dissolved oxygen in Clean and polluted water, BOD, COD-**In this unit you will study about the estimation of quantities of chlorides, carbonates, bicarbonates, dissolved oxygen ,BOD,COD in clean and polluted water.	

LEARNING RESOURCE DETAILS

LR Code	Title	Edition	ISBN

	Author	Year	Publisher
Course Website Link for (1) Mobile and Online Lectures, (2) Discussion Forum for online interaction and (3) Self-Test for each CR Block, Continuous Assessment Test and End Examination			
CW-BNY025			
Text-Books			
BNY025-T01	laboratory manual and Record Cell biology, genetics, biostatistics and ecology i. Prof.M.V.B.Subba Rao ii. Prof. B. Venkateshwar Rao iii. Prof.M.V.B.Subba Rao iv. Prof. V.Rattan Kumar v. Prof. M. Singara Charya vi. Prof. Mary Esther Cynthia	2011	BRAOU, Hyderabad
Reference-Books: Explore additional details and reinforce learning, with this optional learning resource!			
BNY025 –RB1			
BNY025 –RB2			
BNY025 –RB3			
BNY025 –RB4			
BNY025 –RB5			
CD / DVD: Explore additional details and reinforce learning, with this optional learning resource!			
BNY025 -CD1			
Web Links: Explore additional details and reinforce learning, with this optional learning resource!			
BNY025-WL1			

BNY026: MEDICINAL PLANTS & EMBRYOLOGY OF ANGIOSPERMS (PRACTICAL)

PROGRAMME INFORMATION

SN	Description	Details
1	University	Yashwantrao Chavan Maharashtra Open University Nashik - 422 222, Maharashtra, India Website: http://www.ycmou.ac.in/and http://ycmou.digitaluniversity.ac/
2	School	School of Architecture, Science and Technology
3	Discipline	Science
4	Level	PG
5	Course Used in	V134: M.Sc.(BOTANY)

COURSE INFORMATION

Sem	Code	Course Name	CR	CST	ST	CA	EE	TM	Type
01	BNY026	Medicinal plants and embryology of angiosperms	2	8	120	10	40	50	P

PRESUMED KNOWLEDGE AND LEARNING OBJECTIVES

Presumed Knowledge	Learning Objectives
For successful completion of this course, student should have successfully complete: • B.Sc. with botany or equivalent from a recognized University/Board.	After successful completion of this course, student should be able to know • Collection of ethno botanical information of Local Medicinal Plants. • Study of endosperm Haustoria • Study of embryos • Anther culture • Callus culture.

UNITS

UN	Name of the Unit	CSs	Questions
01-01	**Analysis of morphological attributes in Selected Medicinal plants.**	CR 01	Student is required to answer 4 of 5 SAQ, eachof 5 marks, on eachCR
01-02	**Identification of crude drugs using anatomical characters.**		
01-03	**Identification of crude drugs using physical properties.**		
01-04	**Qualitative analysis of crude drugs for different Phytochemicals.**		
01-05	**Antimicrobial studies and determination of MIC (Minimum Inheritance Concentration.)**		
01-06	**Anatomical studies of medicinal plants.**		
01-07	**Histochemical analysis of medicinal plants.**		
01-08	**Collection of ethno botanical information of Local Medicinal Plants.**		

02-01	**Study of ovules and ovaries and their identification.**	**CR 02**	Student is required to answer 4 of 5 SAQ, **each**of 5 marks, on **each**CR
02-02	**Pollen grain analysis by acetolysis.**		
02-03	**Pollen germination studies**		
02-04	**Estimation of pollen fertility**		
02-05	**Study of endosperm Haustoria**		
02-06	**Study of embryos**		
02-07	**Study of protandry and protogyny**		
02-08	**Study of heterostyly.**		
02-09	**Fundamentals of microtome technique**		
02-10	**Preparation of permanent slides.**		
02-11	**Anther culture**		
02-12	**Callus culture.**		

DETAILED SYLLABUS

UN	Detailed Syllabus of the Unit	CR
1-1	**Analysis of morphological attributes in Selected Medicinal plants.**-In this unit you will study the morphological and organoleptic characters of few crude drugs.	CR 01
1-2	**Identification of crude drugs using anatomical characters**- In this unit you will study the identification of crude drugs using microscopic anatomical characters	
1-3	**Identification of crude drugs using physical properties**- In this unit you will study the physical properties for the identification of crude drugs.	
1-4	**Qualitative analysis of crude drugs for different Phytochemicals**-- In this unit you will study the chemical composition of crude drugs through qualitative phytochemical analysis.	
1-5	**Antimicrobial studies and determination of MIC (Minimum Inheritance Concentration.)**-In this unit you will study the experimental design to estimate the inhibitory property of crude drug samples on the pathogenic microorganisms. This experimentalso helps you to determine the MIC of the test sample against the pathological strains. The main aim of the present topic is "to determine the antimicrobial activity of selected crude drug or medicinal plant by using disc diffusion method."	
1-6	**Anatomical studies of medicinal plants**- In this unit you will study the Anatomical studies of some medicinal plants to understand the anatomical diversity in the structure and composition of various tissues in plant parts like stem, root, leaf etc.	
1-7	**Histochemical analysis of medicinal plants**- to study, test and identify the different chemical constituents of the types of wall thickenings and non- living inclusion of plant cells, through histochemical analysis**.**	
1-8	**Collection of ethno botanical information of Local Medicinal Plants**- In this unit you will know how to get ethnobotanical information about the medicinal plants from the people belonging to primitive societies.	
2-1	**Study of ovules and ovaries and their identification.**- In this unit you will study the structure of the typical ovule, types of ovules and their associated structures; different types of ovaries and the features of their identification.	CR 02
2-2	**Pollen grain analysis by acetolysis**-- In this unit you will know the method of the preparation of pollen grains by acetolysis.	
2-3	**Pollen germination studies**-In this unit you will study the germination of pollen grains invitro.	
2-4	**Estimation of pollen fertility**- In this unit you will study the estimation of pollen fertility/ viability by Tetrazolium test.	
2-5	**Study of endosperm Haustoria**- In this unit you will study the morphology of endosperm haustoria in a few species by dissecting endosperm from seeds. You can also study the endosperm haustoria through permanent.	

2-6	**Study of embryos-** In this unit you will study major stages of embryo formation in a couple of species through dissection and also through permanent slides.	
2-7	**Study of protandry and protogyny-**In this unit you will learn about the floral characters and maturity of sex organs at different times.	
2-8	**Study of heterostyly-** In this unit you will study the morphology of flower and pollination mechanisms in preventing self – pollination.	
2-9	**Fundamentals of microtome technique--** In this unit you will be learning to prepare material for studying embryological development in a species using microtome.	
2-10	**Preparation of permanent slides-** In this unit you will be learning to take secretion using a microtom , prepare slides, make them permanent after staining.	
2-11	**Anther culture-** In this unit you will study the methods of antherculture to produce haploids and homozygous diploids under suitable conditions. Then you can practice the same to produce haploids.	
2-12	**Callus culture-** In this unit you will be learn about how to culture the callus tissue on nutrient medium.	

LEARNING RESOURCE DETAILS

LR Code	Title Author	Edition Year	ISBN Publisher
Course Website Link for (1) Mobile and Online Lectures, (2) Discussion Forum for online interaction and (3) Self-Test for each CR Block, Continuous Assessment Test and End Examination			
CW-BNY026			
Text-Books			
BNY026-T01	laboratory manual and Record Medicinal plants and embryology of angiosperms i. Prof. K.Laksminarayana ii. Prof. K.C.Naidu iii. Prof.Shyamala Ravi Shankar iv. Prof.R.R.Venkata Raju v. Prof.Y.N.R.Varma vi. Dr. B.K.Vijay Kumar vii. Dr.A.Vijaya Bhasker Reddy	2011	BRAOU, Hyderabad
Reference-Books: Explore additional details and reinforce learning, with this optional learning resource!			
BNY026–RB1			
BNY026 –RB2			
BNY026 –RB3			
BNY026 –RB4			
BNY026 –RB5			
CD / DVD: Explore additional details and reinforce learning, with this optional learning resource!			
BNY026 -CD1			
Web Links: Explore additional details and reinforce learning, with this optional learning resource!			
BNY026-WL1			

1957

BNY027: APPLIED MYCOLOGY & PLANT PATHOLOGY (PRACTICAL)

PROGRAMME INFORMATION

SN	Description	Details
1	University	Yashwantrao Chavan Maharashtra Open University Nashik - 422 222, Maharashtra, India Website: http://www.ycmou.ac.in/and http://ycmou.digitaluniversity.ac/
2	School	School of Architecture, Science and Technology
3	Discipline	Science
4	Level	PG
5	Course Used in	V134: M.Sc.(BOTANY)

COURSE INFORMATION

Sem	Code	Course Name	CR	CST	ST	CA	EE	TM	Type
01	BNY027	Applied mycology and plant pathology	2	8	120	10	40	50	P

PRESUMED KNOWLEDGE AND LEARNING OBJECTIVES

Presumed Knowledge	Learning Objectives
For successful completion of this course, student should have successfully complete: • B.Sc. with botany or equivalent from a recognized University/Board.	After successful completion of this course, student should be able to know • Fermentation Methods • Testing of some isolates of *Penicillium* species against pathogenic bacteria

UNITS

UN	Name of the Unit	CSs	Questions
01-01	**Sterilization Methods, Preparation of Media and Stains**	CR 01	Student is required to answer 4 of 5 SAQ, each of 5 marks, on each CR
01-02	**Isolation techniques**		
01-03	**Single Spore Isolation, Pure Culture and Conservation of Fungal Germplasm**		
01-04	**Fermentation Methods**		
01-05	**Isolation of *Trichodermaviride* and *T.harzianum and their evaluation as Biocontrol Agents***		
01-06	**Collection and identification of Ectomycorrhizae**		
01-07	**VAM Funagal Root Colonization,Evaluation and Quantification in *Partheniumand Castor***		
01-08	**Isolation of Keratinophilic fungi**		
01-09	**Observation of Hyperparasites and Common Entomogenous Fungi**		
01-10	**Testing of some isolates of *Penicilliumspecies* against pathogenic bacteria**		

02-01 02-02 02-03 02-04 02-05 02-06 02-07 02-08 02-09 02-10 02-11	**Observation of Plant Disease Symptoms Caused by Bacteria, Viruses and Fungi** **Observation of Fungal Pathogens and their identification** **Isolation of plant pathogens and pure culture preparation** **Establishing Koch's postulates for evaluation of pathogenecity** **Evaluation of disease index and crop loss** **Evaluation of culture filtrates for cellulose, pectinase, protease and amylase** **Estimation of protein and amino acids** **Spawn preparation of edible mushrooms(Oyster), bed preparation and mushroom production** **Evaluation of fungicidal efficacy** **Collection of materials with diseases**	**CR 02**	Student is required to answer 4 of 5 SAQ, **each**of 5 marks, on **each**CR

DETAILED SYLLABUS

UN	Detailed Syllabus of the Unit	CR
1-1	**Sterilization Methods, Preparation of Media and Stains**- In this unit you will study the different methods of sterilization, preparation of different media and stains.	
1-2	**Isolation techniques**- In this unit you will determine the number of fungi present in a given sample of soil, air, as well as on leaf.	
1-3	**Single Spore Isolation, Pure Culture and Conservation of Fungal Germplasm**-In this unit you will try to isolate single spores, bring them into pure culture and learn different methods of conservation of fungal cultures.	
1-4	**Fermentation Methods**-In this unit you will determine total acidity,volatile acidity and oer cent alcohol of the fermenting juice.	
1-5	**Isolation of *Trichodermaviride* and *T.harzianum and their evaluation as Biocontrol Agents*-**In this unit you will learn the technique for isolation of *Trichodermaviride* and *Trichodermaharzianum* from rhizosphere soil and phylloplane and study their in vitro and in vivo evaluation of biocontrol ability against *Fusarium* sp. and *Colletotrichum*sp.	CR 01
1-6	**Collection and identification of Ectomycorrhizae**-In this unit,you will study the method of collection and identification of Ectomycorrhizae	
1-7	**VAM Funagal Root Colonization,Evaluation and Quantification in *Partheniumand Castor*-**In this unit you will study the habit and the identification characters of AM fungi.	
1-8	**Isolation of Keratinophilic fungi**-In this unit you will learn the methods of isolation of kerainophilic fungi and examine some common dermatophytes	
01-09	**Observation of Hyperparasites and Common Entomogenous Fungi-**To identify hyperparasites and entomogenous fungi given samples.	
01-10	**Testing of some isolates of *Penicillium*species against pathogenic bacteria-**In this unit you will study how to test some of the isolates of *Penicillium* spp. against pathogenic bacteria	
2-1	**Observation of plant disease symptoms caused by bacteria, viruses and fungi**- in this unit, you will make observation on plant disease symptoms caused by bacteria, viruses and fungi	
2-2	**Observation of Fungal Pathogens and their identification**-To study the anatomical features of leaves infected by fungi	CR 02
2-3	**Isolation of plant pathogens and pure culture preparation**-To isolate and identify the fungal pathogen of a plant disease and prepare pure culture of the pathogen	
2-4	**Establishing Koch's postulates for evaluation of pathogenecity-**To evaluate the pathogenic nature of fungus	
2-5	**Evaluation of disease index and crop loss**-To assess the disease severity index in the given material	
2-6	**Evaluation of culture filtrates for cellulose, pectinase, protease and amylase-**To measure the activity of cellobiohydrolase (C) , Pectin lyase ,by ace,protease, amylase, endogluconase of given fungal culture filtrate.	
2-7	**Estimation of protein and amino acids** –To estimate the proteins and amino acids in the given fungal culture filtrate	
2-8	**Spawn preparation of edible mushrooms(Oyster), bed preparation and mushroom production-** In this unit will study the preparation of spawn substrate,bed and production of Oyster mushrooms	
2-9	**Evaluation of fungicidal efficacy**-In this unit you will study the evaluation of fungicidal efficacy of fungicides viz.,Dithane Z-78,Bavistin,Vitavax using spore germination and poisoned food techniques.	
2-10	**Collection of materials with diseases**-To know the procedure or methods to collect and preserve the diseased plant material.	

LEARNING RESOURCE DETAILS

LR Code	Title Author	Edition Year	ISBN Publisher
Course Website Link for (1) Mobile and Online Lectures, (2) Discussion Forum for online interaction and (3) Self-Test for each CR Block, Continuous Assessment Test and End Examination			
CW-BNY027			
Text-Books			
BNY027-T01	laboratory manual and Record Applied mycology and plant pathology i. Prof.B.P.R.Vittal ii. Prof. B.Bhadraiah iii. Prof.A.Janaki Bai iv. Prof.Rana Kauser v. Prof. K.V.B.R.Tilak vi. Prof. K.Satya Prasad vii. Prof. M.Madhusudan Rao	2011	BRAOU, Hyderabad
Reference-Books: Explore additional details and reinforce learning, with this optional learning resource!			
BNY027–RB1			
BNY027 –RB2			
BNY027 –RB3			
BNY027 –RB4			
BNY027–RB5			
BNY027 –RB6			
CD / DVD: Explore additional details and reinforce learning, with this optional learning resource!			
BNY027 -CD1			
Web Links: Explore additional details and reinforce learning, with this optional learning resource!			
BNY027-WL1			

BNY028: PLANT MOLECULAR BIOLOGY & BIOTECHNOLOGY (PRACTICAL)

PROGRAMME INFORMATION

SN	Description	Details
1	University	Yashwantrao Chavan Maharashtra Open University Nashik - 422 222, Maharashtra, India Website: http://www.ycmou.ac.in/and http://ycmou.digitaluniversity.ac/
2	School	School of Architecture, Science and Technology
3	Discipline	Science
4	Level	PG
5	Course Used in	V134: M.Sc.(BOTANY)

COURSE INFORMATION

Sem	Code	Course Name	CR	CST	ST	CA	EE	TM	Type
01	BNY028	Plant molecular biology and biotechnology	2	8	120	10	40	50	P

PRESUMED KNOWLEDGE AND LEARNING OBJECTIVES

Presumed Knowledge	Learning Objectives
For successful completion of this course, student should have successfully complete: • B.Sc. with BOTANY equivalent from a recognized University/Board.	After successful completion of this course, student should be able to know • RAPD Analysis • Gene cloning- • Exploring Gene bank Database and Blast Search

UNITS

UN	Name of the Unit	CSs	Questions
01-01	**Isolation of plasmid DNA from bacteria and agarose gel electrophoresis of DNA**	CR 01	Student is required to answer 4 of 5 SAQ, eachof 5 marks, on eachCR
01-02	**Production of competent cells and bacterial transformation**		
01-03	**Isolation of plant genomic DNA**		
01-04	**Restriction endonuclease digestion of plasmid and genomic DNA**		
01-05	**Isolation of plant RNA**		
01-06	**Quantification of DNA,RNA and reassociation kinetics of DNA**		
01-07	**Polymerase chain reaction**		
01-08	**Southern, Northern and Western Blotting-**		
01-09	**RAPD Analysis**		
01-10	**Gene cloning-**		

02-01 02-02 02-03 02-04 02-05 02-06 02-07 02-08 02-09	**Preparation of media, surface sterilization and inoculation of explants** **Initiation of callus and suspension cultures** **Plant regeneration from callus cultures-** **Micropropagation of plants** **Protoplast isolation and culture** **Genetic transformation of plants using *Agrobacterium tumefaciens*** **Induction of hairy root cultures using *Agrobacterium rhizogenes*** **Direct gene transformation of plants using biolistic gun—** **Sequence alignment** **Exploring Genebank Database and Blast Search**	**CR 02**	Student is required to answer 4 of 5 SAQ, **each** of 5 marks, on **each** CR

DETAILED SYLLABUS

UN	Detailed Syllabus of the Unit	CR
1-1	**Isolation of plasmid DNA from bacteria and agarose gel electrophoresis of DNA**-In this unit you will study the method of isolation of plasmid DNA from bacteria and agarose gel electrophoresis of DNA	CR 01
1-2	**Production of competent cells and bacterial transformation**- In this unit you will study the method of preparation of competent cells *E coli* and also transformed with plasmid DNA	
1-3	**Isolation of plant genomic DNA**-In this unit you will study the method of isolation ofgenomic DNA from plant material	
1-4	**Restriction endonuclease digestion of plasmid and genomic DNA**-In this unit you will study the method of digestion DNA by using restriction endonuclease to takeout the DNA of interest	
1-5	**Isolation of plant RNA** -In this unit you will study the method of isolation ofRNA from plant material	
1-6	**Quantification of DNA,RNA and reassociation kinetics of DNA**--In this unit you will study the method to estimate the amount of DNA by diphenylamine reaction estimate the amount of RNA by original method of study the reassociation kinetics of DNA .	
1-7	**Polymerase chain reaction**-In this unit you will study the polymerase chain reaction .You will also learn how to set-up a PCR and amplify a sequence of a given gene in the laboratory.	
1-8	**Southern, Northern and Western Blotting**-In this unit you will study the molecular methods of blotting i.e Southern, Northern and Western blotting.	
01-09	**RAPD Analysis**-In this unit you will study the method of RAPD Analysis of plants by using the PCR method and employing random primers.	
01-10	**Gene cloning**--In this unit you will study the method to insert gene of interest in a cloning vector to be used in genetic transformation experiments.	
2-1	**Preparation of media, surface sterilization and inoculation of explants**-In this unit, you will learn to prepare plant tissue culture medium and inoculate the surface sterilized explants into the medium.	CR 02
2-2	**Initiation of callus and suspension cultures**-In this unit, you will learn the procedure for inducing callus from tap root of carrot (*Daucuscarota* L.) and suspension cultures from the callus.	
2-3	**Plant regeneration from callus cultures**-In this unit learn the procedure of regenerating plants from callus cultures induced from leaf explants of tobacco.	
2-4	**Micropropagation of plants**-In this unit you will study the method of culture and regeneration of plants on defined culture media in the laboratory.	
2-5	**Protoplast isolation and culture**-In this unit you will study the method of isolation of protoplast using the enzymatic method and their culture.	
2-6	**Genetic transformation of plants using *Agrobacterium tumefaciens***- In this unit you will study the method of culture of the soil bacterium *Agrobacterium tumefaciens* and the development of genetically transformed shoots after infecting plants with the bacterium.	
2-7	**Induction of hairy root cultures using *Agrobacterium rhizogenes***-In this unit you will study the method of culture of the soil bacterium *Agrobacteriumrhizogenes*and the induction of hairy roots by infecting plants with the bacterium.	
2-8	Direct gene transformation of plants using biolistic gun-- In this unit you will study the method of using the biolistic gun to directly transfer foreign genes into plants and analyse the bombarded explants by histochemical GUS assay.	
2-9	**Sequence alignment** -In this unit you will study the bioinformatics method of sequence alignment by working on a computer online.	
2-10	**Exploring Genebank Database and Blast Search** -In this unit you will study the bioinformatics method of exploring the Genebank Database and Blast Search for homologues in sequence databases by working on a computer online.	

LEARNING RESOURCE DETAILS

LR Code	Title Author	Edition Year	ISBN Publisher
Course Website Link for (1) Mobile and Online Lectures, (2) Discussion Forum for online interaction and (3) Self-Test for each CR Block, Continuous Assessment Test and End Examination			
CW-BNY028			
Text-Books			
BNY028-T01	laboratory manual and Record Plant molecular biology and biotechnology i. Prof.B.Pratibha Devi ii. Prof. N.Ramaswamy iii. Dr.G.Padmaja iv. Dr.Parveen Jahan v. Dr. T.Srivalli	2012	BRAOU, Hyderabad
Reference-Books: Explore additional details and reinforce learning, with this optional learning resource!			
BNY028 –RB1			
BNY028 –RB2			
BNY028 –RB3			
BNY028 –RB4			
CD / DVD: Explore additional details and reinforce learning, with this optional learning resource!			
BNY028 -CD1			
Web Links: Explore additional details and reinforce learning, with this optional learning resource!			
BNY028-WL1			

END OF DOCUMENT

SCHOOL OF ARCHITECTURE, SCIENCE AND TECHNOLOGY

YASHWANTRAO CHAVAN MAHARASHTRA OPEN UNIVERSITY

Syllabus:

V132: M. Sc. (Chemistry) {2021 Pattern}

2021

AST, YCMOU, Nasik – 422 222, MS, India

Yashwantrao Chavan Maharashtra Open University

Vice-Chancellor: Prof. Dr. E. Vayunandan

School of Architecture, Science and Technology

Director (I/C) of the School: Dr. Sunanda More

School Council (2021-2023)

Dr Sunanda More Director(I/c) & Associate Professor, School of Architecture, Science & Technology, YCMOU, Nashik	Dr Manoj Killedar Associate Professor, School of Architecture, Science & Technology, YCMOU, Nashik	Dr Chetana Kamlaskar Assistant Professor, School of Architecture, Science & Technology, YCMOU, Nashik
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Prof. Dr. R. L. Shinde Professor & Head, Department of Statistics and Department of Actuarial Science and Director, School of Mathematical Sciences, North Maharashtra University, Umavi Nagar, Jalgaon 425001	Dr. M. D. Sonawane Associate Professor, Head, Department of Botany K.T.H.M. College, Nashik - 422002	Mr. Sudharm S. Hande, Study Centre Coordinator, (S.C. Code: 12207) Shri R R Lahoti College, Morshi 444905 Dist: Amravati

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- **Prepared by**:

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CONTENTS

SYLLABUS FOR

V132: M.Sc. (CHEMISTRY){2021 PATTERN}

PROGRAMME OBJECTIVE AND SCOPE

This programme is designed to achieve following objectives and scope.

Objectives: After successful completion of this programme, students will be able to

- Inculcate critical thinking and analytical skills to enable students to pursue higher studies and research in Chemistry.
- Provide a strong foundation for a better understanding of current advances in Chemistry and its practical significance.
- Expose students to current trends in research about Chemistry.

Scope of the programmes: After successful completion of this programme, students may get opportunities in various fields/sectors to work as

- Career opportunities in both private and government sector/ in India and abroad
- Job opportunities in sectors like chemical, pharma & petroleum industries, Indian Forest Services, National Chemical Laboratories, Scientist, etc
- Inculcation of research attitude
- Inculcation of entrepreneurship
- Perceive higher education and research in the same or allied fields
- Candidates who have advanced qualifications can pursue either an academic career in institutions as **lecturers and professors or a scientific career** in various scientific positions
- They can also go and work **as Researchers and as administrators.**

MODE OF EDUCATION

This Programme will be offered in Open and Distance Learning (ODL) Mode as defined in "UGC Open and Distance Learning Programmes and Online Programmes Regulations, 2020" published in the gazette notification by dated 4th Sept 2020 by the UGC as specified below.

> *"Open and Distance Learning Mode means a mode of providing flexible learning opportunities by overcoming separation of teacher and learner using a variety of media, including print, electronic, online and occasional interactive face-to-face meetings with the learners or Learner Support Services to deliver teaching-learning experiences, including practical or work experiences"*

MODE OF EXAMINATION

Continuous Assessment is conducted at recognized learner support centres/ study centres and End Examination for all type of courses is conducted at recognized Exam Centres of the University under supervision.

BASIC INFORMATION

1. **Mode of Education**: Open and Distance Learning (ODL) Mode
2. **Minimum Programme Duration**: 2 years/ 4 semesters after Candidates with B.Sc. (PCM)/ B.Sc. Pass with Chemistry at FY and SY or Equivalent pass
3. **Learner Support Centers/ Study Centers:**University approved/ recognized Senior Science Colleges/ Institutes
4. **Medium of Instruction**: English

5. **Attendance**: Minimum 80% attendance for all type of courses.
6. **Minimum Programme Duration**:2 years after Graduation
7. **Teaching-Learning**: 36 working weeks per year
8. **Total Teaching-Learning Support:** 960 Hours in each year
9. **Total Courses:** 16 courses (subjects) at year 01-02
10. **Total Credits:** 48 Credits. As per UGC norms 1 Credit means 30 hours of study efforts required to gain learning of particular content of each credit.
11. **Year Credits**: 24 Credits in each year (16 credits for Theory and 08 credits for Practical).
12. **Total Courses and Credit Points:**

Year	Theory	Practical	Credits
01	4	4	24
02	4	4	24
Total credits			**48**

13.Passing: Minimum 40% or better marks

14. Credit Transfer:

15. **Continuous Assessment:**Continuous Assessment conducted for Continuous evaluation during teaching-learning for 20%Weightage
16. **End Exam:**End Examination conducted for Summative evaluation of the student for80% Weightage
17. **Degree Certification:** Aggregate performance and Class in the programme reported on the basis of performance.
18. **Curriculum Design:** Student centric curriculum is designed to enable professional ability, employability and skill enhancement.
19. **Approval/Equivalence Status**: UGC Approved. UGC-DEB Approval is available on UGC Website

ELIGIBILITY AND FEES

Admission Eligibility	Certification Eligibility	Fees and Deposit / Year UF is payable for a year to the university at the time of online admission
B.Sc. (PCM)/ B.Sc. with Chemistry at FY and SY or equi Passed or Equivalent pass	Min 40% or better marks, in all Theory type of courses, with total 48 credits at Year 01 to 02	**Description** / **INR ₹** University Fee (UF) — 8000 Study Center/ Learner Support Center Fee (LSCF) — 12,000 **Total ≈** — **20000** **Refundable LD** (Payable only when student choose to avail Library Facility at the SC) — 1,500

PROGRAMME STRUCTURE

V132:M.Sc.(CHEMISTRY){2021 Pattern}				
Course → year↓	Course 01, 4 CR, T	Course 02, 4 CR, T	Course 03, 4 CR, T	Course 04, 4 CR, T
Year 1 Theory 16 CR	CHE011: Inorganic Chemistry	CHE012: Organic Chemistry	CHE013: Physical Chemistry	CHE014: Mathematics, Biology, Spectroscopy and Computers
Course →	Course 05, 2 CR, P	Course 06, 2 CR, P	Course 07, 2 CR, P	Course 08, 2 CR, P

Year 1 Practical 8 CR	CHE015: Inorganic Chemistry (Practical)	CHE016: Organic Chemistry (Practical)	CHE017: Physical Chemistry (Practical)	CHE018: Spectroscopy and Computers (Practical)
Course ➔	Course 01, 4 CR, T	Course 02, 4 CR, T	Course 03, 4 CR, T	Course 04, 4 CR, T
Year 2 Theory 16 CR	CHE021: Organic Reaction Mechanisms-II, Pericylic Reactions,Organic Photochemistry, Stereochemistry-II	CHE022: Organic Chemistry - Synthetic Organic Chemistry	CHE023: Organic Chemistry - Natural Products,Heterocycles,Biogenesis and Spectroscopy	CHE024: Organic Chemistry - Drugs and Pharmaceuticals
Course ➔	Course 05, 2 CR, P	Course 06, 2 CR, P	Course 07, 2 CR, P	Course 08, 2 CR, P
Year 2 Practical 8 CR	CHE025: Organic Chemistry - Separation and Identification of Organic Compounds (Practical)	CHE026: Organic Chemistry - Separation and Identification of Organic Compounds and Chromatography(Practical)	CHE027: Synthesis of Organic Compounds and Isolation of Natural Products (Practical)	CHE028: Organic Chemistry - Synthesis and Analysis of Drugs (Practical)

TEACHING-LEARNING SCHEME:

Description	**Total 8 (Twelve) Theory Courses in Programme** **Total 8 (Eight)Practical Courses in Programme**
Face-to-face Counselling Sessions for interaction, problem solving and conduction of practical activities at Study Centre	**12 hrs each of 01 clock hour duration for each Theory Course of 4 Credits, Study Hours – 60**
	12 hrs each of 02 clock hour duration for each Practical/ Activity Course of 2 Credits, Study Hours – 60
Delivery of Information	**08**Books in SLM format: **30**Hours/ for each **08**WorkBooks in SLM format: **60**Hours/ for each
Self-Study, Learning Evaluation and Feedback	(1) Solving Problems, Self-Tests, SAQs and Exploring more Details on Text-Book: **30** Hours
Total Study Hours	(8 x 60 = **480** Hours + 8 x 60 = **480** Hours) = 960 Hours

YEARS AND COURSES

SN	Code	Name	CAT	EE	TM	Type	Credits	Min %
Year 01: 24 Credits								
01	CHE011	Inorganic Chemistry	20	80	100	T	4	40%
02	CHE012	Organic Chemistry	20	80	100	T	4	40%
03	CHE013	Physical Chemistry	20	80	100	T	4	40%
04	CHE014	Mathematics, Biology, Spectroscopy and Computers	20	80	100	T	4	40%
05	CHE015	Inorganic Chemistry (Practical)	10	40	50	P	2	40%
06	CHE016	Organic Chemistry (Practical)	10	40	50	P	2	40%
07	CHE017	Physical Chemistry (Practical)	10	40	50	P	2	40%
08	CHE018	Spectroscopy and Computers (Practical)	10	40	50	P	2	40%
Year 02: 24 Credits								
01	CHE021	Organic Reaction Mechanisms-II, Pericylic Reactions,Organic Photochemistry, Stereochemistry-II	20	80	100	T	4	40%
02	CHE022	Organic Chemistry - Synthetic Organic Chemistry	20	80	100	T	4	40%
03	CHE023	Organic Chemistry - Natural Products ,Heterocycles,Biogenesis and Spectroscopy	20	80	100	T	4	40%
04	CHE024	Organic Chemistry - Drugs and Pharmaceuticals	20	80	100	T	4	40%
05	CHE025	Organic Chemistry - Separation and Identification of Organic Compounds (Practical)	10	40	50	P	2	40%
06	CHE026	Organic Chemistry - Separation and Identification of Organic Compounds and Chromatography(Practical)	10	40	50	P	2	40%
07	CHE027	Synthesis of Organic Compounds and Isolation of Natural Products (Practical)	10	40	50	P	2	40%
08	CHE028	Organic Chemistry - Synthesis and Analysis of Drugs (Practical)	10	40	50	P	2	40%

GRADING SYSTEM

1. "**Absolute Grading**": the marks are converted to grades based on pre-determined class intervals.
2. "**Letter Grade**": It is an index of the performance of students in a said programme. Grades are denoted by letters O, A+, A, B+, B, C, P and F.
3. "**Grade Point**": It is a numerical weight allotted to each letter grade on a 10-point scale. Grade Point shall be "0 (Zero)" for Letter Grade "Ab" and "F". The marks scored by the examinee shall be converted into grade points by dividing the marks scored in the aggregate and dividing the resulting number by maximum marks, multiplying the result by ten, retaining the integer part (ignore the fractional part). Thus if a person has secured 56 marks out of 100 marks in aggregate for a course, we get (56/100) x 10 which is 5.6. Ignoring the fraction, we get 5 as the grade point.

Letter Grade	Grade Point	Class
O	10	Outstanding
A+	9	Excellent
A	8	Very Good
B+	7	Good

Letter Grade	Grade Point	Class
B	6	Above Average
C	5	Average
P	**4**	**Pass**
F	**0**	**Fail**
Ab	**0**	**Absent**

4. "**Credit Point**": It is the product of grade point and number of credits for a course.
5. "**Semester Grade Point Average (SGPA)**": It is a measure of performance of work done in a semester. It is ratio of total credit points secured by a student in various courses registered in a semester and the total course credits taken during that semester. It shall be expressed up to two decimal places.
6. "**Cumulative Grade Point Average (CGPA)**": It is a measure of overall cumulative performance of a student over all semesters. The CGPA is the ratio of total credit points secured by a student in various courses in all semesters and the sum of the total credits of all courses in all the semesters. It is expressed up to two decimal places.
7. "**Transcript or Grade Card or Certificate**": Based on the grades earned, a grade certificate shall be issued to all the registered students after every semester. The grade certificate will display the course details (code, title, number of credits, grade secured) along with SGPA of that semester and CGPA earned till that semester.

EVALUATION PATTERN

SN	Type of Course	Continuous Assessment	End Examination
1	Theory (T)	"Continuous Assessment (**CA**)" of total **20**marks and total 4 SAQs, each of 5 marks, 1 SAQ on **each**CR in a **Single attempt only**	"End Examination (**EE**)" of total **80**Marks and **16** "Short Answer Questions (SAQs)" **each** of **05** marks (**4 out of 5 SAQs on each Credit**), during **150** Minutes. (**80%**)

1. **Separate and independent passing @ 40% in EE and (CAT+EE) shall be essential for Theory and Practical component of each course.** "CA, EE and Total marks" shall be separately reported for each course in the transcript or mark-statement.
2. **Only 1 attempt** for EE for **each**course shall be allowed in **each**semester. **Maximum 2 attempts**, for CAT for **each**course, shall be allowed in **each**semester.
3. **Only best of past performance shall be reported in transcript or mark statement**.
4. **Total student evaluation for**
    a. **Each**semester shall be for **500** marks.
    b. **Each**year shall be for **1000** marks
    c. **Each**regularPG degree shall be for **2000** marks.

SUCCESSFUL COMPLETION OF COURSE OR PROGRAMME

1. "Successful Completion of the Course" means - either course is exempted or student gets minimum specified or better grade, either in end examination of that course or by credit transfer. A student obtaining grade "F" shall be considered failed and will be required to reappear in the examination. The student obtained minimum "P" (Pass) letter grade required for successful completion of the each course.
2. "Successful Completion of the Programme" means – all courses at all semesters are successfully completed and the student obtained "P" (Pass) letter grade for all courses at all semesters along with minimum specified SGPA and CGPA.

YEAR 1

CHE011: INORGANIC CHEMISTRY

PROGRAMME INFORMATION

SN	Description	Details
1	University	Yashwantrao Chavan Maharashtra Open University Nasik - 422 222, Maharashtra, India Website: http://www.ycmou.ac.in/and http://ycmou.digitaluniversity.ac/
2	School	School of Architecture, Science and Technology
3	Discipline	Science
4	Level	PG
5	Course Used in	V132: M.Sc.(CHEMISTRY)

COURSE INFORMATION

Year	Code	Course Name	CR	CST	ST	CA	EE	TM	Type
01	CHE011	INORGANIC CHEMISTRY	4	8	120	20	80	100	T

PRESUMED KNOWLEDGE AND LEARNING OBJECTIVES

Presumed Knowledge	Learning Objectives
For successful completion of this course, student should have successfully complete: • B.Sc. with CHEMISTRY or equivalent from a recognized University/Board.	After successful completion of this course, student should be able to • Name specialize structure, systems and functions presented for each specimen. • Introduction between living and non living.

UNITS

UN	Name of the Unit	CSs	Questions
01-01	**Symmetrical operations and symmetry elements**	CR 01	Student is required to answer 4 of 5 SAQ, eachof 5 marks, on eachCR
01-02	**Mathematical Rules of Groups**		
01-03	**Molecular Point Groups**		
01-04	**Group multiplication Tables**		
01-05	**Symmetry and Properties of molecules**		
02-06	**Crystal Field Theory**	CR 02	Student is required to answer 4 of 5 SAQ, eachof 5 marks, on eachCR
02-07	**Ligand field Parameters**		
02-08	**Molecular Orbital Theory**		
02-09	**Free Ion Terms and Energy Levels.**		

02-10	**Orgel Diagrams**		
03-11	**Labile and Inert Complexes**	CR 03	Student is required to answer 4 of 5 SAQ, **each**of 5 marks, on **each**CR
03-12	**Substitution Reaction Mechanisms of octahedral Complex**		
03-13	**Substitution Reaction Mechanisms of Square Planar**		
03-14	**Electron Trasfer Reaction Mechanisms.**		
03-15	**Reaction Mechanisms of Organometallic Compounds**		
04-16	**Stability constants of Metal complexes**	CR 04	Student is required to answer 4 of 5 SAQ, **each**of 5 marks, on **each**CR
04-17	**Methods of Determination of stability constants**		
04-18	**Ligational aspects of Diatomic Molecules**		
04-19	**Metal Clusters**		
04-20	**Coordination Chemistry of Metal Ions in Biomolecules**		

DETAILED SYLLABUS

UN	Detailed Syllabus of the Unit	CR
01-01	**Symmetry operations and Symmetry elements:** Aims and objectives, concepts of symmetry in molecules,Symmetry operations-Definition, types of symmetry operations, Symmetry Elements,Rotational axis of symmetry (CN) ,Types of rotational axes, Plane of symmetry, Types of planes of symmetry, Types of planes of symmetry Vertical planes of symmetry ,Dihedral planes of symmetry , molecules with vertical and dihedral planes, Distinction between vertical and dihedral planes, Horizontal planes , Improper rotational axis ,Center of symmetry /center of inversion, Identity element ,summary, Terminal Examination Model Questions.	CR 01
01-02	**Mathematical Rules of Groups Abelian and Non-Abelian:** Aims and Objectives, Group Generating elements, Important relations in symmetry elements, Properties of a point group Inverses of elements, summary, Terminal Examination Model Questions.	
01-03	**Molecular Point Groups:** Aims and objectives, molecular point groups,Labeling the point groups, Classification of molecules into point groups, molecules of low symmetry, molecules of high symmetry, molecules of special symmetry, systematic classification of molecules into point groups, Flow-chart for classification of molecules into point groups, Exercises onpoint groups ,summary, Terminal examination Model Questions.	
01-04	**Group Multiplication Tables:** Aims and Objectives, what are Group Multiplication tables, Rules for construction of GMTs ,Types of GMTs, Subgroups ,Classes of elements, more on classes, summary, Terminal Examination Model Questions.	
01-05	**Symmetry Properties Of Molecules- Molecular Polarity,Chirality and optical Activity:** Aims and Objectives,molecular Polarity and Symmetry, Polar Diatomic Molecules,Polar Polyatomic Molecules, Symmetry Criteria for Molecular Polarity, Polar Molecules, Non polar Molecules,Molecular chirality and Symmetry, Optical Isomerism &Non-super impossibility Criteria, Symmetry and Optical Isomerism inOrganic Compounds, Symmetry and Optical Activity of Simple Inorganic Compounds,Symmetry and Optical Activity of Coordination Compounds, Summary, Terminal Examination Model Questions.	

02-06	**Crystal Field Theory-Splitting Of Metal d-Orbitals in Different Geometries:** Aims and objectives, Introducation to crytal field theory, Sailent features of crystal field theory, Crystal field splitting of metal d- orbitals in an octahedral geometry, crystal field splitting in tetragonal geometry, Crystal field splitting in square planar geometry, Crystal field Splitting in tetrahedral geometry, Crystal field splitting in square pyramidal geometry, Crystal field splitting in trigonal bipyramidal geometry, Crystal field splitting in trigonal planar geometry, Crystal Field splitting in linear geometry ,Summary, Terminal examination model questions.	
02-07	**Ligand Field Parameters:** Aims and Objectives, Crystal field spitting energy and its determination, Crystal field stabilization energy and its calculation, Crystal field stabilization energies for octahedral complexes: high-spin and low-spin complexes, Crystal field Stabilization energies for tetrahedral complexes , Factors affecting the magnitude of crystal field splitting, Spectrochemical series, Jahn-Teller effect, Limitations of Crystal field theory, Experimental evidence for metal-ligand bond covalency, Summary, Terminal examination model questions.	CR 02
02-08	**Molecular Orbital Theory:** Aims and Objectives, Molecular Orbital Theory as applied to metal complexes, Molecular orbital diagrams of octahedral complexes, Molecular orbital diagrams of tetrahedral and square planar complexes, Summary, Terminal Examination model Questions.	
02-09	**Free Ion Terms Energy Levels:** Aims and Objectives, Electronic Configuration, Mirostates and Terms, L-S coupling, Terms for pN and dN configurations, Hole formulation, Hunds rule and Interelecton repulsion parameters, Summary , Terminal examination Model questions.	
02-10	**Electronic Spectra Of Transition Metal Complexes And Orgel Diagrams:** Aims and Objectives, Eletronic spectra of transition metal complexes-an introduction, Selection rules to electronic trasitions, Orgel diagrams, Summary, Terminal examination model questions.	
03-11	**Labile And Inert Complexes :** Aims and Objectives, Mechanism of a reaction ,Energy Profile of a Reaction, Intermediates, Trasition States , Energy profile of a catalyzed reaction, Labile and inert complexes, thermodynamic stability, Reactivity in terms of Valence Bond Theory, Reactivity in terms of Crystal Field Theory, Summary ,Terminal examination Model Questions.	
03-12	**Sustitution Reaction Mechanisms Of Octahedral Complexes:** Aims and Objectives, Substitution Reactions, Desiganation of Mechanisms, Langford-Gray Mechanistic Labels, Hughes-Ingold Mechanistic Labels, Substitution reactions of Octahedral Complexes, Acid Hydrolysis, Factors affecting Acid Hydrolysis, Base Hydrolysis,Sn1CB Mechanism or Dcb Mechanism, Reactions without Metal –Ligand Bond Cleavage, Summary, Terminal examination Model Questions.	CR 03
03-13	**Substitution Reaction Mechanisms of Square Planar Complexes:**AimAndObjectives, The Trans-Effect, Definition Of Trans-Effect, Trans-Effect Series, Application Of Trans-Effect, Theories Of Trans-Effect, Mechanism Of Substitution Reaction In Square Planer Complexes, Summary, Terminal Examination Model Questions.	
03-14	**Electron transfer reaction mechanism:**Aim And Objectives, Outer-Sphere Mechanism, Marcuss-Hush Theory, Inner-Space Mechanism, Nature Of The Bridging Ligand, Complementary Reactions, Non-Complementary Reactions, Summary, Terminal Examination Model Questions.	
03-15	**Reaction Mechanisms Of Organometallic Compounds:**Aim And Objectives, Isomerization Reactions, Oxidative Addition Reactions, Reductive Addition Reactions, Insertion Reactions, Reactions Of Alkenes, Hydrogenation, Oxidation, Hydroformylation, Polymerization, Metathesis, Monsanto Acetic Acid Process, Summary, Terminal Examination Model Questions.	
04-16	**Stability Constants Of Metal Complexes And Factors Influencing Stability::** Aim And Objectives, Stability Of Metal Complexes- Types Of Stability, Stepwise And Overall Stability, Constanty Trend In Stepwise Stability Constants, Pearson's Hard And Soft Acids And Bases (HSAB) Rule And Its Application, Factors Influencing Stability Of Metal Complexes, Pearson's Hard And Soft Acids And Bases (HSAB) Rule, Application Of HSAB Rule, Factors Affecting Stability Metal Complexes, Summary, Terminal Examination Model Questions.	CR 04
04-17	**Methods Of Determination Of Stability Constants:**Aim And Objectives, Determination Of	

	Stability Constants Of Metal Complexes, Spectrophotometric Methods, pH-Metric Method, Polarographic Method, Summary, Terminal Examination Model Questions.	
04-18	**Ligational Aspects Of Diatomic Molecules:**Aim And Objectives, Bonding Modes Of Carbon Monoxide To Metals, Bonding Modes Of Nitric Oxide To Metals, Bonding Modes Of Dinitrogen And Dioxygen To Metals, Summary, Terminal Examination Model Questions.	
04-19	**Metal Clusters:**Aim And Objectives, Metal Carbonyl Clusters, Metal Halide Clusters, Metal Carboxylate Clusters, Summary, Terminal Examination Model Questions.	
04-20	**Coordination Chemistry Of Metal Ions In Biomolecules:**Aim And Objectives, Metal Ions In Biological Systems, Principles Underlying Biological Selection Of Elements, Biochemistry Of Iron, Transport And Storage Proteins Of Irons, Respiratory Proteins- O2 Carriers, Electron Carriers- Cytochromes And Fe-S Proteins, Enzymes Of Iron, Biochemistry Of Copper, Types Of Copper Centers, Respiratory Proteins- O2 Carrier (Hemocyanin, Hc), Biochemistry Of Zinc, Photosynthesis And Chlorophyll, Nitrogen Fixation, Summary, Terminal Examination Model Questions.	

Learning Resource Details

LR Code	Title Author	Edition Year	ISBN Publisher
Course Website Link for (1) Mobile and Online Lectures, (2) Discussion Forum for online interaction and (3) Self-Test for each CR Block, Continuous Assessment Test and End Examination			
CHE011	Inorganic Chemistry		
Text-Books			
CHE011	Inorganic Chemistry Prof.K.Veera Reddy,Prof.S.SriHari,K. Prameela Prof. G. Ramchandraiah ,M. Ramesh	Reprint 2017	Dr. B.R.Ambedkar Open University, Hyderabad
Reference-Books: Explore additional details and reinforce learning, with this optional learning resource!			
CHE011-RB1	Advanced Inorganic Chemistry by F.Albert Cotton	2015	A wiley-interscience publication
CHE011-RB2	Concise Inorganic chemistry by J D Lee	2010	Chapman& hall
CHE011-RB3	Inorganic Chemistry by Shriver Atkins/Gray L Miessler		
CHE011-RB4	Introduction Of Co-ordination Chemistry by Geoffrey A .Lawrance		
CD / DVD: Explore additional details and reinforce learning, with this optional learning resource!			
CHE011 -CD1			
Web Links: Explore additional details and reinforce learning, with this optional learning resource!			
CHE011-WL1			

CHE012: ORGANIC CHEMISTRY

PROGRAMME INFORMATION

SN	Description	Details
1	University	Yashwantrao Chavan Maharashtra Open University Nasik - 422 222, Maharashtra, India Website: http://www.ycmou.ac.in/and http://ycmou.digitaluniversity.ac/
2	School	School of Architecture, Science and Technology
3	Discipline	Science
4	Level	PG
5	Course Used in	V132: M.Sc.(chemistry)

COURSE INFORMATION

Year	Code	Course Name	CR	CST	ST	CA	EE	TM	Type
01	CHE012	Organic chemistry	4	8	120	20	80	100	T

PRESUMED KNOWLEDGE AND LEARNING OBJECTIVES

Presumed Knowledge	Learning Objectives
For successful completion of this course, student should have successfully complete: • B.Sc. with Chemistry or equivalent from a recognized University/Board.	After successful completion of this course, student should be able to • Students will understand how this cellular components are sued to generate to utilized energy in cell • Student will understand nucleic acid & proteins and how this molecules interact with in cell to promote growth, division & development

UNITS

UN	Name of the Unit	CSs	Questions
01-01	Molecular Representations and Classification of Stereoisomers.	CR 01	Student is required to answer 4 of 5 SAQ, eachof 5 marks, on eachCR
01-02	Molecular Symmetry and Chirality: Enantiomers and Diastereoisomers.		
01-03	Molecules with one and more than one chiral centers.		
01-04	Absolute configurational Nomenclature Determination of Absolute Configuration and Resolution of racemates		
01-05	Axial, Planar and helical Chirality and II- or E,Z-Diastereoisomerism.		
02-06	Basic concepts, electronic effects, electronegativity resonance, acid and basic characters of organic compounds	CR 02	
02-07	Reaction pathways		
02-08	Electrophilic Addition to Carbon-carbon double bonds		
02-09	Aliphatic nucleophilic Substitution		

02-10	Neighbouring group participation,Ambident nucleophiles,Aromatic Nucleophilic Substitution and Aliphatic electrophilic Substitution.		
03-11	Concepts of armoaticity	CR 03	
03-12	Nonbenzenoid aromatic compounds synthesis and reactions of 3,5,7 membered carbocyclic system		
03-13	Azulenes and polucyclic aromatic compounds		
03-14	Heterocyclic compounds		
03-15	Fused hetero bicyclic and tricyclic systems: carbazole, quinolone, isoquinoline and acridine		
04-16	Natural products terpenes and terpenoids	CR 04	
04-17	Alkaloids		
04-18	Carbohydrates monosaccharides		
04-19	Carbohydrates disaccharides		
04-20	Carbohydrates polysaccharides		

DETAILED SYLLABUS

UN	Detailed Syllabus of the Unit	CR
01-01	**Molecular Representations And Classification Of Stereoisomers:**Aims And Objectives, Introduction, Molecular Models And Molecular Representations, 2-Dimensional Representation Of 3-Dimensional Structures, Fischers Projections, Saw Horse Projections, Newmann Represntations, Zig-Zag (Syn-Anti) Reprenstations, Classification Of Isomers, Classification Of Stereoisomers Based On Symmetry, Classification Of Stereoisomers Based On Energy Barrier, Classification Based On Internal Energy, Summary, Terminal Examination Model Questions In Unit 1	CR 01
01-02	**Molecular symmetry and chirality: enantiomers and diastereoisomers:**Aims And Objectives, Symmetry Elements And Symmetry Operations, Point Groups, Chirality, Chiral Molecules And Stereogenic Center, Achiral Molecules, Desymmetrization, Enatiotopic, Homotopic And Diastereotopic Ligands, Properties Of Enantiomers, Properties Of Diastereoisomers, Summary, Terminal Examination Model Questions In Unit 2	
01-03	**Molecules with one and more than one chiral centers:** Aims And Objectives,, Molecules With Onw Chiral Centers, Chiral Tricoordinate Center, Molecules With Two Or More Chiral Centers, Molecules With Non Identical Chiral Centers, Molecules With Identical Chiral Centers, Summary, Terminal Examination Model Questions In Unit 3	
01-04	**Absolute configurational nomenclature, determination of absolute configuration and resolution of racemates:** Aims And Objectives, Configurationally Nomenclature For Molecules With Centers Of Chirality, R,S Absolute Configurationally Nomenclature, D,L Absolute Configurational Nomenclature, R,S Nomenclature At Pseudoasymmetric Centers, Determination Of Absolute Configuration, Chemical Correlation Methods, Physical Methods, Chiroptical Methods, Resolution Of Racemates, Summary, Terminal Examination Model Questions In Unit 4	
01-05	**Axial, planar and helical chirality and pi or E, Z-diastereoisomerism:**Aims And Objectives, Axial, Planar And Helical Chirality, Axial Chirality, Chiral Spiranes, Chiral Alkylidene Cycloalkanes, Chiral Adamantine, Atropoisomerism, Planar Chirality, Helical Chirality, E, Z-Diastereoisomerism, Physical Properties Of E, Z-Diastereoisomerism, Chemical Properties Of E, Z-Diastereoisomerism, Biological Properties Of E, Z-Diastereoisomerism, Oximes And Azo Compounds, Summary, Terminal Examination Model Questions In Unit 5	
02-06	**Basic concepts, electronic effects, electro negativity, resonance, acid and basic character of organic compound:**Aims And Objectives, Introduction, Electronic Effects In Organic Molecules And Factors Affecting The Availability Of Electrons, Electro negativity, Hybridization And	CR 02

	Polarization Effects, Inductive Field And Resonance (Mesomeric) Effects, Delocalization Of Electrons Involving Pi-Pi And Pi-P And Hyperconjugation, Acidic And Basic Character Of Organic Compounds, Summary, Terminal Examination Model Questions In Unit 6	
02-07	**Reaction Pathways:** Aims And Objectives, Introduction, Thermodynamics And Kinetics Of Chemical Reactions, Transition States, Reaction Intermediates And Energy Profile Diagrams, Kinetic And Other Methods Of Determination Of Reaction Mechanisms, Summary, Terminal Examination Model Questions In Unit 7	
02-08	**Electrophilic Addition To Carbon-Carbon Double Bonds:**Aims And Objectives, Introduction, Addition To Symmetrical Reagents: Addition Of Halogens And Hydrogenation, Addition Of Unsymmetrical Reagents- Addition Of HX And Hydrocarboration-Oxidation, Syn Dihydroxylation: $Kmno_4$ And Oso_4, Epoxidation, Ozonolysis, Summary, Terminal Examination Model Questions In Unit 8	
02-09	**Aliphatic nucleophilic substitution:** Aims And Objectives, Introduction, S_N2 Aliphatic Nucleophilic Substitution, S_N1 Aliphatic Nucleophilic Substitution, Factors Affecting Reactivity In Substitution Reactions, Substitution And Elimination As Competing Reactions, S_Ni Mechanism, Summary, Terminal Examination Model Questions In Unit 9	
02-10	**Neighbouring Group Participation, Ambident Nucleophiles, Aromatic Nucleophilic Substitution And Aliphatic Electrophilic Substitution:** Aims And Objectives, Introduction, Introduction to Neighbouring Group Participation Reactions, Neighbouring Group Participating Reactions: Examples, Ambident Molecules, Aromatic Nucleophilic Substitutions, Aliphatic Substitutions, Aliphatic, Summary, Terminal Examination Model Questions In Unit 10	
03-11	**Concept Of Aromaticity:**Aims And Objectives, Introduction, Criteria For Aromaticity, The 4n+2 Rule, Characteristic Features Of Aromaticity, Nonbenzenoid Aromatic Compunds, Larger Ring Annulenes, Heteroyclic Compounds, Polynuclear Aromatic Hydrocarbons, Limitations Of Huckel's Rule, Alternant And Non-Alternant Hydrocarbons, Craig's rule, Summary, Terminal Examination Model Questions In Unit 11	
03-12	**Nonbenzenoid Aromatic Compounds Synthesis And Reactions Of 3,5,7-Membered Carbocyclic Systems:**Aims And Objectives, Introduction, Synthesis, Properties, Chemical Reactivity, **5-Membered Carbocyclic Systems (Cyclopentadienide Anion)** Introduction, Synthesis, Properties, Chemical Reactivity, FerroceneIntroduction, Synthesis, Properties, Chemical Reactivity, **7-**Membered Aromatic CompoundsIntroduction, Synthesis, Properties, Chemical Reactivity, Summary, Terminal Examination Model Questions In Unit 12.	
03-13	**Azulenes And Polycyclic Aromatic Compounds:** Aims And Objectives, Introduction, Structure, Isolation, Synthesis, Physical Properties, Chemical Reactivity AnthracenceIsolation, Synthesis, Physical Properties, Chemical Reactivity PhenanthreneIntroduction, Structure, Isolation, Synthesis, Physical Properties, Chemical Reactivity,Summary, Terminal Examination Model Questions In Unit 13.	CR 03
03-14	**Heterocyclic compounds:** Aims And Objectives,Nomenclature, pi-excessive and pi-deficientheterocyclic systemsIntroduction, trivial names of common ring system, systematic nomenclature for monocyclic compounds, nomenclature for fused ring systems, replacement nomenclature, pi-Electron excessive and deficient system, importance of heterocyclic compounds, Benzofuran**,** Introduction, synthesis, physical properties, chemical reactivity**,**IndoleIntroduction, synthesis, physical properties, chemical reactivity, Summary, Terminal Examination Model Questions In Unit 14.	
03-15	**Fused hetero bicyclic and tricyclic systems, carbazole, quinolone, isoquinoline and acridine:** Aims And Objectives,CarbazoleIntroduction, synthesis, physical properties, chemical reactivityQuinoline,Introduction, synthesis, physical properties, chemical reactivity IsoquinolineIntroduction, synthesis, physical properties, chemical reactivity ,AcridineIntroduction, synthesis, physical properties, chemical reactivity, Summary, Terminal Examination Model Questions In Unit 15.	

04-16	**Natural product tenpins and terpenoids :** Aims And Objectives, introduction to natural products, terpense and terpenoides, General rule of terpenoide chemistry, Isolation of monoterpenoids, structure determination of alphaterpenoil, structure determination of limo name, structure determination of camphor, biogenesis og monoterpenoids, Summary, Terminal Examination Model Questions In Unit 16	CR 04
04-17	**Alkaloids : :** Aims And Objectives, introduction, tests for detection of alkaloids, methods of extraction and isolation of alkaloids, classification of alkaloids, alkaloid nomenclature, general methods of structure determination of alkaloids, structure determination of palavering, structure determination of quinine, Summary, Terminal Examination Model Questions In Unit 17	
04-18	**Carbohydrates – monoacids,** Aims And Objectives, introduction, monoacids, Fischer projection, Stereochemical nomenclature in monosaccharide, general reaction of monosaccharide, determination of configuration of glucose, determination of relative configuration in glucose, absolute configuration of glucose, cyclic form glucose, alpha and beta enamors, Fisher projection and HGAworth projection of cyclic form of glucose, determination of ring size in glucose, conformationipnal analysis of glucose, structure determination of fructose, confirmation of sugars and their derivatives, monoacids containing other functional groups , Summary, Terminal Examination Model Questions In Unit 18	
04-19	**Carbohydrates disaccharide : ,** Aims And Objectives, introduction, structural determination of sucrose, synthesis of sucrose, conformational structural of sucrose, maltose, calaboose and antibioses, strategies in oligosaccharides of synthesis Summary, Terminal Examination Model Questions In Unit 19	
04-20	**Carbohydrates polysaccharide :** Aims And Objectives, introduction, structural determination of unbar ached and branched polysaccharide, structural determination of starch, structure of cellulose, structure of glycogen, structure of chitin, Summary, Terminal Examination Model Questions In Unit 20	

LEARNING RESOURCE DETAILS

LR Code	Title Author	Edition Year	ISBN Publisher
Course Website Link for (1) Mobile and Online Lectures, (2) Discussion Forum for online interaction and (3) Self-Test for each CR Block, Continuous Assessment Test and End Examination			
CHE012	Organic Chemistry .		
Text-Books			
CHE012	Oraganic Chemistry . Prof. G. L. David Krupadanam, Prof.K. Rajmohan, Prof.Ramachandraiah, Dr. P.Srinivas, Dr. K . Santosh Kumar. Smt. K.Prameela , S.M.Ghouse Mohiuddin.	Reprint 2017	Dr.B.R.Ambedkar Open University Hydrabad
Reference-Books: Explore additional details and reinforce learning, with this optional learning resource!			
CHE012-RB1	Advanced Organic Chemistry Part-A & B by Carey, Francis A, Sundberg,Richard J.	2017	
CHE012-RB2	Advanced Organic Chemistry by Jerry March	2015	Willy & sons
CHE012-RB3	Organic Chemistry by Gene Davis	2006	
CHE012-RB4	Organic Chemistry by Clayden Greeves, Warren & wothers.	2014	
CHE012-RB5	Organic Structures from Spectra by L D field, S Sternhell, J R Kalman	2015	
CD / DVD: Explore additional details and reinforce learning, with this optional learning resource!			
CHE012 -CD1			
Web Links: Explore additional details and reinforce learning, with this optional learning resource!			
CHE012-WL1			

CHE013: PHYSICAL CHEMISTRY

PROGRAMME INFORMATION

SN	Description	Details
1	University	Yashwantrao Chavan Maharashtra Open University Nasik - 422 222, Maharashtra, India Website: http://www.ycmou.ac.in/and http://ycmou.digitaluniversity.ac/
2	School	School of Architecture, Science and Technology
3	Discipline	Science
4	Level	PG
5	Course Used in	V132: M.Sc.(Chemistry)

COURSE INFORMATION

Year	Code	Course Name	CR	CST	ST	CA	EE	TM	Type
01	CHE013	PHYSICAL CHEMISTRY	4	8	120	20	80	100	T

PRESUMED KNOWLEDGE AND LEARNING OBJECTIVES

Presumed Knowledge	Learning Objectives
For successful completion of this course, student should have successfully complete: • B.Sc. with Chemistry or equivalent from a recognized University/Board.	After successful completion of this course, student should be able to • Students will able to study basic understanding of fundamental process and mechanism that serve & control of various function of body

UNITS

UN	Name of the Unit	CSs	Questions
01-01	**Basic Quantum Chemistry**	CR 01	Student is required to answer 4 of 5 SAQ, eachof 5 marks, on eachCR
01-02	**Wave Mechanics Of Some Simple Systems With Constant Potential Energy**		
01-03	**Hydrogen-Like Atoms**		
01-04	**Approximation Methods And Interaction Of Radiation And Matter**		
01-05	**Theories Of Chemical Bonding- Diatomic Molecules**		
02-06	**Concept Of Thermodynamics Laws- First Law Of Thermodynamics**	CR 02	
02-07	**The Second Law Of Thermodynamics**		
02-08	**Spontaneity And Equilibrium**		
02-09	**Ideal And Non-Ideal Solutions And Activity Coefficients**		
02-10	**Nerst Heat Theorem And Third Law Of Thermodynamics**		
03-11	**Electrochemical Cells First Law Of Thermodynamics**	CR 03	
03-12	**Polarization**		
03-13	**Electro Analytical Techniques**		
03-14	**Activity**		
03-15	**Corrosion**		

04-16	**Theories Of Reactions Rates**	**CR 04**	
04-17	**Kinetics Of Complex Reactions**		
04-18	**Reactions In Solutions**		
04-19	**Photochemistry**		
04-20	**Photochemical Reaction Mechanisms**		

DETAILED SYLLABUS

UN	Detailed Syllabus of the Unit	CR
01-01	**Basic Quantum Chemistry:** Aims And Objectives, Introduction, Schrodinger Wave Equation And Its Derivation, Operator Concept In Quantum Chemistry, Postulates Of Quantum Mechanics, Some Important Theorems, Summary, Model Questions	**CR 01**
01-02	**Wave Mechanics Of Some Simple Systems With Constant Potential Energy:** Aims And Objectives, Introduction, Particle In A One Dimensional Box, Three-Dimensional Box, Rigid Rotator, Wave Mechanics Of Some Simple Systems Where The Potential Energy Is Not Constant, Summary, Model Questions	
01-03	**Hydrogen-Like Atoms:** Aims And Objectives, Wave Equation For Hydrogen-Like Atoms, Total Wave Functions Of An Hydrogen-Like Atoms, Shapes Of Atomic Orbital's, Electron Spin, Summary, Model Questions	
01-04	**Approximation Methods And Interaction Of Radiation And Matter:** Aims And Objectives, Introduction, Time- Independent Perturbation Theory, Variation Method, Many- Electron Atoms: The Wave Function Of Many- Electron Systems, Hartree Self-Consistent Field Method, Summary, Model Questions	
01-05	**Theories Of Chemical Bonding- Diatomic Molecules:** Aims And Objectives, Introduction, The Molecular Orbital Theory (The LCAO Approximation), MO Theory Of The Hydrogen Molecule Ion, Valence-Bond Method Of Chemical Bonding, Hybridization, Summary, Model Questions	
02-06	**Concept Of Thermodynamics Laws- First Law Of Thermodynamics:** Aims And Objectives, Introduction, Definitions And Terminology Of Thermodynamics Principles, Energy And First Law Of Thermodynamics, Relation Between C_p And C_v And Joule-Thomson Effect, Summary, Terminal Examination Model Questions And Answers	**CR 02**
02-07	**The Second Law Of Thermodynamics:** Aims And Objectives, Introduction, Carnot Cycle-Cyclic Transformations, Entropy Function And Its Properties, Entropy And Probability, Summary, Terminal Examination Model Questions And Answers	
02-08	**Spontaneity And Equilibrium:**Aims And Objectives, Introduction, Clausius Inequality And Spontaneity, Fundamental Equations Of Thermodynamics And Maxwell's Relations, Properties Of Gibb's Free Energy Function, Free Energy And Entropy Of Mixing, Chemical Equilibrium In A Mixture Of Ideal Gases-Vant Hoff Isochore, Temperature Dependence Of Equilibrium Constant, Lechatelier Principle, Criterion For Phase Equilibrium-Gibbs-Duhem Equation, Summary, Model Questions, Problems	
02-09	**Ideal And Non-Ideal Solutions And Activity Coefficients:**Aims And Objectives, Introduction, Ideal Solutions And Raoult's Law, Non-Ideal Solutions And Activity Coefficients, Liquid-Vapour/Solid-Liquid Equilibrium-Clapeyron Equation, Summary, Model Questions, Problems	
02-10	**Nerst Heat Theorem And Third Law Of Thermodynamics:**Aims And Objectives, Introduction, Nerst Heat Theorem, Third Law Of Thermodynamics, Entropy Changes In Chemical Reactions, Exceptions To Third Law Of Thermodynamics, Summary, , Terminal Examination Model Questions, Problems And Answers	

03-11	**Electrochemical Cells First Law Of Thermodynamics:**Aims And Objectives, Introduction, Nernst Equation, Representation Of Electrodes And Cells, Types Of Electrodes, Chemical Cells And Concentration Cells, Concentration Cell Without Transference, Concentration Cell With Transference, Liquid Junction Potential And Its Determination, Determination Of Transport Number, Fetermination Of Ph From emf Data, Solubility Product From emf Data, Potentiometric Titrations, Summary, Model Questions	
03-12	**Polarization:** Aims And Objectives, Introduction, Ideal Polarized And Nonpolarized Electrodes And Cells, Sources Of Polarization, Over Voltage- Effect Of Current Density (CD) On Overvoltage, Influence Of Ph On Overvoltage, Theories Of Overvoltage- Bubble Formation Of The Slow Process, Combination Of Atom As The Slow Process, Ion Discharge As The Slow Process, Proton Transfer As The Slow Process, Fick's Law And Determination Of Thickness Of The Diffusion Layer, Summary, Model Questions	CR 03
03-13	**Electro Analytical Techniques:** Aims And Objectives, Introduction, Polaogram, Ilkovic Equation, Dropping Mercury Electrode (DME), Half-Wave Potentials, Application Of Polarography, Cyclic Voltammentry, Amperometric Titrations, Summary, Model Questions	
03-14	**Activity:** Aims And Objectives, Introduction, Mean Activity Coefficient Of Electrolyte, Debye-Huckel Limiting Law, Extended DHLL, Debye-Huckel Theory, Debye-Huckel-Onsagar Equation, Ion Association, Determination Of Activity Coefficient By EMF Method, Summary, Model Questions	
03-15	**Corrosion:** Aims And Objectives, Introduction, Theories Of Corrosion- Dry Or Chemical Corrosion, Wet Or Electro-Chemical Corrosion, Forms Of Corrosion- Uniform Corrosion, Galvanic Corrosion, Concentration-Cell Corrosion, Pitting Corrosion, Intergranular Corrosion, Stress Corrosion, Deploying Corrosion, Erosion Corrosion, Protection Against Corrosion (Mitigation)- Proper Designing And Material Selection, Modifying The Corrosive Environment, Application Of Inhibitors, Purification And Anodic Protection, Application Of Protective Coatings, Summary, Model Questions	
04-16	**Theories Of Reactions Rates:** Aims And Objectives, Introduction, Collision Theory- Steric Factor, Transition State Theory, Thermodynamic Formulation Of Transition State Theory, Reaction Coordinate Activated Complex And Transition State, Activation Parameters And Their Significance- The Eyring Equation, Unimolecular Reactions And Lindaman's Theory, Summary, Model Questions	
04-17	**Kinetics Of Complex Reactions:** Aims And Objectives, Introduction, Opposing Reactions, Parallel Reactions, Consecutive Reactions (All First Order Type), Chain Reactions	
04-18	**Reactions In Solutions:** Aims And Objectives, Introduction, Primary Salt Effect, Secondary Salt Effect, Effect Of Dielectric Constant, Effect Of Structure On Reactivity- Linear Free Energy Relationships, The Taft Equation, Acid-Base Catalysis, Summary, Model Questions	CR 04
04-19	**Photochemistry:** Aims And Objectives, Introduction, Thermal Reactions, Photochemical Reactions, Lambert's Law, Beer's Law, Electronically Excited Molecules, Jablonski Diagram, Relation less Transitions, Fluorescence & Phosphorescence, Quantum Yield, Quantum Yield And Its Determination. Experimental Determination Of Quantum Yields, Photochemical Reactions With High And Low Quantum Yields, Sensitization, Quenching, Actinometrical, Uranyloxalate Acidometer, Solved Examples, Summary, Model Questions	
04-2 0	**Photochemical Reaction Mechanisms:** Aims And Objectives, Introduction, Mechanism Of Photochemical Reaction Between Hydrogen And Chlorines, Determination Of Rate Constants, Life Times Of Reactive Intermediates, Effect Of Light Intensity On The Rate Of Photochemical Reaction, Types Of Photochemical Reactions, Photodissociation, Gas Phase Photolysis, Cycloaddition Reactions- Dimerisation, Introduction To Fast Reactions- The Flash Photolysis	

	Technique, Summary	

LEARNING RESOURCE DETAILS

LR Code	Title Author	Edition Year	ISBN Publisher
Course Website Link for (1) Mobile and Online Lectures, (2) Discussion Forum for online interaction and (3) Self-Test for each CR Block, Continuous Assessment Test and End Examination			
CHE013	PHYSICAL CHEMISTRY.		
Text-Books			
CHE013	PHYSICAL CHEMISTRY Prof V Ananta Raman , Prof. P.V Krishna Rao , Prof.K .M .M Krishana , Dr. K. Ramakrishna	Reprint 2017	Dr. B.R.Ambedkar Open University Hyderabad
Reference-Books: Explore additional details and reinforce learning, with this optional learning resource!			
CHE013-RB1	Quantum Chemistry by Ira Levine	2017	Willy& sons
CHE013-RB2	Physical Chemistry by Peter Atkins	2015	
CHE013-RB3	Instrumental metods of chemical Analysis by Gurdeep Chatwal, Sham Anand.	2016	
CHE013-RB4	Basic Thermodynamics by Basavaraj H. Tilikoti	2017	
CD / DVD: Explore additional details and reinforce learning, with this optional learning resource!			
CHE013 -CD1			
Web Links: Explore additional details and reinforce learning, with this optional learning resource!			
CHE013-WL1			

CHE014: MATHEMATICS,BIOLOGY, SPECTROSCOPY & COMPUTERS.

PROGRAMME INFORMATION

SN	Description	Details
1	University	Yashwantrao Chavan Maharashtra Open University Nasik - 422 222, Maharashtra, India Website: http://www.ycmou.ac.in/and http://ycmou.digitaluniversity.ac/
2	School	School of Architecture, Science and Technology
3	Discipline	Science
4	Level	PG
5	Course Used in	V132: M.Sc.(Chemistry)

COURSE INFORMATION

Year	Code	Course Name	CR	CST	ST	CA	EE	TM	Type
01	CHE014	Mathematics, Biology, Spectroscopy and Computers.	4	8	120	20	80	100	T

PRESUMED KNOWLEDGE AND LEARNING OBJECTIVES

Presumed Knowledge	Learning Objectives
For successful completion of this course, student should have successfully complete: • B.Sc. with Chemistry or equivalent from a recognized University/Board.	After successful completion of this course, student should be able to • To understand transmission genetics problems, make accurate predictions about inheritance of traits, and map the location of gene

UNITS

UN	Name of the Unit	CSs	Questions
01-01	**Co-Ordinate System**	CR 01	**Student is required to answer 4 of 5 SAQ, eachof 5 marks, on eachCR**
01-02	**Differential Calculus**		
01-03	**Matrics.**		
01-04	**Integral Calculus**		
01-05	**Differential Equations**		
02-06	**Cell Structure And Functions**	CR 02	
02-07	**Carbohydrates**		
02-08	**Fatty Acids**		
02-09	**Amino Acids, Peptides And Proteins**		
02-10	**Nucleic Acids**		
03-11	**Rotational Spectra**	CR 03	
03-12	**Vibrational Spectroscopy- 1**		
03-13	**Vibrational Spectroscopy- 2**		
03-14	**Vibrational Spectroscopy- 3**		
03-15	**Roman Spectroscopy**		
03-16	**Electron Spectroscopy**		
03-17	**H NMR Spectroscopy- 1**		
03-18	**H NMR Spectroscopy- 2**		

03-19	**NMR Of Paramagnetic Compounds**		
03-20	**Mass Spectroscopy-1**		
03-21	**Mass Spectroscopy- 2**		
04-22	**Introduction To Computers**		
04-23	**Basic Language**		
04-24	**C Language**	**CR 04**	
04-25	**Chemistry Application Using Basic Programme**		
04-26	**Chemistry Application Using C Language**		

DETAILED SYLLABUS

UN	Detailed Syllabus of the Unit	CR
01-01	**Co-Ordinate System:** Aims And Objectives, Introduction, Coordinate Axes, Cartesian Coordinates, Polar Coordinates, Spherical Polar Coordinates, Relation Between Polar And Cartesian Coordinates, Relation Between Spherical Polar And Cartesian Coordinates, Straight Line- Slope Of Straight Line, Features Of Slope, Intercept Of Straight Line, Features Of Intercept, Equation Of Straight Line- Slope-Intercept Form, Intercept Form, Point-Slope Form, Two-Point Form, Graphical Representation Of Functions, Appendix: Trigonometric Relationships, Summary, Model Questions.	
01-02	**Differential Calculus:** Aims And Objectives, Functions, Types Of Functions- Constant Function, Identity Function, Injective Function, Surjective Function, Buinjective Function, Composite Function, Inverse Function, Intervals, Neighborhood, Limit Of A Function, Certain Standard Limits, Continuity Of A Limits, Differentiation, Rules Of Differentiation, Derivatives Of Some Standard Functions, Special Methods Of Differentiation, Second And Higher Order Derivatives, Maxima And Minima- Finding Minimum And Maximum, Partial Differentiation, Differentiation Of Composite Functions, Summary, Model Questions.	**CR 01**
01-03	**Matrics:** Aims And Objectives, Introduction, Matrix, Order Of A Matrix, Square Matrix, Diagonal Matrix, Unit Matrix, Null Matrix, Addition Of Matrices, Scalar Multiplication Of A Matrix, Multiplication Of Matrices, Transpose Of A Matrix, Symmetric Of A Matrix, Determinant Of A Matrix- Minor Of An Element, Cofactor Of An Element, Definition Of Determinant, Properties Of Determinant, Adjoint Of A Matrix, Inverse Of A Matrix, Summary, Model Questions	
01-04	**Integral Calculus:** Aims And Objectives, Definition Of Integration, Indefinite Integral, Standard Form Of Integration, Properties Of Integrals, Integration By Method Of Substitution, Integration By Parts, Integration Of Rational Functions, Reduction Formula, Definite Integral- Method Of Substitution, Integration By Parts, Reduction Formula, Summary, Model Questions	
01-05	**Differential Equations:** Aims And Objectives, Definition Of Differential Equations, Order And Degree Of Differential Equations, Formation Of Differential Equations, First Order Differential Equations, Variable Separable Method, Homogeneous Differential Equations- Homogeneous Equation, Solving Homogeneous Differential Equation, Linear Differential Equation- Solving Linear Differential Equation, Partial Differential Equations- Formation Of Partial Differential Equations, Solutions Of Partial Differential Equations, Method Of Separation Of Variables, Summary, Model Questions	
02-06	**Cell Structure And Functions:** Aims And Objectives, Introduction, Structure Of Prokaryotic And Eukaryotic Cells, Intracellular Organelles And Their Functions, Comparison Of Plant And Animal Cells, Metabolic Processes- Catabolism And Anabolism, ATP- The Biological Energy Currency, Origin Of Life, Unique Properties Of Carbon, Chemical Evolution And Rise Of Living Systems, Introduction To Biomolecules, Building Blocks And Biomacro molecules, Summary, Model	**CR 02**

	Questions	
02-07	**Carbohydrates:** Aims And Objectives, Introduction, Classification, Structure And Functions Of Monosaccharides And Their Derivatives, Disaccharides And Polysaccharides, Mucopolysaccharides, Glycoproteins And Glycolipids, Blood Group Substances, Metabolism Of Carbohydrates, Glycogen Metabolism, Glycolysis, TCA Cycle, Pentose Phosphate Pathway, Summary, Model Questions	
02-08	**Fatty Acids:** Aims And Objectives, Introduction, Essential Fatty Acids, Structure And Functions Of Triacylglycerols, Glycerophospholipids, Sphingolipids, Cholesterol Bile Acids, Prostanglandins, Lipoproteins Composition And Function, Role In Atherosclerosis, Summary, Model Questions	
02-09	**Amino Acids, Peptides And Proteins:** Aims And Objectives, Introduction, Chemical Hydrolysis Of Proteins, Structural Hydrolysis Of Proteins, Amino Acid Sequencing- Primary Structure Of Bovine Insulin, Secondary Structures Of Proteins, Tertiary Structure Of Proteins, Quaternary Structure Of Proteins, Amino Acid Metabolism, Summary, Model Questions	
02-10	**Nucleic Acids:**Aims And Objectives, Introduction, purine and pyrimidine bases of nucleic acids, nucleosides and nucleotides, base pairing via H-bonding, double helix model of DNA, properties of DNA, structure of RNA, forces stabilizing the nucleic acids, chemical and enzymatic hydrolysis of nucleic acids, Summary, Model Questions	
03-11	**Rotational Spectra:** Aims And Objectives, Introduction, types of molecular spectra – rotational spectroscopy, Classification of molecules based on movement of Inertia, Rotational spectra of Dia atomic molecules, Rotaional enery levels, Selection rules, Isotopic effects of rotational spectra, Calculation of bond lengh of diatomic molecules, Summary, Model Questions	
03-12	**Vibrational Spectroscopy- 1:**Objectives, Introduction, vibration emery levels of diatomic molecules, Selection rules, calculation of force constant, Anharmonic nature of vibrations, Fundamental bands oberstrones and hot bands, Summary, Model Questions	
03-13	**Vibrational Spectroscopy- 2:**Objectives, vibration rotation spectra of diatomic molecules, , vibration of polyatomic molecules normal modes of vibration, Combination bands, defense bands and fermiresonance, concept of group frequencies and characteristics of vibration frequencies of functional groups, structural and stereo chemicals effects on the absorption pattern in carbonyl group, absorption pattern in substitution benzene, sis-trance isomerism, Summary, Model Questions	
03-14	**Vibration Spectroscopy- 3:**objectives, effect of hydrogen bonding, totomerism and conformational analysis, metal ligand and bonding in biodentate ligands, , Summary, Model Questions	**CR 03**
03-15	**Roman Spectroscopy:**Objectives, Introduction, Principles of Raman Spectroscopy, pure rotational raman,vibrational raman,and vibrational rotational raman spectroscopy, complimentary nature of ir and Ramanspectra ,usualexclusion principle, summary and model question	
03-16	**Electron Spectroscopy:**Aims And Objectives, Introduction, Electron energy level of molecules, Selection rules for electronic transitions, Some terms in electronic spectra, UV spectra of unsaturated compounds , UV spectra of aromatic hydrocarbons, Solvent effects in U. V spectra, Stereo chemicalfactors in U.V spectra, UV spectra of transition metal aqua complexes, Quantitative applications of U,V spectroscopy Summary, Model Questions	
03-17	**H NMR Spectroscopy- 1:**Aims And Objectives, Introduction, Principles of magnetic resonance, Instrumentation, Shielding constant, Chemical shift, Factors affecting chemical shifts, Spin Spin coupling abed its types, coupling constant, selfassessment questions, higher order splitting, self assessment questions, magnitude of coupling constant, simplification of spectra, Nuclear	

	overhouser Enhancment,summary and model question	
03-18	**H NMR Spectroscopy- 2:** Aims And Objectives, Introduction, amylases of NMR spectrum, Study of dynamic process throw NMR spectroscopy, Restricted rotation of C-N bonds, Reaction mechanism by NMR, study of conformational changes through NMR, Summary, module question.	
03-19	**NMR Of Paramagnetic Compounds:**Aims And Objectives, Introduction, metal hydride complexes, Acetyl acton complexes, Floxional molecules, summary and model question.	
03-20	**Mass Spectroscopy-1:** Aims And Objectives, Introduction, origin of mass spectrum, types of fragments, Nitrogen rules, isotopic picks, molecular formula from molecular ion peaks, met stable peaks, high resolution mass spectrometry, Ion production technices, Summry, model question.	
03-21	**Mass Spectroscopy- 2:**Aims And Objectives, Introduction, Common fragmentation petter, one bond sigma bond cleavage, Tao bond sigma bond cleavage, fragmentation of cycle alkenes, fragmentation of akanol, fragmentation of cyclic/dial ether, fragmentation of carbonyl compounds, fragmentation of carboxylic acid, fragmentation of alkyl halides, fragmentation nitro compounds, fragmentation amines, interpretation of known compounds, Application of mass spectrometry to metal carbonyls, summary and model question.	
04-22	**Introduction To Computers:**Aims And Objectives, Introduction, classification of computers, digital computer, computer organization, input output devises, input devices, output devises, hardware and software, algawithers and flow charts, solve problems , summary and model question	
04-23	**Basic Language:** Aims And Objectives, Introduction, fundamental concept, BASIC statements, Branching and looping, additional feature of basis, function and subroutines, summary and model question	
04-24	**C Language:** Aims And Objectives, Introduction, fundamentals, porters and expression, library functions, input and output operations, control statement, Function, ayes, summary and modelquestion	CR 04
04-25	**Chemistry Application Using Basic Programme:**Aims And Objectives, Introduction, summation of series, last square feet of XY data to strait line, calculation of activation energy using Arrhenius equation by least square feting, Determine of antis energy of Cristal, Determination of equivalent conductivity of electrolytes at definite concentration, Calculation of critical constant pf vender wall gaseous, summary and model question	
04-26	**Chemistry Application Using C Language:** Aims And Objectives, Introduction, Vander wale question for real gaseous, calculation of entry of activation Ea, calculation of lasts emery of crystals, First order rate constant from kinetic data, calculation of the average value of threat constant for second order reactions, calculation of desolation constant of weak acid, summary and model question.	

LEARNING RESOURCE DETAILS

LR Code	Title Author	Edition Year	ISBN Publisher
Course Website Link for (1) Mobile and Online Lectures, (2) Discussion Forum for online interaction and (3) Self-Test for each CR Block, Continuous Assessment Test and End Examination			
CHE014	MATHEMATICS,BIOLOGY,SPECRTOSCOPY&COMPUTERS.		

Text-Books			
CHE014	MATHEMATICS,BIOLOGY,SPECRTOSCOPY&COMPUTERS Prof. G.Nageswara Rao ,Prof.t ramana,Prof. G Ramachandraiah Prof. A.Satyanarayana, Prof. Nittala S Sarma	2007	Dr. B.R. Ambedkar Open University Hyderabad
Reference-Books: Explore additional details and reinforce learning, with this optional learning resource!			
CHE014 –RB1	Mathematics for Physical Chemistry,by Donald A McQuarrie Mervin	2014	
CHE014 –RB2	Spectroscopy by Paiva	2015	
CHE014 –RB3	Spetroscopy of Organic Compounds by P.S kalsi	2015	
CD / DVD: Explore additional details and reinforce learning, with this optional learning resource!			
CHE014 -CD1			
Web Links: Explore additional details and reinforce learning, with this optional learning resource!			
CHE014-WL1			

PRACTICAL CHEMISTRY

CHE015- INORGANIC CHEMISTRY(PRACTICAL)

PROGRAMME INFORMATION

SN	Description	Details
1	University	Yashwantrao Chavan Maharashtra Open University Nashik - 422 222, Maharashtra, India Website: http://www.ycmou.ac.in/and http://ycmou.digitaluniversity.ac/
2	School	School of Architecture, Science and Technology
3	Discipline	Science
4	Level	PG
5	Course Used in	V132: M.Sc.(CHEMISTRY)

COURSE INFORMATION

Year	Code	Course Name	CR	CST	ST	CA	EE	TM	Type
01	CHE015	INORGANIC CHEMISTRY(Practical)	2	8	120	20	80	100	p

PRESUMED KNOWLEDGE AND LEARNING OBJECTIVES

Presumed Knowledge	Learning Objectives
For successful completion of this course, student should have successfully complete: • B.Sc./ with Chemistry or equivalent from a recognized University/Board.	After successful completion of this course, student should be able to • Develop technical skill • To empower our students with practical skills to comprehend the physiology and other functions of each ad every vital systems

UNITS

UN	Name of the Unit	CSs	Questions
01-01	**Introduction to Semi Micro Analysis.**	CR 01	Student is required to answer 4 of 5 SAQ, eachof 5 marks, on eachCR
01-02	**Classification of Cat ions Into Group for Qualitative Analysis.**		
01-03	**Reactions of Cat ions.**		
01-04	**General Group Separation and Analysis of Individual Group**		
01-05	**Model Semi-Micro Analysis of Captions mixture I**		
01-06	**Model Semi-Micro Analysis of Cations mixture II**		
02-07	**Sulphate.Hydrate, preparation of hexammine nickel (II) chloride. Preparation of Chloropentammine cobalt (III) chloride. Preparation of Diaminoethane Nickel(II). Preparation Of Sodium Oxalatoferrate (III) .**	CR 02	
02-08	**Calibration of Analytical Apparatus.**		
02-09	**Estimation of Ca2+ by substitution Titration Using EDTA**		
02-10	**Estimation of Cu in So4 by EDTA**		
02-11	**Estimation of Cu2+ and Ni2+ Present in sample solution**		

02-12	**Estimation of Ag+ and Ca2+ in a sample solution.**		

DETAILED SYLLABUS

UN	Detailed Syllabus of the Unit	CR
1-1	**Introduction to Semi Micro Analysis.:** .: AIM, Objectives, Semi Micro Qualitative Analysis , General intructions and Guidelines.	CR 01
1-2	**Classification of Cations Into Groups For Qualitative Analysis. :** Aim:, Objectives, Classification of Cat ions into Groups.	
1-3	**Reactions Of Cations:** Aim ,Objectives, General Instructions', Reactions Group-IA Cations, Reactions Of Group-IB cations, Reactions of group IIA cations, Reactions of Group IIB Cations,Reactions Of Group III Cations, Reaction of Group IV Cations, Reaction of Group V Cations, Reaction Of Group VI Cation.	
1-4	**General Group Separation and analysis of Individual Groups**: Aim, Objectives , Preparation of Original Solution of the Salt Mixture ,Tests for NH4, General Group Separation and analysis Of Individual Group.	
1-5	**Model Semi-Micro Analysis of Cations(A Known Salt Mixture – I)** : Aim, Objectives, Preliminary Examination, Examination for Cations, Report.	
1-6	**Model Semi-Micro Analysis Of Cations (A Known Salt Mixture – II) :**Aim:, Objectives, Preliminary Examination:, Examination For Cations,Report.	
2-7	**Preparation Of Tetrammine Copper(II) Sulphate.Hydrate**: Aim, Principal, Procedure , Result.	CR 02
2-8	**Calibration Of Analytical Apparatus:** Aim, Objectives, Procedure, Calibration of Weights, calibration of pipette, calibration of burette.	
2-9	**Estimations Involving Volumetric:** Estimation of Ca2+,Ni2+,Mn2+ and Mg2+ by substitution titration using EDTA: Aim, principle, Requirements, procedure, observations, Calculations.	
2-10	**Estimations Involving Volumetric-II:** Aim, Principle, Requirements, Procedure, Observations, Calculations, determination of Ion exchange capacity of a resin, Aims, Principle, Requirements, Procedure observation, calculations.	
2-11	**Estimation of Cu2+ and Ni2+ present in a Sample Solution:** Aim, Principle, Requirements, Procedure, Observation, Calculations.	
2-12	Estimation of Ag+ and Ca2+ in a Sample Solution: Aim, Principle, Requirements, procedure ,Observations, Calculations.	

LEARNING RESOURCE DETAILS

LR Code	Title Author	Edition Year	ISBN Publisher
Course Website Link for (1) Mobile and Online Lectures, (2) Discussion Forum for online interaction and (3) Self-Test for each CR Block, Continuous Assessment Test and End Examination			
Text-Books			
CHE015	INORGANIC CHEMITRY(Practical) Prof. P. manikamba. Smt. K. Prameela.	2007	Dr.B.R. Ambedkar Open University Hyderabad
Reference-Books :	Vogel's qualtitative inorganic analysis, 7th edition revised by G. Svehala Longman	2010	

CHE015-RB1	Inoorganic semi micro qualtitative analysis 3rd edition. V.V by Ramanujun	2014	National publication
CHE015-RB2	Vogels textbook of quantitative chemical anylsis 6th edition. J mendam	2015	Person education
CHE015-RB3	Practical inorganic chemistry G. Marr and BWrocket von. Nonstrand rteilfold Co.	2017	
Reference-Books :			
CD / DVD: Explore additional details and reinforce learning, with this optional learning resource!			
CHE015 -CD1			
Web Links: Explore additional details and reinforce learning, with this optional learning resource!			
CHE015-WL1			

CHE016: ORGANIC CHEMITRY(PRACTICAL)

PROGRAMME INFORMATION

SN	Description	Details
1	University	Yashwantrao Chavan Maharashtra Open University Nasik - 422 222, Maharashtra, India Website: http://www.ycmou.ac.in/and http://ycmou.digitaluniversity.ac/
2	School	School of Architecture, Science and Technology
3	Discipline	Science
4	Level	PG
5	Course Used in	V132: M.Sc.(Chemistry)

COURSE INFORMATION

Year	Code	Course Name	CR	CST	ST	CA	EE	TM	Type
01	CHE016	ORGANIC CHEMISTRY PRACTICAL.	2	8	120	20	80	100	p

PRESUMED KNOWLEDGE AND LEARNING OBJECTIVES

Presumed Knowledge	Learning Objectives
For successful completion of this course, student should have successfully complete: • B.Sc. With Chemistry or equivalent from a recognized University/Board.	After successful completion of this course, student should be able to • Develop technical skill • To empower our students with practical skills to comprehend the physiology and other functions of each and every vital systems

UNITS

UN	Name of the Unit	CSs	Questions
01-01	**Safety in Chemical Laboratory.**	CR 01	Student is required to answer 4 of 5 SAQ, eachof 5 marks, on eachCR
01-02	**Methods and manipulation laboratory Equipment & Technique.**		
01-03	**Systematic Qualitative analysis of organic compounds.**		
01-04	**Systematic Qualitative analysis of a model organic compound.**		
01-05	**Identification of organic compounds by systematic qualitative analysis.**		
01-06	**Preparation of organic compounds- preparation of 1,2,3,4,6- Penta O-acetyl-beta-D glucopyranose.**		
01-07	**Preparation of m-Nitro Aniline.**		
02-08	**Preparation of Benzoyl glycine.**	CR 02	
02-09	**Estimation of Phenol.**		
02-10	**Estimation of Primary Aromatic Amine.**		
02-11	**Estimation of Methyl Ketone.**		
02-12	**Estimation of reducing sugars.** **Chromatography-separation technique Gas-liquid& paper.** **Separation of a solid mixture by column chromatography.**		

DETAILED SYLLABUS

UN	Detailed Syllabus of the Unit	CR
01-01	**Safety in chemical Laboratory,Laboratory Equipment& technique** : Introduction, objectives , multiple adapters, Condensers and Receiver Adapters Or connecters, Funnels, Hot water Funnels, Distillation ,Fractional distillation, crystallization, Dissolution, Filtration, Drying the Crystals.	CR 01
01-02	**Systematic Qualitative Analysis of Organic Compounds** : Aim,Objectives, Apparatus,Chemicals,Procedure, Preliminary Examination,Detection of Extra Elements,Detection of Functional Group.	
01-03	**Systematic Qualitative analysis of A Model Organic Compound**:Aim,Objective, Procedure, Report.	
01-04	**Identification of organic compounds by systematic qualitative analysis :**Physical state, physical constant, ignitions or flame test, detection of element, solubility class, functional group test, tests for carbohydrates, hydrooxymic acid test for esters, Derivatives.	
01-05	**1,2,3,4,6-penta-o-acetyle-B-D-glocopyranose(-B-D-glocopyranose penta acetate) :** Aim, principle, apparatus and chemicals, procedure, result. 2,4,6 tribromoanyline and 1,3,5 tribromobenezene.	
01-06	**m-nitro aniline**: aim, objectives, priciples, apprates, chemicals, procvedure, result and 2,4 dihydrooxy acetophenon, 4 methyl -7- hydroxy coumarin .	
01-07	**Benzoyl glycine:** Aim, objectives, principles, apparatus', chemicals, procedure, result 1,2,3,4,-tetrahydrocarbazol. 9,10 dihydroanthracene-9,10 alpha,B-succinic anhdrinine	
02-08	**Estimation of phenol :**estimation of primary aromatic amine; aims, principles, apparatusrequired, chemicals required, procedure, result, observation and calculation.	CR 02
02-09	**Estimation of methyl ketone:** aim of the experiment, principle, apparatus', chemical required, procedure, result, preparation of reagent, observation and calculations.	
02-10	**Estimation of reducing sugars:** aims, principles, apparatus,chemicals, procedure, precautions, observations, preparation of reagents.	
02-11	**Chromatography:**introduction, principles, classification. Columchromatography, elements, column, packing of column, procedure, thin layer chromatography, principles, procedure, application of TLC.	
02-12	**Separation of a solid mixture by column chromatography:**aims, objectives, principles, apparatus required, chemicals required, procedure, result,precaution, advantages of column chromatography, limitations, questions.	

LEARNING RESOURCE DETAILS

LR Code	Title Author	Edition Year	ISBN Publisher
Course Website Link for (1) Mobile and Online Lectures, (2) Discussion Forum for online interaction and (3) Self-Test for each CR Block, Continuous Assessment Test and End Examination			
CHE016	ORGANIC CHEMISTRY (PRACTICAL)		
Text-Books			
CHE016	Dr K.raja mohan Prof G. Ramchandrajah	Reprint 2017	Dr. B.R. Ambedkar Open University Hyderabad
Reference-Books: Explore additional details and reinforce learning, with this optional learning resource!			
CHE016-RB1	A text book or practical organic chemistry by man and saundres	2003	
CHE016-RB2	Text book of practical organic chemistry by A vogel	2010	

CHE016-RB3	Practical organic chemistry textbook for students by. V.K. Ahuliwalia and sunita dhingre.		
CHE016-RB4	Techniques in organic chemistry by JErrry R. Mohring C.N. Hanmond P.F. schatz, T.C. Morrill		
CD / DVD: Explore additional details and reinforce learning, with this optional learning resource!			
CHE016 -CD1			
Web Links: Explore additional details and reinforce learning, with this optional learning resource!			
CHE016-WL1			

CHE017: PHYSICAL CHEMISTRY(PRACTICAL)

SN	Description	Details
1	University	Yashwantrao Chavan Maharashtra Open University Nasik - 422 222, Maharashtra, India Website: http://www.ycmou.ac.in/and http://ycmou.digitaluniversity.ac/
2	School	School of Architecture, Science and Technology
3	Discipline	Science
4	Level	PG
5	Course Used in	V132: M.Sc.(**Chemistry**)

COURSE INFORMATION

Year	Code	Course Name	CR	CST	ST	CA	EE	TM	Type
01	CHE017	PHYSICAL CHEMISTRY (PRACTICAL)	2	8	120	20	80	100	p

PRESUMED KNOWLEDGE AND LEARNING OBJECTIVES

Presumed Knowledge	Learning Objectives
For successful completion of this course, student should have successfully complete: • B.Sc./ with Chemistry or equivalent from a recognized University/Board.	After successful completion of this course, student should be able to • Develop technical skill • To empower our students with practical skills to comprehend the physiology and other functions of each and every vital systems

UNITS

UN	Name of the Unit	CSs	Questions
01-01	**Physical properties & disputation study**	CR 01	Student is required to answer 4 of 5 SAQ, **each of** 5 marks, on **each**CR
01-02	**Determination of density and viscosity of liquids**		
01-03	**Distribution of I2 between CCL4 and aqueous KI solution and calculation of formation constant of KI3**		
01-04	**Adsorption of acetic acid on activated charcoal and verification of freundiation adsorption isotherm**		
02-05	**Kinetics of acids catalyzed hydrolysis of methyl acetate**	CR 02	
02-06	**Kinetics of persulphate-iodide reaction**		
02-07	**Conductivity study titration of strong acid and strong base Titration of weak acid with strong base Titration of mixture of acids with strong base**		
02-08	**Determination of cell constant Determination of solubility product Determination of dissociation constant of acetic acid**		
02-09	**Potentiomentry : titration of strong acid with strong base, titration of weak acid and strong base, redox titration of Fe2+ bwith KMno4,single electrode potential of Cu/Cu2+**		
02-10	**PHmetry : measurement of ph of the given solutions, preparation of buffers, determination of PKa of weak acid**		
02-11	**Colorimetry: verification of lambert-beer's law**		

02-12	**Polarimerty : Determination of specific rotation of sucrose, study of kinetics of acids catalyzed hydrolysis of sucrose**		

Detailed Syllabus

UN	Detailed Syllabus of the Unit	CR
01-01	**Density and viscosity liquids :**Aim, principle, requirements, procedure, observation, calculations & results.	CR 01
01-02	**Distribution of I2 between CCL4 and aqueous KI and calculation of formation constant of K3:** aim,requirement , procedure, calculation, result.	
01-03	**Adsorption of acetic acid on activated charcoal:** aim, requirement, procedure, observation, calculation, result.	
01-04	**Kinetic study Acid catalyzed hydrolysis of methyl acetate** :aim, principle, requirement, procedure, observation, calculations, results.	
02-05	**Persulphate Iodide reactions, :** aim, principles, chemicals, procedure, calculations, results, observations,	CR 02
02-06	**Conductivity study :** Titration of strong acid with strong base : Aim, principles, requirement, procedure, calculations, result, observations,	
02-07	**Determination of cell constant :** Aim, principles, requirements, procedures, observations, calculations,	
02-08	**Potentiometry :** Titration of a strong acid with a strong base: titration of weak acid with a strong base : aim, principles, requirement, procedure, calculations, result, observations,	
02-09	**PH metery :** measurement of ph of the given solution, preparation of buffers, determination of weak acid: aim, requirement , procedure, result,	
02-10	**Colorometry :** Verification of lamberts beers law: Aim, requirements, procedure, observations, result,	
02-11	**Polarimerty :**Determination of specific rotation of sucrose, Study of Kinetics of acid catalyzed hydrolysis of sucrose, kinetic of hydrolysis of sucrose, Aim, principle, requirements, procedure, results, observations.	

Learning Resource Details

LR Code	Title Author	Edition Year	ISBN Publisher
Course Website Link for (1) Mobile and Online Lectures, (2) Discussion Forum for online interaction and (3) Self-Test for each CR Block, Continuous Assessment Test and End Examination			
CHE017	Physical Chemistry(Practical)		
Text-Books			
CHE017	Physical Chemistry Practical Dr. P. Manikamba Prof. G. ramchandrah	2007	Dr. B.R. Ambedkar Open University Hyderabad
Reference-Books: Explore additional details and reinforce learning, with this optional learning resource!			
CHE017 RB-1	Experimental physical chemistry by V.D. athawale, Parul mathur.		
CHE017 RB-2	Practical in physical chemistry by p.s. sindhu		
CHE017 RB-3	Practical physical chemistry 8th edition by Alexander Findlay		
CHE017 RB-4	Text book of physical chemistry by Jyotirmay lohini		
CD / DVD: Explore additional details and reinforce learning, with this optional learning resource!			
CHE017 -CD1			

Web Links: Explore additional details and reinforce learning, with this optional learning resource!			
CHE017-WL1			

CHE018 :SPECTROSCOPY & COMPUTERS (PRACTICAL)

SN	Description	Details
1	University	Yashwantrao Chavan Maharashtra Open University Nasik - 422 222, Maharashtra, India Website: http://www.ycmou.ac.in/and http://ycmou.digitaluniversity.ac/
2	School	School of Architecture, Science and Technology
3	Discipline	Science
4	Level	PG
5	Course Used in	V132:MSc.(CHEMISTRY)

COURSE INFORMATION

Year	Code	Course Name	CR	CST	ST	CA	EE	TM	Type
01	CHE018	SPECTROSCOPY & COMPUTERS(Practical)	2	8	120	20	80	100	p

PRESUMED KNOWLEDGE AND LEARNING OBJECTIVES

Presumed Knowledge	Learning Objectives
For successful completion of this course, student should have successfully complete: • B.Sc./ with Chemistry or equivalent from a recognized University/Board.	After successful completion of this course, student should be able to • Develop technical skill • To empower our students with practical skills to comprehend the physiology and other functions of each and every vital systems

UNITS

UN	Name of the Unit	CSs	Questions
01-01	**Infrared spectroscopy**	CR 01	Student is required to answer 4 of 5 SAQ, each of 5 marks, on eachCR
01-02	**Analysis of the I.R Spectra Problems**		
01-03	**Proton Magnetic reasonance spectroscopy**		
01-04	**Analysis of HNMR spectrum problem**		
01-05	**Ultraviolet visible spectroscopy**		
01-06	**Mass spectroscopy**		
01-07	**Analysis of Mass Spectra Problems**		
01-08	**Structural determination of organic compounds using the combine spectral data**		
02-09	**Computer applications in chemistry practices Basic language practical**	CR 02	
02-10	**C language Practical**		

DETAILED SYLLABUS: CHE018

UN	Detailed Syllabus of the Unit	CR
01-01	**Infrared Spectroscopy** : analysis of I.R Spectra problems, Aim, objectives, Range and principles of Infrared absorption, principle, introduction, instrumentation, interpretation, Guide lines, Division of I.R range.	CR 01
01-02	**Proton Magnetic resonance spectroscopy:** Aim, objective, introduction, Theory of nuclear magnetic resonance, Measurements of chemical shift, instrumentation, shielding and deshilding effects of electro negativity , spin spin coupling spin spin splitting: Coupling constant , analysis of NMR spectra, rules of the analysis of NMR spectra, Aromatic spine system: application of PMR spectroscopy, summery.	
01-03	**Ultraviolet visible spectroscopy :** Aim, objectives, introduction, principle, Electronic transaction, chromospheres, instrumentation, interpretation of the spectra, Aromatic compounds, nonbenzoid aromatic hydrocarbons, identification of phenols and amines, application of stereochemitry, summery	
01-04	**Mass spectrometry :** aim, objective, introduction, principle, instrumentation-mass spectrometer, fragmentation processes, nitrogenurule, isotopic peaks, recognition of the molecular ion, metastable peaks, mass spectra of different functional groups, interpretation of the mass spectrum, summary,	
02-05	**Structural determination of organic compounds using the combined spectral data (IR, PMR, Mass & UV) data:** aim, objective, introduction, spectrometric identification, spectrometric identification,	CR 02
02-06	**Basic language practical :** aim and objective, summation of series, Simple linear regression/ least squarefitting of two variables,	
02-07	**Calculation of activation energy using Arrhenius question by least squarefitting** : aim, objectives, problems, program.	
02-08	**Language practical's** : aims, objective, roots of quadratic question	
02-09	**First order rate constant from kinetic data:** aim, objective, entering and executive program, calculation of dissociation constant of a acetic acid from conductancedata.	

LEARNING RESOURCE DETAILS

LR Code	Title Author	Edition Year	ISBN Publisher
Course Website Link for (1) Mobile and Online Lectures, (2) Discussion Forum for online interaction and (3) Self-Test for each CR Block, Continuous Assessment Test and End Examination			
CHE018	Spectroscopy & Computers (Practical)		
Text-Books			
CHE018	Prof. K.raja mohan Fr. Krishna devulapalli	2007	Dr. B.R. Ambedkar Open University Hydrabad
Reference-Books: Explore additional details and reinforce learning, with this optional learning resource!			
CHE018 RB-1	Organic spectroscopy William kemp.	2014	
CHE018 RB-2	Spectranativfe identification of organic compnenets 6th edition by R.M. Siberstine G.C. BASseler and T.C Morrile	2016	
CHE018 RB-3	Organic structures from spectra. By S.tenhell and J.K kalmon	2018	
CHE018 RB-4	Spectroswper methods in organic chemistry. by D.H. William and I.felming	2013	

CHE018 RB-5	Modern NMR spectroscopy 2md edition practical JKm sanders by and B.K.hunter.		
CD / DVD: Explore additional details and reinforce learning, with this optional learning resource!			
CHE018 -CD1			
Web Links: Explore additional details and reinforce learning, with this optional learning resource!			
CHE018-WL1			

YEAR 2

CHE021: ORGANIC REACTION MECHANISMS- II ,PERICYCLIC REACTIONS, ORGANIC PHOTOCHEMISTRY STEREOCHEMISTRY - II

PROGRAMME INFORMATION

SN	Description	Details
1	University	Yashwantrao Chavan Maharashtra Open University Nasik - 422 222, Maharashtra, India Website: http://www.ycmou.ac.in/and http://ycmou.digitaluniversity.ac/
2	School	School of Architecture, Science and Technology
3	Discipline	Science
4	Level	PG
5	Course Used in	V132: M.Sc.(chemistry)

COURSE INFORMATION

Year	Code	Course Name	CR	CST	ST	CA	EE	TM	Type
02	CHE021	Organic Reaction Mechanisms-II,Pericyclic Reactions,Organic photochemistry, Stereochemistry-II	4	8	120	20	80	100	T

PRESUMED KNOWLEDGE AND LEARNING OBJECTIVES

Presumed Knowledge	Learning Objectives
For successful completion of this course, student should have successfully complete: • B.Sc. with chemistry or equivalent from a recognized University/Board.	After successful completion of this course, student should be able to • An understanding of the characteristics of antigen and antibodies • And understanding of the nature of antigen and antibody.

UNITS

UN	Name of the Unit	CSs	Questions
01-01	**Reaction intermediates –I**	CR 01	Student is required to answer 4 of 5 SAQ, eachof 5 marks, on eachCR
01-02	**Reaction intermediates –II**		
01-03	**Molecular rearrangements I**		
01-04	**Molecular rearrangements II**		
01-05	**Elimination reactions**		
02-06	**Classification and stereochemistry of pericyclic reactions**	CR 02	Student is required to answer 4 of 5 SAQ, eachof 5 marks, on eachCR
02-07	**Molecular orbital and their symmetric properties**		
02-08	**Analysis of electrocyclic reactions**		
02-09	**Analysis of cycloaddition reactions**		
02-10	**Analysis of sigmatropic reactions**		
03-11	**Electronic transitions**	CR 03	Student is required to answer 4 of 5 SAQ, eachof 5 marks, on eachCR
03-12	**Photochemistry of carbonyl compounds**		
03-13	**Photochemistry of alkenes and dienes**		
03-14	**Photochemistry of benzene derivatives**		

03-15	**Photochemistry of peroxides nitrites, hypohalites, azo compounds and diazo compounds**		
04-16	**Confirmation of some acyclic molecules**	**CR 04**	Student is required to answer 4 of 5 SAQ, **each**of 5 marks, on **each**CR
04-17	**Confirmation of cyclobutanes, cyclopentanes, cyclohexanes and monosubstituted cyclohexanes**		
04-18	**Confirmation of disubstituted cyclohexanes and**		
04-19	**cyclohexens and cyclohexanones**		
04-20	**Confirmation of a few other monocyclic and bicylic systems Confirmation and reactivity**		

DETAILED SYLLABUS

UN	Detailed Syllabus of the Unit	CR
01-01	**Reaction intermediates I** : aims and objectives, introductions, 1)carbonium ions, 2)carbanions 3)free radicals summary, terminal examination model question in unit 1	CR 01
01-02	**Reaction intermediates II :** aims and objectives, introductions, cabanas, Nirenes, arynes, summary, terminal examination model question in unit 2	
01-03	**Molecular rearrangements 1**: aims and objectives, introductions, wagner-Meerwein rearrangements, pinacol-pinacolone rearrangement, acid catalyzes rearrangement of carbonyl compounds, the Woilff rearrangement, the Vaeyer-Villiger oxidation, Rearrangement of peroxides, transannular rearrangements, summary, terminal examination model question in unit 3	
01-04	**Molecular rearrangements II**- aims and objectives, introductions, the hofman rearrangement, the lossen rearrangement, the curtius rearrangements, the schimidt rearrangements, the Beckmann rearrangements, Base catalysed rearrangements, the Fries rearrangements, Summary, terminal examination model question in unit 4	
01-05	**Elimination reactions**: aims and objectives, introduction mechanism of B-elimination reaction, orientation in elimination reactions, elimination vs, substitution, summary, terminal examination model question in unit 5	CR 02
02-06	**Classification and stereo chemistry of pericyclic reactions**: aims and objectives, introductions classification of pericylic reactions, stereochemistry of peri cyclic reactions, summary, terminal examination model question in unit 6	
02-07	**Molecular orbital and their symmetry properties'**: aims and objectives, introduction, Molecular orbital of C-C bond, Molecular orbital of C=C bond, pi molecular orbital of conjugated pi system, pi molecular orbitals of conjugated polienes, pi molecular orbitals of conjugated Pi systems containing odd number of P atomic orbital , summary, terminal examination model question in unit 7	
02-08	**Analysis of electro cyclic reactions:** aims and objectives, methods for the analysis of electro cyclic reactions, perturbanatinal molecular orbital method, Frontier molecular orbital method, orbital symmetry correlations diagram, some example of eletrocylic reactions, summary, terminal examination model question in unit 8.	
02-09	**Analysis of electro cyclicoaddition reactions** : aims and objectives, methods for the anylsis of cycloaddition reactions, perturbation molecular orbital method, fronitr molecular method, orbital symmetry correlation diagram some examples of cycloaddition and cycloreversion reaction, summary, terminal examination model question in unit 9	CR 03
02-10	**Analysis of sigmatropic reactions: :**aims and objectives, methods of anaylysis of sigmatropic reactrion, perturbational molecular orbital method, frontier molecular orbitals methods, some example of sigma tropic reactions, summary, terminal examination model question in unit10	
03-11	**Electronic transition :** aims and objectives, , introduction, electronic transitions, Carbonyl chromophore, Sin gate and triplet state, Deactivation of excited states, Intersysyeam crossing efficiency, photosensitization and triplet energy transfer, intermolecular triplet energy transfer, confuration of T1 state in carbonyl compounds, reactivity of exited state, summary, terminal examination model question in unit 11	
03-12	**Photochemistry of carbonyl compound :** aims and objectives, , introduction, photoreduction, paterno-buchi reactions, Norrish cleavages, Photochemical reactions of alpha-beta unsaturated carbonyl compounds, photochromisms, summary, terminal examination model question in unit 12	
03-13	**Photochemistry of alkenes and dienes :** aims and objectives, introduction, Cis-trans isomerisation of alkenes, Acyclic additions of alkenes, photochemistry of conjugated dines, Di-Pi methane rearragemtns, Intramolecular crossed additions, Oxidations using singlet Oxygen,	

	summary,terminal examination model question in unit 13	
03-14	**Photochemistry if benzene derivatives :**aims and objectives, , introduction, ring isomerisation reactions, addition reactions, cycloaddition reactions, substituation reactions, summary, terminal examination model question in unit 14.	CR 04
03-15	**Photochemistry of peroxides, nitrates, hypohalites, azocompounds, and Daizo compounds : :** aims and objectives, , introduction, photochemistry of peroxides, photochemistry of nitrate, photochemistry of hlphohalites, photochemistry of azo compounds, photochemistry of diazo compounds, summary, terminal examination model question in unit 15	
04-16	**Conformations of some acyclic molecules :** aims and objectives, , introduction,Dihedral angle, designation of conformer, Klyne-prelog terminology for designation of conformers, stability of conformers, conformation of ethane's, conformation of N-butanes, conformation of 1,2 dihaloethenes, conformation of 1,1,2,2,tetrabromoehtene, conformations of 2,2,,3,3 tetracholobutane, conformations of ethylene cholohydrine, conformations of ethylene glycol conformations of diastereomers, , summary, terminal examination model question in unit 16.	
04-17	**Conformation of cyclobutanes, cyclopentanes, cyclohexanes and monosubsituted cyclohexanes:** aims and objectives, , introduction, conformation of cyclobutane, conformation of monosubstitutaed cyclobutane, conformation of disubstituted cyclobutanes, conformation of cyclopentane, conformation of monosubstituted cyclopentanes, conformation of disbustituted cylopentanes, Half-chair cobnformations of cylopentane, conformation of monosubstitutaed cyclohexane, isolation andcharacterisation of conformationof monochlohexane, summary, terminal examination model question in unit 17	
04-18	**Conformation of disubstitutaed cyclohexanes, cyclohexenes and cyclohexanones:** aims and objectives, , introduction, conformation of 1,1 disubstituted cyclohexanes, non-geminally disubstituted cyclohexanes, Boat conformations, conformation of cyclohexanes, conformation of cyclo hexamine, summary, terminal examination model question in unit 18.	
04-19	**Confirmations of a few others monocylic and bicylic systems** : aims and objectives, introduction, confirmation of rings larger than 6-membered, confirmation of some saturated hetrocycles, conformation ofsome fused bicylic systems, conformation of some bridge bicylic system, summary, terminal examination model question in unit 19.	
04-20	**conformation and reactivity** : aims and objectives, , introduction, reactions of conforamtionally rigid diastereomers, reaction of conforamtionally mobile system, summary, terminal examination model question in unit 20.	

LEARNING RESOURCE DETAILS

LR Code	Title Author	Edition Year	ISBN Publisher
Course Website Link for (1) Mobile and Online Lectures, (2) Discussion Forum for online interaction and (3) Self-Test for each CR Block, Continuous Assessment Test and End Examination			
CHE021	Organic Reaction mechanisms-II,Pericyclic Reactions,Organic Photochemistry,Stereochemistry-II		
Text-Books			
CHE021	Organic Reaction Mechanisms-II, pericyclic Reaction,Stereochemistry-II Prof. K.Kondal reddy, Prof. G Ramachandrainh, Smt. K. Prameela Dr. B.R. Ambedkar Open University, Hyderabad.	2012 2017	Dr. B.R. Ambedkar Open University Hyderabad
Reference-Books: Explore additional details and reinforce learning, with this optional learning resource!			
CHE021 –RB1	Advanced Organic Chemistry Part-A &B by Carey,Francis A, Sundberg, Richard J	2013	
CHE021- RB2	Advanced Organic Chemistry by Michael B. Smith, Jerry March.	2010	

CHE021- RB3	Organic Chemistry byGene Davis	2014	
CHE021 RB-4	Organic Chemistry by Clayden Greeves, Warren &Wothers	2014	
CHE021 RB-5	Organic Structure From Spectra by L D Field, S Sternhell	2013	
CD / DVD: Explore additional details and reinforce learning, with this optional learning resource!			
CHE021 -CD1			
Web Links: Explore additional details and reinforce learning, with this optional learning resource!			
CHE021-WL1			

CHE022: ORGANIC CHEMISTRY-SYNTHETIC ORGANIC CHEMISTRY

PROGRAMME INFORMATION

SN	Description	Details
1	University	Yashwantrao Chavan Maharashtra Open University Nasik - 422 222, Maharashtra, India Website: http://www.ycmou.ac.in/and http://ycmou.digitaluniversity.ac/
2	School	School of Architecture, Science and Technology
3	Discipline	Science
4	Level	PG
5	Course Used in	V132: M.Sc.(chemistry)

COURSE INFORMATION

Year	Code	Course Name	CR	CST	ST	CA	EE	TM	Type
02	CHE022	Organic Chemistry –Synthetic Organic Chemistry.	4	8	120	20	80	100	T

PRESUMED KNOWLEDGE AND LEARNING OBJECTIVES

Presumed Knowledge	Learning Objectives
For successful completion of this course, student should have successfully complete: • B.Sc. with Chemistry or equivalent from a recognized University/Board.	After successful completion of this course, student should be able to • Identification &characterization of animal breeds. • Developing DNA based diagnostics and genetically enquired various for animals.

UNITS

UN	Name of the Unit	CSs	Questions
01-01	**A brief of functionalisation and functional group transformation reactions and oxidation of alkanes and alkenes.**	CR 01	Student is required to answer 4 of 5 SAQ, eachof 5 marks, on eachCR
01-02	**Oxidation of alcohols.**		
01-03	**Reductions of catalytic hydrogenation.**		
01-04	**Reduction by hydride transfer agents.**		
01-05	**Reductions by dissolving metals.**		
02-06	**Formation of C-C single bond.**	CR 02	
02-07	**Formation of C-C double bond.**		
02-08	**Synthetic applications of organoborenes.**		
02-09	**synthetic applications of oranosilanes.**		
02-10	**protecting groups in organic synthesis.**		
03-11	**Introduction, target selection and terminology.**	CR 03	
03-12	**Disconnection approach with example.**		
03-13	**Strategic bonds in carbocylic and hetrocylic systems.**		
03-14	**Applications of some important strateges in organic synthesis.**		
03-15	**Some selected synthesis Dispalure, Z-jasmone.**		

04-16	**Topicity,configurational,descriptors and stereoselectivity.**	**CR 04**	
04-17	**Principle of asymmetric synthesis and analysis of stereoisomer mixtures.**		
04-18	**Substrate controlled methods.**		
04-19	**Auxilary controlled method.**		
04-20	**Reagents controlled and catalyzed controlled synthesis.**		

DETAILED SYLLABUS

UN	Detailed Syllabus of the Unit	CR
01-01	**Fictionalization and functional group interconversation & oxidation of alkanes and alkenes** : Aims and Objective, Introduction, a brief review of functionalisation and functional group transformations, oxidations, summary, terminal examination model question in unit1	CR 01
01-02	**Oxidations of alcohols :**Aims and Objective, Introduction, oxidation of alcohols with chromic acid, oxidation of alcohols with chromium IV oxide, oxidation with pyridine complexes, oxidation with alkoxy sulphonium salts, oxidation of alcoholsworth manages dioxide. oxidation of bsilvercarbonate Oppenure oxidation. summary, terminal examination model question in unit2	
01-03	**Reduction- catalytic hydrogenation : :** Aims and Objective, Introduction, catalytic hydrogenation, heterogeneous catalytic hydrogenation, homogenation hydrogenation, summary, terminal examination model question in unit3	
01-04	**Reduction by hydride transfer reagents:** Aims and Objective, Introduction, Reduction by hydride transfer reagents, summary, terminal examination model question in unit4	
01-05	**Dissolving metal reductions:** Aims and Objective, Introduction, dissolving metal reductions, ,summary, terminal examination model question in unit 5.	
02-06	**Formation of carbon carbon single bonds:** Aims and Objective, Introduction, Alkylation, The aldole reaction, Knovengel condensation, stork Enamine synthesis, Michel addition, Robinsone annulations, Use of Cabanas in C-C bond formation, Simmons-smith reactions, formation of C-C bonds using oranometalic compounds, summary, terminal examination model question in unit6.	
02-07	**Formation of carbon carbon double bonds:** Aims and Objective, Introduction, Elimination reactions, the Witting reactions, Alkenes from sulphoens, Decaboxylation of B-lactose, fragmentation reactions, oxidative decarboxilation of carboxylic acids, synthiesis of alkenes from dioles, Alkenes from arysulphonyl hydrazones-shapiro reactions, reductive domerisation of carnonyl compounds,summary, terminal examination model question in unit7	
02-08	**Synthetic application of organoboranes :** Aims and Objective, Introduction, hydroboration, some important organoboranes, synthetic applications of organo borane, summary, terminal examination model question in unit8	
02-09	**Synthetic application of organo silanes :** Aims and Objective, Introduction, synthesis of organo silicon compounds, applications of organo silances, silyl enol ethers and ketenes acetales, synthetic applications of iodotrimethyl silane, reductions using silicon hydrides, reactions involving silicon stabilized catboantion petron alkenes syntheisi, reactions of binary silence, reactions involving ally silence, florid induced reactions of silicone, reactions of trimethylesilyslecyanide, summary, terminal examination model question in unit9.	CR 02
02-10	**Protecting groups of organic chemistry :** Aims and Objective, Introduction, protection of alcholes, protections of diaoles, protection of aldehydes and ketones, protection of amines, summary, terminal examination model question in unit9	
03-11	**Introduction and target selection and terminology** : Aims and Objective, Introduction, target selections, Retrosynthetic analysis, terms used in retro synthetic analysis, Different strategies for retro synthetic analysis, summary, terminal examination model question in unit 10.	
03-12	**Disconnection approach with examples**: Aims and Objective, Introduction, Disconnection approach, synthesis of aromatic compounds, One group C-X Disconnections, synthesis of Ethers, Alkyl Halids and Sulphides, synthesis of alkenes, two Group of C-X Disconnections, summary, terminal examination model question in unit 10.	CR 03
03-13	**Carbon- Carbon disconnections:** Aims and Objective, Introduction, one ground C-C disconnections, Two group -C disconnections, summary, terminal examination model questionin unit 11.	

3-14	**Application of some important strategies in organic synthesis :** Aims and Objective, Introduction,	
	chemo selectivity, regioselectivity, sterioselectivity, cyclisation reactions, reversal of polarity, summary, terminal examination model question in unit 14.	
03-15	**Amine synthesis, consecutive and convergent synthesis & some selected synthesis**: Aims and Objective, Introduction, Amine synthesis, consecutive synthesis and convergent syntheisis, some selected synthesis, summary, terminal examination model question in unit 15.	
04-16	**Tropicity and prochirality :** Aims and Objective, Introduction, homomorphic ligandes, homomorphic faces, topicity, prichirality, prochiral symbols for enatiotropic ligandes, prochiral symbols for disteriotopic lifands, prochiral symbol for inhatiotopic faces, prochiral symbol for diasteriotopic faces, summary, terminal examination model question in unit 16	
04-17	**sterioselectivity and strategies of asymmetric synthesis. :** Aims and Objective, Introduction, sterioselectivity, product composition, determination of product compos ion, pinnacleof sterioselecticity, strategies if asymmetricsynthesis summary, terminal examination model question in unit 17	**CR 04**
04-18	**Substrate controlled methods: :** Aims and Objective, Introduction, reduction of cholestan 3-one, synthesis of diaestromeric-2mrhylnobornane2 ols, reduction of camphor, catalytic hydrogeniation, syn-hydroxlation of 2,3 cholestene, 1-2 asymmetric induction, summary, terminal examination model question in unit 18	
04-19	**Chiral auxiliary-controlled methods :** Aims and Objective, Introduction, Alkylation of chiral enolates, alkylation of chiral azenolates, alkylation of chiral hydragones and chiral imines, prelog rules1,4 asymmetric induction, asymmetric diaels alder reaction, summary, terminal examination model question in unit 19	
04-20	**Chiral eragent controlled and catalyst controlled method :** Aims and Objective, Introduction, chiral regent controlled methods, chiral catalyst-controlled methods, summary, terminal examination model question in unit 20	

LEARNING RESOURCE DETAILS

LR Code	Title Author	Edition Year	ISBN Publisher
Course Website Link for (1) Mobile and Online Lectures, (2) Discussion Forum for online interaction and (3) Self-Test for each CR Block, Continuous Assessment Test and End Examination			
CHE022	Organic Chemistry –Synthetic Organic Chemistry.		
Text-Books			
CHE022	Organic Synthesis –I & II Synthetic Strategies Prof. K.Kondal reddy,Dr.G. Sridevi, Smt. K. Prameela.	2017	Dr. B.R. Ambedkar Open University, Hyderabad
Reference-Books: Explore additional details and reinforce learning, with this optional learning resource!			
CHE022 RB-1	Advanced Organic Chemistry Part-A &B by Carey,Francis A, Sundberg, Richard J	2013	
CHE022 RB-2	Advanced Organic Chemistry by Michael B. Smith, Jerry March.	2014	
CHE022 RB3	Organic Chemistry by Gene Davis	2016	
CHE022 RB-4	Organic Chemistry by Clayden Greeves, Warren &Wothers	2016	
CHE022 RB-5	Organic Structure From Spectra by L D Field, S Sternhell	2015	
.CD / DVD: Explore additional details and reinforce learning, with this optional learning resource!			
CHE022 -CD1			
Web Links: Explore additional details and reinforce learning, with this optional learning resource!			

CHE022-WL1			

CHE023: Organic Chemistry-Natural Products, Hetrocycles, Biogenesis And Spectroscopy

Programme Information

SN	Description	Details
1	University	Yashwantrao Chavan Maharashtra Open University Nashik - 422 222, Maharashtra, India Website: http://www.ycmou.ac.in/and http://ycmou.digitaluniversity.ac/
2	School	School of Architecture, Science and Technology
3	Discipline	Science
4	Level	PG
5	Course Used in	V132: M.Sc.(chemistry)

Course Information

Year	Code	Course Name	CR	CST	ST	CA	EE	TM	Type
02	CHE023	Organic chemistry –Natural Products, Hetrocycles,Biogenesis and Spectroscopy.	4	8	120	20	80	100	T

Presumed Knowledge and Learning Objectives

Presumed Knowledge	Learning Objectives
For successful completion of this course, student should have successfully complete: • B.Sc./BA with Chemistry or equivalent from a recognized University/Board.	After successful completion of this course, student should be able to • Identify various aspects of chemicals\ exposure & identify method & common application of toxicology in chemicals

Units

UN	Name of the Unit	CSs	Questions
01-01	**Alkaloids**	CR 01	Student is required to answer 4 of 5 SAQ, eachof 5 marks, on eachCR
01-02	**Steroids and hormones**		
01-03	**Prostaglandins**		
01-04	**Vitamins**		
01-05	**Tortenoids and porphyries**		
02-06	**Enzyme and their reactivity**	CR 02	
02-07	**Biochemical pathway 1**		
02-08	**Metabolism and fatty acids and proteins**		
02-09	**Biosynthetic method, general methods, and feeding experiment**		
02-10	**Biosynthesis aromatic hydrocarbons by acetate malonate and shikmic acid pathway**		
03-11	**5 me bared hetrocycles containnf two hetro atoms**	CR 03	
03-12	**5- member hetrocycle cotainng more than 2 hetro atoms**		
03-13	**6 membrane hetrocycles containg 2 hetro atom**		
03-14	**Synthesis of pyridimines, purine and xanthine bases**		

03-15	**3 and 4 membered hetrocylic compounds**		
04-16	**13C NMR spectroscopy I.**	**CR 04**	
04-17	**13C NMR spectroscopy II.**		
04-18	**19F, 31P NMR spectroscopy.**		
04-19	**Multiple sequence in NMR spectroscopy.**		
04-20	**Optical rotator dispersion studies .**		

DETAILED SYLLABUS

UN	Detailed Syllabus of the Unit	CR
01-01	**Alkaloids: Aims, objective, introductions**. Morohine, reserpine, summary, terminal examination model question in unit 1.	CR 01
01-02	**Steroids and harmones :** Aims, objective, introductions, steroids, Hormones**,** summary, terminal examination model question in unit 2.	
01-03	**Prostaglandins :** Aims, objective, introductions, structure of Prostaglandins, Classification of Prostaglandins, physiological activity of Prostaglandins, structural elucidation of PGE1aplha, structural elucidation of PGE2aplha, structural elucidation of PGE3aplha, syntheisi of prostaglandins, biosynthesis of prostaglandins, , summary, terminal examination model question in unit 3.	
01-04	**Vitamins :**Aims, objective, introductions Vitamin A group I Vitamin B group, Vitamin H, Vitamin C Vitamin D Vitamin E group, Vitamin K group summary, terminal examination model question in unit 4.	
01-05	**Retinoid and popyrins :**Aims, objective, introductions, structural of rotenone, synthesis of rotenone, porphyrins summary, terminal examination model question in unit 5.	
02-06	**Enzymes and their reactivity :**Aims, objective, introductions, enzymes as catalyst, mechanism of enzyme catalyst, coenzymes classification and nomenclature of enzymes, Factors affecting the enzymatic catalysis, enzyme inhibitions, specific of enzymes catalyzed reactions, enzyme immobilization, summary, terminal examination model question in unit 6.	CR 02
02-07	**Biochemical pathways 1 :**Aims, objective, introductions metabolism of carbohydarates, summary, terminal examination model question in unit 7.	
02-08	**Metabolism of fatty acids and proteins :** Aims, objective, introductions, fatty acid metabolism, proteins metabolism, summary, terminal examination model question in unit 8	
02-09	**Biosynthetic methods general methods, and feeding experiments :** Aims, objective, introductions biogenesis of natural products, difference between laboratory synthesis and biosynthesis, coenzymes, methods for determining biosynthesis mechanism, summary, terminal examination model question in unit 9.	
02-10	**Biosyntheisi of aromatic hydro carbins by acetate/melonate and shikmic acid pathway :** Aims, objective, introductions, biosynthesis of aromatic compounds, biosynthesis of terfinopids by mevolonate patheay, biosynthesis of aromatic compounds by shicmic acids pathway, niosyntheis of alkaloids, summary, terminal examination model question in unit 10.	
03-11	**5 membrane hetrocycles contain two hetero atoms :**Aims, objective, introductions, isozolies, oxazoles, pyrazoles, imidazoles, isothizoles, thiozoles, summary, terminal examination model question in unit 10.	CR 03
03-12	**Synthesis of 5 membrane hetrocycles containing more than two hetro atoms:**Aims, objective, introductions, oxidizoles, thiadiazoles, triazoles, tetrazoles, summary, terminal examination model question in unit 11.	
03-13	**6 membraed hetrocycles containing two nitrogen atoms :**Aims, objective, introductions, pyridazines, pyrimidines, pyrazines, summary, terminal examination model question in unit 12.	
03-14	**Synthesis of pyramidine purine anf=d xanthenine bases :**Aims, objective, introductions, synthesis if pyramidine bases, synthesis of purine bases, synthesis of xanthamine bases, summary, terminal examination model question in unit 13.	
03-15	**Three and four membered hetrocylic compounds :**Aims, objective, introductions, oxiranes, thiranes, aziridines, oxetens, thietance, azetidiense, summary, terminal examination model question in unit 14.	

04-16	**13 C NMR spectroscopy I :**Aims, objective, introduction significance of 13 C NMR, fundamental difficulties, advantages of 13C NMR, Principle, recoding of spectra, continuous wave methods, PET methods, types of 13C NMR spectra, chemical shift, calculation of chemical shifts of alkanes, calculation of chemical shifts of alkanes, calculation of chemical shifts of aromatic compounds, summary, terminal examination model question in unit 16.	CR 04
04-17	**13 C NMR Spectroscopy II:** Aims, objective, introduction, factor affecting the chemical shifts of carbons, coupling in 13 C NMR spectroscopy, Application of 13 N NMR, summary, terminal examination model question in unit 17.	
04-18	**19F AND 31 BP NMR spectroscopy :**Aims, objective, introduction, 19 F NMR spectroscopy, 31P NMR spectroscopy, summary, terminal examination model question in unit 18	
04-19	**Multiples techniques in NMR spectroscopy 2D NMR & APT, DEPT, and INEPT** :Aims, objective, introduction, some important term used in 2D NMR. Types of experiments using multiple pulse sequences, 2D NMR, 13 CNMR spectra editing techniques, summary, terminal examination model question in unit 19.	
04-20	**Optical rotator dispersion studies :**Aims, objective, introduction, Circular birefringence, circular dichroism, Cotton effect, ORD curves, octant rules, application of octant rules, axial alpha keto rules, summary, terminal examination model question in unit 20	

LEARNING RESOURCE DETAILS

LR Code	Title Author	Edition Year	ISBN Publisher
Course Website Link for (1) Mobile and Online Lectures, (2) Discussion Forum for online interaction and (3) Self-Test for each CR Block, Continuous Assessment Test and End Examination			
CHE023	Organic Chemistry-Natural Products ,Hetrocycles , Biogenesis and Spectroscopy.		
Text-Books			
CHE023	Organic Chemistry Natural Products Biogenisis. Prof.Dr. G. Sridevi, Dr. T. Udaya Kumari., A k Bhavani , C.Kotaiah, Smt K. Prameela	2007	Dr. B.R. Ambedkar open university hydrabad
Reference-Books: Explore additional details and reinforce learning, with this optional learning resource!			
CHE023 RB-1	Advanced Organic Chemistry Part-A &B by Carey,Francis A, Sundberg, Richard J	2014	
CHE023 RB-2	Advanced Organic Chemistry by Michael B. Smith, Jerry March.	2016	
CHE023 RB-3	Organic Chemistry by Gene Davis.	2015	
CHE023 RB-4	Organic Chemistry by Clayden Greeves, Warren &Wothers	2014	
CHE023 RB-5	Organic Structure From Spectra by L D Field, S Sternhell	2014	
CD / DVD: Explore additional details and reinforce learning, with this optional learning resource!			
CHE023 -CD1			
Web Links: Explore additional details and reinforce learning, with this optional learning resource!			
CHE023-WL1			

CHE024: Organic Chemistry-Drugs And Pharmaceuticals.

Programme Information

SN	Description	Details
1	University	Yashwantrao Chavan Maharashtra Open University Nasik - 422 222, Maharashtra, India Website: http://www.ycmou.ac.in/and http://ycmou.digitaluniversity.ac/
2	School	School of Architecture, Science and Technology
3	Discipline	Science
4	Level	PG
5	Course Used in	V132: M.Sc.(chemistry)

Course Information

Year	Code	Course Name	CR	CST	ST	CA	EE	TM	Type
02	CHE024	Organic Chemistry –Drugs and Pharmaceutical.	4	8	120	20	80	100	T

Presumed Knowledge and Learning Objectives

Presumed Knowledge	Learning Objectives
For successful completion of this course, student should have successfully complete: • B.Sc./with Chemistry or equivalent from a recognized University/Board.	After successful completion of this course, student should be able to • The infirmary between insect and environment was emphasized to the entomological research in many dissection which later proved of immense value in the indigenous control measure so as to provide more food for growing population. •

Units

UN	Name of the Unit	CSs	Questions
01-01	**Drug discovery design and development.**	CR 01	Student is required to answer 4 of 5 SAQ, eachof 5 marks, on eachCR
01-02	**Concept of receptors, agonists and antagonists.**		
01-03	**Drug development of salbutamol, cimetidine and captopril.**		
01-04	**Structure activity relationship studies I.**		
01-05	**SAR studies II, development of oxaminonquinon & SAR studies of sulphonamoides and benzodiazepins.**		
02-06	**Combinatorial synthesis**	CR 02	Student is required to answer 4 of 5 SAQ, eachof 5 marks, on eachCR
02-07	**Quantitative structure Activity relationships**		
02-08	**Pharmacokinetics, products and clinical trials**		
02-09	**Drugs acting and metabolic process**		
02-10	**Drug acting and cell walls and cell membranes**		
03-11	**Drug citing on the nervous system.**	CR 03	Student is required to answer 4 of 5 SAQ, eachof 5 marks, on eachCR
03-12	**Enzyme inhibitors.**		
03-13	**Drug effecting cholinergic nervous system.**		
03-14	**Drug acting on histamine receptors and ion channels.**		

03-15	**Drug acting on genetic materials.**		
04-16	**Introduction to chiral drugs.**	**CR 04**	Student is required to answer 4 of 5 SAQ, **each**of 5 marks, on **each**CR
04-17	**Synthesis of chiral drugs.**		
04-18	**Drug and intermediates from fermentation.**		
04-19	**Drug analysis.**		
04-20	**Quality controls methods in drug manufacturing and formulation.**		

DETAILED SYLLABUS

UN	Detailed Syllabus of the Unit (Application Oriented problems)	CR
01-01	**Drug discovery design and development:** Aims, objective, introduction, drug discovery in the past, drug discovery at present, drug discovery without lead, drug discovery with lead. Random screening, non random screening, summary, terminal examination model question in unit 1	
01-02	**Concept of receptors, agonist and antagonists:**Aims, objective, introduction, receptors, Binding interactions between rhea receptors and the messengers, Neurotranmiters and harmones, Agonist, antagonist, The design of agonists, the design of antagonist summary, terminal examination model question in unit 2	
01-03	**Design of agonist and antagonist development of captoprilsalbutamol and cimetides:** Aims, objective, introduction, development of salbutamol, development of Cimetidine, X-ray crystallography studies in drug design, development of captrophile, summary, terminal examination model question in unit 3	CR 01
01-04	**Structural activities relationship studies I :** Aims, objective, introduction, Binding role of functional groups, synthesis of analogies', summary, terminal examination model question in unit 4	
01-05	**SAR studies II Developemnt of oxaminoquinon & SAR studies of sulphjonamiteds and benzioidazepines :** Aims, objective, introduction, development of oxaminiquinon, strucral activity relationship of sulphoamides, Structural activity relationship studies of benzodiazepins summary, terminal examination model question in unit 5	
02-06	**Combinatorial synthesis :** Aims, objective, introduction, need odf combinatorial synthesis, solid phase techniques, methods of parallel synthesis, methods of mix combinatorial synthesis, structural determination of the active compounds, Examples of combinatorial synthesis, Automation in combination chemistry- high throughput screening, summary, terminal examination model question in unit 6	
02-07	**Quantitative structure activity relationship:** Aims, objective, introduction, what is QSAR?, overview of QSAR, condition for applicability of QSAR, QSAR steps, graphs and equations in QSAR studies, phsyiochewmical properties, Hench analysis, crag plots, Topips designation trees, cluster significance analysis, summary, terminal examination model question in unit 7	
02-08	**Pharmacokinetics prodrugs and clinical trials:** Aims, objective, introduction, pharmacokinetics, Principles of prodrugs design, clinical trials, summary, terminal examination model question in unit 8	CR 02
02-09	**Drug acting on metabolic process:** Aims, objective, introduction, history of sulfoniamides, Sulgonilamide drugs, mechanism of action of Sulgonilamide, adverse effects, method of synthesis of Sulgonilamide, synthesis of Sulgagunanides, Sulfasalizin, trimethoprism, sulphones, summary, terminal examination model question in unit 9	
02-10	**Drugs acting on cell wall and cell membrane :** Aims, objective, introduction ,Bacterial cell wall, B-lacto me antibiotics, Broad spectrum antibiotics, action of some important penicillin,derivitives, B lacto me inhabitation, Drugs acting on cell membrane, summary, terminal examination model question in unit 10	
03-11	**Drug acting on nervous system :**Aims, objective, introduction, classification of nervous system, central nervous system, peripheral nervous system, definition of neurotrasmiter, summary, terminal examination model question in unit 8	
03-12	**Enzyme inhibitors:** Aims, objective, introduction Ace inhibitors, H+/k+ atpase inhibitors, Carbonic and hydride enzymes inhibitors, Glycosidase inhibitors, Drug acting on immune system, summary, terminal examination model question in unit9	CR 03
03-13	**Drugs affecting cholinergic nervous system**: Aims, objective, introduction, cholinergic receptors, cholinesterase inhibitors, ant cholinesterase drugs, summary, terminal examination modelquestion in unit 10	

03-14	**Drug acting on histamine receptors and ion channels:**Aims, objective, introduction, drug acting on histamine receptors, histamine receptors antagonist, drug acting on ion channels, summary, terminal examination model question in unit 11	
03-15	**Drugs acting on genetic materials :** Aims, objective, introduction DNA-Inetrcalaeting agents, DNA-binding and Nicking agents, DNA-Topoisomers inhibitors, DNA-Polyinhibitors, transcriptase enzyme inhibitors, Drug interfering with translation process, summary, terminal examination model question in unit 11	
04-16	**Introduction to chiral drugs :** Aims, objective, introduction, relationship between chirality and biological activity, eudismic ratio, Case study of eusio,ic ratio, Three pointcontact models, Classification chiral drugs, Pfeiffer's rule, terminal examination model question in unit 12	
04-17	**Synthesis of chiral drugs :** Aims, objective, introduction, synthesis of ibuprofen, synthesis of Naprozen, synthesis of propanodol, synthesis of Quinalpril, synthesis of Ramipril, synthesis of Digitization, synthesis of Indinavir sulfate, summary, terminal examination model question in unit 13	
04-18	**Drugs and drug intermediates from fermentation :** Aims, objective, introduction, history of fermentation, Basics of industrial fermentation, Fermentation products, summary, terminal examination model question in unit 14	CR 04
04-19	**Drug analysis:** Aims, objective, introduction, Bio analysis of drug, importance of radioactive isotopes, ADME studies drug, Use of stable of heavy isotopes in drug analysis, Bio availability studies, summary, terminal examination model question in unit 15	
04-20	**Quality control methods in drug manufacturing and formulation:** Aims, objective, introduction, spectroscopic methods for qualitative and quantitative analysis of drugs, Clinical and Forensics applications, Chromatography, Combination techniques, Quality control methods in drug analysis, summary, terminal examination model question in unit 20	

LEARNING RESOURCE DETAILS

LR Code	Title Author	Edition Year	ISBN Publisher
Course Website Link for (1) Mobile and Online Lectures, (2) Discussion Forum for online interaction and (3) Self-Test for each CR Block, Continuous Assessment Test and End Examination			
CHE024	Organic Chemistry –Drugs and Pharmaceuticals.		
Text-Books			
CHE024	Organic Chemistry Drugs and Pharmaceuticals Dr. G shirdevi, Dr. Y. jayprakashrao, Dr, T,Udayakumari, B.nupama	2007`	`Dr. B.R. Ambedkar Open university hydrabad
Reference-Books: Explore additional details and reinforce learning, with this optional learning resource!			
CHE024 –RB 1	Advanced Organic Chemistry Part-A &B by Carey,Francis A, Sundberg, Richard J		
CHE024-RB2	Advanced Organic Chemistry by Michael B. Smith, Jerry March.		
CHE024 –RB3	Organic Chemistry by Gene Davis		
CHE024-RB4	Organic Chemistry by Clayden Greeves, Warren &Wothers		
CHE024-RB5	Organic Structure From Spectra by L D Field, S Sternhell		
CD / DVD: Explore additional details and reinforce learning, with this optional learning resource!			
CHE024 -CD1			
Web Links: Explore additional details and reinforce learning, with this optional learning resource!			
CHE024-WL1			

CHE025 :Organic Chemistry- Separation & Identification Of Organic Compounds(Practical).

Programme Information

SN	Description	Details
1	University	Yashwantrao Chavan Maharashtra Open University Nasik - 422 222, Maharashtra, India Website: http://www.ycmou.ac.in/and http://ycmou.digitaluniversity.ac/
2	School	School of Architecture, Science and Technology
3	Discipline	Science
4	Level	PG
5	Course Used in	V132: M.Sc.(chemistry)

Course Information

Year	Code	Course Name	CR	CST	ST	CA	EE	TM	Type
02	CHE025	Organic chemistry-separation and Identification of organic compounds (Practical)	2	8	120	20	80	100	p

Presumed Knowledge and Learning Objectives

Presumed Knowledge	Learning Objectives
For successful completion of this course, student should have successfully complete: • B.Sc./ with Chemistry or equivalent from a recognized University/Board.	After successful completion of this course, student should be able to • Develop technical skill • To empower our students with practical skills to comprehend the physiology and other functions of each and every vital systems.

Units

UN	Name of the Unit	CSs	Questions
01-01	**Separation and qualitative analysis general methods of binary organic mixture,**	CR 01	Student is required to answer 4 of 5 SAQ, each of 5 marks, on eachCR
01-02	**Systematic procedure for the separation of diethylether in soluble organic mixture .**		
01-03	**Systematic procedure of separation of organic mixture based on salt formation I.**		
01-04	**Systematic procedure of separation of organic mixture based on salt formation II.**		
01-05	**Systematic procedure of separation of organic mixture based on salt formation III.**		
02-06	**Systematic procedure for qualitative analysis of organic compounds.**	CR 02	
02-07	**Separation and identification of unknown binary organic mixture .**		
02-08	**Identification of unknown binary organic mixture I.**		
02-09	**Identification of unknown binary organic mixture II.**		

02-10	**Identification of unknown binary organic mixture III**		
02-11	**Identification of unknown binary organic mixture IV**		
02-12	**Identification of unknown binary organic mixture V**		
02-13	**Identification of unknown binary organic mixture VI**		
02-14	**Identification of unknown binary organic mixture VII**		
02-15	**Identification of unknown binary organic mixture VIII**		
02-16	**Identification of unknown binary organic mixture IX**		
02-17	**Identification of unknown binary organic mixture X**		
02-18	**Separation and identification of ternary organic mixture**		
02-19	**General separation procedure for ternary organic mixture**		
02-20	**Identification of unknown ternary mixture XVI**		
02-21	**Identification of unknown ternary mixture XVII**		

DETAILED SYLLABUS

UN	Detailed Syllabus of the Unit	CR
01-01	**Systematic procedure for the separation of diethyl ether in soluble binary organic mixture** : aim, objectives, apparatus, chemicals , preliminary examination Separation procedure, report	CR 01
01-02	**Systematic procedure of separation of organic mixture based on salt formation I:** Aim, objectives, apparatus, chemicals, preliminary examination Separation procedure, report.	
01-03	**Systematic procedure of separation of organic mixture based on salt formation II :**Aim, objectives, apparatus, chemicals, preliminary examination Separation procedure, report.	
01-04	**Systematic procedure of separation of organic mixture based on salt formation III :** Aim, objectives, apparatus, chemicals, preliminary examination Separation procedure, report.	
01-05	**Systematic procedure for qualitative analysis of organic compounds formation III :** Aim, objectives, apparatus, chemicals, preliminary examination, detection of extra element, solubility test, detection of functional group.	
02-06	**Identification of unknown binary organic mixture I** : aims, preliminary examination, separation of the mixture, identification of unknown compound 1, identification of unknown compound 2, final report	CR 02
02-07	**Identification of unknown binary organic mixture II :** aims, preliminary examination, separation of the mixture, identification of unknown compound 1, identification of unknown compound 2, final report	
02-08	**Identification of unknown binary organic mixture III** : aims, preliminary examination, separation of the mixture, identification of unknown compound 1, identification of unknown compound 2, final report.	

02-09	**Identification of unknown binary organic mixture IV :** aims, preliminary examination, separation of the mixture, identification of unknown compound 1, identification of unknown compound 2, final report.	
02-10	**General separation procedure for the ternary organic mixture :** aim, objectives, apparatus, chemicals, preliminary examination, separation procedure, report,	
02-11	**Separation and identification of ternary organic mixture XVI :** aim, objectives, apparatus, chemicals, preliminary examination, separation procedure, report,	
02-12	**Separation and identification of ternary organic mixture XVII :** aim, objectives, apparatus, chemicals, preliminary examination, separation procedure, report,	

LEARNING RESOURCE DETAILS

LR Code	Title Author	Edition Year	ISBN Publisher
Course Website Link for (1) Mobile and Online Lectures, (2) Discussion Forum for online interaction and (3) Self-Test for each CR Block, Continuous Assessment Test and End Examination			
CHE025	Organic Chemistry –Separation and Identification of Organic Compounds (practical).		
Text-Books			
CHE025	Organic Chemistry Dr. d. kmoteshwararao Prof. G.ramchandra	2007	Dr. B.R.Ambedkar Open university hydrabad
Reference-Books: Explore additional details and reinforce learning, with this optional learning resource!			
CHE025-RB1	Organic structure from spectra 4th edition by L.D. field S.sternel JR kalman		
CHE025-RB2	Vogels textbook of practicle organic chemistry by brain furnish anotony hamford		
CHE025-RB3	Laboratry mannuak of organic chemistry by raj K. bansal		
CD / DVD: Explore additional details and reinforce learning, with this optional learning resource!			
CHE025 -CD1			
Web Links: Explore additional details and reinforce learning, with this optional learning resource!			
CHE025-WL1			

CHE026: ORGANIC CHEMISTRY - SEPARATION AND IDENTIFICATION OF ORGANIC COMPOUNDS AND CHROMATOGRAPHY(PRACTICAL)

PROGRAMME INFORMATION

SN	Description	Details
1	University	Yashwantrao Chavan Maharashtra Open University Nasik - 422 222, Maharashtra, India Website: http://www.ycmou.ac.in/and http://ycmou.digitaluniversity.ac/
2	School	School of Architecture, Science and Technology
3	Discipline	Science
4	Level	PG
5	Course Used in	V132: M.Sc.(Chemistry)

COURSE INFORMATION

Year	Code	Course Name	CR	CST	ST	CA	EE	TM	Type
02	CHE026	Organic chemistry Separation and Identification of Organic Compounds and Chromatography(practical).	2	8	120	20	80	100	p

PRESUMED KNOWLEDGE AND LEARNING OBJECTIVES

Presumed Knowledge	Learning Objectives
For successful completion of this course, student should have successfully complete: • B.Sc./ with Chemistry or equivalent from a recognized University/Board.	After successful completion of this course, student should be able to • Develop technical skill • To empower our students with practical skills to comprehend the physiology and other functions of each and every vital systems.

01-01	**Spectrometric identification of organic compounds :IR, mass, NMR, UV spectroscopy for structure identification and Correlation table.**	CR 01	Student is required to answer 4 of 5 SAQ, **each of** 5 marks, on **each**CR
01-02	**Discusses solved problem**		
01-03	**Solved spectral problem 1**		
01-04	**Solved spectral problem 2**		
01-05	**Solved spectral problem 3**		
01-06	**Provides practice problems**		
01-07	**Spectral problems 4**		
01-08	**Spectral problems 5**		
01-09	**Spectral problems 6**		
01-10	**Spectral problems 7**		
01-11	**Spectral problems 8**		
01-12	**Spectral problems 9**		
01-13	**Spectral problems 10**		
02-14	**Spectral problems 11**	CR 02	
02-15	**Spectral problems 12**		

02-16	**Spectral problems 13**		
02-17	**Spectral problems 14**		
02-18	**Spectral problems 15**		
02-19	**Spectral problems 16**		
02-20	**Spectral problems 17**		
02-22	**Spectral problems 18**		
02-23	**Spectral problems 19**		
02-24	**Spectral problems 20**		
02-25	**Spectral problems 21**		
02-26	**spectral problems 22**		
02-27	**Spectral problems 23**		
02-28	**Spectral problems 24**		
02-29	**Spectral problems 25**		
02-30	**Spectral problems 26**		
02-31	**Spectral problems 27**		
02-32	**Spectral problems 28**		
02-33	**Spectral problems 29**		
02-34	**Spectral problems 30**		
02-35	**Chromatography**		
02-36	**Thin layer chromatography**		
02-37	**Monitoring of chemical reaction by thin layer**		
02-38	**chromatography**		
02-39	**Preparative thin layer chromatography**		
02-40	**Column chromatography**		

DETAILED SYLLABUS

UN	Detailed Syllabus of the Unit	CR
01-01	**Correlation tables of mass, infrared NMR, UV spectroscopy :** mass spectra, IR spectra, UV spectra, NMR spectra, C-13 NMR spectra,	CR 01
01-02	**Solved spectra; problem 1 :**aim, requirement, interpretation of spectral data, structural assignment from all the spectral data, mass spectral fragmentation of the compound, result.	
01-03	**Solved spectra; problem 2 :**aim, requirement, interpretation of spectral data, structural assignment from all the spectral data, mass spectral fragmentation of the compound, result.	
01-04	**Solved spectra; problem 3 :**aim, requirement, interpretation of spectral data, structural assignment from all the spectral data, mass spectral fragmentation of the compound, result.	
01-05	**Solved spectra; problem 4 :**aim, requirement, interpretation of spectral data, structural assignment from all the spectral data, mass spectral fragmentation of the compound, result.	
01-06	**Solved spectra; problem 5 :**aim, requirement, interpretation of spectral data, structural assignment from all the spectral data, mass spectral fragmentation of the compound, result.	
02-07	**Solved spectra; problem 6 :**aim, requirement, interpretation of spectral data, structural assignment from all the spectral data, mass spectral fragmentation of the compound, result.	CR 02
02-08	**Solved spectra; problem 7 :**aim, requirement, interpretation of spectral data, structural assignment from all the spectral data, mass spectral fragmentation of the compound, result.	
02-09	**Solved spectra; problem 8 :**aim, requirement, interpretation of spectral data, structural assignment from all the spectral data, mass spectral fragmentation of the compound, result.	
02-10	**Solved spectra; problem 9:** aim, requirement, interpretation of spectral data, structural assignment from all the spectral data, mass spectral fragmentation of the compound, result.	
02-11	**thin layer chromatography TLC1 :** aim, principle, procedure, result	
02-12	**Monitoring of chemical reaction by thin layer chromatography :** aim, principle, procedure, result	
02-13	**Preparation of thin layer chromatography :** aim, principle, procedure, result	
02-14	**Separation of solid mixture by column chromatography:** aim, principal, materials needed, procedure, report	

LEARNING RESOURCE DETAILS

LR Code	Title Author	Edition Year	ISBN Publisher
Course Website Link for (1) Mobile and Online Lectures, (2) Discussion Forum for online interaction and (3) Self-Test for each CR Block, Continuous Assessment Test and End Examination			
CHE026	Organic chemistry-Separation and Identification of Organic Compounds and Chromatography(Practical).		
Text-Books			
	Prof G.ramchandrah D.koteshwarrao, k.prmila.	2007	Dr, B .R. Ambedkar open University Hydrabad
Reference-Books:			
CHE026-RB1	Spectroscopy identification of organic compounds by silverstain and bailier		
CHE026-RB2	Organic spectroscopy by wiliam kemp		
CHE026-RB3	Elementary organic spectroscopy by V.R shrama		

CD / DVD: Explore additional details and reinforce learning, with this optional learning resource!			
CHE026 -CD1			
Web Links: Explore additional details and reinforce learning, with this optional learning resource!			
CHE026-WL1			

CHE027: Synthesis Of Organic Compound And Isolation Of Natural Products (Practical).

Programme Information

SN	Description	Details
1	University	Yashwantrao Chavan Maharashtra Open University Nasik - 422 222, Maharashtra, India Website: http://www.ycmou.ac.in/and http://ycmou.digitaluniversity.ac/
2	School	School of Architecture, Science and Technology
3	Discipline	Science
4	Level	PG
5	Course Used in	V132: M.Sc.(Chemistry)

Course Information

Sem	Code	Course Name	CR	CST	ST	CA	EE	TM	Type
01	CHE027	Synthesis of Organic Compounds and Isolation of Natural products(Practical).	2	8	120	20	80	100	p

Presumed Knowledge and Learning Objectives

Presumed Knowledge	Learning Objectives
For successful completion of this course, student should have successfully complete: • B.Sc./ with Chemistry or equivalent from a recognized University/Board.	After successful completion of this course, student should be able to • Develop technical skill • To empower our students with practical skills to comprehend the physiology and other functions of each and every vital systems

Units

UN	Name of the Unit	CSs	Questions
01-01	**Preparation 2 PEHNYL INDOLE**	CR 01 MLs 01-20	Student is required to answer 4 of 5 SAQ, each of 5 marks, on eachCR
01-02	**Preparation OF 7 HDROXY 3 METHYL FLAVONE**		
01-03	**Preparation of 2-5 Dihydroxy acetophenone**		
01-04	**Preparation of benzilic acid**		
01-05	**Preparation of benzanilide**		
01-06	**Preparation of caprolactum**		
01-07	**Preparation of acridon**		
02-08	**One step preparation of organic molecule**	CR 02 MLs 21-40	Student is required to answer 4 of 5 SAQ, each of 5 marks, on eachCR
02-09	**Preparation of 4chloro toluene**		
02-10	**Preparation of Benzpinacol**		
02-11	**Preparation of 7 hydroxy coumarine**		
02-12	**Preparation of photodimerisation of maleic anhydride**		
02-13	**Preparation of benozophinone**		
02-14	**Preparation of Vanily alchol**		
02-15	**Preparation of of Ortho and para nitro phenol**		
02-16	**Isolation of piperine from peppers**		Student is required to answer 4 of 5 SAQ, each of 5 marks,
02-17	**Isolation of Caffeine from Tea leves**		

02-18	**Isolation of Cineole from Eucalptus leaves:**		on **each**CR

DETAILED SYLLABUS

UN	Detailed Syllabus of the Unit (Exercises word should not be mentioned here as it is a part of each unit)	CR
01-01	**PREPARATION 2 PEHNYL INDOLE** : Aim, chemical name, structure, principle, types of reaction, step 1: preparation of acetophenone phenyl hydrazone, preparation of 2 phenyl indole	
01-02	**PREPARATION OF 7 HDROXY 3 METHYL FLAVONE** : Aim, chemical name, structure, principle, types of reaction, preparation of respropiophenone	
01-03	**PREPARATION OF 2-5 Dihydroxy acetophenone** : aim, chemical name, structure, principle, types of reaction, preparation of hydroquinone diacetate, preparation of 2-5 dihydroxacetophynone	CR 01
01-04	**Preparation of benzilic acid** : aim, chemical name, structure, principle, types of reaction, benzoin condensation, benzalic acid rearrangement.	
01-05	**Preparation of benzenilide :**aim, chemical name, structure, principle, types of reaction, preparation of benzophenon oxime .	
01-06	**Preparation of caprolactum:** aim, chemical name, structure, principle, types of reaction,preparation of cyclohexanone oxime.	
01-07	**Preparation of acridine :**aim, chemical name, structure, principle, types of reaction, preparation of acridine.	
02-08	**Preparation of 4chloro toluene:** aim, chemical name, structure, principle, types of reaction chemical required, apparatus required, procedure, recrystalization, yield, melting point.	
02-09	**Preparation of 7 hydroxy coumarine :** aim, chemical name, structure, principle, types of reaction chemical required, apparatus required, procedure, recrystalisation, yield, melting point	
02-10	**Preparation of photodimerisation of maleic anhydride :** aim, chemical name, structure, principle, types of reaction chemical required, apparatus required, procedure, recrystalisation, yield, melting point	CR 02
02-11	**Preparation of benozophinone :** aim, chemical name, structure, principle, types of reaction chemical required, apparatus required, procedure, recrystalisation, yield, melting point	
02-12	**Isolation of Caffeine from Tea leves** aim, chemical name, structure, principle, types of reaction chemical required, apparatus required, procedure, recrystalisation, yield, melting point	

LEARNING RESOURCE DETAILS

LR Code	Title Author	Edition Year	ISBN Publisher
Course Website Link for (1) Mobile and Online Lectures, (2) Discussion Forum for online interaction and (3) Self-Test for each CR Block, Continuous Assessment Test and End Examination			
CHE027	Synthesis of Organic Compounds and Isolation of natural Products (Practical).		
Text-Books			
	Organic Chemistry Practical Prof. G ramchandrah, D. Koteshwarah	2007	Dr. B.R. Ambedkar Open University Hydrabad
Reference-Books: Explore additional details and reinforce learning, with this optional learning resource!			
CHE027-RB1	Pharmacognocy by kokate		
CHE027-RB2	Elementary practical organic chemistry by arthur1st vogel		
CHE027-RB3	Laboratory method of organic chemistry by L. Gatterman		
CHE027-RB4	Slective organic preparation by devide todd.		
CD / DVD: Explore additional details and reinforce learning, with this optional learning resource!			
CHE027 -CD1			

Web Links: Explore additional details and reinforce learning, with this optional learning resource!			
CHE027-WL1			

CHE028 : ORGANIC CHEMISTRY- SYNTHESIS AND ANALYSIS OF DRUGS(PRACTICAL).

PROGRAMME INFORMATION

SN	Description	Details
1	University	Yashwantrao Chavan Maharashtra Open University Nasik - 422 222, Maharashtra, India Website: http://www.ycmou.ac.in/and http://ycmou.digitaluniversity.ac/
2	School	School of Architecture, Science and Technology
3	Discipline	Science
4	Level	PG
5	Course Used in	V132: M.Sc.(CHEMITRY)

COURSE INFORMATION

Year	Code	Course Name	CR	CST	ST	CA	EE	TM	Type
02	CHE028	Organic Chemistry-Synthesis and Analysis of Drugs (practical).	2	8	120	20	80	100	p

PRESUMED KNOWLEDGE AND LEARNING OBJECTIVES

Presumed Knowledge	Learning Objectives
For successful completion of this course, student should have successfully complete: • BSc/ with Chemistry or equivalent from a recognized University/Board.	After successful completion of this course, student should be able to • Develop technical skill • To empower our students with practical skills to comprehend the physiology and other functions of each ad every vital systems

UNITS

UN	Name of the Unit	CSs	Questions
01-01	**Preparation of Drug Intermediate: Preparation of Paracetamol.**	CR 01	Student is required to answer 4 of 5 SAQ, each of 5 marks, on eachCR
01-02	**Preparation of Phenytoin.**		
01-03	**Preparation of 6-Methyl Uracil.**		
01-04	**Preparation of Benzocaine.**		
01-05	**Preparation of Chloritone.**		
01-06	**Preparation of 4-Aminobenzene sulphonamide.**		
01-07	**Preparation of Florescence.**		
01-08	**Preparation of Antipyrine.**		
01-09	**Preparation of Diazepam.**	CR 02	Student is required to answer 4 of 5 SAQ, each of 5 marks, on eachCR
02-10	**Esterification of assay of aspirin.**		
02-11	**Esterification of assay of Ibuprofen.**		
02-12	**Esterification of assay of Analgin.**		
02-13	**Esterification of assy of Ascarbic acid.**		
02-14	**Esterification of assay of Ca+2 ions in calcium gluconate injection.**		

02-15	**Esterification of assay of chloride in ringer lactate solution for injection.**		
02-16	**Estimation of assay of Sulphonilamides by potentiometric titrations.**		
02-17	**Estimation of assay of riboflavin by colorimetric titrations.**		

DETAILED SYLLABUS

UN	Detailed Syllabus of the Unit	CR
01-01	**Preparation of Paracetamol:** Aim ,chemical name ,structure, pharmacological activity, principle,type of reaction,chemicals, apparatus, procedure, re-crystallization, result,melting point, yield, uses.	CR 01
01-02	**Preparation of phenytoin:**Aim, chemical name, structure, pharmacological activity, principle,chemical required, apparatus, procedure, recrystalisation,yield,melting point.	
01-03	**Preparation of 6-methyl uracil :**Aim, chemical name, structure, pharmacological activity, principle, condensation of ethylacetoacetate and thiourea,synthesis of thiopyrimidine to 6-methyl uracil.	
01-04	**Preparation of benzocaine:** Aim, chemical name, structure,pharmacological, principle, preparation, of P- aminobenzoic acid, Etherification of P-Amino benzoic acid to Ethyl P-amino benzoate.	
01-05	**Preparation of synthesis of chlorbutol:** Aim, chemical name, Pharmacological Activity, structure, principle, procedure, yield, melting point**.**	
01-06	**Preparation of sulfanilamide:** Aim, chemical name,structure,pharmacology activity,principle, preparation ofP-acetamidobenzene sulphonyl chloride,preparation of P-acetamido benzene sulphaonamide,preparation of sulphonilamide.	
01-07	**Preparation of flourescein:** Aim, chemical name, structure, pharmacological activity, chemicals, apparatus, procedure, recrystalisation, yield**.**	
01-08	**Preparation of antipyrine:** Aim, chemical name, structure, pharmacological activity, principle, synthesis of phenyl methyl pyrazolone, methylation of phenyl methyl pyrazolone.	
01-09	**Preparation of diazepam:** Aim, chemical name, structure, principle, chemical required, apparatus required, procedure, recrystalisation, melting point.	
02-01	**Esterification of assay of aspirin**: Aim, chemical name, molecular formula, structure, therapeutic uses, required dose, standards, principle, chemicals, apparatus, procedure, result.	CR02
02-02	**Esterification of assay of Ibuprofen:**Aim, chemical name, molecular formula, structure, therapeutic uses, dose, usual strength, standards, principle, apparatus required, chemical required, procedure, result.	
02-03	**Estimation of assay Analgin:** Aim, chemical name, molecular formula, structure, therapeutic use, dose, standards, principal, apparatus required, chemical require, procedure, result.	
02-04	**Estimation of assay of ascorbic acid :**Aim, chemical name, molecular formula, structure, therapeutic use, standards, principle, chemical required, apparatus required, procedure, result.	
02-05	**Estimation of Ca+2 ions in calcium gluconate injection :** Aim, chemical name, molecularformula, structure, therapeutic uses, dose, usual strength, standards, principle, apparatus required, chemical required, procedure, result.	
02-06	**Estimation of chloride in ringer lactate injection:** Aim, chemical composition, therapeutic uses, standards, dosage and administration, principle, apparatus required, chemical required, procedure, report.	
02-07	**Estimation of assay of sulphanilmide by potentiometric titrations:** Aim, chemical name, structure, molecular formula, therapeutic use, requirement, principle, procedure, result.	
02-08	**Estimation of assay of riboflavin by colorimetric:** Aim, chemical name, molecular formula, structure, therapeutic use, dose level, standards, principle, procedure, report**.**	

LEARNING RESOURCE DETAILS

LR Code	Title Author	Edition Year	ISBN Publisher
Course Website Link for (1) Mobile and Online Lectures, (2) Discussion Forum for online interaction and (3)			

Self-Test for each CR Block, Continuous Assessment Test and End Examination			
Text-Books			
CHE028	Organic chemistry Synthesis and Analysis of Drugs Prof . G. ramchnfdrah. D.koteshwarao K.pramila	2007	Dr.B. R. Ambedkar open university hydrabad
Reference-Books: Explore additional details and reinforce learning, with this optional learning resource!			
CHE028-RB1	Indian pharmacopoeia vol 1 & 2	2014	
CHE028-RB2	Practical pharmaceutical chemistry by A.H. beckett and J.B stenlack	2014	
CHE028--RB3	Pharmaceutical analysis by ashtohakr	2015	
CHE028-RB4	Vogel textbook of quantitative analysis	2016	
CD / DVD: Explore additional details and reinforce learning, with this optional learning resource!			
CHE028 -CD1			
Web Links: Explore additional details and reinforce learning, with this optional learning resource!			
CHE028-WL1			

END OF DOCUMENT

SCHOOL OF ARCHITECTURE, SCIENCE AND TECHNOLOGY YASHWANTRAO CHAVAN MAHARASHTRA OPEN UNIVERSITY

Syllabus:

V131: M.Sc. (Physics)

{2021 Pattern}

2021

AST, YCMOU, NASHIK-422 222, MS, INDIA

Contents

Yashwantrao Chavan Maharashtra Open University

Vice-Chancellor: Prof. Dr. E. Vayunandan

School of Architecture, Science and Technology

Director (I/C) of the School: Dr. Sunanda More

School Council (2021-2023)

Dr Sunanda More Director(I/c) & Associate Professor, School of Architecture, Science & Technology, YCMOU, Nashik	Dr Manoj Killedar Associate Professor, School of Architecture, Science & Technology, YCMOU, Nashik	Dr Chetana Kamlaskar Assistant Professor, School of Architecture, Science & Technology, YCMOU, Nashik
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Dr. Dayaram Pawar Assistant Professor School of Education, YCMOU, Nashik	Prof. Dr. Madhavrao K. Deore Professor & Head of Department of Physics, K.T.H. M. College, Nashik	Dr. Bapu B. Shingate Assistant Professor, Dr. Babasaheb Ambedkar Marathwada University (BAMU), Aurangabad 431004
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- **Prepared by**:

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SYLLABUS FOR
V131: M.Sc. (PHYSICS){2021 PATTERN}

Programme Objective and Scope

This programme is designed to achieve following objectives and scope.

Objectives: After successful completion of this programme, students will be able to

1. Explain core concepts related to fundamental physics principles.
2. Explain how physics will help us in day-to-day life.
3. Discuss core concepts and methods of physical sciences and their application in problem-solving

Scope of the Physics programmes: After successful completion of this programme, students may get opportunities in various fields/sectors to work as

- Career opportunities in both private and government sector/ in India and abroad
- Job opportunities in allied sectors[High Tech Industries, Medical Labs, Government Hospitals, Medical Research Labs, Defense Services, Nuclear Power Plants, Aerospace Sector, Research Analyst, Space and Astronomy, Healthcare, Technology, Geophysics and meteorology, College Lecturer/ Professor Banking, Business/ Start-up
- Inculcation of research attitude
- Inculcation of entrepreneurship
- Perceive higher education and research in the same field

Mode of Education

This Programme will be offered in Open and Distance Learning (ODL) Mode as defined in "UGC Open and Distance Learning Programmes and Online Programmes Regulations, 2020" published in the gazette notification by dated 4th Sept 2020 by the UGC as specified below.

> *"Open and Distance Learning Mode means a mode of providing flexible learning opportunities by overcoming separation of teacher and learner using a variety of media, including print, electronic, online and occasional interactive face-to-face meetings with the learners or Learner Support Services to deliver teaching-learning experiences, including practical or work experiences"*

Mode of Examination

Continuous Assessment is conducted at recognized learner support centres/ study centres and End Examination for all type of courses is conducted at recognized Exam Centres of the University under supervision.

Basic Information

1. **Mode of Education**: Open and Distance Learning (ODL) Mode
2. **Minimum Programme Duration**: 2 years/ 4 semesters after Candidates with B.Sc. (PCM)/ B.Sc.(Phy)/ B.Sc.(Electronics)/ B.E./ B. Tech. Degree or Equivalent pass
3. **Learner Support Centers/ Study Centers:** University approved/ recognized Senior Science Colleges/ Institutes
4. **Medium of Instruction**: English
5. **Attendance**: Minimum 80% attendance for all type of courses.
6. **Minimum Programme Duration**: 2 years after Graduation
7. **Teaching-Learning**: 36 working weeks per year
8. **Total Teaching-Learning Support:** 960 Hours in each year
9. **Total Courses:** 16 courses (subjects) at year 01-02
10. **Total Credits:** 48 Credits. As per UGC norms 1 Credit means 30 hours of study efforts required to gain learning of particular content of each credit.
11. **Year Credits**: 24 Credits in each year (16 credits for Theory and 08 credits for Practical).
12. **Total Courses and Credit Points:**

Year	Theory	Practical	Credits
01	4	4	24
02	4	4	24
Total credits			**48**

13. **Passing:** Minimum 40% or better marks
14. **Credit Transfer:**
15. **Continuous Assessment:** Continuous Assessment conducted for Continuous evaluation during teaching-learning for 20%Weightage
16. **End Exam :**End Examination conducted for Summative evaluation of the student for 80% Weightage
17. **Degree Certification:** Aggregate performance and Class in the programme reported on the basis of performance.
18. **Curriculum Design:** Student centric curriculum is designed to enable professional ability, employability and skill enhancement.
19. **Approval/Equivalence Status**: UGC Approved. UGC-DEB Approval is available on UGC Website

Eligibility and Fees

<table>
<tr><th>Admission Eligibility</th><th>Certification Eligibility</th><th>Fees and Deposit / Year
UF is payable for a year to the university at the time of online admission</th></tr>
<tr><td>Candidates with B.Sc. (PCM)/ B.Sc.with Physics upto SY/ B.Sc.(Electronics)/ B.E./B. Tech. Degree or Equivalent pass</td><td>Min 40% or better marks, in all Theory type of courses, with total 48 credits at Year 01 to 02</td><td>
<table>
<tr><th>Description</th><th>INR ₹</th></tr>
<tr><td>University Fee (UF)</td><td>8000</td></tr>
<tr><td>Study Center/ Learner Support Center Fee (LSCF)</td><td>12,000</td></tr>
<tr><td>Total ≈</td><td>20000</td></tr>
<tr><td>Refundable LD
(Payable only when student choose to avail Library Facility at the SC)</td><td>1,500</td></tr>
</table>
</td></tr>
</table>

Programme Structure

V131: M.Sc. (Physics) {2021Pattern}

Course ➔ / Year ↓	Course 01, 4 CR, T	Course 02, 4 CR, T	Course 03, 4 CR, T	Course 04, 4 CR, T
Year 01 24CR	**PHY011** Mathematical Physics and Classical Mechanics	**PHY012** Statistical Mechanics and Quantum Mechanics	**PHY013** Solid State Physics	**PHY014** Semiconductor Devices, Analog and Digital Electronics
	Course 05, 2 CR, P	Course 06, 2 CR, P	Course 07, 2 CR, P	Course 08, 2 CR, P
	PHY015 Heat and Acoustics	**PHY016** Optics	**PHY017** Basic Electronics	**PHY018** Digital Electronics and Computers Programming
Year 02 24 CR	Course 01, 4 CR, T	Course 02, 4 CR, T	Course 03, 4 CR, T	Course 04, 4 CR, T
	PHY021 Nuclear Physics and Analytical Techniques	**PHY022** Electromagnetic Theory and Spectroscopy	**PHY023** Memory Devices and Microprocessors	**PHY024** Microwave Devices and Communication Systems
	Course 05, 2 CR, P	Course 06, 2 CR, P	Course 07, 2 CR, P	Course 08, 2 CR, P
	PHY025 Spectroscopy	**PHY026** Modern Physics	**PHY027** Memory Devices and Microprocessors	**PHY028** Microwave Devices and Communication Systems

Teaching-Learning Scheme:

Description	Total 08 (Eight) Theory Courses in Programme Total 08 (Eight)Practical Courses in Programme
Face-to-face Counselling Sessions for interaction, problem solving and conduction of practical activities at Study Centre	12 hrs each of 01 clock hour duration for each Theory Course of 4 Credits, Study Hours – 60
	12 hrs each of 02 clock hour duration for each Practical/ Activity Course of 2 Credits, Study Hours– 60
Delivery of Information	(1) Books in SLM format: 30Hours/ for each
Self-Study, Learning Evaluation and Feedback	(1) Solving Problems, Self-Tests, SAQs and Exploring more Details on Text-Book: 30 Hours
Total Study Hours	(08 x 60 = **480** Hours + 08 x 60 = **480** Hours) = 960 Hours

Semesters and Courses

SN	Code	Name	CA	EE	TM	Type	CR	Grade Point
Year 01 : 24 Credits								
01	PHY011	Mathematical Physics and Classical Mechanics	20	80	100	T	4	4
02	PHY012	Statistical Mechanics and Quantum	20	80	100	T	4	4
03	PHY013	Solid State Physics	20	80	100	T	4	4
04	PHY014	Semiconductor Devices, Analog and Digital Electronics	20	80	100	T	4	4
05	PHY015	Heat and Acoustics (Practical)	10	40	50	P	2	4
06	PHY016	Optics (Practical)	10	40	50	P	2	4
07	PHY017	Basic Electronics (Practical)	10	40	50	P	2	4
08	PHY018	Digital Electronics and Computers (Practical)	10	40	50	P	2	4
Year 02 : 24 Credits								
01	PHY021	Nuclear Physics and Analytical Techniques	20	80	100	T	4	4
02	PHY022	Electromagnetic Theory and Spectroscopy	20	80	100	T	4	4
03	PHY023	Memory Devices and Microprocessors	20	80	100	T	4	4
04	PHY024	Microwave Devices and Communication Systems	20	80	100	T	4	4
05	PHY025	Spectroscopy (Practical)	10	40	50	P	2	4
06	PHY026	Modern Physics (Practical)	10	40	50	P	2	4
07	PHY027	Memory Devices and Microprocessors (Practical)	10	40	50	P	2	4
08	PHY028	Microwave Devices and Communication Systems (Practical)	10	40	50	P	2	4

Grading system

1. "Absolute Grading": the marks are converted to grades based on pre-determined class intervals.

2. "Letter Grade": It is an index of the performance of students in a said programme. Grades are denoted by letters O, A+, A, B+, B, C, P and F.

Letter Grade	Grade Point	Class
O	10	Outstanding
A+	9	Excellent
A	8	Very Good
B+	7	Good
B	6	Above Average
C	5	Average
P	**4**	**Pass**
F	**0**	**Fail**
Ab	**0**	**Absent**

3. "Grade Point": It is a numerical weight allotted to each letter grade on a 10-point scale. Grade Point shall be"0 (Zero)"for Letter Grade "Ab" and "F". The marks scored by the examinee shall be converted into grade points by dividing the marks scored in the aggregate and dividing the resulting number by maximum marks, multiplying the result by ten, retaining the integer part (ignore the fractional part).Thus if a person has secured 56 marks out of 100 marks in aggregate for a course, we get (56/100) x 10 which is5.6.Ignoring the fraction, we get 5 as the grade point.

1. "**Credit Point**": It is the product of grade point and number of credits for a course.
2. "**Cumulative Grade Point Average (CGPA)**": It is a measure of overall cumulative performance of a student overall Year. The CGPA is the ratio of total credit points secured by a student in various courses in all Year and the sum of the total credits of all courses in all the Years. It is expressed up to two decimal places.
3. "**Transcript or Grade Card or Certificate**": Based on the grades earned, a grade certificate shall be issued to all the registered students after every Year. The grade certificate will display the course details (code, title, number of credits, grade secured) along with CGPA earned till that Year.

Evaluation Pattern

Separate and independent passing @ 40% in EE and (CAT+EE) shall be essential for Theory and Practical component of each course. "CA, EE and Total marks" shall be separately reported for each course in the transcript or mark-statement.

1. **Only 1 attempt** for EE for **each** course shall be allowed in **each** Year. **Maximum 1 attempt**, for CAT for **each** course, shall be allowed in **each** Year.
2. Only best of past performance shall be reported in transcript or mark statement.
3. **Total student evaluation for**
    a. **Each** Year shall be for **600** marks.
    b. **Each** regular PG degree shall be for **1200** marks.

SN	Type of Course	Continuous Assessment	End Examination
1	Theory (T)	"Continuous Assessment (**CA**)" of total **20** 4SAQs, each of 5marks, 1 SAQ on **each** CR in a **Single attempt only**	"End Examination (**EE**)" of total **80** Marks and **16** "Short Answer Questions (SAQs)"**each** of **05** marks (**4 out of 5 SAQs on each Credit**), during **150** Minutes
2	Practical (P)	Student is required to submit "Activity Report" of total 10 Marks and total 2 Activities, each of 5 Marks on **each** CR in a **Single Attempt only**	External and internal examiners shall assess each student based on for total 40 Marks: Conduct of One Randomly Selected Practical Activity – 10 Marks Viva-Voice – 10 Marks Journal (Workbook) - 10 Marks and Report of Practical Activity – 10 Marks **Duration**: 120 minutes

Evaluation Pattern Of Practical Type Courses of 2 CR

SN	Description	Internal Examiner	External Examiner	Total Marks
	Duration of End Exam: 120 minutes(2hrs) Batch size: ≈ 15 students			
a	Actual Conduct of 1 randomly selected practical activity	04 Marks	06 Marks	10
b	Viva-Voice	03 Marks	07 Marks	10
c	Workbook	04 Marks	06 Marks	10
d	Report of Practical Activity with Diagram, synoptic Answers, Graph/Observation and Conclusion	04 Marks	06 Marks	10
Total		**15 Marks**	**25 Marks**	**40 Marks**

Successful Completion of Course or Programme

1. "Successful Completion of the Course" means - either course is exempted or student gets minimum specified or better grade, either in end examination of that course or by credit transfer. A student obtaining grade "F" shall be considered failed and will be required to reappear in the examination. The student obtained minimum "P" (Pass) letter grade required for successful completion of the each course.
2. "Successful Completion of the Programme" means – all courses at all year are successfully completed either in end examination of that course or by credit transfer and the student obtained "P" (Pass) letter grade for all courses at all years along with minimum specified CGPA.

Year 01

PHY011: Mathematical Physics and Classical Mechanics

Course Information

Year	Code	Course Name	CR	CST	ST	CA	EE	TM	Type
01	PHY011	Mathematical Physics and Classical Mechanics	4	8	120	20	80	100	T

Presumed Knowledge and Learning Objectives

Presumed Knowledge	Learning Objectives
For successful completion of this course, student should have successfully complete: • Eligibility criteria required for admission to this PG Course	After successful completion of this course, student should be able to • apply the mathematical skills to solve quantitative problems in the study of physics. • apply the Variation principles to real physical problems

Units and Detailed Syllabus

UN	Detailed Syllabus of the Unit	CR
1-1	**Legender's Polynomials**: Aims and Objectives, Introduction, Legendre's Differential Equation and Its Solution, Associated Legendre's Polynomial, Generating Function, Rodrigue's Formula, Orthogonal Properties of $P_n(x)$, Recurrence Formulae, Summary, and Model Examinations Questions.	CR 01
1-2	**Bessel Functions**: Aims and Objectives, Introduction, Bessel's Differential Equation and Solution , Generating Function For $J_n(x)$, Recurrence Formulae For $J_n(x)$,Orthogonal Property , Summary , Model Examinations Questions	
1-3	**Hermite Polynomials**: Aims and Objectives, Introduction, Hermite Differential Equation and Solution , Hermite Polynomials , Generating Function of Hermite Polynomials, Recurrence Formulae , orthogonality of Hermite Polynomials ,Rodrigre's Formulae , Summary , Model Examinations Questions	
1-4	**Laplace Equation and Wave Equation**: Aims and Objectives, Introduction , Solution of laplace Equation in Cartesian Coordinates , Application of Wave Equation (Vibration of Rectangular Membrane , Vibration of Circular membrane , Summary , Model Examinations Questions	

2-1	**Fourier Transforms and Applications**:. Aims and Objectives, Introduction , Nomenclature and Definition of Fourier Transforms , Relationship Between Fourier Transforms and Laplace Transforms , Linearity Property , Scaling Property , Time shifting Property, Frequency Shifting Property , Integration Property , Time Convolution Property , Frequency Convolution Property , Parseval's theorem Fourier Transform For Dirac Delta Function , Examples , Finite fourier Sine Transform of F(x) , Finite fourier cosine Transform of F(x) , some Operational Properties of Finite sine and Cosine Transforms , Summary , Model Examinations Questions , References.	
2-2	**Laplace Transforms and Applications:** Aims and Objectives, Introduction , Definition of Laplace Transform , Some Properties of Laplace Transform (Linearity Property , First shifting(Translation) property , Second Shifting (Translation) property , Change of Scale Property) , Laplace Transform of Derivatives ,Derivatives of Laplace Transform , integral of Laplace Transform , Laplace Transform of Periodic Function , Laplace Transform of convolution Integral , Initial Value Theorem , Final Value Theorem , Behavior of f(S) as $S \to 0$ ans $S \to \infty$, Laplace Transform Of Some Special Functions, The Gamma Function , The Bessel Function , Error Function ,Dirac Delta Function , Evaluation of certain Integrals by Laplace Transform , Application of Partial Differential Equations partial Fractions, electric Circuits, A Short Table Of Laplace Transform , Summary , Model Examinations Questions , References.	
3-1	**Tensor Algebra:** Aims and Objectives , Introduction, Transformation of coordinates and summation convention , contravariant Vector , scalar Invariant and covariant Vector, Definition of Tensor, Tensor of Second Order and Any Order , Symmetric and skew Symmetric Tensors ,Open and Outer Product of two Tensors , Contraction of Tensors , Inner Product or compounding of Two Tensors , Quotient Law Conjugate or Reciprocal Symmetric Tensors , Tensors In Elasticity (Strain Tensor , Physical Significance Of strain Tensor, Stress Tensor), Simple rule Regarding Indices, Summary , Model Examinations Questions , References	**CR 02**
3-2	**Metric Tensor and Chrioffel Symbols** : Aims and Objectives , Introduction, Fundamental Tensor , Magnitude of Vector, Associate Covariant and Contravariant Vectors ,Cristoffel Symbols , Law Of Transformation for Cristoffel Symbols ,Covariant Derivatives of Covariant Vectors, Covariant Derivatives of Scalar Invariant ,Curl of Vectors , Covariant Derivatives of Contravariant Vectors , Covariant Derivatives of Second Order Covariant Tensor , Divergence of Vectors , Laplacian of Scalar Invariant , Summary , Model Examinations Questions , References	

4-1	**Lagrangian Mechanics:** Aims and Objectives, Introduction, Mechanics of Particle, mechanics of Constraints, Principles of Virtual Work, D- Alembert's system of particles, Generalized co-ordinates, Principle, Worked Example , Model Examination Questions	CR 03
4-2	**Lagrange's Equations:** Aims and Objectives, Introduction, Lagrange's Equations from D-Alembert's Principle, Applications of Lagrange's Equations , Velocity-Depends Potentials and the Dissipation Function , Model Questions	
4-3	**Hamilton's Principle:** Aims and Objectives, Introduction, Hamilton's Principle , Lagrange's Equation From Hamilton's Principle , Lagrange's Equation for Non-Conservative and Non-Holonomic System , Model Examination Questions.	
4-4	**Hamilton's Mechanics:** Aims and Objectives, Introduction, Hamilton's Equation of Motion, Cyclic Co-ordinates , physical Significance of Hamiltonian Or The time independent Hamiltonian, Principle of Least action, Model Questions	
4-5	**Canonical Transformation and Hamilton- Jacobi Theory:** Aims and Objectives, Introduction, Canonical Transformations, Examples of Canonical Transformation, Conditions for a Transformations To be Canonical , Hamilton- Jacobi Equations , Harmonic Oscillator problem by Hamilton- Jacobi Method ,Model Questions	
4-6	**Poissons Brackets:** Aims and Objectives, Introduction **,** Poissons Brackets , Invariant of Poisson Brackets under Canonical Transformations , Hamilton's Equation in Poissons Brackets Nation, Model Questions , Reference Books.	
5-1	**Numerical Interpolation:** Aims and Objectives, Introduction **,**Numerical Interpolation, Finite Differences and Interpolation(Forward Differences ,Backward Differences, The Shift Operators and the Difference Operators, Differences of Polynomial), Interpolation Using Forward Differences ,Newton's Backward Difference Interpolation , Lagrange's Polynomial Interpolation(Inverse Interpolation , Summary , Model Questions, Answers to Model Questions.	CR 04
5-2	**Numerical Differentiation :** Aims and Objectives and Introduction ,Differentiation Based on Equal Interval Interpolation , Derivatives using Newton's Forward Difference Formula **,**derivatives using Newton's Backward Difference Formula, Differentiation Based on lagrange's Interpolation Formula, Summary, Model questions , Answers to Model Questions	
5-3	**Numerical Integration :** The General Quadrature Formula For Equidistant Ordinates(The Trapezoidal Rule, Geometric Interpretation of the Trapezoidal rule, Simpson's One Third Rule, Graphical illustration of the Application of Simpson's 1/3rd Rule, Simpson's Three Eight's Rule, Graphical illustration of the Application of Simpson's 3/8 Rule), The Gaussian Quadrature Formula	

5-4	**Solution Of Equations:** Solutions of Nonlinear Equation(The Bisection Method, The Newton-Raphson Method), Systems of Linear Equations(The Gauss Elimination Method, The Triangularisation Method), Matrix Methods to Solve Linear Equations, Finding the Inverse of a Matrix by Compact Schemes(The Gauss-Jordan Method), Jacobi's Iterative Method (The Gauss-Seidel Method)	
5-5	**Numerical Solutions Of Ordinary Differential Equations:** Initial Value Problems, The Taylor Series Method (Merits and Demerits of Taylor's Series Method), Euler,s Method (Modified Euler's Method), Runge- Kutta Methods(Runga-Kutta second order method, Runga-Kutta fourth Order methods).	

Learning Resource Details

LR Code	Title Author	Edition Year	ISBN Publisher
Text-Books			
PHY011	Mathematical Physics and Classical Mechanics - Dr. P. Babu Rao - Prof. G. T. Naidu - Prof. G. Satyanandam - Dr. V. V. Subrahmanya Sharma	2006	BRAOU
Reference-Books: Explore additional details and reinforce learning, with this optional learning resource!			
PHY011 –RB1			
CD / DVD: Explore additional details and reinforce learning, with this optional learning resource!			
PHY011 -CD1			
Web Links: Explore additional details and reinforce learning, with this optional learning resource!			
PHY011-WL1			

PHY012: Statistical Mechanics and Quantum Mechanics

Course Information

Year	Code	Course Name	CR	CST	ST	CA	EE	TM	Type
01	PHY012	Statistical Mechanics and Quantum Mechanics	4	8	120	20	80	100	T

Presumed Knowledge and Learning Objectives

Presumed Knowledge	Learning Objectives
For successful completion of this course, student should have successfully complete: • BSc with Physics or Mathematics or equivalent from a recognized University/Board.	After successful completion of this course, student should be able to • Explore the concepts of Phase space, Macro and Microstate • Interpret thermodynamic probability • Illustrate Maxwell-Boltzmann law - distribution of velocity • Investigate the basic concepts of quantum statistics • Validate Fermi-Dirac distribution law - electron gas and Bose-Einstein distribution law - photon gas

Units And Detailed Syllabus

UN	Detailed Syllabus of the Unit	CR
1-1	**Statistical Mechanics - Thermodynamics:** Macroscopic and Microscopic States, Phase space (Division of phase space into cells, volume in phase space), Constraints.	CR 01
1-2	**Ensembles:** Definition of an Ensemble, Different types of Ensembles (Micro Canonical, Canonical, Grant Canonical), Uses of Ensembles.	
1-3	**Density Distribution- Liouville's Theorem:** Density of distribution in phase space, Liouville's Theorem, Density of phase point in a canonical ensemble.	
1-4	**Postulate of Classical Statistical Mechanics:** Postulate of equal a priori probability, Statistical equilibrium, Thermal equilibrium, Mechanical equilibrium, and Particle equilibrium, Connection between statistical and thermodynamic parameters.	
1-5	**Micro Canonical Ensemble:** Definition and explanation of micro canonical ensemble, perfect gas in micro canonical ensemble, Gibb's paradox, Resolving the paradox,	

	Partition function and Thermodynamics functions.	
1-6	**Maxwell- Boltzmann Statistics:** Maxwell- Boltzmann Statistics, Maxwell- Boltzmann distribution of velocities, Boltzmann equipartition theorem.	
1-7	**Canonical And Grand Canonical Ensembles:** Canonical Ensemble, Thermodynamics Parameters, Ideal gas in Canonical ensemble, Grand Canonical ensemble, Thermodynamic parameters with grand canonical ensemble, Ideal gas in grand canonical ensembles, Fluctuations.	
2-1	**Postulate of Quantum Statistical Mechanics:** Postulate of quantum statistical mechanics, Density matrix Liouville's theorem, Micro canonical ensemble, Canonical ensemble, Grand canonical ensembles.	
2-2	**Quantum Statistics- B.E. and F.D. Statistics:** The three statistics, Distribution function, B.E. distribution function, F.D. Statistics function, Comparison of the three statistics.	
3-1	**Birth of Quantum Mechanics:** Necessity of Quantum Mechanics, Postulates of Quantum Mechanics, Wave function and operators, Hermitian operators and their properties, Wave function and its interpretation, Conditions on the wave functions, Superposition principle and wave packet, Completeness.	**CR 02**
3-2	**Eigen Value and Eigen Functions:** Eigen values and Eigen functions, Degenerate Eigen functions and degree of degeneracy, Orthonormality of Eigen functions.	
3-3	**Dirac's Bra And Ket Vectors:** Dirac's Bra and Ket notation, Expectation value and Dynamical variable and operators, Ehrenfest Theorem.	
3-4	**Eigen Functions and Uncertainty Principle:** Eigen functions of commuting operators, Theorems, Uncertainty principle.	
4-1	**Schrodinger Wave Equation:** Time dependent wave equation, Time independent wave equation, Stationary states, Free particle solutions, Dirac delta normalization.	
4-2	**Applications of Schrodinger Equations one Dimensional Problem:** Solutions of wave equations for a particle moving in one dimension in potential step, Solutions in potential well with finite and infinite walls, Square well potential with finite wall.	**CR 03**
4-3	**Angular Momentum:** Angular momentum-Commutation relations for angular momentum operator, Eigen value problem for L^2 and L_z Linear harmonic oscillator.	
4-4	**Application of Schrodinger Equation To Three Dimensional problems:** A Particle moving in three dimensional boxes in a constant potential field with finite walls, Rigid Rotator.	

4-5	**Hydrogen Atom:** Schrodinger Wave equation for the Hydrogen Atom, Solution of ø equation, Solution of Θ equation, Solution of radial part, Normalization for the function R(ρ).	
4-6	**Spin Angular Momentum:** Spin operators and Eigen values, Pauli spin matrices for electron, Commutation relations of spin operators, Two component wave functions, Pauli's eigen values and eigen functions, Electron spin functions.	
4-7	**Addition Angular Momenta Clebsch-Godvan Coefficients:** Clebsch-Gordan Coefficients, Calculation of Clebsch-Gordan coefficients for p-state of electron, Scalar operators,vector operators, spherical harmonics, Rotations, Transformation properties of angular momentum eigen functions under rotations, Connections between spherical harmonics and the functions, Euler's theorem, Wiegner- Eckart theorem.	
5-1	**Time Independent Perturbation Theory:** Time independent perturbation theory (First order perturbation theory, Higher order perturbations), Helium atom, Degenerate perturbation theory, Stark effect in Hydrogen atom.	
5-2	**Variation Method:** Variation Method, Application to ground state of Helium atom, Application to harmonic oscillator, Application to excited states of Harmonic oscillator and hydrogen atom, WKB Approximation method, Connecting formulae, Application to potential well, Application to α-decay Time independent perturbation theory.	
5-3	**Time Dependent Perturbation Theory:** Time dependent perturbation theory, Fermi Golden Rule, Harmonic perturbation, Adiabatic and Sudden Approximation, Einstein Transition coefficient.	CR 04
6-1	**Kelvin Gordon Relativistic equation and Application:** Kelvin Gordon Relativistic equation, Probability and current density, Application of K.G. equation to Hydrogen atom, Inadequacies of K.G. Equation.	
6-2	**Dirac's Relativistic equation and Application:** Dirac's relativistic equation, Dirac's matrices and free particle solution, Probability and current densities, Spin of a dirac particle, Dirac's equation in the presence of electromagnetic field, Negative energy state.	

Learning Resource Details

LR Code	Title Author	Edition Year	ISBN Publisher
Text-Books			
PHY012-T01	Statistical Mechanics and Quantum Mechanics - Prof. K. Ravindra Prasad	2006	BRAOU

	- Prof. D. Punya Seshudu - Prof. D. Raja Reddy		
Reference-Books: Explore additional details and reinforce learning, with this optional learning resource!			
PHY012 –RB1			
CD / DVD: Explore additional details and reinforce learning, with this optional learning resource!			
PHY012 -CD1			
Web Links: Explore additional details and reinforce learning, with this optional learning resource!			
PHY012-WL1			

PHY013: Solid State Physics

Course Information

Year	Code	Course Name	CR	CST	ST	CA	EE	TM	Type
01	PHY013	Solid State Physics	4	8	120	20	80	100	T

Presumed Knowledge and Learning Objectives

Presumed Knowledge	Learning Objectives
For successful completion of this course, student should have successfully complete: • BSc with Physics or Mathematics or equivalent from a recognized University/Board.	After successful completion of this course, student should be able to • The students will be able to understand the Various Crystal structure. • The students will be able to understand the magnetic properties of crystal.

Units And Detailed Syllabus

UN	Detailed Syllabus of the Unit	CR
1-1	**Crystalline State of Crystal Structure:** Crystal, The Language of crystals, Crystal structure, Crystal symmetry, Translational symmetry operation, Point symmetry operations, point Groups, Bravais Lattices and crystal systems, Space groups, Miller Indices, Inter planer Spacing- separation between lattice planes, Atomic packing in crystals, Important crystal structures.	CR 01
1-2	**Non Crystalline State:** Distinction between crystalline and non-crystalline states, Glass characterizing Properties, Distinction between amorphous solids and glasses, Glass formation, Composition of oxide glasses, Glass Transition, Various definition of Glass, Liquid to crystal transition Vs Liquid to Glass Transition, Kinetic Nature of the Glass Transition, Types of Glasses, Methods of preparation of Glasses.	
1-3	**Element of X-Ray Diffraction:** Bragg's Law, Diffraction Directions, Laue treatment of X-Ray diffraction, Intensity of diffracted beam, Reciprocal Lattice, Application to some cubic lattices, Ewald Construction- Bragg's law in terms of reciprocal lattices vectors, Brillouin Zones.	
1-4	**Experimental Techniques For Structure Determination:** Experimental methods of X-Ray diffraction, Laue Method, The powder method, The Powder diffractometer, application, Limitation, Conclusions, Electron Diffraction, Neutral Diffraction.	
2-1	**Imperfections In Crystals:** Classification of Imperfections, Thermodynamical Consideration for the existence of defects, Schottky defects in metals, Frenkel defects in	

	metals, Schottky defect in ionic crystals, Frenkel defect in ionic crystals, Extrinsic defects, Color centers.	
2-2	**Diffusion:** Diffusion Mechanisms, Steady state Diffusion- fick's first law, Non- steady state diffusion- Fick's second law, Coefficient of diffusion, Chemical diffusion- Kirkendall effect, Ionic conduction, Einstein's Relation, Ionic conduction in alkali halides.	**CR 02**
2-3	**Dislocation:** Line defects, Edge dislocations, Screw dislocation, Energy of a dislocation, Mixed dislocation, Observation of dislocation, Grain boundaries, Dislocation multiplication.	
3-1	**Free Electron Theory:** Important properties of metals, Theories of metals, the Drude model, Lorentz modification of the Drude model, Sommerfeld model, Parameter of free electron gas, Effect of temperature on the parameters of free electron gas, Heat capacity, Drawbacks of Sommerfeld theory.	
3-2	**Band Theory of Solids:** Formation of energy bands in crystals, Bloach theorem, Kronig Penney model,, Distinction between metals, Insulators and Semiconductors	
3.3	**Semiconductors:** Different varieties of semiconductors, Classification of semiconductors, Band structure in semiconductors, Energy gap, Fermi level and Fermi function, Conductivity of Intrinsic semiconductor, Carrier concentration of charge carriers in extrinsic semiconductors, Hall effect in semiconductors.	
3.4	**Solid State LASERs:** Principle of LASER Emission, Popular Inversion, Laser Oscillations, Properties of a LASER light, Solid state LASERs, Ruby LASER, Nd-YAG LASER, GaAs based semiconductor LASERs, Application of LASERs.	
4-1	**Elastic Waves In Solids:** One-dimensional chain of identical atoms, Characteristics of the dispersion curve, The Brillouin Zones, Diatomic linear chain of atoms, Vibrational modes of diatomic linear lattice, Properties of acoustic and branches.	
4-2	**Infrared Absorption In Ionic Crystal:** Infra-red adsorption in ionic crystals, Phonons, Verification of dispersion relation in crystal lattices.	
4-3	**Lattice Heat Capacity:** Einstein Model, Debye Model, Thermal conductivity, phonon Mean Free Path, Thermal expansion, Gruneisen Parameter.	**CR 03**
5-1	**Microscopic Description of Dielectrics:** Induced Dipole in dielectrics, Polarization charge density, Macroscopic theory of dielectric constant, Properties of E and D, Microscopic view f dielectrics, Local fields in dielectrics, Polarizability, Electronic Polarizability, Ionic Polarization, Orientation Polarization.	
5-2	**Measurement of Dielectric Constant:** Measurement of dielectric constant, Schearing	

	Bridge, Resonance Bridges, Auto-balancing bridge, Clausius-Mossoti relation, Lorentz-Lorentz relation, Frequency dependence of electronic Polarizability, Breakdown of dielectrics, Mechanism of Breakdown, Dielectric Materials.	
5-3	**Ferroelectrics:** General characteristics of ferroelectrics, Classification of ferroelectrics, Theories of Ferro electricity, Application of ferroelectric materials.	
6-1	**Magnetism:** Diamagnetism, Larmor- Langevin theory, Quantum Theory of diamagnetism, Paramagnetism Paramagnetic cooling.	
6-2	**Spontaneous Magnetization:** Ferromagnetism, Molecular field- Weiss-domain model, Curie- Weiss law, Heisenberg Exchange Interaction, Ferromagnetic domains, Hysteresis loop, Anti-ferromagnetism, Bloch's theory of anti-ferromagnetism, Ferrimagnetism theory, Application of ferrites.	
6-3	**Occurrence of Superconductivity:** Experimental observations, Superconductivity and Transition temperature, Zero resistance, Effect of magnetic field on superconductivity, Meissner effect, Persistent currents, type I Type II superconductors, isotope effect, Entropy, Specific heat Energy gap and its nature, Thermal conductivity, Absorption of electromagnetic radiation.	**CR 04**
6-4	**Superconductivity- Theoretical Explanations:** London Equations, Flux Quantization, BCS theory, Tunneling effects in superconductors- Giaever tunneling, Josephson effect, Elements of high temperature superconductors, Applications.	

Learning Resource Details

LR Code	Title Author	Edition Year	ISBN Publisher
Text-Books			
PHY013-T01	Solid State Physics - Prof. Bhima Shankaram - Prof. M. Lakshmipati Rao - Dr. G. Prasad	2017	BRAOU
Reference-Books: Explore additional details and reinforce learning, with this optional learning resource!			
PHY013 –RB1			
CD / DVD: Explore additional details and reinforce learning, with this optional learning resource!			
PHY013 -CD1			
Web Links: Explore additional details and reinforce learning, with this optional learning resource!			
PHY013-WL1			

PHY014: Semiconductor Devices Analog and digital electronics

Course Information

Year	Code	Course Name	CR	CST	ST	CA	EE	TM	Type
01	PHY014	Semiconductor Devices Analog and Digital Electronics	4	8	120	20	80	100	T

Presumed Knowledge and Learning Objectives

Presumed Knowledge	Learning Objectives
For successful completion of this course, student should have successfully complete: • BSc with Physics or Mathematics or equivalent from a recognized University/Board.	After successful completion of this course, student should be able to • Distinguish between conductor, insulator and semiconductor. • Explain the intrinsic and extrinsic semiconductor. • Differentiate the intrinsic and extrinsic semiconductor

Units and Detailed Syllabus

UN	Detailed Syllabus of the Unit	CR
1-1	**Semiconductor Diodes:** Basic concept of p-n junction diode, Types of Diodes, Photo Diode, Solar Cell, LED, Varactor Diode, Zener Diode, Silicon Controlled Rectifier, Photo Transistor.	CR 01
1-2	**Transistors:** Construction and V-I characteristics of BJT, Construction and V-I characteristics of UJT, Construction and V-I characteristics of JFET, Construction and V-I characteristics of MOSFET.	
1-3	**Power Supplies:** Rectifiers, Voltage regulator, Zener Diode Regulated Power Supply, Electronic series regulated power supply, IC voltage regulator, Switching mode power supplies.	
1-4	**Feedback Amplifier:** Concept of feedback, Feedback Amplifier, Advantages of Negative feedback Amplifier, General characteristics of negative feedback amplifier, Classification of feedback amplifiers.	
1-5	**RC Coupled Amplifier and its frequency Response:** Types of Amplifiers, Transistor as an Amplifier, Single Stage RC Coupled Transistor Amplifier, Frequency response, Applications of RC coupled Amplifier.	
1-6	**Oscillators(Using Transistors):** Oscillatory Circuit, Positive feedback amplifier-Oscillator mechanism, Bark Hausen criterion, Classification of Transistor oscillators, Phase Shift	

	Oscillator, Colpitt's Oscillator, Hartley Oscillator.	
1-7	**Multivibrators (Using transistor):** Astable Multivibrator, Frequency of Oscillations, collector coupled astable multivibrator, gated astable multivibrator, Schmitt Trigger, Application of Schmitt Trigger.	
2-1	**Operational Amplifier and It's Characteristics Parameters:** Operational feedback, Block Diagram of Op-Amp, Characteristics of Op-Amp, Op-Amp Parameter and specification.	CR 02
2-2	**Operational Amplifier Configurations:** inverting configuration, The Miller effect, Non-inverting configuration, comparison between the two configurations.	
2-3	**Operational Amplifier – Frequency:** Open- loop Frequency response, Closed loop frequency response, Stability of Op-Amp.	
2-4	**Operational Amplifier- Linear Application:** Summing Amplifier, Integrator, Differentiator, Basic Comparator, Solving of second order differential equation.	
2-5	**Operational Amplifier- Non-Linear Applications:** Half-Wave Precision rectifier, Full-Wave Precision Rectifier, Logarithmic Amplifier, Exponential Amplifier, Differential Amplifier.	
2-6	**Operational Amplifier- Waveform Generators:** Sine Wave Generator, Square Wave Generator, Triangular Wave Generator.	
3-1	**Introduction To Digital Electronics and Logic Gates:** Boolean Algebra, Logic system, De'Morgan's Theorem/Laws, Duality Theorem, NAND gate, NOR gate, Universal Building Blocks, The exclusive- OR gate.	CR 03
3-2	**Application of Exclusive-OR Gate:** Half-Adder, Full-Adder, Parallel Adder, Subtractors, Adders/ Subtractor, Parity checker/ Generator, Binary-Gray code converters.	
3-3	**De-Morgan's Theorem, Fundamental Products, K-Map:** Postulate of Boolean Algebra, De-Morgan's Theorems, Fundamental Products and fundamental sums, Canonical form, Standard forms, Karnaugh Map, K-Map simplification.	
3-4	**Flip-Flops:** Types of Flip-Flops, RS Flip-Flops, Clocked RS Flip-Flop, D- Flip-Flop, JK Flip-Flop, T- Flip-Flop.	
3-5	**Shift Registers:** serial-in/Serial-out Register, Parallel-In-Serial-Out Shift register using D flip-flops, Serial-In-Parallel-Out Shift register, Parallel-In-Parallel-Out register, Ring Counter, Applications.	
3-6	**Counters:** Ripple counters, MOD-8 counter, MOD-7 counter, MOD-5 counter, Mod-3	

	counter, Mod-16 counter, MOD-10 counter.	
3-7	**Multiplexers and Demultiplexer:** Multiplexer, Demultiplexer, BCD to &-segment displays, Binary Coded Decimal, BCD to &-segment decoders, BCD to Decimal decoders, Binary decoders.	
4-1	**Digital-to-Analog (D/A) Converters:** D/A converters, Variable Resistor Network, Binary Ladder network, Resolution, Accuracy, Linearity, Setting Time.	CR 04
4-2	**Analog-to-Digital (A/D) Converters:** A/D converters, Quantization, Flash method, Counter method, Dual-Slope technique, Successive Approximation converter, Accuracy, Resolution.	

Learning Resource Details

LR Code	Title Author	Edition Year	ISBN Publisher
Text-Books			
PHY014-T01	Semiconductor Devices Analog and Digital Electronics - Prof. G. T. Naidu - Dr. B. Rama Murthy - Mrs. V. Rama - Mr. L. Anjaneyulu - Dr. G. Pushpa Chakrapani	2017	BRAOU
Reference-Books: Explore additional details and reinforce learning, with this optional learning resource!			
PHY014 –RB1			
CD / DVD: Explore additional details and reinforce learning, with this optional learning resource!			
PHY014-CD1			
Web Links: Explore additional details and reinforce learning, with this optional learning resource!			
PHY014-WL1			

PHY015: Heat and Acoustics

Course Information

Year	Code	Course Name	CR	CST	ST	CA	EE	TM	Type
01	PHY015	Heat and Acoustics	2	8	120	10	40	50	P

Presumed Knowledge and Learning Objectives

Presumed Knowledge	Learning Objectives
For successful completion of this course, student should have successfully complete: • BSc with Physics or Mathematics or equivalent from a recognized University/Board.	After successful completion of this course, student should be able to • Understand the various concept of Heat and thermodynamic • Understand the various concept of Acoustics

Units and Detailed Syllabus

UN	Detailed Syllabus of the Unit	CR
1-1	**Errors:** In this experiment we will learn about errors in measurements and also estimate the best value of a quantity measured.	CR 01
1-2	**Thermal conductivity of a bad conductor- Lee's Method:** To determine the coefficient of thermal conductivity of a bad conductor using Lee's Method.	
1-3	**Determination of melting point of Wax – thermo E. M. F. diagram Potentiometer:** To determine determination of melting point of Wax using thermo E. M. F. diagram with help of a Potentiometer.	
1-4	**Study of Variation of Specific Heat of Graphite with Temperature:** To study the Variation of specific heat of graphite with Temperature.	
1-5	**Stefan's Constant:** To determine the Stefan's Constant.	
1-6	**Coefficient of Viscosity – Meyer's Formula:** To determine the Coefficient of Viscosity of liquid (say water) by oscillating disc method using Meyer's Formula.	
2-1	**Elastic Constants of the Material of a Spiral Springs:** To determine the elastic constants of the material of a spiral springs.	CR 02
2-2	**Energy Gap of a Semi-Conductor:** To determine the energy gap of a semi-conductor.	
2-3	**Ultrasonic Velocity in Liquids Debye – Sears Method:** To determine the Velocity	

	Ultrasonic waves in different Liquids by Debye – Sears Method.
2-4	**Ultrasonic Velocity in Liquids Ultrasonic Interferometer Method:** To determine the velocity of ultrasonic waves in different liquids and liquids mixtures using ultrasonic interferometer method.
2-5	**Fibre Optics – Determination of Numerical Aperture and Losses:** To determine the numerical aperture of the optical fibre and the losses in optical fibre due to cable, coupling, bending, air gap, etc.,
2-6	**Fibre Optics – Conversion of Electrical to Optical and to Electrical Signal:** To study the relationship between LED DC forward current and LED optical output power and determine the linearity of the LED.

Learning Resource Details

LR Code	Title Author	Edition Year	ISBN Publisher
Text-Books			
PHY015-T01	Heat and Accoustics - Dr. B. Appa Rao - Prof K. Gnana Prasuna - Dr. V. V. Subrahmanya Sharma	2009	BRAOU
Reference-Books: Explore additional details and reinforce learning, with this optional learning resource!			
PHY015 –RB1			
CD / DVD: Explore additional details and reinforce learning, with this optional learning resource!			
PHY015 -CD1			
Web Links: Explore additional details and reinforce learning, with this optional learning resource!			
PHY015-WL1			

PHY016: Optics

Course Information

Year	Code	Course Name	CR	CST	ST	CA	EE	TM	Type
01	PHY016	Optics	2	8	120	10	40	50	P

Presumed Knowledge and Learning Objectives

Presumed Knowledge	Learning Objectives
For successful completion of this course, student should have successfully complete: • BSc with Physics or Mathematics or equivalent from a recognized University/Board.	After successful completion of this course, student should be able to • Obtain the interference pattern of light experimentally by using Young's double slit, Bi-prism, Lloyd's mirror • Demonstrate different methods to obtain steady interference pattern. • Understand the term monochromatic, coherence, coherent sources, incoherent sources, coherent waves, incoherent waves.

Units And Detailed Syllabus

UN	Detailed Syllabus of the Unit	CR
1-1	**Biprism – λ of Sodium Light:** To determine the wavelength λ of a sodium light using biprism.	CR 01
1-2	**Biprism – Thickness of a Thin Mica Sheet:** To determine the thickness of a Thin Mica Sheet using Biprism arrangement.	
1-3	**Cauchy's Constant:** To study the variation of refractive index of the material of the prism with wavelength and to verify Cauchy's dispersion relation.	
1-4	**Determination of Wavelength and Difference in Wavelength of Sodium Source using Michelson Interferometer:** To determine the wavelength of sodium light using Michelson Interferometer.	
1-5	**Y – of a Glass Plates – Newton's Rings' Method:** To determine the Young's modulus of the glass (taken in the form of a bar) using Newton's Rings' Method.	
1-6	**Determination of Photoelastic Constant of Transparent Material:** To study the Photoelasticity of a Transparent Material.	

2-1	**Study of Dispersion Spectra - Double Refraction:** To study the Dispersion Spectra of a prism made of double refracting material such as quartz or calcite.	CR 02
2-2	**Verification of Malus Law:** To verify Malus Law.	
2-3	**Determination of Wavelength of Laser Using Diffraction Grating:** To determine the wavelength of a given Laser Using Diffraction Grating.	
2-4	**Hart Mann's Dispersion Formula:** To verify Hartmann's Dispersion Formula using constant deviation spectrometer or ordinary spectrometer.	
2-5	**Study of Led Characteristics And Determination of Plank's Constant:** study of I-V Characteristics of light emitting diode (LED) and determination of Planck's constant (h).	
2-6	**Determination of Rydberg Constant:** To find the Rydberg Constant using sodium emission lines.	

Learning Resource Details

LR Code	Title Author	Edition Year	ISBN Publisher
Text-Books			
PHY016-T01	Optics - Dr. B. Appa Rao - Dr. G. Bhikshamaiah - Dr. V. V. Subrahmanya Sharma	2008	BRAOU
Reference-Books: Explore additional details and reinforce learning, with this optional learning resource!			
PHY016 -RB1			
CD / DVD: Explore additional details and reinforce learning, with this optional learning resource!			
PHY016 -CD1			
Web Links: Explore additional details and reinforce learning, with this optional learning resource!			
PHY016-WL1			

PHY017: Basic Electronics

Course Information

Year	Code	Course Name	CR	CST	ST	CA	EE	TM	Type
01	PHY017	Basic Electronics	2	8	120	10	40	50	P

Presumed Knowledge and Learning Objectives

Presumed Knowledge	Learning Objectives
For successful completion of this course, student should have successfully complete: • BSc with Physics or Mathematics or equivalent from a recognized University/Board.	After successful completion of this course, student should be able to • Explain the construction of transistor. • Recall the characteristics of transistor.

Units and Detailed Syllabus

UN	Detailed Syllabus of the Unit	CR
1-1	**Power Supplies:** To construct a dc power supply using half wave, full wave and bridge rectifiers.	CR 01
1-2	**Zener Diode As A Voltage Regulator:** To construct an inexpensive Voltage Regulator with a Zener Diode and study its line and load regulation.	
1-3	**RC – Coupled Amplifier:** To construct RC – Coupled Amplifier (CE configuration) and study its frequency response for different collector (load) resistance. Plot the response curve and estimate gain, band-width product.	
1-4	**RC - Phase Shift Oscillator:** To construct a RC - Phase Shift Oscillator and study its frequency of oscillations.	
1-5	**Colpits Oscillator:** To construct and study the Colpits Oscillator and its frequency response for various values of d & L of the 'tank' circuit of the oscillator.	
1-6	**Operational Amplifier (OP – AMP) Characteristics:** To study the Characteristics of an Operational Amplifier (OP – AMP).	
2-1	**Operational Amplifier (OP – AMP) As An Inverting And Non – Inverting Amplifier:** To study the Operational Amplifier as an inverting & Non – Inverting Amplifier.	CR 02
2-2	**Wein Bridge Oscillator:** To construct a Wein Bridge Oscillator and study its response by changing its resistance and capacitance Values of the Bridge.	

2-3	**Triangular Wave Generator:** To construct a Triangular Wave Generator using Operational Amplifier IC 741
2-4	**Schmitt Trigger Using IC 741 (OP – AMP):** To measure the Upper triggering point (UTP) and Lower triggering point (LTP) of an OP – AMP Schmitt Trigger.
2-5	**Astable Multivibrator Using IC 555:** To construct an Astable Multivibrator Using IC 555(timer) and calculate its frequency and percentage of duty cycle.
2-6	**Monostable Multivibrator Using IC 555:** To construct a Monostable Multivibrator Using IC 555 and generate different pulse widths.

Learning Resource Details

LR Code	Title Author	Edition Year	ISBN Publisher
Text-Books			
PHY017-T01	Basic Electronics - Dr. B. Rama Murthy - Dr. N. Lalithakumari - Ms. V. Rama		BRAOU
Reference-Books: Explore additional details and reinforce learning, with this optional learning resource!			
PHY017 –RB1			
CD / DVD: Explore additional details and reinforce learning, with this optional learning resource!			
PHY017 -CD1			
Web Links: Explore additional details and reinforce learning, with this optional learning resource!			
PHY017-WL1			

PHY018: Digital Electronics and Computers

Course Information

Year	Code	Course Name	CR	CST	ST	CA	EE	TM	Type
01	PHY018	Digital Electronics and Computers	2	8	120	10	40	50	P

Presumed Knowledge and Learning Objectives

Presumed Knowledge	Learning Objectives
For successful completion of this course, student should have successfully complete: • BSc with Physics or Mathematics or equivalent from a recognized University/Board.	After successful completion of this course, student should be able to • Explain methods of analogue and digital measurement. • Distinguish between analogue circuit and digital circuit. • Recall the general number system.

Units and Detailed Syllabus

UN	Detailed Syllabus of the Unit	CR
1-1	**Verification of Boolean And Demorgan Theorem:** To verify Boolean And De-morgan's laws using IC's.	CR 01
1-2a	**Half Adder / Half Subtractor:** To construct an Half Adder / Half Subtractor circuit and test it.	
1-2b	**Full – Adder:** To construct a full Adder circuit and test it.	
1-3	**Verification of Flip – Flops:** To verify (a) S-R latch using NAND gates, (b) D flip-flop, (c) Master- Slave J-K flip-flop.	
1-4	**Implementation of Ring Counter And Johnson Counter:** To verify Ring Counter And Johnson Counter using IC 7474 (D flip-flops)	
1-5	**Counter (Part – A):** To construct an asynchronous (Ripple) counter using IC 7493, Mod 16 and Mod 8 counters.	
1-6	**Decade Counter:** To design a circuit to display the number from 0-9on seven segment display by using Ic7447 & IC 7490.	
1-7	**Digital to Analog Converter:** To design a circuit to convert Digital information into Analog information using IC 0808/IC 0800.	

2-1	**Crystal Oscillator:** To design a circuit diagram and to obtain frequency 200KHz and 20KHz from 2MHz crystal.	CR 02
2-2	**History of The 'C' Programing Language.**	
2-3	**Evaluation of Function:** Programme to find evaluation of Function Sin(x), Cos(x), and log(x).	
2-4	**Evaluation of Determinant of Matrix:** Programme to find determinant of Matrix and Matrix multiplication.	
2-5	**Solution of Non – Linear Equations:** Programme to implement Newton Raphson Algorithm to find the root of the equation.	
2-6	**Numerical Integration:** Programme to implement Trapezoidal method and Simpson's rule.	
2-7	**Solution For Differential Equations:** Programme to solve the ordinary Differential Equation for a particular value of x by EULERS METHOD.	
2-8	**Solutions TO System of Linear Equations:** Programme to find solution of system of linear Equation by GAUSS- ELIMINATION METHOD.	

Learning Resource Details

LR Code	Title Author	Edition Year	ISBN Publisher
Text-Books			
PHY018-T01	Digital electronics and computers - Prof. K. Madhukar - Dr. B. B. Rama Murthy - Dr. N. Lalithakumari - Ms. V. Rama	--	BRAOU
Reference-Books: Explore additional details and reinforce learning, with this optional learning resource!			
PHY018 –RB1			
CD / DVD: Explore additional details and reinforce learning, with this optional learning resource!			
PHY018 -CD1			
Web Links: Explore additional details and reinforce learning, with this optional learning resource!			
PHY018-WL1			

Year 02

PHY021: Nuclear Physics and analytical techniques

Course Information

Year	Code	Course Name	CR	CST	ST	CA	EE	TM	Type
02	PHY021	Nuclear Physics and Analytical Techniques	4	8	120	20	80	100	T

Presumed Knowledge and Learning Objectives

Presumed Knowledge	Learning Objectives
For successful completion of this course, student should have successfully complete: • BSc with Physics or Mathematics or equivalent from a recognized University/Board.	After successful completion of this course, student should be able to • Understand the various concept of nuclear physics. • Apply the different analytical techniques.

Units and Detailed Syllabus

UN	Detailed Syllabus of the Unit	CR
1-1	**Alpha Spectrum, Gamow's Theory of α- Decay:** Fine Structure of α- spectrum, Range of α-particles, Range- Energy (velocity) relationship, Geiger- Nuttal law, Gamow's theory of α-decay, α- particle energies and selection rules, Limitations in theory.	CR 01
1-2	**Beta Spectrum Neutrino Hypothesis, Fermi Theory of α- decay, Fermi- Kurie Plots, Selection rules for β- decay:** β- spectrum and features, Neutrino hypothesis, Fermi theory of β- decay, Fermi- Kurie plots, selection rules for β- decay.	
1-3	**Gamma Emission- Multiple Radiation- Selection rules for γ- decay:** Radiation transition in Nuclei, General features, Multipolarity in Gamma transitions, selection rules, Transition rate.	
1-4	**Classification of Elementary Particles- Fundamental Interactions- Conservation laws:** Discovery of Elementary particles, Fundamental Interactions, (Gravitational, Electromagnetic, Weak, Strong), Classification of elementary particles (Hadrons, Leptons, Photons), Conservation laws (Exact laws, Approximation laws).	
1-5	**Interaction of Charged Particles and Gamma Radiation with matter:** Interaction of charged particles with matter (Bohr's formula, Bethe's modification, Stopping power, Range- Energy relation, Straggling), Bremsstrahlung, Interaction of γ- radiation with matter (Photo- electric effect, Compton effect, Pair production).	
1-6	**Radiation Detectors:** Radiation detectors (Scintillation detectors, Solid state detectors,	

	Nuclear emulsion techniques).	
2-1	**Properties of Nucleus, Nuclear Radius, Nuclear Mass and Binding Energy, Angular Momentum, Nuclear Statistics, Parity and Symmetry, Magnetic Dipole moment, Electric Quadrupole moment:** Nuclear Radius, Nuclear mass and binding energy, Angular momentum, Nuclear statistics, Parity and symmetry, Magnetic dipole moment, Electric quadrupole moment.	CR 02
2-2	**Nature of Nuclear Forces, Two Body Problem, Bound and Spin States of Two Nucleons, Theory of Deuteron, Tensor Forces, Exchange Forces, Meson Theory of Nuclear Forces:** Nature of nuclear forces, Two body problem (Bound and Spin States of Two Nucleons, Theory of Deuteron), Tensor Forces, Exchange Forces, Meson Theory of Nuclear Forces.	
2.3	**Nuclear Model:** Liquid drop model, Semi empirical mass formula (Formula for the total binding energy of a nucleus, Weizsacher's semi empirical formula, Values of the empirical coefficients).	
2.4	**Shell Model:** Shell Model (Experimental evidence, Predictions, Achievements of the shell- model).	
3-1	**Types of Nuclear Reactions:** Types of nuclear reactions, Conservation laws, Kinematics of nuclear reaction (Expression for Q-value, Threshold energy and endoergic reaction, Double valued function of the projectile), Nuclear cross section, Compound nucleus, Discrete energy levels of nucleus; Breit –Wigner formula.	CR 03
3-2	**Basic Properties of Neutrons:** Basic properties of neutrons, Classification of neutrons, sloe=wing down of neutrons, Logarithmic decrement in energy, Moderating ratio, Neutron Diffusion- Neutron current density, Neutron leakage rate, Fermi age equation, Bohr and Wheeler theory of fission, Four-Factor formula.	
4-1	**Phase Contrast Microscopy, Scanning Electron Microscope, Transmission Microscope:** Phase contrast microscopy introduction, Principle, Theory, Instrumentation, Applications, Electron microscopy, Principle, Scanning Electron Microscope, Transmission Electron Microscope, Application of Electron Microscopes, Advantages of SEM over TEM.	
4-2	**Thermogravimetric analyzer, Principle, Instrument Control, applications, Differential Scanning Calorimetry, Principle, Instrumentation, Power Compensated DSC, Heat flux DSC, Temperature control methods, The average Temperature control , Differential Temperature control :** Thermogravimetric analyzer (TGA), Principle, Instrumentation- the balance, the furnace, Instrument Control, applications, Differential Scanning Calorimetry (DSC), Principle, theory, Instrumentation, Power Compensated DSC, Heat flux DSC, Temperature control methods- The average Temperature control , Differential Temperature control, Application.	

4-3	**Theory of Mossbauer Effect: Recoil-less Emission and Absorption of Gamma Rays – Nuclear Resonance, Experimental Technique to Observe Mossbauer Effect, Mossbauer Nuclides:** Theory of Mossbauer Effect: Recoil-less Emission and Absorption of Gamma Rays – Nuclear Resonance, Experimental Technique to Observe Mossbauer Effect, Mossbauer Nuclides	
4-4	**Mossbauer Parameters – Isomer Shift, Quadrupole Splitting, Magnetic Hyperfine Splitting(Qualitative Treatment) Simple applications:** Isomer Shift and Application, Quadrupole Splitting and Application, Magnetic Hyperfine Splitting and applications.	
5-1	**NMR Theory – Simple and classical, Relaxation Mechanism – Spin – Spin and Spin – Lattice:** NMR Probes, Nobel Prizes and various branches of magnetic resonance, NMR Theory- Introduction, Simple treatment of Nuclear Magnetic Resonance, Classical treatment of Nuclear Magnetic Resonance, Relaxation Mechanism- Introduction, Spin – Lattice, Spin –Lattice Relaxation time, Spin – Spin, Line width of NMR Line, Application of T_1 &T_2 measurements.	
5-2	**Bloch Equations, Complex Susceptibility, NMR Instrumentation Related to Absorption and Induction Techniques, Chemical Shift, Spin – Spin Coupling, Ethyl and Methyl Alcohol NMR Spectra, Major Areas of NMR:** Bloch Equations, Bloch Complex Susceptibility, NMR Spectrometers: Introduction –(i) Absorption type and (ii) Induction Type, Chemical Shift, Spin – Spin Coupling: Introduction – Origin of Chemical Shift, Measurement of Chemical Shift - Ethyl and Methyl Alcohols, Contributions to screening constant, Spin – Spin Coupling- NMR Spectra of ethyl and Methyl Alcohol, Coupling between several hydrogen nuclei, Chemical exchange, Pure ethyl Alcohol Spectrum under High resolution, Methyl Alcohol and Acetaldehyde, Major Areas of NMR	CR 04
5-3	**Principles of ESR, Conditions For Resonance, ESR Spectrometer, Interpretation of Spectra, Hyperfine Interaction, Applications of ESR:** Origin of Electron Paramagnetism, Orbital magnetic moment, Spin Magnetic moment, Electron Spin Resonance Phenomenon, ESR Spectrometer- Working of the ESR Spectrometer, Fine Structure (Electron – Electron Coupling), Hyperfine Interaction – (i) Dipole – Dipole Interaction, (ii) Contact Hyperfine Interaction, Super Hyperfine Interaction, Nuclear Quadrupole moment effects, Variation of g- (a)Spin – Orbit Interaction, (b) Orbital hybridization, Some Applications of ESR	
5-4	**Nuclear Quadrupole moment, Electric field Gradients, Nuclear Quadrupole resonance, energy levels in Different EFG Symmetries, NQR Spectrometer, Applications, Review on NMR, ESR and NQR:** Nuclear Quadrupole moment, Electrified Gradients, Nuclear Quadrupole resonance, energy levels in Different EFG Symmetries, NQR Spectrometer, Applications, Review on NMR, ESR and NQR	

Learning Resource Details

LR Code	Title Author	Edition Year	ISBN Publisher

Text-Books			
PHY021-T01	Nuclear Physics and analytical Techniques - Dr. V. Komalamba - Prof. N. Manohara Murthy - Prof. C. Nageshwara Rao	2009	BRAOU
Reference-Books: Explore additional details and reinforce learning, with this optional learning resource!			
PHY021 –RB1			
CD / DVD: Explore additional details and reinforce learning, with this optional learning resource!			
PHY021 -CD1			
Web Links: Explore additional details and reinforce learning, with this optional learning resource!			
PHy021-WL1			

PHY022: Electromagnetic theory and spectroscopy

Course Information

Year	Code	Course Name	CR	CST	ST	CA	EE	TM	Type
02	PHY022	Electromagnetic Theory and Spectroscopy	4	8	120	20	80	100	T

Presumed Knowledge and Learning Objectives

Presumed Knowledge	Learning Objectives
For successful completion of this course, student should have successfully complete: • BSc with Physics or Mathematics or equivalent from a recognized University/Board.	After successful completion of this course, student should be able to • Understand Electromagnetism. • Understand the different spectroscopic techniques.

Units and Detailed Syllabus

UN	Detailed Syllabus of the Unit	CR
1-1	**Electrostatic field:** Electrostatic field and potential, Poisson and Laplace Equation, Work & energy, Electrostatic field in matter	CR 01
1-2	**Magneto statics:** Magneto statics, Magneto Vector Potential, Magneto statics Boundary Conditions, Magnetic field in matter, Magneto statics Energy	
1-3	**Electro dynamics:** Maxwell's Equation in Vacuum, Maxwell's Equation in Conducting Media, Energy transport By EM waves, Poynting Theorem	
1-4	**EW waves in matter:** Propagation in Linear media, Reflection & Transmission at normal incidence, Reflection & Transmission at Oblique incidence, Polarization parallel to plane of incidence, Polarization normal to plane of incidence	
1-5	**Electromagnetic radiation:** Retarded Potentials, Radiation from an Oscillating Dipole- (i) Radiation Pattern- Intensity Profile, (ii) Magnetic Dipole Radiation, (iii) Electric Quadruple Radiation	
1-6	**Lienard - Wiechert potentials:** Radiation from Accelerated Charges, Fields of an Accelerated Point charge	
1-7	**Radiated power:** Power Radiated by a Charge, Radiation Resistance, Centre-led Linear Antennas	

2-1	**Fine structure:** Orbital magnetic dipoles, Spin magnetism, Spin – orbit coupling-(i) Spin – orbit coupling in the Bohr model (ii) Spin – orbit coupling beyond the Bohr model, The total angular momentum, Evaluation of the spin- orbit energy for the Hydrogen, Selection rule for the LS coupling, Spin – orbit coupling in alkali atoms, Nuclear effects in atoms- (i) Isotope Shifts, (ii) Hyperfine Sturecture	
2-2	**Zeeman , Paschen-back and Stark effects:** Zeeman effects, Paschen-back effects and Stark effects	**CR 02**
2-3	**Vector atom model L-S and J-J coupling of two electron states:** Vector atom model, The L-S and J-J coupling	
2-4	**Two electron system , Lande 'G' Factor:** Lande 'g' Factor in L-S coupling, Lande 'g' Factor in j-j coupling, Zeeman effect for two electron system,	
3-1	**Rotational spectra of diatomic molecules:** Rotational spectra, The molecule as a rigid rotator, Observed Rotational spectra and energy level, Isotopic effect of Rotational levels	
3-2	**Vibrational spectra:** Vibrational energy of a diatomic molecule, Observed Vibrational – Rotational spectrum, Vibrational Course structure, Vibrational analysis of band systems	
3-3	**Electronic spectra:** Electronic spectra, Resolution of the total energy, The Born – Oppenheimer Approximation, Vibrational Isotopic effect	**CR 03**
3-4	**Franck-Condon principle , dissociation Enalgies:** Rotational fine structure of Electronic spectra, the Fortrat Parabolae, Franck-condon principle, Dissociation energies, Deslandres Table of Vibrational Bands, Progressions & Sequences	
3-5	**Franck Condon principle:** Features of Electronic spectra, Electronic transitions, Intensity Distribution of spectra : Franck condon principle, dissociation Energies	
4-1	**Principle of IR spectroscopy , IR double beam spectrometer:** Principles of IR spectroscopy, IR Double beam spectrometer, Vibrations of Polyatomic molecules	
4-2	**Raman scattering:** Theory of Raman scattering, Classical Theory of Raman scattering, Quantum Theory of Raman scattering, Polarization of Raman scattered Light	**CR 04**
4-3	**Rotational and vibrational Raman spectra:** Rotational Raman spectra, vibrational Raman spectra, vibrational Raman spectra CO_2	
4-4	**Laser Raman spectrometer , differences between IR and Raman spectra:** Laser Raman spectrometer, differences between IR and Raman spectra	

Learning Resource Details

LR Code	Title Author	Edition Year	ISBN Publisher
Text-Books			
PHY022-T01	Electromagnetic Theory and Spectroscopy - Prof. B. K. Naidu - Prof. G. T. Naidu - Dr. G. Prasad	2010	BRAOU
Reference-Books: Explore additional details and reinforce learning, with this optional learning resource!			
PHY022 –RB1			
CD / DVD: Explore additional details and reinforce learning, with this optional learning resource!			
PHY022 -CD1			
Web Links: Explore additional details and reinforce learning, with this optional learning resource!			
PHY022-WL1			

PHY023: memory devices and microprocessors

Course Information

Year	Code	Course Name	CR	CST	ST	CA	EE	TM	Type
02	PHY023	Memory Devices and Microprocessors	4	8	120	20	80	100	T

Presumed Knowledge and Learning Objectives

Presumed Knowledge	Learning Objectives
For successful completion of this course, student should have successfully complete: • BSc with Physics or Mathematics or equivalent from a recognized University/Board.	After successful completion of this course, student should be able to • Understand the different logic families and their application • Understand the function of Memory devices and Microprocessor

Units and Detailed Syllabus

UN	Detailed Syllabus of the Unit	CR
1-1	**Logic families and their performance characteristics:** Saturated and Unsaturated logic circuits, Performance characteristics, Resistance- Transistor logic circuit (RTL), Diode-Transistor Logic circuit (DTL), Transistor – Transistor Logic Circuit(TTL), Integrated Injection Logic (I^2L)	CR 01
1-2	**Emitter coupled logic (ECL , PMOs, CMOs logic and Tri state logic):** Emitter Coupled Logic (ECL), PMOS Logic, NMOS Logic, CMOS Logic, Tristate Logic	
1-3	**Comparisons of logic families:** Input and Output Logic level, Noise Immunity, Noise Margin, Fan Out, Propagation Delay, Comparison of Logic Families	
1-4	**Classification and characteristics of memories:** Memory Terminology, Memory Architecture, RAM (SRAM,DRAM), ROM (Diode ROM, PROM, EPROM, EEPROM, Flash Memory)	
1-5	**Memory organization and expansion:** Memory Organization and Expansion, 8155- RAM, 6116-RAM, 8355-ROM, 2716-EPROM	
2-1	**Micro Processor organization and architecture:** Evolution of Microprocessors, CPU(Central Processing Unit), Memory, Input Devices, Output Devices, Microprocessor Applications, Microprocessor (Intel 8085) Architecture	CR 02

2-2	**Pin configuration of Intel 8085 Microprocessor:** Pin Configuration of 8085 Microprocessor, Interrupts, Serial input and output	
2-3	**Timing diagrams:** Instruction Cycle (Fetch Operation, Execute Operation), Instruction and Data Flow, Timing Diagrams (Timing Diagram for Opcode Fetch Cycle, Memory Read, I/O Read, Memory Write, I/O write)	
2-4	**Addressing modes and instruction set of Intel 8085:** Instruction and Data Formats, Addressing modes (Direct Addressing, Register Addressing, Register Indirect Addressing, Immediate Addressing, Implicit Addressing), Symbol	
2-5	**Programming of Micro Processor Intel 8085:** Machine Language, Assembly Language, Assembly Language Programs(Simple Programs), Addition of two 8bit numbers, 8 bit subtraction, Decimal addition of two 8 bit numbers, Addition of 16 bit numbers, 8 bit decimal subtraction, one's compliment of 8 bit numbers, one's compliment of 16 bit numbers, making of LSBs of 8 bit numbers, Making of MSBs of 8 bit number, word Disassembly	
2-6	**Assembly language programming using loops:** To find the smaller of two numbers, To find the larger of two numbers, Block movement of data, Find the largest number in an array, To find the smallest number in an array, Sum of series of 8 bit numbers, sum of series of decimal numbers, multibyte addition	
3-1	**I/O interfacing & data transfer schemes:** Types of input/ output (I/O), Memory mapped, Isolated I/O, I/O Handshaking, Classification of data transfer methods/ schemes, Synchronous Data transfer scheme, Asynchronous transfer, Interrupt Driven data transfer, Direct Memory Access (DMA) data transfer scheme, serial data transfer	
3-2	**Intel 8053 programmable interval timer:** Pin diagram of 8253, Functional blocks of 8253, System interface, Programming the 8253, operating modes, Mode0 (Terminal count), Mode1(Programmable one shot), Mode2(rate generator/ Divide by n counter) , Mode3 (Square wave generator), Mode4 (Software trigger strobe), Mode5(Hardware Trigger Strobe)	**CR 03**
3-3	**Programmable peripheral interface (8255):** Pin diagram and description of signals, Functional blocks of 8255, Group A and Group B control, Operating modes of 8255, Special mode combination consideration	
3-4	**Priority interrupt controller(8259):** Pin description of 8259, Functional blocks of 8259, Interrupt sequence, Programming o 8259 (Initialization command words, Operation command word), reading the 8259 status	

4-1	**Intel 8086 microprocessor:** General organization of microcomputer, architecture of Intel 8086 Microprocessor, Programming model of 8086, Generating physical memory address	CR 04
4-2	**Addressing modes and instruction set of Intel 8086 microprocessor:** Addressing modes of 8086, Instruction set of 8086, Assembly Language programming Examples of 8086	
4-3	**Pin configuration of Intel 8086 microprocessor:** Pin configuration of 8086 Microprocessor, Maximum and minimum modes	
4-4	**Architecture of Micro Processor 80286, 80386 , 80486:** Architecture of 80286 Processor, Architecture of 80386 Processor, real address mode, Protected virtual address mode, paging mode, Virtual 8086 mode, Architecture of 80486 Processor	
4-5	**The Pentium microprocessor:** Architecture of Pentium processor, Architecture of Pentium pro microprocessor, Comparison of 80X86 Processor	

Learning Resource Details

LR Code	Title Author	Edition Year	ISBN Publisher
Text-Books			
PHY023-T01	Memory Devices and Microprocessors - Dr. B. Rama Murthy - Dr. Aruna Mani - Prof. K. Madhukar - Prof. B. Punya Sheshudu	2010	BRAOU
Reference-Books: Explore additional details and reinforce learning, with this optional learning resource!			
PHY023 –RB1			
CD / DVD: Explore additional details and reinforce learning, with this optional learning resource!			
PHY023 -CD1			
Web Links: Explore additional details and reinforce learning, with this optional learning resource!			
PHY023-WL1			

PHY024: Microwave Devices and Communication Systems

Course Information

Year	Code	Course Name	CR	CST	ST	CA	EE	TM	Type
02	PHY024	Microwave Devices and Communication Systems	4	8	120	20	80	100	T

Presumed Knowledge and Learning Objectives

Presumed Knowledge	Learning Objectives
For successful completion of this course, student should have successfully complete: • BSc with Physics or Mathematics or equivalent from a recognized University/Board.	After successful completion of this course, student should be able to • Understand the basic concept of Microwave devices • Understand the various function and application of different communication systems

Units and Detailed Syllabus

UN	Detailed Syllabus of the Unit	CR
1-1	**Passive devices- wave guides:** Reflection of from a conducting plane, Parallel plane wave guide	CR 01
1-2	**Cut-off wave length:** Cut off wavelength, Group and phase velocities in waveguides	
1-3	**Rectangular wave guides:** Rectangular wave guides (Transverse magnetic waves, cut-off wavelength of TM mode, field pattern of TM waves, Transverse electric waves, Field pattern of TE waves), Circular waveguides (TM waves in cylindrical guide, field configuration of TM waves, TE waves in cylindrical waveguides, field configuration of TE waves), Application	
2-1	**Scattering matrix:** Need of S- parameters, Scattering matrix formulation, Properties of S-matrix, Scattering matrix for loss less junction, Scattering matrix for a two- port junction (Shunt element in a transmission line, S-matrix for series element in the transmission line)	
2-2	**s- matrix of e-plane H-plane and magic tee:** E-plane tee (series tee), scattering matrix of E plane tee, H-plane tee (shunt tee) junction, scattering matrix of H plane tee, Magic tee (Hybrid tee), scattering matrix of magic tee, Application of magic tee	

3-1	**Wave guide components:** Directional couplers (Two hole directional coupler, scattering matrix of a directional coupler), Hybrid rings, Terminations	CR 02
3-2	**Phase shifters:** Phase shifters (Rotary rotation and its applications), Faraday rotation and its applications (Gyrator, Isolator, Circulator)	
4-1	**Microwave semiconductor devices:** Negative Resistance devices (Tunnel diode, Avalanche transit- Time devices, IMPATT diodes, TRAPATT diodes, BARITT diodes)	
4-2	**Parametric devices:** Manley- Rowe power relations, Parametric Amplifier (Parametric up converter, parametric down converter)	
5-1	**Two cavity Klystron:** Two cavity klystron, Expression for velocity modulation, Bunching process, Output power and efficiency	CR 03
5-2	**Magnetron:** Introduction, Magnetron	
5-3	**Travelling wave tube (TWT):** Introduction, Travelling wave tube(TWT)	
6-1	**Modulation:** Usefulness of modulation, Amplitude modulation**(**AM**),** Linear modulation methods, Transistor collector modulation, Square law modulation methods, Frequency modulation(FM), frequency modulation theory, Generation of frequency modulation, Reactance tube method, Transistor reactance modulator, Comparison of frequency and amplitude modulation, Amplitude modulation, Frequency modulation	
6-2	**Demodulation:** Demodulation of amplitude modulated signals, square law detection, Linear detectors, Demodulation of FM signals slope detector, Stagger tuned discriminator, Foster seeley discriminator	
7-1	**Antenna fundamentals:** Antenna fundamentals, Antenna theorems, Radiation pattern, Directivity(D), Gain(G) of an Antenna, Antenna Impedance, Effective area (OR) Effective aperture (OR) Capture area, Effective length of an antenna	CR 04
7-2	**VHF antennas:** Reflector type antenna, Loop antenna, Radiation resistance of loop antenna, Helical antenna, Yogi- Uda antenna, Slot antenna	
7-3	**Microwave antennas:** Parabolic reflector, Focusing by a parabolic reflector, operation of parabolic reflector, beam width and directivity, Horn antennas, Lens antennas, Dielectric lenses, Metal lenses	
8-1	**Radars 184:** Basic RADAR system, RADAR Range equation	
8-2	**Types radar:** CW Radar, MTI Radar	

8-3	**Tracking radar:** Sequential lobing, Conical scan, Monopulse Tracking amplitude comparison mono pulse, Comparison of trackers	

Learning Resource Details

LR Code	Title Author	Edition Year	ISBN Publisher
Text-Books			
PHY024-T01	Microwave Devices and Communication Systems - Prof. M. Anjan Reddy - Prof. R. Sayanna - Prof. C. Vishnuvaradhan Reddy - Prof. D. Sureshbabu - Dr. Md. Shareefuddin	2010	BRAOU
Reference-Books: Explore additional details and reinforce learning, with this optional learning resource!			
PHY024 –RB1			
CD / DVD: Explore additional details and reinforce learning, with this optional learning resource!			
PHY024 -CD1			
Web Links: Explore additional details and reinforce learning, with this optional learning resource!			
PHY024-WL1			

PHY025: Spectroscopy

Course Information

Year	Code	Course Name	CR	CST	ST	CA	EE	TM	Type
02	PHY025	Spectroscopy	2	8	120	10	40	50	P

Presumed Knowledge and Learning Objectives

Presumed Knowledge	Learning Objectives
For successful completion of this course, student should have successfully complete: • BSc with Physics or Mathematics or equivalent from a recognized University/Board.	After successful completion of this course, student should be able to • Understand the different spectroscopic techniques

Units and Detailed Syllabus

UN	Detailed Syllabus of the Unit	CR
1-1	**Study of The Band Spectra:** Aim is to photograph the band spectrum of aluminum oxide and to study the vibrational structure of the Al-O bands by constructing Deslander's tables.	CR 01
1-2	**Raman Effect:** To photograph the Raman spectra of organic liquids and to find out the Raman shifts in each case.	
1-3	**Zeeman Effect:** To photograph the Zeeman spectra.	
1-4	**Hall Effect:** To determine (a) Hall coefficient, (b) The carrier charge density, (c) whether the semiconductor is n- type or p- type.	
1-5	**Magnetic Susceptibility "Gouy's Method":** To determine Magnetic Susceptibility of given paramagnetic solid by Gouy's Method.	
1-6	**ESR Spectrometer:** To determine the Lande's g-factor using electron spin resonance.	
2-1	**Electrical Conductivity of a Solid Variation With Temperature (Four Probe Method):** To measure the resistance of semiconductor at various temperatures and to determine the energy band gap of the given semiconducting material.	CR 02
2-2	**Laue Spots:** To interpret Laue photograph and to index a given cubic crystal.	
2-3	**Powder Pattern:** To index the given x-ray powder diffraction pattern and to determine the unit cell dimensions, interpalnar spacing.	

2-4	**Study of B – H Curve:** To study the hysteresis loop and to determine the hysteresis loss of a ferrite.
2-5	**Thermal Study Of Magnetic Permeability of Ferrite (Toroid):** To determine curie Temperature of a Ferrite in the shape of toroid.
2-6	**Determination of Curie Temperature of Ferroelectric Material**: To determine Curie Temperature of $BaTiO_3$.

Learning Resource Details

LR Code	Title Author	Edition Year	ISBN Publisher
Text-Books			
PHY025-T01	Spectroscopy - Dr. K. Gnana Prasuna	2013	BRAOU
Reference-Books: Explore additional details and reinforce learning, with this optional learning resource!			
PHY025 –RB1			
CD / DVD: Explore additional details and reinforce learning, with this optional learning resource!			
PHY025 -CD1			
Web Links: Explore additional details and reinforce learning, with this optional learning resource!			
PHY025-WL1			

PHY026: Modern physics

Course Information

Year	Code	Course Name	CR	CST	ST	CA	EE	TM	Type
02	PHY026	Modern Physics	2	8	120	10	40	50	P

Presumed Knowledge and Learning Objectives

Presumed Knowledge	Learning Objectives
For successful completion of this course, student should have successfully complete: • BSc with Physics or Mathematics or equivalent from a recognized University/Board.	After successful completion of this course, student should be able to • Understand the different concept of Modern physics • Understand the various application of LASER

Units and Detailed Syllabus

UN	Detailed Syllabus of the Unit	CR
1-1	**Reciprocal Dispersion Curve:** To draw reciprocal dispersion curve.	CR 01
1-2	**Characteristics of a Solar Cell:** To draw various Characteristics curves of a Solar Cell.	
1-3	**G. M. Counter – Characteristics Curve:** To draw G.M. Counter Characteristics, to estimate plateau region and fix operating voltage.	
1-4	**Dead Time Determination:** To determine the Dead Time of the given G. M. Counter.	
1-5	**Range And End Point Energy of β – Ray Absorption:** To determine Range of beta rays and to find its Absorption coefficient.	
1-6	**Linear And Mass Attenuation Coefficient Using Gamma Ray Absorption:** To evaluate gamma ray linear and mass Coefficient.	
2-1	**Verification of Inverse Square Law of Gamma Ray:** To verify Inverse Square Law.	CR 02
2-2	**Half – Life of Uranium:** To determine Half – Life period of uranium.	
2-3	**Magnetic Susceptibility – Quick Tube Method:** To determine Magnetic Susceptibility of a material solution using Quick's Tube.	
2-4	**Study of Birefringence:** To determine refractive indices and polarization Characteristics of ordinary and extra ordinary rays using birefringent prism. To verify Brewster's law.	

2-5	**Babinet's Compensator:** To produce and analyze circularly and elliptically polarized light.
2-6	**Thickness of Thin Wire By Diffraction:** To find thickness of a Thin Wire By Diffraction method.
2-7	**Characteristics of Laser Diode:** To draw Laser Diode Characteristics.

Learning Resource Details

LR Code	Title Author	Edition Year	ISBN Publisher
Text-Books			
PHY026-T01	Modern Physics - Dr. M. Purnanandam	--	BRAOU
Reference-Books: Explore additional details and reinforce learning, with this optional learning resource!			
PHY026 –RB1			
CD / DVD: Explore additional details and reinforce learning, with this optional learning resource!			
PHY026 -CD1			
Web Links: Explore additional details and reinforce learning, with this optional learning resource!			
PHY026-WL1			

PHY027: Memory Devices and Microprocessors

Course Information

Year	Code	Course Name	CR	CST	ST	CA	EE	TM	Type
02	PHY027	Memory Devices and Microprocessors	2	8	120	10	40	50	P

Presumed Knowledge and Learning Objectives

Presumed Knowledge	Learning Objectives
For successful completion of this course, student should have successfully complete: • BSc with Physics or Mathematics or equivalent from a recognized University/Board.	After successful completion of this course, student should be able to • Understand the different Application of Memory Devices and Microprocessors

Units and Detailed Syllabus

UN	Detailed Syllabus of the Unit	CR
1-1	**Introduction To Microprocessors.**	CR 01
1-2A	**One's Compliment and Two's Compliment of a Number:** To determine One's and Two's Compliment of a given 8-bit Number.	
1-2B	**Mask Off Most Significant and Least Significant 4 – Bits of an 8 – Bit Data:** To Mask Off Most Significant and Least Significant 4 – Bits of an 8 – Bit Data.	
1-3	**Picking of Largest / Smallest of a Number From an Array of Number:** To Picking of Largest / Smallest of a Number From an Array of Number	
1-4	**Square of a Number using Look up table Technique:** To find Square of a Number (Decimal) using Look up table Technique.	
1-5A	**Addition of 8 – Bit Hexadecimal Data:** To perform the Addition of two 8 – Bit Hexadecimal Data and find the sum.	
1-5B	**Addition of 8 – Decimal Data:** To perform the Addition of two 8 – Bit decimal Data and find the sum.	
1-5C	**Subtraction of Two 8 – Bit Data:** To perform the Subtraction of two 8 – Bit Hexadecimal Data and find the difference.	
1-6A	**Addition 16 – Bit Data Using an Individual Registers:** To perform the Addition of two 16 – Bit Hexadecimal Data and find the sum.	

1-6B	**Addition 16 – Bit Data Using DAD Instruction:** To perform the Addition of two 16 – Bit Hexadecimal Data using DAD (Double addition) instruction and find the sum.	
1-7A	**Addition of a Number For 'N' Times:** To perform the Addition of an 8 – Bit Data for n times and find the sum.	
1-7B	**Multiplication:** To perform the Multiplication of two 8 – Bit Data and find the product.	
2-1A	**Division of Two 8– Bit Data and The Quotient and The Remainder Are Stored In Two Successive Memory Location:** To perform the Division of two 8 – Bit Data and find the quotient (without considering the decimal values) and the remainder.	
2-1B	**Division of Two 8– Bit Data and The Quotient Up To 'N' Decimal Values and The Remainder Are Stored In 'N + 1' Memory Locations:** To perform the Division of two 8 – Bit Data and find the quotient up to 'n' decimal values and the remainder are stored in 'n+1' memory locations.	
2-2	**Sum of Series Of 8– Bit Numbers:** To perform the Addition of an array of 8- bit Hex data stored at some memory location and find the sum.	
2-3	**Block Movement of Data In An Array:** To find an array of 8- bit Hex data stored at some memory location are transferred to the new memory locations defined by the programmer.	
2-4A	**Conversion Of ASCII To Binary:** To convert ASCII into packed BCD.	CR 02
2-4B	**Conversion of Binary To ASCII:** Conversion of packed Binary To ASCII characters.	
2-5	**Data Transformation Through 8255 (PPI) I/O Ports AND Generation of Time Delay Between The Data's:** To find out the Data Transformation Through 8255 PPI and To find out the Generation of Time Delay Between The Data's.	
2-6	**Displaying Traffic Lights At 8255 I/O Ports:** To interface the Traffic Lights and control the vehicles.	
2-7	**4 – Bit / 8– Bit Digital To Analog Converter (DAC):** To convert the 4 – Bit / 8– Bit Digital To Analog Converter (DAC) by using 8085 microprocessor.	
2-8	**Rotating The Shaft of a Stepper Motor With (i) Given Direction, (ii)Given Speed, (iii) Given Angle, (iv) Bidirectional Rotational :** To interface a stepper motor to the 8085 microprocessor system and write an 8085 assembly language program to control the stepper motor.	
2-9	**Displaying of A Number On 7 – Segment Display:** To interface the seven segments	

	Display to 8085 microprocessor to display number 1 to 9.	

Learning Resource Details

LR Code	Title Author	Edition Year	ISBN Publisher
Text-Books			
PHY027-T01	Memory Devices and Microprocessors I - Dr. N. Lalitha Kumari - Mr. V. Santosh Kumar	2013	BRAOU
Reference-Books: Explore additional details and reinforce learning, with this optional learning resource!			
PHY027 –RB1			
CD / DVD: Explore additional details and reinforce learning, with this optional learning resource!			
PHY027 -CD1			
Web Links: Explore additional details and reinforce learning, with this optional learning resource!			
PHY027-WL1			

PHY028: Microwave Devices and Communication Systems

Course Information

Year	Code	Course Name	CR	CST	ST	CA	EE	TM	Type
02	PHY028	Microwave Devices and Communication Systems	2	8	120	10	40	50	P

Presumed Knowledge and Learning Objectives

Presumed Knowledge	Learning Objectives
For successful completion of this course, student should have successfully complete: • BSc with Physics or Mathematics or equivalent from a recognized University/Board.	After successful completion of this course, student should be able to • Understand the basic concept of Microwave devices • Understand the various function and application of different communication systems

Units and Detailed Syllabus

UN	Detailed Syllabus of the Unit	CR
1-1	**Microwaves**: Introduction To Microwaves.	CR 01
1-2	**Reflex Klystron Characteristics:** To study the characteristics of Reflex Klystron.	
1-3	**Gunn Diode Characteristics:** To study the I-V Characteristics of Gunn Diode.	
1-4	**Directional Coupler Characteristics:** To find the Coupling factor and Directivity of a given Directional Coupler.	
1-5	**Waveguide Parameters Measurement:** To determine the Waveguide Parameters in rectangular Waveguide working in TE_{10} mode.	
1-6	**Scattering Matrix of Isolator And Circular:** To obtain Scattering Matrix of Isolator And Circular.	
1-7	**Scattering Matrix of Magic Tee:** To obtain the Scattering Matrix of Magic Tee.	
1-8	**Amplitude Modulation:** To study the process of Amplitude Modulation and demodulation of a signal and calculate the depth of modulation and modulation index.	
2-1	**Frequency Modulator And Demodulator:** To study the Frequency Modulator And	CR 02

	Demodulator and calculate the modulation index.	
2-2	**Balanced Modulator:** To study the performance of the Balanced Modulator.	
2-3	**Pre Emphasis And DE – Emphasis:** To study Frequency response of pre – emphasis and de- emphasis circuit trainer.	
2-4	**Amplitude Shift Keying:** To generate and demodulate the Amplitude Shift Keying (ASK) signal.	
2-5	**Pulse Amplitude Modulation And Demodulation:** To study the Pulse Amplitude Modulation And Demodulation.	
2-6	**Pulse Position Modulation (PPM):** To study the Pulse Position Modulation and demodulation.	
2-7	**Pulse Width Modulation And Demodulation:** To study the process of Pulse Width Modulation And Demodulation.	
2-8	**Analog Signal Sampling And Reconstruction:** To study the Analog Signal Sampling And Reconstruction.	

Learning Resource Details

LR Code	Title Author	Edition Year	ISBN Publisher
Text-Books			
PHY028-T01	Microwave Devices and Communication Systems - Prof. G. Pushpa Chakrapani - Dr. N. Lalitha Kumari - Mr. A Gopal	2013	BRAOU
Reference-Books: Explore additional details and reinforce learning, with this optional learning resource!			
PHY028 –RB1			
CD / DVD: Explore additional details and reinforce learning, with this optional learning resource!			
PHY028 -CD1			
Web Links: Explore additional details and reinforce learning, with this optional learning resource!			
PHY028-WL1			

End of Document

SCHOOL OF ARCHITECTURE, SCIENCE AND TECHNOLOGY

YASHWANTRAO CHAVAN MAHARASHTRA OPEN UNIVERSITY

Detail Syllabus

V133: M. Sc. (Zoology) {2021 Pattern}

2021

AST, YCMOU, Nasik – 422 222, MS, India

CONTENTS

Yashwantrao Chavan Maharashtra Open University

Vice-Chancellor: Prof. Dr. E. Vayunandan

School of Architecture, Science and Technology

Director (I/C) of the School: Dr. Sunanda More

School Council (2021-2023)

Dr Sunanda More Director(I/c) & Associate Professor, School of Architecture, Science & Technology, YCMOU, Nashik	Dr Manoj Killedar Associate Professor, School of Architecture, Science & Technology, YCMOU, Nashik	Dr Chetana Kamlaskar Assistant Professor, School of Architecture, Science & Technology, YCMOU, Nashik
Dr. Abhay Patil Assistant Professor, School of Health Science, YCMOU, Nashik	Mr. RajendraWagh Assistant Professor, School of Agricultural Science, YCMOU, Nashik	Mrs. Shubhangi Patil Assistant Professor, Student Service Devision, YCMOU, Nashik
Dr. Dayaram Pawar Assistant Professor School of Education, YCMOU, Nashik	Prof. Dr. Madhavrao K. Deore Professor & Head of Department of Physics, K.T.H. M. College, Nashik	Dr. Bapu B. Shingate Assistant Professor, Dr. Babasaheb Ambedkar Marathwada University (BAMU), Aurangabad 431004
Prof. Dr. R. L. Shinde Professor & Head, Department of Statistics and Department of Actuarial Science and Director, School of Mathematical Sciences, North Maharashtra University, Umavi Nagar, Jalgaon 425001	Dr. M. D. Sonawane Associate Professor, Head, Department of Botany K.T.H.M. College, Nashik - 422002	Mr. Sudharm S. Hande, Study Centre Coordinator, (S.C. Code: 12207) Shri R R Lahoti College, Morshi 444905 Dist: Amravati

- **Publication** : 30/09/ 2021,
- **Price**: Free Download from Website. **No Print Copy**.

Prepared by:

Dr Sunanda More, Director, AST School, YCMOU, Nashik– 422222	Amol Pund Academic Coordinator, AST School, YCMOU, Nashik– 422222	Aashutosh Nirbhavne Academic Coordinator, AST School, YCMOU, Nashik– 422222	Sachin Jangam Academic Coordinator, AST School, YCMOU, Nashik– 422222

V133 M Sc (Zoology) {2021 Pattern}

Programme Objective and Scope

This programme is designed to achieve following objectives and scope.

The 'M.Sc. Zoology' program aims to develop understanding about significance of fauna and their biology from animals of single cell to multi-cellular systems. This Program trains the students to appreciate the diversity of Earth's fauna, with opportunities to specialize in areas such as animal evolution, behavior and ecology.

Objectives: The 'M.Sc. (Zoology)' program will

- Inculcate critical thinking and analytical skills to enable students to pursue higher studies and research in Life Sciences or related fields of Zoology.
- Provide a strong foundation for a better understanding of current advances in Zoology and its practical significance.
- Expose students to current trends in research about Zoology.

Scope of the programmes: After successful completion of this programme, students may get opportunities in various fields/sectors to work as

- Career opportunities in both private and government sector/ in India and abroad
- Job opportunities in sectors like Marine industries, NMCs, Pest Control, zoological parks, applied business like fisheries, apiculture, sericulture, pearl culture, etc
- Inculcation of research attitude
- Inculcation of entrepreneurship
- Perceive higher education and research in the same or allied fields like veterinary science

Mode of Education

This Programme will be offered in Open and Distance Learning (ODL) Mode as defined in "UGC Open and Distance Learning Programmes and Online Programmes Regulations, 2020" published in the gazette notification by dated 4th Sept 2020 by the UGC as specified below.

> *"Open and Distance Learning Mode means a mode of providing flexible learning opportunities by overcoming separation of teacher and learner using a variety of media, including print, electronic, online and occasional interactive face-to-face meetings with the learners or Learner Support Services to deliver teaching-learning experiences, including practical or work experiences"*

Mode of Examination

Continuous Assessment is conducted at recognized learner support centres/ study centres and End Examination for all type of courses is conducted at recognized Exam Centres of the University under supervision.

Basic Information

1. **Mode of Education**: Open and Distance Learning (ODL) Mode
2. **Minimum Programme Duration**: 2 years/ 4 semesters after Candidates with B.Sc. with Zoology at FY and SY/ B.Sc. (Agri) or Equivalent pass
3. **Learner Support Centers/ Study Centers:** University approved/ recognized Senior Science Colleges/ Institutes
4. **Medium of Instruction**: English
5. **Attendance**: Minimum 80% attendance for all type of courses.
6. **Minimum Programme Duration**: 2 years after Graduation
7. **Teaching-Learning**: 36 working weeks per year

8. **Total Teaching-Learning Support:** 960 Hours in each year
9. **Total Courses:** 16 courses (subjects) at year 01-02
10. **Total Credits:** 48 Credits. As per UGC norms 1 Credit means 30 hours of study efforts required to gain learning of particular content of each credit.
11. **Year Credits**: 24 Credits in each year (16 credits for Theory and 08 credits for Practical).
12. **Total Courses and Credit Points:**

Year	Theory	Practical	Credits
01	4	4	24
02	4	4	24
Total credits			**48**

13. **Passing:** Minimum 40% or better marks
14. **Credit Transfer:**
15. **Continuous Assessment:** Continuous Assessment conducted for Continuous evaluation during teaching-learning for 20%Weightage
16. **End Exam :**End Examination conducted for Summative evaluation of the student for 80% Weightage
17. **Degree Certification:** Aggregate performance and Class in the programme reported on the basis of performance.
18. **Curriculum Design:** Student centric curriculum is designed to enable professional ability, employability and skill enhancement.
19. **Approval/Equivalence Status**: UGC Approved. UGC-DEB Approval is available on UGC Website

ELIGIBILITY AND FEES

Admission Eligibility	**Certification Eligibility**	**Fees and Deposit / Year** UF is payable for a year to the university at the time of online admission
Candidates with B.Sc. with B.Sc. with Zoology at FY and SY/ B.Sc. (Agri) or Equivalent pass	Min 40% or better marks, in all Theory type of courses, with total 48 credits at Year 01 to 02	

Description	INR ₹
University Fee (UF)	8000
Study Center/ Learner Support Center Fee (LSCF)	12,000
Total ≈	20000
Refundable LD (Payable only when student choose to avail Library Facility at the SC)	1,500

PROGRAMME STRUCTURE

V133:M.Sc.(Zoology){2021 Pattern}				
Course → year↓	Course 01, 4 CR, T	Course 02, 4 CR, T	Course 03, 4 CR, T	Course 04, 4 CR, T
Year 1 Theory 16 CR	ZGY011 Animal Diversity and Ecology	ZGY012 Cell and Molecular Biology	ZGY013 Animal Physiology and Physiological Chemistry	ZGY014 Human Cytogenetic and Developmental Biology
Year 1 Practical 8 CR	Course 05, 2 CR, P	Course 06, 2 CR, P	Course 07, 2 CR, P	Course 08, 2 CR, P
	ZGY015 Animal Diversity and Ecology	ZGY016 Cell and Molecular Biology (Practical)	ZGY017 Animal Physiology and Physiological Chemistry	ZGY018 Human Cytogenetic and Developmental Biology

	(Practical)		(Practical)	(Practical)
Year 2 Theory 16 CR	Course 01, 4 CR, T	Course 02, 4 CR, T	Course 03, 4 CR, T	Course 04, 4 CR, T
	ZGY021 Immunology	ZGY022 Animal Biotechnology	ZGY023 Toxicology	ZGY024 Applied Entomology
Year 2 Practical 8 CR	Course 05, 2 CR, P	Course 06, 2 CR, P	Course 07, 2 CR, P	Course 08, 2 CR, P
	ZGY025 Immunology (Practical)	ZGY026 Animal Biotechnology (Practical)	ZGY027 Toxicology (Practical)	ZGY028 Applied Entomology (Practical)

TEACHING-LEARNING SCHEME:

Description	**Total 8 (Twelve) Theory Courses in Programme** **Total 8 (Eight)Practical Courses in Programme**
Face-to-face Counselling Sessions for interaction, problem solving and conduction of practical activities at Study Centre	**12 hrs each of 01 clock hour duration for each Theory Course of 4 Credits, Study Hours – 60**
	12 hrs each of 02 clock hour duration for each Practical/ Activity Course of 2 Credits, Study Hours – 60
Delivery of Information	**08**Books in SLM format: **30**Hours/ for each **08**WorkBooks in SLM format: **60**Hours/ for each
Self-Study, Learning Evaluation and Feedback	(1) Solving Problems, Self-Tests, SAQs and Exploring more Details on Text-Book: **30** Hours
Total Study Hours	(8 x 60 = **480** Hours + 8 x 60 = **480** Hours) = 960 Hours

YEARS AND COURSES

SN	Code	Name	CA	EE	TM	Type	CR	Min %
I Year:24 Credits								
01	ZGY011	Animal Diversity and Ecology	20	80	100	T	4	40%
02	ZGY012	Cell and Molecular Biology	20	80	100	T	4	40%
03	ZGY013	Animal Physiology and Physiological Chemistry	20	80	100	T	4	40%
04	ZGY014	Human Cytogenetic and Developmental Biology	20	80	100	T	4	40%
05	ZGY015	Animal Diversity and Ecology (Practical)	10	40	50	P	2	40%
06	ZGY016	Cell and Molecular Biology (Practical)	10	40	50	P	2	40%
07	ZGY017	Animal Physiology and Physiological Chemistry (Practical)	10	40	50	P	2	40%
08	ZGY018	Human Cytogenetic and Developmental Biology (Practical)	10	40	50	P	2	40%
II Year:24 Credits								
09	ZGY021	Immunology	20	80	100	T	4	40%
10	ZGY022	Animal Biotechnology	20	80	100	T	4	40%
11	ZGY023	Toxicology	20	80	100	T	4	40%
12	ZGY024	Applied Entomology	20	80	100	T	4	40%
13	ZGY025	Immunology (Practical)	10	40	50	P	2	40%
14	ZGY026	Animal Biotechnology (Practical)	10	40	50	P	2	40%
15	ZGY027	Toxicology (Practical)	10	40	50	P	2	40%
16	ZGY028	Applied Entomology (Practical)	10	40	50	P	2	40%

GRADING SYSTEM

1. "**Absolute Grading**": the marks are converted to grades based on pre-determined class intervals.
2. "**Letter Grade**": It is an index of the performance of students in a said programme. Grades are denoted by letters O, A+, A, B+, B, C, P and F.
3. "**Grade Point**": It is a numerical weight allotted to each letter grade on a 10-point scale. Grade Point shall be "0 (Zero)" for Letter Grade "Ab" and "F". The marks scored by the examinee shall be converted into grade points by dividing the marks scored in the aggregate and dividing the resulting number by maximum marks, multiplying the result by ten, retaining the integer part (ignore the fractional part). Thus if a person has secured 56 marks out of 100 marks in aggregate for a course, we get (56/100) x 10 which is 5.6. Ignoring the fraction, we get 5 as the grade point.

Letter Grade	Grade Point	Class
O	10	Outstanding
A+	9	Excellent
A	8	Very Good
B+	7	Good
B	6	Above Average
C	5	Average
P	**4**	**Pass**
F	**0**	**Fail**
Ab	**0**	**Absent**

4. "**Credit Point**": It is the product of grade point and number of credits for a course.
5. "**Semester Grade Point Average (SGPA)**": It is a measure of performance of work done in a semester. It is ratio of total credit points secured by a student in various courses registered in a semester and the total course credits taken during that semester. It shall be expressed up to two decimal places.
6. "**Cumulative Grade Point Average (CGPA)**": It is a measure of overall cumulative performance of a student over all semesters. The CGPA is the ratio of total credit points secured by a student in various courses in all semesters and the sum of the total credits of all courses in all the semesters. It is expressed up to two decimal places.
7. "**Transcript or Grade Card or Certificate**": Based on the grades earned, a grade certificate shall be issued to all the registered students after every semester. The grade certificate will display the course details (code, title, number of credits, grade secured) along with SGPA of that semester and CGPA earned till that year.

EVALUATION PATTERN

SN	Type of Course	Continuous Assessment	End Examination
1	Theory (T)	"Continuous Assessment (**CA**)" of total **20** marks and total 4 SAQs, each of 5 marks, 1 SAQ on **each** CR in a **Single attempt only**	"End Examination (**EE**)" of total **80** Marks and **16** "Short Answer Questions (SAQs)" **each** of **05** marks (**4 out of 5 SAQs on each Credit**), during **150** Minutes. (**80%**)

1. **Separate and independent passing @ 40% in EE and (CAT+EE) shall be essential for Theory and Practical component of each course.** "CA, EE and Total marks" shall be separately reported for each course in the transcript or mark-statement.
2. **Only 1 attempt** for EE for **each** course shall be allowed in **each** semester. **Maximum 2 attempts**, for CAT for **each** course, shall be allowed in **each** semester.
3. **Only best of past performance shall be reported in transcript or mark statement**.
4. **Total student evaluation for**
    a. **Each** semester shall be for **500** marks.
    b. **Each** year shall be for **1000** marks
    c. **Each** regular PG degree shall be for **2000** marks.

SUCCESSFUL COMPLETION OF COURSE OR PROGRAMME

1. "Successful Completion of the Course" means - either course is exempted or student gets minimum specified or better grade, either in end examination of that course or by credit transfer. A student obtaining grade "F" shall be considered failed and will be required to reappear in the examination. The student obtained minimum "P" (Pass) letter grade required for successful completion of the each course.
2. "Successful Completion of the Programme" means – all courses at all semesters are successfully completed and the student obtained "P" (Pass) letter grade for all courses at all semesters along with minimum specified SGPA and CGPA.

YEAR 01

ZGY011 ANIMAL DIVERSITY AND ECOLOGY

PROGRAMME INFORMATION

SN	Description	Details
1	University	Yashwantrao Chavan Maharashtra Open University Nasik - 422 222, Maharashtra, India Website: http://www.ycmou.ac.in/and http://ycmou.digitaluniversity.ac/
2	School	School of Architecture, Science and Technology
3	Discipline	Science
4	Level	PG
5	Course Used in	VXX: M.Sc.(Zoology)

COURSE INFORMATION

Sem	Code	Course Name	CR	CST	ST	CA	EE	TM	Type
01	ZGY011	Animal Diversity and Ecology	4	8	120	20	80	100	T

PRESUMED KNOWLEDGE AND LEARNING OBJECTIVES

Presumed Knowledge	Learning Objectives
For successful completion of this course, student should have successfully complete: • B.Sc with Zoology or equivalent from a recognized University/Board.	After successful completion of this course, student should be able to • Name specialize structure, systems and functions presented for each specimen. • Introduction between living and non living.

UNITS

UN	Name of the Unit	CSs	Questions
1-1 1-2 1-3	**Theories and concepts of Taxonomy** **Biological Classification** **Methodologies in Systematic**	CR 01	Student is required to answer 4 of 5 SAQ, each of 5 marks, on each CR
2-1 2-2 2-3 2-4 2-5	**Coelom** **Circulatory System** **Nervous System** **Excretory System** **Phylogenic Importance of Echinoderm Larvae**	CR 02	Student is required to answer 4 of 5 SAQ, each of 5 marks, on each CR
3-1 3-2 3-3 3-4	**Integument** **Heart and Circulatory System** **Respiratory System** **Nervous System, Brain and Sensory Organs**	CR 03	Student is required to answer 4 of 5 SAQ, each of 5 marks, on each CR
4-1 4-2 4-3 4-4	**Ecology and Animal Diversity** **Aquatic ecosystems and Animal Diversity** **Protected areas (sanctuaries and National Parks)** **Extinction and Biodiversity Conservation**	CR 04	Student is required to answer 4 of 5 SAQ, each of 5 marks, on each CR

DETAILED SYLLABUS

UN	Detailed Syllabus of the Unit	CR
1-1	**Theories and Concepts of Taxonomy:** Objectives, Introduction, Why Classification and Nomenclature, The Science of Classification / Taxonomy, Binomial Systems of Classification,	CR 01

	Systems of Classification, Current Theories on Taxonomy, Traditional Evolutionary Taxonomy, Phylogenetics / Climactic Taxonomy, Current Status of Taxonomy, Summery, Model Examination Questions..	
1-2	**Biological Classification:** Objectives, Introduction, Systems of Classification, Major Division of Kingdom Animal, Subkingdom: Protozoa- General characters and classification, Kingdom: Animalia- General characters and classification, Summary, Model Examination Questions.	
1-3	**Methodologist in Systematic:** Objectives, Introduction, Types and Methodologies in Taxonomy, Numerical (Phonetics) Taxonomy, Cytological Taxonomy, Biochemical and Molecular Taxonomy, Summary, Model Examination Questions.	
2-1	**Coelom:** Objectives, Introduction, Advantages and Function of Coelom, Origin of Coelom, Classification of Animals based on the types of Coelom, Comparative study of Coelom in Coelomates, Summary, Model Examination Questions.	
2-2	**Circulatory System:** Objectives, Introduction, Function of circulating fluid or blood, Types of Circulation, Circulatory system and its status in Non- chordates, Circulatory system in Annelida, Circulatory system in Arthropod, Circulatory system in Mollusca, Circulatory system in Echinodermata, Summary, Model Examination Questions.	
2-3	**Nervous System:** Objectives, Introduction, The Neuron: Structure and Function, Types of Neurons, Synapses: Junction Points between Nerves, Nerve Impulse, Evolution of Nervous System in Invertebrates, Nervous system in Various Phyla of Invertebrates, Summary, Model Examination Questions..	CR 02
2-4	**Excretory System:** Objectives, Introduction, Excretory Organs in Annelid, Excretory Organs in Arthropod, Excretory Organs in Mollusk, Excretory Organs in Echinodermata, Summary, Model Examination Questions.	
2-5	**Phylogenetic Importance of Echinoderm Larvae:** Objectives, Introduction, Broad Classification of Echinoderm, Larval Form in Echinodermata, Phylogenetics importance of Echinoderm Larvae, Summary, Model Examination Questions.	
3-1	**Integument:** Objectives, Introduction, Structure and Function, Derivatives of Integument, Summary, Model Examination Questions, Recommended Reference Book.	
3-2	**Heart and Circulatory system:** Objectives, Introduction, Origin Evolution of Heart, Evolution of aortic arches, Lymphatic system, Structure of Blood vessels, Summary, Model Examination Questions.	
3-3	**Respiratory system:** Objectives, Introduction, Respiratory system in Vertebrates, Respiratory organs, Gills, Lungs, Accessory Respiratory organs, Comparative account of Respiratory system of Vertebrate types Summary, Model Examination Questions.	CR 03
3-4	**Nervous system, Brain and Sensory Organs:** Objectives, Introduction, Generalized Nervous system of Vertebrates, Brain in different classes of Vertebrates, Sense organs in Vertebrates, Photorespiration in vertebrates: Vision, Statoacoustic organs in vertebrates: Ear, Summary, Model Examination Questions.	
4-1	**Ecology and Animal Diversity:** Objectives, Introduction, Ecology, Communities, Ecosystems and Organization, Environment and Diversity, Terrestrial Ecosystem and Diversity, Brief account on major Geographical Realms/Biomes, The tundra Biome, Environment and diversity, Taiga Biome, Environment and Biodiversity, The temperate Deciduous forest Biome environment and diversity, Evergreen subtropical and tropical forest biome environment and diversity, Grassland biome environment and diversity, Chapparal biome and diversity, Desert biome environment and diversity, Summary, Model Examination Questions	CR 04
4-2	**Aquatic Ecosystem and Animal Diversity:** Objectives, Introduction, Marine life zones, life styles and diversity, Zonation in marine water and diversity inter tidal zone and animal diversity, Diversity of animals of sandy shore in an Indian Coast, Coral reef animal Diversity, Subtidal zone and diversity, Oceanic region and diversity, fresh water life zones and diversity, Animal diversity in lentic water lotic water lakes and ponds, Estuarine biodiversity in India, Summary, Model	

	Examination Questions..	
4-3	**Protected Areas (Sanctuaries and National parks) Extinction and Biodiversity Conservation:** Objectives, Introduction, Types of biodiversity, Status of biodiversity in India and Value of biodiversity, Global status of Biodiversity threatened species and project in India, Causes of Extinction of Wild life, Importance Sanctuaries National parks and Biodiversity, Summary, Model Examination Questions.	

LEARNING RESOURCE DETAILS

LR Code	Title Author	Edition Year	ISBN Publisher
Course Website Link for (1) Mobile and Online Lectures, (2) Discussion Forum for online interaction and (3) Self-Test for each CR Block, Continuous Assessment Test and End Examination			
ZGY011	Animal Diversity and Ecology,		
Text-Books			
ZGY011	Animal Diversity and Ecology, Dr. K.V. Rama Rao, Dr. P. Nagaraja Rao, Dr. Pramila Devi, Dr. P. Neeraja, Prof. N.V. Nanda Kumar.	Reprint 2013	Dr. B.R.Ambedkar Open University, Hyderabad
Reference-Books: Explore additional details and reinforce learning, with this optional learning resource!			
ZGY011-RB1	wild life in india V.B, Saharia	1980	Rastogi publication Dehradun
ZGY011-RB2	Ecology and Environment P.D. Sharma	1999	
ZGY011-RB3	Word Bank Project Technical report on Jerdons Course.Dept. of forest. Govt. of AP. N.V. Nanda Kumar	WL25216/96	World Bank Project
CD / DVD: Explore additional details and reinforce learning, with this optional learning resource!			
ZGY011- -CD1			
Web Links: Explore additional details and reinforce learning, with this optional learning resource!			
ZGY011--WL1			

ZGY012: Cell and Molecular Biology

Programme Information

SN	Description	Details
1	University	YashwantraoChavan Maharashtra Open University Nasik - 422 222, Maharashtra, India Website: http://www.ycmou.ac.in/and http://ycmou.digitaluniversity.ac/
2	School	School of Architecture, Science and Technology
3	Discipline	Science
4	Level	PG
5	Course Used in	VXX: M.Sc.(Zoology)

Course Information

Sem	Code	Course Name	CR	CST	ST	CA	EE	TM	Type
01	ZGY012	Cell And Molecular Biology	4	8	120	20	80	100	T

Presumed Knowledge and Learning Objectives

Presumed Knowledge	Learning Objectives
For successful completion of this course, student should have successfully complete: • B.Sc with Zoology or equivalent from a recognized University/Board.	After successful completion of this course, student should be able to • Students will understand how this cellular components are sued to generate to utilized energy in cell • Student will understand nucleic acid & proteins and how this molecules interact within cell to promote growth, division & development

Units

UN	Name of the Unit	CSs	Questions
1-1 1-2 1-3 1-4	An overview of the Cell, Cell shapes and types Method in Cell Biology Structure and function of the Cell Membrane Functional aspects of cell Organelles	CR 01	Student is required to answer 4 of 5 SAQ, each of 5 marks, on each CR
2-1 2-2 2-3 2-4	The Cell Organelles Nucleus Cell Division Cell Communication and Signaling	CR 02	Student is required to answer 4 of 5 SAQ, each of 5 marks, on each CR
3-1 3-2 3-3 3-4	Nucleic Acid DNA Replication Transcription Genetic code and Protein Synthesis	CR 03	Student is required to answer 4 of 5 SAQ, each of 5 marks, on each CR
4-1 4-2 4-3 4-4	Gene Regulation Gene Transfer method in Prokaryotes Mobile Genetic Elements Cancer	CR 04	Student is required to answer 4 of 5 SAQ, each of 5 marks, on each CR

Detailed Syllabus

UN	Detailed Syllabus of the Unit	CR

1-1	**An Over view of the Cell, Cell shapes and Types:** Introduction, objective, History of development of event leading to the establishment of the cell theory, Development in cell biology, Model Organism, Tools used in cell biology, Culturing, shape of the cell, size of the cell, summary, Check your progress, Model Question	CR 01
1-2	**Method in cell biology:** Objectives, Introduction, Microscopy, Fractionation of cell – isolation of cell organelles, Tracer Technique, Audiography, Summary, Check your progress- Model Answer, Model Examination Question	
1-3	**Structure and Functions of The Cell Membrane:** Objectives, Introduction, Structure and Composition, Functions-Transport of large molecules, Summary, Check Your progress- model answers, Model Examination Questions.	
1-4	**Functional Aspects Of Cell Organelles:** Objectives, Introduction, Structure of Mitochondrion, Endoplasmic reticulum, Summary, Model Examination Questions.	
2-1	**The Cell Organelles:** Objectives, The Golgi Complex-Structure, Golgi Complex and Protein sorting, Lysosomes - Structure and Function, Summary, Model Examination Questions.	CR 02
2-2	**Nucleus:** Objectives, Introduction, Historical Background, Characteristics of components of the nucleus, Organization of chromatin, Nucleolus, Summary, Model Examination Questions.	
2-3	**Cell Division:** Objectives, Introduction, Mitosis, Meiosis, Cell Cycle, Endomitosis, Cytoskeleton, Summary, Model Examination Questions.	
2-4	**Cell Communication and Signaling:** Objectives, Introduction, Strategies of chemical signaling, Intracellular and Cell Surface receptor, Signaling mediated by cell surface receptor, Second And third Messenger, C-AMP Inositol phosphate prostaglandins, Summary, Check Your Progress Model Examination Questions.	
3-1	**Nucleic Acid:** Objectives, Introduction, DNA, Structure of DNA, Types of DNA, DNA Polymorphism, RNA, Structure of RNA, Types of RNA, Summary, Check your progress, Model Examination Questions, Books for further reference	CR 03
3-2	**Transcription:** Objectives, Introduction, Transcription in Prokaryotes, Eukaryotic transcription, Split genes- introns and axons, Post – transcriptional processing of RNA, Summary, Check Your Progress, Model Examination Questions, Book For further reference.	
3-3	**DNA Replication :** Objectives, Introduction, Types of replication , Enzymology of DNA replication, Mechanism of DNA replication, Summary, Check Your Progress, Model Examination Questions, Book For further reference.	
3-4	**Genetic Code and Protein Synthesis:** Objectives, Introduction, Historical Developments, Properties of codon- codon assignment – Ribosome binding technique, Genetic Code, Components of Protein synthesis, Translation Initiation Elongation and Termination with reference to Prokaryotes and Eukaryotes, Check Your Progress, Model Questions.	
4-1	**Gene Regulation:** Objectives, Introduction, Basic terminology, Gene regulation in Prokaryotes, Gene regulation in Eukaryotes, Summary, Check your progress, Model Examination question, Book for further reference.	CR 04
4-2	**Gene transfer method in prokaryotes:** Objectives, Introduction, Basic test for transformation, conjugation and transduction, Summary, Test Your Process, and Model Questions.	
4-3	**Mobile Genetic Element :** Objectives, Introduction, Definition significance, Types of Mobile Genetic element, Transposes, Transposon families, Retrotransposon, Mechanism of transposition, Av-bv controlling elements, Ty element in yeast, Transposable element in Drosophila, Application of transposons, Summary, Check your progress, Model Examination Questions, Books for further reference	
4-4	**Cancer :** Objectives, Introduction, Molecular basis of Cancer, (Cell Differentiation, Mutations	

	effecting cellular process, Accumulation of mutation, Cell proliferation, Genomic insrability, Familial cancers, proto oncogenes, Tumor Suppressor genes, Summary, Model Examination Questions.	

LEARNING RESOURCE DETAILS

LR Code	Title Author	Edition Year	ISBN Publisher
Course Website Link for (1) Mobile and Online Lectures, (2) Discussion Forum for online interaction and (3) Self-Test for each CR Block, Continuous Assessment Test and End Examination			
ZGY012	Cell And Molecular Biology		
Text-Books			
ZGY012	Cell And Molecular Biology Dr. V. Manga,DR. G. Gnanamani, DR.G.M.V. Subba Rao, Dr. K. Vijaya Lakshmi, Dr. V. Shameem, Dr.B.V. Sandeep	Reprint 2013	Dr. B.R. Ambedkar Open University, Hyderabad
Reference-Books: Explore additional details and reinforce learning, with this optional learning resource!			
ZGY012-RB1	Cell and molecular biology DE Robertis		
ZGY012-RB1	The cell Garald Karp		
ZGY012-RB1	Genetics of bacteria and virus William Hayes		
ZGY012-RB1	Genes lewis1		
CD / DVD: Explore additional details and reinforce learning, with this optional learning resource!			
ZGY012-CD1			
Web Links: Explore additional details and reinforce learning, with this optional learning resource!			
ZGY012-WL1			

ZGY013: ANIMAL PHYSIOLOGY AND PHYSIOLOGICAL CHEMISTRY

PROGRAMME INFORMATION

SN	Description	Details
1	University	YashwantraoChavan Maharashtra Open University Nasik - 422 222, Maharashtra, India Website: http://www.ycmou.ac.in/and http://ycmou.digitaluniversity.ac/
2	School	School of Architecture, Science and Technology
3	Discipline	Science
4	Level	PG
5	Course Used in	VXX: M.Sc.(Zoology)

COURSE INFORMATION

Sem	Code	Course Name	CR	CST	ST	CA	EE	TM	Type
01	ZGY013	ANIMAL PHYSIOLOGY AND PHYSIOLOGICAL CHEMISTRY	4	8	120	20	80	100	T

PRESUMED KNOWLEDGE AND LEARNING OBJECTIVES

Presumed Knowledge	Learning Objectives
For successful completion of this course, student should have successfully complete: • BSc with Zoology or equivalent from a recognized University/Board.	After successful completion of this course, student should be able to • Students will able to study basic understanding of fundamental process and mechanism that serve & control of various function of body

UNITS

UN	Name of the Unit	CSs	Questions
1-1 1-2 1-3 1-4	Water Thermoregulation Respiration Circulation	CR 01	Student is required to answer 4 of 5 SAQ, each of 5 marks, on each CR
2-1 2-2 2-3 2-4	Nutrition and Digestion Excretion Immunology Nerve and receptor	CR 02	Student is required to answer 4 of 5 SAQ, each of 5 marks, on each CR
3-1 3-2 3-3 3-4	Muscle Endocrinology and bioluminescence Enzyme Carbohydrate	CR 03	Student is required to answer 4 of 5 SAQ, each of 5 marks, on each CR
4-1 4-2 4-3 4-4	Amino acids Proteins Lipids Biological oxidation	CR 04	Student is required to answer 4 of 5 SAQ, each of 5 marks, on each CR

DETAILED SYLLABUS

UN	Detailed Syllabus of the Unit	CR
1-1	**Water: objectives, Introduction**: Water in the Cell Environment, Movement of water and Solutes across Cell membrane, Euryhaline and Stenohaline, Osmoregulation in Hetrosmotic media, Hormonal regulation of osmoregulation, summary, References	
1-2	**Thermoregulation :** objectives, Introduction, Concept of Poikilothermy and Homeotherms, Summary	
1-3	**Respiration :** objectives, introduction, Respiratory Organs, Respiratory mechanism in different animals, Transport of Respiratory Gases, Cascade of O2 transport, Transport of CO2,Oxygene Toxicity, Hypercapnea, summary	CR 01
1-4	**Circulation:** Objectives, Introduction, Types of heart concept of neurogenic and myogenic hearts, Cardiac cycle, ECG Pattern in mammals, Principles of haemodynamics, Haemostasis and blood clothe formation, summery, References.	
2-1	**Neutrion and digestion:** objectives, introduction, Nutritive patterns in animals, Role of vitamins, Digestion of carbohydrates, proteins and fates, Mechanisms of absorption, Special aspects of digestion- ruminant digestion and coprohagy, Hormonal regulation of digestion, summary, Questions	
2-2	**Excretion:** Objectives, Intoduction, Generation of Ammonia, Ammonia Toxicity, Urea cycle, The formation of Urine, Purine Excretion, Summary, References.	
2-3	**Immunology :** objectives, Concept of antigen-antibody, humoral and cell mediated immunity, Types of antibodies- structure of antibody, antibody-antigen interaction, Opsonization-anibody, Allergy and hypersensitivity, summary, Model examination question	CR 02
2-4	**Nerve and receptors :** objectives, introduction, Structural elements, Concepts of membrane(resting) potential, Action potential, generation of impulse and propagation, Types of synapses and mechanism of transmission, Neurotransmitters, Concept of sensory receptors, Chemoreception, Phonoreception, Photoreception, Summery	
3-1	**Muscle :** Objective, introduction, Classification and Types of muscles, Ultra structure of skeleton muscle, Biochemistry of skeleton muscle, General mechanism of muscle contraction, Spread of Action Potential and Excitation contraction Coupling, Molecular mechanism of muscle contraction, changes during muscle contraction, Neuromuscular junction, summery,	
3-2	**Endocrinology and Bioluminescence** : Objectives, Introduction, Type of Hormones and mechanism of hormonal action, Protein and steroid hormones, Hormonal regulation of reproduction, Biochemistry and significance of bioluminescence, Summary, Check your progress.	
3-3	**Enzyme :** Objectives, Introduction, Classification, nomenclature and properties of enzymes-catalysis and energy activation, Co-enzyme and enzyme specificity, Enzyme kinetics, derivation of Km, Kt values and LB plots, Mechanism of enzyme action and regulation of enzyme activity, Summary	CR 03
3-4	**Carbohydrate :** Objectives, Introduction, Chemistry and structure of mono, di, amide polysaccharides, Deoxy sugar, Amino sugar and Glycosides, Metabolism of carbohydrate (Glycolysis, TCA cycle, Glycogenesis, Glycogenolysis ,Gluconeogenesis, HMP shut), Metabolic disease of carbohydrate metabolism , Summary, Model examination questions.	
4-1	**Amino acid:** Objective, Introduction, History of amino acids, Metabolic defects, Summary, Model Examination Questions	
4-2	**Proteins:** Objectives, Introduction, Classification of Protein, Structure of proteins, Defects in protein nutrition Metabolism of purines and pyrimidines, Summary	CR 04
4-3	**Lipids:** Objectives, Introduction, Structure of lipid, Classification of lipid, Fatty acids, Triglycerides, Phospholipids, Cerbrosides, Steroids, Prostaglandins, Biosynthesis of fatty acids, Metabolism of cholesterol, synthesis of steroids, Prostaglandins, Biosynthesis of fatty acids, Metabolism of cholesterol, Synthesis of steroid, porphyries and bile pigments, Lipdoses,	

	Summary, Model examination question.	
4-4	**Biological Oxidation :** Objective, Introduction, Breakdown of carbohydrates, B-oxidation of lipids, Bioenergetics of high energy compounds, Electron Transport chain, Summary, References	

LEARNING RESOURCE DETAILS

LR Code	Title Author	Edition Year	ISBN Publisher
Course Website Link for (1) Mobile and Online Lectures, (2) Discussion Forum for online interaction and (3) Self-Test for each CR Block, Continuous Assessment Test and End Examination			
ZGY013	Animal physiology and physiological chemistry		
Text-Books			
ZGY013	Animal physiology and physiological chemistry Dr.Srinivas Reddy, Prof. T. Nagraju, Dr.K.Prastap Reddy, Dr. Radhakrishnaiah, Dr. Jane Theophilus.	Reprint 2013	Dr. B.R. Ambedkar Open University, Hyderabad
Reference-Books: Explore additional details and reinforce learning, with this optional learning resource!			
ZGY013-RB1	Animal physiology P.S.Verma		
ZGY013-RB1	Animal physiology and Biochemistry R.A.Agrval		
ZGY013-RB1	General and Comparative Physiology By William S. Hoar,		Prentice-Hall of India pub. New Delhi
ZGY013-RB1	Principal of Animal physiology Dennis W. Wood		Arnots pub. Ltd.london
CD / DVD: Explore additional details and reinforce learning, with this optional learning resource!			
S30013 -CD1			
Web Links: Explore additional details and reinforce learning, with this optional learning resource!			
S30013-WL1			

ZGY014: Human Cytogenetic and Developmental Biology

Programme Information

SN	Description	Details
1	University	Yashwantrao Chavan Maharashtra Open University Nasik - 422 222, Maharashtra, India Website: http://www.ycmou.ac.in/and http://ycmou.digitaluniversity.ac/
2	School	School of Architecture, Science and Technology
3	Discipline	Science
4	Level	PG
5	Course Used in	VXX: M.Sc.(Zoology)

Course Information

Sem	Code	Course Name	CR	CST	ST	CA	EE	TM	Type
01	ZGY014	Human Cytogenetics and Developmental Biology	4	8	120	20	80	100	T

Presumed Knowledge and Learning Objectives

Presumed Knowledge	Learning Objectives
For successful completion of this course, student should have successfully complete: • B.Sc. with Zoology or equivalent from a recognized University/Board.	After successful completion of this course, student should be able to • To understand transmission genetics problems, make accurate predictions about inheritance of traits, and map the location of gene

Units

UN	Name of the Unit	CSs	Questions
1-1 1-2 1-3 1-4 1-5	**Introduction to human Cytogenetic** **Chromosomes and Karyotypings** **Chromosomal Abnormalities** **Genetic Disorder** **Mutations and Repair of DNA**	CR 01	Student is required to answer 4 of 5 SAQ, each of 5 marks, on each CR
2-1 2-2 2-3 2-4 2-5	**Recombination DNA Technology** **Cytogenetic Culture setup and Harvest** **Slide Preparation and staining** **Glossary of Genetics Terms** **Glossary of Malformation**	CR 02	Student is required to answer 4 of 5 SAQ, each of 5 marks, on each CR
3-1 3-2 3-3 3-4	**Basic concepts of Development Biology** **Gametes and Fertilization** **Cleavage and Gastrulating** **Early vertebrate Development**	CR 03	Student is required to answer 4 of 5 SAQ, each of 5 marks, on each CR
4-1 4-2 4-3 4-4	**Differentiation** **Body Axis** **Tetrapod Limb Development** **Growth and post- embryogenic Development**	CR 04	Student is required to answer 4 of 5 SAQ, each of 5 marks, on each CR

DETAILED SYLLABUS

UN	Detailed Syllabus of the Unit	CR
1-1	**Introduction to Human Cytogenetic:** Introduction, Objective, History, Chromosomes, Cell division-Mitosis and Meiosis, Origin of Chromosome abnormality, Basics of Chromosome structure, Chromatin, Nucleosomes, Euchomatin and Heterochromatin, Nucleus, Nucleolus, The cell cycle in relation to Cytogenetic, Chromosome banding and Staining, Florescence In-Situ Hybridization (FISH), The future, Cytogenetic Workup, Summary, Check Your Progress, Model Examination Questions, Check your progress –Answers.	CR 01
1-2	**Chromosomes and Karyotyping:** Objective, Overview, Chromosome, Band Resolution, Objective of Karyotyping, Fundamental features of each chromosomes, Landmark to identify each chromosome under Banding procedure with standard ideograms indicating band locations with band resolution, Karyotype Description, Automated Karyotyping systems, Summary, Check Your Progress, Model Examination Questions, Check your progress –Answers.	
1-3	**Chromosomal Abnormality:** Introduction, Objective, Chromosomes, Chromosomal pattern of Inheritance, Impact of Chromosomal Abnormality, Chromosomal Abnormalities, Common Chromosomal Abnormalities with clinical consequences, Basic Dismorphology, Dismorphology and Chromosomal Databases, Summary, Check Your Progress, Model Examination Questions, Appendix A: Glossary of genetic terms, Appendix B: Glossary of malformations.	
1-4	**Genetic Disorders:** Objective, Introduction, Dominant trait, Recessive trait, Genetic Disorders and its modes of inheritance, Biochemical Disorders; Inborn error of metabolism, Teratogens, Parental Diagnosis, Genetic Counseling, Preconception and Parental Risk Assessment tools, Ethical and Social Implication of genetic disorders, Summary, Check Your Progress, Model Examination Questions, Check your progress –Answers.	
1-5	**Mutation and repair of DNA:** Objective, Introduction, Gene are made of DNA, Gene are like recipes for protein, Importance of reading the genetic code, Types of Mutation, the effect of mutation on the gene product, Frequency of mutations, Male contribute more mutation than females, Somatic Vs Germ line Mutation, Mutation detection AMES Test, Transgenic animal developed for detecting mutagens, Are there favorable mutation?, Mutagens mutation causing agents, Radiation, Mutagens and Carcinogens, DNA repair system, Summary, Check Your Progress, Check your progress –Answers.	
2-1	**Recombinant DNA Technology:** Objective, Introduction, Production of Recombinant DNA molecule, process of Recombinant DNA technology, DNA sequencing, Techniques used for mutation sequencing, Mutation analysis of Single Gene Disorders, Animal models of Inherited Diseases, Gene Mapping Identification and Cloning of Genes in Human beings, Application of Recombinant DNA technology, Summary, Model Examination Questions.	CR 02
2-2	**Cytogenetic Culture Setup and Harvest:** Introduction, Cell Culture Lab, The Substrate, Suspension culture, Media, Aseptic Condition, Culture method, Peripheral blood culture, Harvesting, Summary, Landmark in the development of tissue and cell culture, Check Your Progress, Model Examination Questions, Check your progress –Answers.	
2-3	**Slide Preparation and Stain:** Objective, Introduction, Theory Side Making, Protocol for Slide Making, Technique Variation for Slide Making, Centrifugation, Fixative, Angle of the slide, Dilution Factor, Controlled Chromosome Spreading, Cell and Cell Type, Cell drying, Pre dropping techniques, Dropping techniques, Slide aging, Slide storage, Slide wash procedure, Slide Making Chambers (Drying Chamber), Staining, Microscopy of Imaging, Concept of Magnification, Part of the Standard Microscope, Image Quality, Digital Imaging, Contrast and resolution, Aperture, Lens faults, correct illumination, Maintenance, Cleaning the Microscope, Summary, Check Your Progress, Model Examination Questions, Check your progress –Answers.	
Appendix A	**Glossary of Genetics Terms**	

Appendix B	**Glossary of Malformations**	
3-1	**Basic Concepts of Developmental Biology:** Objective, Introduction, Historical roots of Developmental Biology, Principal features of development, Development patterns in Matazons, Development in Unicellular Eukaryotes, Summary, Check Your Progress, Model Examination Questions.	CR 03
3-2	**Gametes and fertilization:** Objective, Introduction, Ultra structure of Gametes, Fertilization, Summary, Check Your Progress, Model Examination Questions.	
3-3	**Cleavage and Gastrulation:** Objective, Introduction, Cleavage, Gastrulation, Summary, Check Your Progress, Model Examination Questions.	
3-4	**Early Vertebrate Development:** Objective, Introduction, Neutrulation and Ectoderm origin and fate crest cells, Mesoderm and Endoderm, Summary, Check Your Progress, Model Examination Questions.	
4-1	**Differentiation:** Objective, Introduction, Cellular basis of differentiation, Trans differentiation, Metaplasisa, Regeneration, Summary, Check Your Progress, Model Examination Questions.	CR 04
4-2	**Body Axis:** Objective, Introduction, Establishment of Body Axis in mammals and birds, Proximate tissue Interactions, Genetics of axis specification in Drosophila, Summary, Check Your Progress, Model Examination Questions. Summary, Check Your Progress, Model Examination Questions.	
4-3	**Tetra pod limb Development:** Objective, Introduction, Tetra pod limb Development, Summary, Check Your Progress, Model Examination Questions.	
4-4	**Growth and Post-embryonic Development:** Objective, Introduction, Apoptosis, Aging, Senescence, Abnormal Development, Summary, Check Your Progress, Model Examination Questions.	

LEARNING RESOURCE DETAILS

LR Code	Title Author	Edition Year	ISBN Publisher
Course Website Link for (1) Mobile and Online Lectures, (2) Discussion Forum for online interaction and (3) Self-Test for each CR Block, Continuous Assessment Test and End Examination			
ZGY014	Human Cytogenetic and Developmental biology		
Text-Books			
ZGY014	Human Cytogenetic and Developmental biology Dr. Priyatham G., Dr. Vinitha, Dr. B.B. Hosetti.	Reprint 2013	Dr. B.R. Ambedkar Open University, Hyderabad
Reference-Books: Explore additional details and reinforce learning, with this optional learning resource!			
ZGY014 –RB1	Fundamentals of cytogenetic and genetics mahabal ram		
ZGY014 –RB2	Developmental Biology Gilbert		
CD / DVD: Explore additional details and reinforce learning, with this optional learning resource!			
ZGY014 -CD1			
Web Links: Explore additional details and reinforce learning, with this optional learning resource!			
ZGY014-WL1			

Practical

ZGY015 Animal Diversity and Ecology (Practical)

Programme Information

SN	Description	Details
1	University	YashwantraoChavan Maharashtra Open University Nashik - 422 222, Maharashtra, India Website: http://www.ycmou.ac.in/and http://ycmou.digitaluniversity.ac/
2	School	School of Architecture, Science and Technology
3	Discipline	Science
4	Level	PG
5	Course Used in	Vxx: M.Sc.(Zoology)

Course Information

Sem	Code	Course Name	CR	CST	ST	CA	EE	TM	Type
01	ZGY015	Animal Diversity and Ecology (Practical)	2	8	120	20	80	100	p

Presumed Knowledge and Learning Objectives

Presumed Knowledge	Learning Objectives
For successful completion of this course, student should have successfully complete: • B.Sc with Zoology or equivalent from a recognized University/Board.	After successful completion of this course, student should be able to • Develop technical skill • To empower our students with practical skills to comprehend the physiology and other functions of each ad every vital systems

Units

UN	Name of the Unit	CSs	Questions
1-1	**Identification of evolutionary significant specificant specimens and important connecting links and biodiversity.**	CR 01	Student is required to answer 4 of 5 SAQ, **each** of 5 marks, on **each** CR
1-2	**Diversity of beak in birds.**		
1-3	**Mode of life and Modification of feet of birds.**		
1-4	**Preparation of check list of animal in a zoo-park or sanctuary or a National Park.**		
1-5	**Protected areas (sanctuaries and National Parks) Extinction and biodiversity conservation.**		
1-6	**Aquatic ecosystem and animal diversity.**		
2-1	**7. Freshwater crab (paratelphusa) Nervous System**	CR 02	Student is required to answer 4 of 5 SAQ, **each** of 5 marks, on **each** CR
2-2	**8. Grasshopper (Locust) Reproductive System**		
2-3	**9. Digestive System in chick.**		
2-4	**10. Circulatory system in chick**		
2-5	**11. Urinogenital System in chick**		
2-6	**12. Respiratory System in Chick**		

Detailed Syllabus

UN	Detailed Syllabus of the Unit	CR
1-1	**Identification of evolutionary significant specicant specimens and important connecting links and biodiversity.** : Introduction, Echinoderm Larvae(Bipinnaria Larvae, Brachiolaria Larvae,	CR 01

	Echinopluteus Larva, Ophioluteus Larva, Dolliolaria Larva), Perpatus, Archaeopteryx, Ichthyophis, Ornithorhynchus(Duck-billed platypus), Rhynchocephalia, Dipnoian Fishes, Pteropus, Sea Cow, Transgenic Animals, Domesticated Biodicersity, Summary, Check Your Progress, Model Examination Questions	
1-2	**Diversity of beak in birds. :** Summary, Check Your progress, Model Examination Questions.	
1-3	**Mode of life and Modification of feet of birds:** Introductions, Material and Methods, observations(perching Feet, Cursorial or running Feet, Climbing Feet, Scratching Feet, Clinical Feet, Raptorial Feet, Wading Feet, Swimming Feet, Recording the Observation	
1-4	**Preparation of check list of animal in a zoo-park or sanctuary or a National Park** : Introduction, Material And methods, Observations Important Animal Types Described For Model study,(Tiger-Panther Tigris or Filis Tigris, Linnawus, Lion- oanthra Leo.Linnaeus, Sloth Bear-Marlursus Ursinus shaw, Organ gutan-Pongo, chimpanzee Pam=Anthropithecus, Otter-lutra lutra, Blackbuck or Indian Antelope, Elephants, Rhinoceros or the Great Indian One Horened Rhinoceros, Camel, Mangoos, Recording The observations, Model Of an Animal Feed Data Collections sheet.	
1-5	**Protected areas (sanctuaries and National Parks) Extinction and biodiversity conservation. :** Introduction, Material And Method, Observation, Nandur madhmeshwar bird sanctuary Nashik, Tadoba national park chandrapur, Sanjay Gandhi national park Mumbai, and chandoli national park, Model Examination Questions,	
1-6	**Aquatic ecosystem and animal diversity:** Introductions, Material and Methods, procedure for plankton Collection,Obsertion, Model Examination Questions	
2-1	**Freshwater crab (paratelphusa) Nervous System :** Introduction, Nervous system, Procedure For Dissection, Tracing of Ganglia and Nerves to Various Parts, Summary, Check Your Progress, Model Examination Questions.	
2-2	**Grasshopper (Locust) Reproductive System** : Introduction, Reproductive system, Procedure For Dissection, Tracing of male reproductive system, Tracing of Female Reproductive system, Model Examination Questions..	
2-3	**Digestive System in chick:** Introduction, Digestive system ,Procedure for Dissection, Tracing of different Parts of digestive System, Summary, Cheek Your Progress Model Examination Question	CR 02
2-4	**Circulatory System in chick:** introduction, Circulatory system, Procedure For Dissection, Tracing of different Vein System of chick, summary, Check Your Progress Model Examination Question	
2-5	**Urinogenital /system in chick:** introduction, Urinogenital System, Male Reproductive System. Female Reproductive System, Procedure.	
2-6	**Respiratory system:** introduction, Respiratory system, Procedure For Dissection, Tracing of Different Parts of Respiratory system, Model examination Questions.	

LEARNING RESOURCE DETAILS

LR Code	Title Author	Edition Year	ISBN Publisher
Course Website Link for (1) Mobile and Online Lectures, (2) Discussion Forum for online interaction and (3) Self-Test for each CR Block, Continuous Assessment Test and End Examination			
ZGY015	Animal Diversity and Ecology		
Text-Books			
ZGY015	Animal Diversity and Ecology	Reprint 2013	Dr. B.R. Ambedkar Open University, Hyderabad
Reference-Books: Explore additional details and reinforce learning, with this optional learning resource!			
CD / DVD: Explore additional details and reinforce learning, with this optional learning resource!			
ZGY015-CD1			
Web Links: Explore additional details and reinforce learning, with this optional learning resource!			
ZGY015-WL1			

ZGY016: Cell and Molecular Biology (Practical)

Programme Information

SN	Description	Details
1	University	Yashwantrao Chavan Maharashtra Open University Nasik - 422 222, Maharashtra, India Website: http://www.ycmou.ac.in/ and http://ycmou.digitaluniversity.ac/
2	School	School of Architecture, Science and Technology
3	Discipline	Science
4	Level	PG
5	Course Used in	Vxx: M.Sc.(Zoology)

Course Information

Sem	Code	Course Name	CR	CST	ST	CA	EE	TM	Type
01	ZGY016	Cell and Molecular Biology (Practical)	2	8	120	20	80	100	p

Presumed Knowledge and Learning Objectives

Presumed Knowledge	Learning Objectives
For successful completion of this course, student should have successfully complete: • B.Sc. With or equivalent from a recognized University/Board.	After successful completion of this course, student should be able to • Develop technical skill • To empower our students with practical skills to comprehend the physiology and other functions of each ad every vital systems

Units

UN	Name of the Unit	CSs	Questions
1-1 1-2 1-3 1-4 1-5 1-6 1-7 1-8	**Preparation of blood Smear, Cell Type Identification and Differential Counts.** **Osmotic Fragility of Erythrocytes** **Estimation of RNs and DNA in Tissue** **Extrication of DNA** **Extraction of RNA** **Fractionation of proteins by Ammonium sulfatre Precipitation** **Localization of RNA by methyl Green- Pyronin Y** **Fulgent reaction Method for DNA Localization**	**CR 01**	Student is required to answer 4 of 5 SAQ, each of 5 marks, on each CR
2-1 2-2 2-3 2-4	**Tissue Homogenization and fraction by differential Centrifugation for isolation of Nuclei and Mitochondria** **Separation of proteins by Polysacrylamide Gel Electrophoresis** **Polythene Chromosome** **Cell Division** **12A Mitosis** **12B Meiosis**	**CR 02**	Student is required to answer 4 of 5 SAQ, each of 5 marks, on each CR

Detailed Syllabus

UN	Detailed Syllabus of the Unit	CR
1-1	**Preparation of Blood Smeat, Cell Type identification and differential counts**: Introduction, objectives, Materials, procedure(preparation of blood smear, Staining with Giemsa), Examination of Blood Film and Identication of Leukocytes, Examination of the Blood Firm for Differential Leukocyte Count (DLC), Precautions, observations, results/Exercise.	
1-2	**Osmotic Fragility of erythrocytes** : introduction, objectives, principle, procedure, precautions, result, observations, Result, observations, Result/ Exercise	
1-3	**Estimation of RNA and DNA in Tissue**: A) Estimation of RNA by orcinol method, introduction, objectives, principle, reagent, procedure, Table Estimation of RNA by Oricinol Method, calculation and result. B) Estimation DNA with Diphenylamine Reagent, Introduction, objectives, principle, reagent, procedure, calculation and result, observation, result/ Exercise	
1-4	**Extraction of DNA :** introduction, objectives, principle, reagent, procedure, report, observations, result/ Exercise	CR 01
1-5	**Extraction of RNA:** introduction, objectives, principle, material, procedure, Report, Observations, Result,/ Exercise	
1-6	**Fractionation of proteins by Ammonium sulfate precipitation :** introduction, objectives, principle, material, procedure, Report, Observations, Result,/ Exercise	
1-7	**Localization of RNA by Methyl Green- Pronin Y** : introduction, objectives, principle, material, procedure, Report, Observations, Result, Exercise	
1-8	**Feulgen Reaction Method For DNA Localization** : introduction, objectives, principle, material, procedure, Report, Observations, Result, Exercise	
2-1	**Tissue homogenization and fractionation by differential centrifugation for isolation of nuclei and mitochondria** : A) isolation of Nucle from rat liver : introduction, objectives, principle, material, procedure, Report, B) introduction, objectives, principle, material, procedure, Report, Observations, Result,/ Exercise	
2-2	**Separation of proteins by polyacrylamide Gel Electrophoresis :** introduction, objectives, principle, material, procedure, Report, Observations, Result,/ Exercise	CR 02
2-3	**Polytene chromosomes :** introduction, objectives, material & Reagent, procedure, observation, Result/exercise	
2-4	**Cell Division – meiosis & mitosis :** introduction, objectives, principle, material, procedure, Report, Obesrvations, Result,/ Exercise	

Learning Resource Details

LR Code	Title Author	Edition Year	ISBN Publisher
Course Website Link for (1) Mobile and Online Lectures, (2) Discussion Forum for online interaction and (3) Self-Test for each CR Block, Continuous Assessment Test and End Examination			
ZGY016	Cell and molecular biology		
Text-Books			
ZGY016	Cell and Molecular Biology Dr.U. Shameen, Dr. Govindra Rao	Reprint 2013	Dr. B.R. Ambedkar Open University, Hyderabad
Reference-Books: Explore additional details and reinforce learning, with this optional learning resource!			
CD / DVD: Explore additional details and reinforce learning, with this optional learning resource!			
ZGY016 -CD1			
Web Links: Explore additional details and reinforce learning, with this optional learning resource!			
ZGY016-WL1			

ZGY017 Animal Physiology and Physiological Chemistry

SN	Description	Details
1	University	Yashwantrao Chavan Maharashtra Open University Nasik - 422 222, Maharashtra, India Website: http://www.ycmou.ac.in/and http://ycmou.digitaluniversity.ac/
2	School	School of Architecture, Science and Technology
3	Discipline	Science
4	Level	PG
5	Course Used in	Vxx: M.Sc.(Zoology)

Course Information

Sem	Code	Course Name	CR	CST	ST	CA	EE	TM	Type
01	ZGY017	Animal Physiology and physiological chemistry	2	8	120	20	80	100	p

Presumed Knowledge and Learning Objectives

Presumed Knowledge	Learning Objectives
For successful completion of this course, student should have successfully complete: • B.Sc. With or equivalent from a recognized University/Board.	After successful completion of this course, student should be able to • Develop technical skill • To empower our students with practical skills to comprehend the physiology and other functions of each ad every vital systems

Units

UN	Name of the Unit	CSs	Questions
1-1 1-2 1-3 1-4 1-5	**Laboratory Technues-1 Estimation** **Determination of protein by Buiret method.** **Determination of Glucose by Anthone Method / Somagi method** **Determination of lipids by veiling method** **Determination of glycogen by kemps method** **Determination of cholesterol by acetic anhydride method**	CR 01	Student is required to answer 4 of 5 SAQ, each of 5 marks, on each CR
2-1 2-2 2-3 2-4 2-5 2-6 2-7 2-8	**Laboratory techniques 2** **Determination of Enzyme Activities of SDH, LDH, GDH.** **Effect of subtract Concentration and pH on Succinate Dehydrogenate Activity.** **Effect of Competitive inhibitor on SDH Activity.** **Estimation of Blood Chlorides under Hetero Osmotic Media.** **Estimation of acetyl cholinesterase (ACHE).** **Adrenaline and insulin induced changes in blood Glucose /levels in frog.** **Estimation of Hemoglobin, Erythrocyte Sedimentation Rate (ESR), Coagulation Time.** **Kymograph Recording of Muscle Twitch, Tetanus and Fatigue.**	CR 02	Student is required to answer 4 of 5 SAQ, each of 5 marks, on each CR

DETAILED SYLLABUS

UN	Detailed Syllabus of the Unit	CR
1-1	**Determination of proteins by Burnet Method :** introduction, objective, estimation of proteins by Biuret Method : introduction, objectives, Estimation of proteins by beret Method (Aim, Material, Chemical, Apparatus, principle) Experiment 2 : estimation of total proteins: (Aim, Material, Chemicals, Equipment Tissue and sample preparation, procedure, observation, calculation of protein content, result and Inference Experiment : Estimation of structural and soluble protein in tissue (Aim, Material, Chemical, Apparatus, procedure, observation, result/exercise	CR 01
1-2	**Determination of glucose by enthrone method/ somogi method:** introduction, objective, Apparatus and material, procedure(method1 : Enthrone method, Method 2: Nelosn-somgyi method, result and Exercise, observation, result/exercise.	
1-3	**Determination of lipid by Valailline method :** Introduction, objective, martial, Chemicals and reagent, Apparatuses, principle, procedure, Result, conclusion, inference, Preparation of standard graph, aim, chemicals and reagent apparatus, procedure, observations result,/ Exercise	
1-4	**Determination of glycogen by KEMPs Method :** introduction, objectives, apparatus and materials, procedure, result and observation, observations, results / Exercise .	
1-5	**Determination of cholesterol by acetic anhydride method :** introduction, objectives, material and chemicals, apparatuses, principle, procedure, calculation, Result, Inference. Application, preparation standard graph of cholesterol, Observation, result, Exercise	
2-1	**Determination of enzyme activities of SDH, LDH and GDH : introduction, objectives, Determination of Succinct Dehydrogenate Activity : SDH**.(Principle ,materials and Reagents, procedure, preparation of Formosan standard Graph,), Estimation of lactate Dehydrogenate Activity : LDH (Aim, Principle, Materials and Reagent, procedure, observations,) Estimation of Glutamate Dehydrogenate Activity : GDH(Aim, Principle, Materials and chemicals, Procedure, observations, observations, result/ Exercise	CR 02
2-2	**Effect of substrate concentration and PH on succinct Dehydrogenate activity :** Introduction, objective, Effects of substrate concentration on SDH activity, (procedure, observation), Effects of ph on enzyme activity(procedure, observation & presentation, Inference) Observations, Results/ Exercise..	
2-3	**Effect of competitive inhibitor on SDH activity :** introduction, objectives, Materials/Apparatus(chemicals, Apparatus), procedure & presentation, observations, results/Exercise	
2-4	**Estimation of blood chlorides under hetero osmotic media** : introductions, objective, material methods, apparatus, reagent, procedure, Standards value, observations, calculations, result inference, observations result/ excise, end to end session)	
2-5	**Estimation of acetyl cholinesterase (Ache) :** introductions, objectives, principle, materials and methods/apparatus(materials, chemicals, Apparatuses), Procedure, Results and calculation, inference, observations, results/ Exercise	
2-6	**Adrenalin and insulin induced changes in Blood Glucose levels in frog** : introduction, objectives, apparatus and Materials, procedure, observations, results/ Exercise	
2-7	**Estimation of Hemoglobin, Erythrocyte sedimentation rate (ESR), Coagulation time :** Estimation of Hemoglobin(introduction, objectives, chemicals/Apparatus, procedure for Estimation of Hemoglobin,), Erythrocyte Sedimentation Rate(ESR)Procedure for coagulation, observations, results/ exercise	
2-8	**Kymograph recording of muscle twitch, tetanus and fatigue :** introduction, objectives, materials and apparatus, procedure, B simple Muscle Concentration or twitch, C Trappe pr stair Case phenomenon, D Summation, E. Fatigue, G. Concentration, observations & Results, observations, results/ Exercise	

LEARNING RESOURCE DETAILS

LR Code	Title Author	Edition Year	ISBN Publisher
Course Website Link for (1) Mobile and Online Lectures, (2) Discussion Forum for online interaction and (3) Self-Test for each CR Block, Continuous Assessment Test and End Examination			
ZGY017	Animal physiology & physiological chemistry		
Text-Books			
ZGY017	Animal physiology & physiological chemistry DR. Pratap Reddy, DR. P. Nagaraj	Reprint 2013	Dr. B.R. Ambedkar Open University, Hyderabad
Reference-Books: Explore additional details and reinforce learning, with this optional learning resource!			
CD / DVD: Explore additional details and reinforce learning, with this optional learning resource!			
ZGY017-CD1			
Web Links: Explore additional details and reinforce learning, with this optional learning resource!			
ZGY017-WL1			

ZGY018 HUMAN CYTOGENETIC AND DEVELOPMENT BIOLOGY (PRACTICAL)

SN	Description	Details
1	University	YashwantraoChavan Maharashtra Open University Nasik - 422 222, Maharashtra, India Website: http://www.ycmou.ac.in/and http://ycmou.digitaluniversity.ac/
2	School	School of Architecture, Science and Technology
3	Discipline	Science
4	Level	PG
5	Course Used in	Vxx: M.Sc.(Zoology)

COURSE INFORMATION

Sem	Code	Course Name	CR	CST	ST	CA	EE	TM	Type
01	ZGY018	Human Cytogenetic and Developmental Biology (Practical)	2	8	120	20	80	100	p

PRESUMED KNOWLEDGE AND LEARNING OBJECTIVES

Presumed Knowledge	Learning Objectives
For successful completion of this course, student should have successfully complete: • B.Sc. With or equivalent from a recognized University/Board.	After successful completion of this course, student should be able to • Develop technical skill • To empower our students with practical skills to comprehend the physiology and other functions of each ad every vital systems

UNITS

UN	Name of the Unit	CSs	Questions
	Human Cytogenetic	CR 01	Student is required to answer 4 of 5 SAQ, each of 5 marks, on each CR
1-1	**Culture setup and harvest**		
1-2	**Slide preparation**		
1-3	**Staining**		
1-4	**Microscopy Training and Mitotic Index Calculation**		
1-5	**Scoring**		
1-6	**Karyoptyping**		
	Developmental Biology	CR 02	Student is required to answer 4 of 5 SAQ, each of 5 marks, on each CR
2-1	**Procedure for isolating and culturing early hours chick embryo by filter paper ring method.**		
2-2	**Development of a Microlecithal Eg. Spiral cleavage in a snail.**		
2-3	**Demonstration of vitellogenesis by classifying the developmental stage of oocytes un thecrustacean ovary.**		
2-4	**Fecundity index.**		
2-5	**Culturing of Drosophila and observing its embryonic and larval stages.**		
2-6	**Regeneration.**		

DETAILED SYLLABUS

UN	Detailed Syllabus of the Unit	CR
1-1	**Culture setup and harvest** : objective, introduction, materials for culture setup, Specimen procurement(sample collection, Blood Sample Collection Protocol for Chromosomal analysis, Specimen logging), Culture setup (Cell culture, Peripheral blood, peripheral blood constituents, Lymphocytes, PHAv, RPMI Media preparation, L-Glutamine, FBS, Penciline G buffered solution, preparation of streptomycin solution, Micro method and macro method, culture setup steps), Harvesting(Equipment, reagent, Preparation of the equipment, procedure of harvesting), Trouble shooting, observations result/Exercise	
1-2	**Slide Preparation :** objectives, introduction, materials (pre washed slides, slide warmer, Pasteur pipette, hot air oven at 90 c, inverted microscopic, tissue papers), Reagent (fixative, pallete suspended in fixative, distilled water), Slide washing, Slide preparation 2 (principle, specimen, equipment, reagents, preparations, quality control preparation, unacceptable results, procedure trouble shooting) slide aging, check your process, check your progress answers, observations, results/ exercise	
1-3	**Staining :** objectives, introduction, materials (equipment, reagent), Protocol for Geisma staining for high resolution analysis, Trouble shooting, Comparison of chromosomes in different grades of staining, observations, results/exercise	CR 01
1-4	**Microscopy training and mitotic index calculation :** objectives, part of standard microscope, microscope its operation and maintenance (warning labels, Getting ready, Maintenance and storage, caution, summary of observation procedures), Screening a slide(vertical method, Horizontal method, fusion method), slide shots/ microscopy training examples. Mitotic index training sheet, observations, results/ Exercise	
2-5	**Scoring :** objectives, procedure, Worksheet 1, Worksheet 2, Worksheet 3, Worksheet 4, observations, results/ Exercise	
1-6	**Karyotyping :** objectives, introduction, procedure, worksheet 1 (Metaphase spread), worksheet2 (Representative Field with Metaphase Spreads), worksheet3(Example Karyotype), worksheet5(Key to human chromosomes), worksheet6(Karyoptype sheet), Karyoptyping – practice exercise karyoptype answers, observations , results/ exercise	
2-1	**Procedure for isolating and culturing early hoarse chick embryo by filter paper ring method :** objectives, introductions, materials required, procedure (preparation of culture assembly, filter paper rings, preparation of culture platform, isolation of blastoderm, setting up the culture), observations, self evaluation, observations, results / Exercise	
2-2	**Development of a micro lecithal egg: spiral cleavage in a snail :** objective, introduction, materials required, procedure, inference, self evaluations, observations, results/ exercise	CR 02
2-3	**Demonstration of vitellogenesis by classifying the developmental stages of oocytes in the crustacean ovary :** objective, introduction, materials required, procedure(immature ovary, vitellogenesis-1, vitellogenesis-2) inference, self evaluations, observations, results/ exercise	
2-4	**Fecundity index:** objective, introduction, materials required, procedure(stages of ovary to be selected, required parameter for calculations, Fecundity index, histosomatic index)) inference, self evaluations, observations, results/ exercise	
2-5	**Culturing of Drosophila and observing its embryonic and larval stages :** objective, phylogenetic position of drosophila, introduction, collection of drosophila from the wild, equipments for handling drosophila, culturing techniques(Media preparation, handling of drosophila, etherizer, observing external features of drosophila, identification between male and female pupae and adults, collection of virgin females, life cycle, inference, self evaluation. Observation, result/ exercise	
2-6	**Regeneration :** objective, introduction, materials required, procedure (grouping, observations), inference, observations, results/ exercise	

LEARNING RESOURCE DETAILS

LR Code	Title Author	Edition Year	ISBN Publisher
Course Website Link for (1) Mobile and Online Lectures, (2) Discussion Forum for online interaction and (3) Self-Test for each CR Block, Continuous Assessment Test and End Examination			
ZGY018	Human Cytogenetic and Developmental Biology		
Text-Books			
ZGY018	Human Cytogenetic and Developmental Biology Dr. U. Anuradha, Prof. Krupanidhi Srirama	Reprint 2013	Dr. B.R. Ambedkar Open University, Hyderabad
Reference-Books: Explore additional details and reinforce learning, with this optional learning resource!			
CD / DVD: Explore additional details and reinforce learning, with this optional learning resource!			
ZGY018-CD1			
Web Links: Explore additional details and reinforce learning, with this optional learning resource!			
ZGY018-WL1			

YEAR 02

ZGY021: IMMUNOLOGY

PROGRAMME INFORMATION

SN	Description	Details
1	University	YashwantraoChavan Maharashtra Open University Nasik - 422 222, Maharashtra, India Website: http://www.ycmou.ac.in/and http://ycmou.digitaluniversity.ac/
2	School	School of Architecture, Science and Technology
3	Discipline	Science
4	Level	PG
5	Course Used in	Vxx: M.Sc.(Zoology)

COURSE INFORMATION

Sem.	Code	Course Name	CR	CST	ST	CA	EE	TM	Type
01	ZGY021	Immunology	4	8	120	20	80	100	T

PRESUMED KNOWLEDGE AND LEARNING OBJECTIVES

Presumed Knowledge	Learning Objectives
For successful completion of this course, student should have successfully complete: • B.Sc. with Zoology or equivalent from a recognized University/Board.	After successful completion of this course, student should be able to • An understanding of the characteristics of antigen and antibodies • And understanding of the nature of antigen and antibody.

UNITS

UN	Name of the Unit	CSs	Questions
1-1 1-2 1-3 1-4	Introduction to the Immune system The Lymphoid System Cell Involve in Immune Response Structure and functions of Immunoglobulin	CR 01	Student is required to answer 4 of 5 SAQ, each of 5 marks, on each CR
2-1 2-2 2-3 2-4	Major Histocompactibility Complex in mouse and Humans Humoral Immunity Cell Mediated Immunity, The complement system	CR 02	Student is required to answer 4 of 5 SAQ, each of 5 marks, on each CR
3-1 3-2 3-3 3-4	Hypersensitivity Auto Immunity and Immune diseases Immunity to Infectious disease Immunity to Parasitic disease	CR 03	Student is required to answer 4 of 5 SAQ, each of 5 marks, on each CR
4-1 4-2 4-3 4-4	Vaccinology Transplantation and Organ Rejection Tumor Immunology Immunodiagnostic and Applications	CR 04	Student is required to answer 4 of 5 SAQ, each of 5 marks, on each CR

DETAILED SYLLABUS

UN	Detailed Syllabus of the Unit	CR
1-1	**Introduction to Immune System:** Introduction, History of Immunology, Innate and Acquired immunology, Antigens Haptens and carriers, Summary, Test your progress-Question and Answers, Model examination Questions.	CR 01
1-2	**The Lymphoid System:** Objective, Introduction, Primary Lymphoid organs, Secondary Lymphoid organs, Clonal Selection theory, Lymphocyte traffic, Summary, Test your progress-Question and Answers, Model examination Questions.	
1-3	**Cells Involve in Immune Response:** Objective, Introduction, Origin of cell involved in Immune Response, Cells of the Immune System- Lymphocytes, Cells of the Immune System- Phagocytes Granulocytes and Dendrite cells, Cell involve in antigen processing and presentation, Summary, Test your progress-Question and Answers, Model examination Questions.	
1-4	**Structure and Function of Immunoglobulin:** Objective, Introduction, Basic structure of Immunoglobulin, Immunoglobulin classes and their functions, Immunoglobulin genes and their diversity, Summary, Test your progress-Question and Answers, Model examination Questions.	
2-1	**Major Histocompactibility Complex in Mouse and Humans:** Objective, Introduction, Organization of MHC, MHC Molecule- Class-I and Class II Molecule, Pathway for Antigen presentation, Self MHC restriction of T cells, MHC and disease susceptibility, Summary, Test your progress-Question and Answers, Model examination Questions.	CR 02
2-2	**The Humeral Immunity:** Chapter Outline Objective, Introduction, Kinetics of Humeral Immune response, Immunological Memory, Antibody Production, Regulation of Immune Response, Summary, Test your progress-Question and Answers, Model examination Questions.	
2-3	**Cell Mediated Immunity:** Objective, Introduction, Overview of cell mediated Immunity, Cells involve in cell mediated Immune Response, Function of cell mediated Immunity, Role of cytokines, Summary, Test your progress-Question and Answers, Model examination Questions.	
2-4	**The Complement System:** Objective, Introduction, Components of the complement, The Complement Pathways, Complement deficiencies, Summary, Test your progress-Question and Answers, Model examination Questions.	
3-1	**Hypersensitivity:** Objective, Introduction, Classification of hypersensitivity reaction, Type I Hypersensitivity reaction, Type II Hypersensitivity reaction, Type III Hypersensitivity reaction, Type VI Hypersensitivity reaction, Inflammation, Summary, Test your progress-Question and Answers, Model examination Questions.	CR 03
3-2	**Autoimmunity and Immune Diseases**: Objective, Introduction, Organ Specific Autoimmune diseases, Systemic Autoimmune diseases, T-cell deficiency diseases, B-cell deficiency diseases, Secondary Immunodeficiency, , Summary, Test your progress-Question and Answers, Model examination Questions.	
3-3	**Immunity to Infectious diseases:** Objective, Introduction, Viruses, Bacteria, Summary, Test your progress-Question and Answers, Model examination Questions.	
3-4	**Immunity to Parasitic Diseases:** Objective, Introduction, Immunity response to Protozoan Parasites, Immune Response to Helminthes, Summary, Test your progress-Question and Answers, Model examination Questions.	
4-1	**Vccinology:** Objective, Introduction, History, Immunity - immunization, Classification of Vaccines, Summary, Test your progress-Question and Answers, Model examination Questions.	CR 04
4-2	**Transplantation and Organ Rejection:** Objective, Introduction, Transplantation antigens, Transplantation Immunity, Immune Mechanism of Graft Rejection, GvHr, Immune tolerance and immunosuppressive agents Summary, Test your progress-Question and Answers, Model examination Questions.	

4-3	**Tumor Immunology:** Objective, Introduction, Tumor antigens, Immune response to tumors, Immune surveillance, Immunodiagnostic and Immunotherapy, Summary, Test your progress-Question and Answers, Model examination Questions.	
4-4	**Immunodiagnostic and Applications:** Objective, Introduction, Antigen antibody interaction, Precipitation and agglutination reaction, RIA and ELISA and Immunoflorescence, Hybridoma Technology and monoclonal Antibodies, Summary, Test your progress-Question and Answers, Model examination Questions.	

LEARNING RESOURCE DETAILS

LR Code	Title Author	Edition Year	ISBN Publisher
Course Website Link for (1) Mobile and Online Lectures, (2) Discussion Forum for online interaction and (3) Self-Test for each CR Block, Continuous Assessment Test and End Examination			
ZGY021	Immunology		
Text-Books			
ZGY021	Immunology Dr. A. Rama Rao, Dr. U. Shameen, Dr. T. R. Aghava Rao, Dr. D. Govinda Rao, Dr. I. Shubrahmanyam. Dr. B.R. Ambedkar Open University, Hyderabad.	Reprint 2013	Dr. B.R. Ambedkar Open University, Hyderabad
Reference-Books: Explore additional details and reinforce learning, with this optional learning resource!			
ZGY021 –RB1	Immunology Dulsy Fatima and N Arumugam		Saras publication
CD / DVD: Explore additional details and reinforce learning, with this optional learning resource!			
ZGY021 -CD1			
Web Links: Explore additional details and reinforce learning, with this optional learning resource!			
ZGY021-WL1			

ZGY022: Animal Biotechnology

Programme Information

SN	Description	Details
1	University	Yashwantrao Chavan Maharashtra Open University Nasik - 422 222, Maharashtra, India Website: http://www.ycmou.ac.in/and http://ycmou.digitaluniversity.ac/
2	School	School of Architecture, Science and Technology
3	Discipline	Science
4	Level	PG
5	Course Used in	Vxx: M.Sc.(Zoology)

Course Information

Sem	Code	Course Name	CR	CST	ST	CA	EE	TM	Type
01	S25021	Animal Biotechnology	4	8	120	20	80	100	T

Presumed Knowledge and Learning Objectives

Presumed Knowledge	Learning Objectives
For successful completion of this course, student should have successfully complete: • B.Sc with Zoology or equivalent from a recognized University/Board.	After successful completion of this course, student should be able to • Identification & characterization of animal breeds. • Developing DNA based diagnostics and genetically enquired various for animals.

Units

UN	Name of the Unit	CSs	Questions
1-1 1-2 1-3 1-4	**Introduction, History and Scope of Biotechnology** **General Histology and Cell Tissue Culture** **Preparation of Culture Media** **The Stem cell**	CR 01	Student is required to answer 4 of 5 SAQ, each of 5 marks, on each CR
2-1 2-2 2-3 2-4	**Propagation and Maintenance of Tissue Culture** **Preparation of Cell Lines** **Cellular aspects of Tumor Cells** **In Vitro Fertilization and Embryo Transfer**	CR 02	Student is required to answer 4 of 5 SAQ, each of 5 marks, on each CR
3-1 3-2 3-3 3-4	**Agricultural Biotechnology** **Aquatic Biotechnology** **Microbial Biotechnology** **Environmental Biotechnology-I: Environmentally important microorganisms, Waste water treatment, waste water utilization.**	CR 03	Student is required to answer 4 of 5 SAQ, each of 5 marks, on each CR
4-1 4-2 4-3 4-4	**Environmental Biotechnology-II: Landfill, Composting, Bioremediation** **Enzyme Biotechnology** **Industrial Biotechnology**	CR 04	Student is required to answer 4 of 5 SAQ, each of 5 marks, on each CR

DETAILED SYLLABUS

UN	Detailed Syllabus of the Unit	CR
1-1	**Introduction, History and Scope of Biotechnology:** Objective, Introduction, History, New products and Techniques, Molecular Engineering, Link between Science and Technology, Risk and Hazards, Scope and Importance, Summary , Model Examination Questions, References.	CR 01
1-2	**General Histology and Cell Tissue Culture:** Objective, Introduction, Morphology and different cell types, Media for cell and tissue culture, Summary, Model Examination Questions, References.	
1-3	**Preparation of Culture Media:** Objective, Introduction, Simple Growth Media, Serum and its Quality, Sterilization and Aseptic culture techniques for animal cells, Summary, Model Examination Questions, References.	
1-4	**The Stem cell:** Objective, Introduction, the Stem cell, The Embryonic stem cell, The Adult stem cell, Hematopoietic stem cell, Summary, Model Examination Questions, References.	
2-1	**Propagation and Maintenance of Tissue Culture:** Objective, Introduction, Basic techniques of Animal cell primary culture and their application, Preparation of primary culture, Maintaining the culture, Applications of cell culture, Summary, Model Examination Questions, References.	CR 02
2-2	**Preparation of Cell Lines:** Objective, Introduction, Preservation and maintenance of animal cell lines Cryopreservation and Transport of animal germ plasma, Purification and Processing of animal cell culture product, production of monoclonal Antibodies, Processing of animal cell culture Products, Purification of Monoclonal Antibodies, Application of monoclonal antibodies, Summary, Model Examination Questions, References.	
2-3	**Cellular aspects of Tumor Cells:** Objective, Introduction, Characterization of benign and malignant tumors, Molecular aspect of transformation and malignancy, Different kinds of Oncogenes. Mechanism of Activation and tumor suppressor genes, Summary, Model Examination Questions, References.	
2-4	**In Vitro Fertilization and Embryo Transfer:** Objective, Introduction, Animal transgenesis: aims and concepts, Gene transfer into gametes, Gene transfer into embryos, Gene transfer via cells, Vectors for gene addition and replacement, Gene- knock in and knock-out, Application, Limitations, Summary, Model Examination Questions, References.	
3-1	**Agricultural Biotechnology:** Objective, Introduction, Production of disease free plant, Tissue culture as a source of genetic variability and its application in crop management, Molecular biology of Nitrogen fixation, Herbicide resistance and stress tolerant plants, Bio insecticides, Bio fertilizers, Summary, Model Examination Questions.	CR 03
3-2	**Aquatic Biotechnology:** Objective, Introduction, Fish genetics and Development of transgenic fish, Hybridization Studies, Construction and Delivery of vector DNA INTO Cytoplasm /Nucleus of the fertilized Eggs, Methods of transgenic Integration, Fish antifreeze Protein Gene Promoter in the Production of growth Hormone (Transgenic salmon With Enhanced Growth Performance), Future Prospective and Thrust areas in Fish gene Transfer technology, Biotechnological tools for disease diagnosis in Aquaculture, Disease Management Technologies, Biotechnological approach to pearl production, Summary, Model Examination Questions.	
3-3	**Microbial Biotechnology:** Objective, Introduction, Fermentation and fermentable microbes: Design and type (any three) of bioreactor (fermentor)- construction of Bioreactor (Control of temperature, aeration and agitation), downstream Processing, Production of microbial product, Microbial biotransformation, Microorganisms related to plant growth promoting-mycorrhizae rhizobia Azospirillum Azotobacter, Production of bacteria Bio fertilizer, Green manuring, (Algae, mass cultivation of cynobacteria and azolla), Summary, Model Examination Questions.	
3-4	**Environmental Biotechnology-I:** Objective, Introduction, Environmentally important microorganisms, Waste water treatment, waste water utilization, Fermentative bacterial- technical process, Summary, Model Examination Questions.	

4-1	**Environmental Biotechnology-I: (landfill, composting Earth worm treatment, degradation of plastic :** Objective, Introduction, Landfill, Composting, Earth worm treatment, Recycling of Organic wastes, Hazardous Wastes, Source and Management, Degradation of Plastics, Release of Genetically engineered microbes in the environment, Summary, Model Examination Questions.	CR 04
4-2	**Bioremediation:** Objective, Introduction, Principal Overview and application of Bioremediation, Factors of Types of Bioremediation, Microbial Bioremediation, Phytoremediation, Role of genetic engineering in Bioremediation, Bioremediation strategies, Zoo remediation, Summary, Model Examination Questions.	
4-3	**Enzyme Biotechnology:** Objective, Enzyme immobilization-Classification and Techniques, Enzyme Reactors, Properties of Immobilized Enzymes, Uses of Immobilized Enzymes, Important strategies for Commercial Uses of Immobilized Enzymes, Summary, Model Examination Questions.	
4-4	**Industrial Biotechnology:** Objective, Introduction, Scope; Characteristics and Composition of bio processing with chemical processing, Bioconversion process and design of media, Isolation preservation and Improvement of industrial of microorganisms, , Summary, Model Examination Questions.	

LEARNING RESOURCE DETAILS

LR Code	Title Author	Edition Year	ISBN Publisher
Course Website Link for (1) Mobile and Online Lectures, (2) Discussion Forum for online interaction and (3) Self-Test for each CR Block, Continuous Assessment Test and End Examination			
ZGY022	Animal Biotechnology		
Text-Books			
ZGY022	Animal Biotechnology Prof. P. Prakash Babu, Dr. A. Padmini, Prof. A. Indira, Prof. Jayraj, Prof. Radha. D. Kale. Dr. B.R. Ambedkar Open University, Hyderabad.	2010	Dr. B.R. Ambedkar Open University, Hyderabad
Reference-Books: Explore additional details and reinforce learning, with this optional learning resource!			
ZGY022-RB1	Animal Biotechnology V Kumaresan		
ZGY022-RB2	Animal Biotechnology R Sasidhara		
CD / DVD: Explore additional details and reinforce learning, with this optional learning resource!			
ZGY022-CD1			
Web Links: Explore additional details and reinforce learning, with this optional learning resource!			
ZGY022-WL1			

ZGY023: TOXICOLOGY

PROGRAMME INFORMATION

SN	Description	Details
1	University	YashwantraoChavan Maharashtra Open University Nashik - 422 222, Maharashtra, India Website: http://www.ycmou.ac.in/and http://ycmou.digitaluniversity.ac/
2	School	School of Architecture, Science and Technology
3	Discipline	Science
4	Level	PG
5	Course Used in	Vxx: M.Sc.(Zoology)

COURSE INFORMATION

Sem	Code	Course Name	CR	CST	ST	CA	EE	TM	Type
	ZGY023	Toxicology of insecticides	4	8	120	20	80	100	T

PRESUMED KNOWLEDGE AND LEARNING OBJECTIVES

Presumed Knowledge	Learning Objectives
For successful completion of this course, student should have successfully complete: • BSc with Zoology or equivalent from a recognized University/Board.	After successful completion of this course, student should be able to • Identify various aspects of chemicals\ exposure & identify method & common application of toxicology in chemicals

UNITS

UN	Name of the Unit	CSs	Questions
1-1 1-2 1-3 1-4	**Formulation and Classification of insecticide** **Evaluation of insecticide** **Insecticide and Cuticle** **Effects of insecticides on the Nervous System**	CR 01	Student is required to answer 4 of 5 SAQ, each of 5 marks, on each CR
2-1 2-2 2-3 2-4	**Botanical insecticide** **Organ chlorines** **Organ phosphorus Insecticide** **Carbonate Insecticide**	CR 02	Student is required to answer 4 of 5 SAQ, each of 5 marks, on each CR
3-1 3-2 3-3	**Synthetic Pyrethoroides** **Molecules with Different Chemistry** **Synthetic Insect Control Agents**	CR 03	Student is required to answer 4 of 5 SAQ, each of 5 marks, on each CR
4-1 4-2 4-3 4-4 4-5	**Photochemistry of Pesticide** **Microsomal Mono-Oxygenizes** **Extra- Microsomal Metabolism of Insecticide** **Insecticide Resistance** **Pesticide Residues**	CR 04	Student is required to answer 4 of 5 SAQ, each of 5 marks, on each CR

DETAILED SYLLABUS

UN	Detailed Syllabus of the Unit	CR
1-1	**Formulations and Classification of Insecticide:** Objective, Introduction, History of insecticides, Formulations of insecticides, (common Formulation: Dust, Watt able Powders, Water-Soluble Powders, Emulsifiable Concentrates, Solution Concentrate, Oil Solutions, Suspension Concentrates of Flow able, Aerosols, Granular, Fumigants, Ultra-low Volume Concentrates, Fogging Concentrate, Poison Baits, Slow-Release Insecticides) Function and Classification of insecticides, inorganic compounds, summary, Model Examination Questions, Suggest References.	
1-2	**Evaluation of insecticide toxicity :** Objective, Introduction, Evaluation Of toxicity, describing Adverse Toxicological Effects, Use of Animals in Toxicity studies, Toxicological Testing and Evaluation of pesticides, Sub chronic Test (Repeated Exposure, Intermediate Dose, Moderate Duration) Chronic Test(Multiple Exposure, Low Dose, Long Duration) Reproductive Toxicology, Genetic Toxicology, Testing for Mutagen city, Pharmacokinetics: Absorption, Distribution, Excretion, and metabolism, Method of testing Chemicals on Insects, Prohibit Analysis, Summary , etabolism, Method of testing Chemicals on Insects, Prohibit Analysis, Summary , Model Examination Questions, Suggest References.	CR 01
1-3	**Insecticides and Cuticle:** Objective, Introduction, Cuticle, Penetration and distribution of insecticides, Effect of physical agents on Cuticle, Chemical Agents. Summary, Model Examination Questions, Selected References.	
1-4	**Effects of insecticides on the Nervous**: Objectives, Introduction, Background basis of ionic permeability changes, Voltage-dependant channels, Insecticides and ionic channels. Synaptic mechanism, presynaptic mechanism, postsynaptic mechanism, Physiological consequences of neuron toxicities, Summary, Model Examination Questions, Selected Books.	
2-1	**Botanical insecticide :** Objective, Introduction, Nicotinoids, physical and chemical property, structure-toxicity relationship, mode of action, Effects of nicotine on mammals, Toxicity to insects, Molecular target, Metabolism, Therapy, Pyrethrum, Neem, Rotenone and retinoid, Summary, Model Examination Questions, Selected reference	
2-2	**Organochlorines :** objectives, Introductions, DDT and analogues, DDt toxicity, Mode of action, Metabolism of DDt, Lindane, Cyclodiene insecticides, Summary, Model Examination Questions, Selected References.	
2-3	**Organophosphorus insecticides :** Objectives, Introduction, Structure of Poisoning, Mode if action, Aging of the inhibited Cholinestrace, metabolism of organophorus Insecticides, Activation Reactions, Degradation reactions, Treatment of Poisoning, Summary, Model Examination Questions, Selected Reference	CR 02
2-4	**Carbamate insecticides:** Objective, Introduction, Development of Carbonate Insecticides, Mode of action Symptoms of Toxicity, Metabolism of carbamares, Effects of synergists, Therapy, Structure-activated Correlations, Selective Toxicity of cabamates, Summary, Model Examination Questions, Selected References.	
3-1	**Synthetic pyrethroids : Objective**, Introductions, Development of synthetic Pyrethroids, Chemical Structure and Toxicity, Toxicity, Mode of action, Influence of Temperature on toxicity, Metabolism(Ester Cleavage, Acid Moiety, Intact Ester Metabolites, Metabolism in Mammals, metabolism in Plant, metabolism in soil and water, Enzymes involved in parathyroid Degradation, Resistance to References, Model Examination Questions.	
3-2	**Molecules with different chemistry** : objective, Introduction, Neonicotinoids or nicotinic insecticides, Nereistoxin, Spinosad, Avermectins, Milbemycins, Fipronil, Formamidines, Indoxacarb, Chlorfenapry, Pymetrozine, Summary, Model Examination, Selected Refrences	CR 03
3-3	**Synthetic insect control agents:** objective, introduction, Insect Chemosterilants. Alkylating agemts, Nonalylating chemosterilants, Insect growth regulators(Chitin synthesis Inhibitors, Benzoyl phenyl Urea's, Buprofezin, Juvenile Hormones Mimic, Edison Agonists, Attractions, Sex	

	Pheromones(Monitoring of pest densities, Mass trapping, Mating Disruption, Insect Repellents, Antifeedants) Summary, Model Examination Questions, Selected Reference	
4-1	**Photochemistry of pesticides :** objectives, introductions, Basic process in photochemistry, Factors affecting pesticides photodecomposition studies, Chlorinated hydrocarbon pesticides(DDT and analogues, HCH, Cyclodienes) Organophosphate pesticides, carbonate pesticides, pyrethroids, Rotenone, Summary, Model Examination Questions, Selected References.	CR 04
4-2	**Microsomal mono-oxygenase:** Objectives, Introduction, Mode of action of microsomal Oxygenizes, mode of action of mono- oxygenize, insect mono- oxygen's s systems, Cytochrome p-450-dependent mono- oxygenase system, factors affecting mono-oxygenase activity, Multiplicity of cytochrome p-450, Inductions and inhibition of mfos, functions of the microsomal cytochrome p-450, inductions and inhibitions of mfos, functions of the microsomal cytochrome p-450-dependent mono-oxygenize system, Role in pheromone biosynthesis, Role in xenobiotic metabolism, Role in resistance and tolerance to toxicant , Lipid metabolism and phospholipids, Non-mono oxygenize enzyme, summary, Model examination questions, Selected References.	
4-3	**Extra Microsomal Metabolism** of insecticides : Objectives, Introductions, Phase1 reaction(hydrolysis, Reduction) Phase 2 reactions, Role of detoxication enzymes in insecticide resistance, Introduction of detoxication enzymes, Microbial degration, Composting, Mechanism affecting Biological Degradation, Microbial Metabolic Pathway, Summary, Model Examination Questions, Selected References	
4-4	**Insecticide resistance :** objective , introduction, Development of insecticide resistant traits, Mechanism of insecticides resistance, Factors conductive to rapid development of resistance, Genetic basic of resistance, summary, Model Examination Questions, Selected References	
4-5	**Pesticide residues:** objective, introductions, critical terms and definition. Biomagnifications, Bio concentration, and Biomagnifications, Effects of pesticide residues on human beings, Environment and Non-target Animals, pesticide residue standard in food and water, principle and method of pesticides residues Analysis, Principle of chromatography (Column chromatography, Thin layer Chromatography, Gas chromatography, GC equipment, Basic operation, types of GC detectors, HPCL) pesticide residues standards in foods, principles of chromatography, Summary, Model Emanation Questions, Selected References	

LEARNING RESOURCE DETAILS

LR Code	Title Author	Edition Year	ISBN Publisher
Course Website Link for (1) Mobile and Online Lectures, (2) Discussion Forum for online interaction and (3) Self-Test for each CR Block, Continuous Assessment Test and End Examination			
ZGY023	Toxicology of insecticide		
Text-Books			
ZGY023	Toxicology of insecticides Prof. M.sriranulu, Dr,ch. Sreenivasa Rao, T.B Gour	Reprint 2013	Dr. B.R. Ambedkar Open University, Hyderabad
Reference-Books: Explore additional details and reinforce learning, with this optional learning resource!			
ZGY023-RB1	Physiology And Eco-toxicology : Vol - II	**2010**	**Hardcover**
ZGY023-RB2	Biological Insect Pest Suppression (Advanced Series in Agricultural Sciences)		
CD / DVD: Explore additional details and reinforce learning, with this optional learning resource!			
ZGY023-CD1			
Web Links: Explore additional details and reinforce learning, with this optional learning resource!			
ZGY023-WL1			

ZGY024: Applied Entomology

Programme Information

SN	Description	Details
1	University	YashwantraoChavan Maharashtra Open University Nasik - 422 222, Maharashtra, India Website: http://www.ycmou.ac.in/and http://ycmou.digitaluniversity.ac/
2	School	School of Architecture, Science and Technology
3	Discipline	Science
4	Level	PG
5	Course Used in	Vxx: M.Sc.(Zoology)

Course Information

Sem	Code	Course Name	CR	CST	ST	CA	EE	TM	Type
01	ZGY024	Applied Entomology	4	8	120	20	80	100	T

Presumed Knowledge and Learning Objectives

Presumed Knowledge	Learning Objectives
For successful completion of this course, student should have successfully complete: • BSc with Zoology or equivalent from a recognized University/Board.	After successful completion of this course, student should be able to • The infirmary between insect and environment was emphasized to the entomological research in many dissection which later proved of immense value in the indigenous control measure so as to provide more food for growing population

Units

UN	Name of the Unit	CSs	Questions
	Classification and structure	CR 01	Student is required to answer 4 of 5 SAQ, each of 5 marks, on each CR
1-1	**Insect toxonomy**		
1-2	**External Morphology-study of generalized insect**		
1-3	**Internal Morphology**		
1-4	**Insect Behavior**		
	Economic Entomology	CR 02	Student is required to answer 4 of 5 SAQ, each of 5 marks, on each CR
2-1	**Pests of field Crops of stored grains**		
2-2	**Horticulture Crop Pests**		
2-3	**Integrated Pest Management**		
2-4	**Non Insect Pest (Biology), Damage and Management**		
3-1	**Silkworm (Biology, nature of produce, uses)**	CR 03	Student is required to answer 4 of 5 SAQ, each of 5 marks, on each CR
3-2	**Honeybees (Biology, nature of produce, uses)**		
3-3	**Lac insect and other beneficial insects**		
	Livestock, urban and medical entomology	CR 04	Student is required to answer 4 of 5 SAQ, each of 5 marks, on each CR
4-1	**Livestock**		
4-2	**Urban Entomology**		
4-3	**Medical Entomology**		
4-4	**Forensic Entomology**		
4-5	**Aquatic Entomology**		

DETAILED SYLLABUS

UN	Detailed Syllabus of the Unit (Application Oriented problems)	CR
1-1	**Insect taxonomy :** Objective, introduction, character and classification of phylum Arthropod, Character and classification of class insect, Characters and classification of phylum Arthropod, Character and classification of class insecta, Character of insect orders (Thysanura, Diplura, Protura, Collembola, Ephemeroptera, Odonata, Plecoptera, Grylloblattodea, Orthoptera, Phasmida, Dermaptera, Embioptera, Dictyoptern, Isoptera, Zoraptera, Psocoptera, Mallophaga, Siphunculata or Anaplura, Hemioptera, Thysanoptera, Neuroptera, Coleoptera, Strepsiptera, Mecoptra, Diptera, Lepidoptera, Trichoptera, Hymenoptera) summary, Model Examination Question Suggested books	
1-2	**External Morphology Study of Generalized insects** : objectives, Introduction, Head, Thorax, Appendages(Mouthparts, Antennae, Leg of insects, General Characters of wings of insects, wing variation) Summary, Model Examination Questions, Suggested books.	CR 01
1-3	**Internal Morphology :** objective, Introduction, integument(cuticle, Epidermis, Basement Membrane, chitin), Endocrine system, Digestive system, Excretory system, Circulative system, Respiratory system, Nervous system, Reproductive system, Summary, Model examination questions, Suggested books	
1-4	**Insect Behavior :** Objectives, Introductions, Pattern of behavior (innate behavior, Learning), Communication and modes of communication, Courtship and mating behavior, Copulation, Migration, Feeding behavior, Social behaour, Escape behavior, Defense behavior, Clocks and circadian rhythms, Diapauses, Summary, Model Examination Questions, Suggested books.	
2-1	**Pest of field crops and storage grains** : Objectives, Introduction, Pest o rice, Pest of Millets, Pest of sugarcane, pest of groundnut, pest of castor, pest of cotton, pest of chilies, pest of red gram, Coleopteran pests of stored Grains, Lepidopteron [pests of stored grains, Storage pest management, Summary, Model Examination Questions, Suggested books.	
2-2	**Horticultural crop pests :** objectives, Introduction, Pest of Brinjal, Pest of Okra, Pest of tomato, pest of cabbage and cauliflower, pest of mango, pest of citrus, pest of Grapevien, pests of Ginger and Turmeric, Pest of pepper, pest of tobacco, pest of Roses, Pest of chrysanthemum pest of Turerose, pest of jasmine, pest of coconut, summary, Model Examination Questions, Suggested books,	CR 02
2-3	**Integrated pest management :** Objectives, introductions, Definitions, Aims of IPM, Ecology and IPM, Principles of IPM, Component (Tools) of IPM< Curative measures(Mechanical control, Biological control, Microbial control. Chemical control, Achievements in IPM, Summary, Model Examination Questions, Suggested books..	
2-4	**Non- Insects (Biological, Damage and Management) :** objectives, introductions, plants mites, nematodes, Rodents(Striped Squirrel, Indian Crested Porcupine, The Indian Gerbille, The Indian Desert Gerbile, House rat, Soft-Furred Filed Rat, The House Mouse, Lesser Bandicoot Rat, Large Bandicoot Rat), Rodent Control, Birds, Birds pest Management, summary, Model Examination Questions, Suggested Books	
3-1	**Silkworms (Biology, Nature of produce, uses) :** objectives, introduction, Kinds of silkworms, Morphology of silkworms, Voltinism and molting, Exploitation of hererosis, Silkworm rearing, Disease of silkworms(Protozoan, Bacterial, Viruses, Fungal Desases), Pest of silkworm, Use of silk and its economic importance, Summary, Model Examination Questions, suggested books.	
3-2	**Honeybees** : (Biological, nature of produce, uses) : objectives, introductions, Kinds of honeybees, structural adaptations in honeybees (Legs, Digestive system, Stings, Specialized glands) The Bea Colony(Queen, Drones, Workers) Foraging of Bees, Evolution of Social life in honeybees, Social behaviors of honeybees, beekeeping, Appliance in beekeeping, Diseases of honeybees, Pests of honeybees, Uses of honey, Beeswax and its uses, Bee Venom, Summary, Model Examination Questions, Suggested Reference books	CR 03
3-3	**Lac insects and other beneficial insects :** objective, introduction, Historical background of Lac, life history of Lac insect, Lac cultivation, Host plants of Lac insect, Problems of Lac insects, Problem of	

	Lac growers, Enemies of Lac insects, Yield, Preparation for the market, Technology of Lac processing. Uses of shellac, Various products of Lac, Predators and parasitoids, insect pollinators, Summary, Model Examination Questions, Suggested books.	
4-1	**Livestock entomology :** objectives, introduction, insect associate with Cattle(horse fly, stable fly, Cattle fly, Blow fly, Ox-warble fly, House fly, Blood Sucking Sand flies, Eye flies, Eye Frequenting Moths, Insects Associated with Poultry, Summary, Model Examination, Suggested Books.	CR 04
4-2	**Urban Entomology :** objectives, introduction, Termites, (character, Classification of termites, cats of Termites, Biological and caste Differentiation, Feeding Habits, Habitations of termites, Control) Cockroaches (Character, Biology, Economic Importance, control), Ants(Biology, Economic importance, control) Summary, Model Examination Questions, Suggested books	
4-3	**Medical Entomology :** Objectives, introduction, Insect of Medical Importance(Mosquitoes, Sand flies, The sumulium or Black flies, Eye-flies, the housefly, Bed bug, The Assassin Bug, Fleas, Human Body Louse, Summary, Model Examination Questions, Suggested Books.	
4-4	**Forensic Entomology:** objectives, introduction. scope of forensic entomology (Estimating PMI, Corpse relocation, finding the cause of death, Detecting physical Abuse, Detection controlled/contraband substances, Forensic Entomology in wildlife Investigation) history of Forensic entomology in wildlife investigation, process after death, Estimating time of death(Principle 1: ager and stage of insect, Accumulated Degree hours, factor affecting rate of development of maggots on a Body, principle 2 faunal succession,) Arthropod diversity on the carrion(Flies Associated with carrion, Beatles Associated with carrion, Moths associated with carrion, Wasps, ants and bees Associated with Carrion, Death Sense procedures (Sense observation and whether data, Collection of insect from sense after body removal, Laboratory Finding, Data Analysis, Interpretation of Blood Spatter Pattern, Entomological Collection Equipment, Collection and observation of insect, Summary, Model examination questions, Suggested Books)	
4-5	**Aquatic Entomology: Objectives, Introduction, Taxonomic Position of Aquatic insects, Respiration in Aquatic insects, Aquatic Locomotion, Summary, Model Examination Questions.**	

LEARNING RESOURCE DETAILS

LR Code	Title Author	Edition Year	ISBN Publisher
Course Website Link for (1) Mobile and Online Lectures, (2) Discussion Forum for online interaction and (3) Self-Test for each CR Block, Continuous Assessment Test and End Examination			
ZGY024	Applied Entomology		
Text-Books			
ZGY024	Applied Entomology Prof. T.B. Gour, Prof. T.V.K Singh, Dr. J. Sathyanarayana	Reprint 2013	Dr. B.R. Ambedkar Open University, Hyderabad
Reference-Books: Explore additional details and reinforce learning, with this optional learning resource!			
ZGY024-RB1	An introduction to the study of insects	1976	**Hardcover**
ZGY024-RB2	Essential Entomology: An Order-by-Order Introduction 1st Edition		**George C. McGavin**
CD / DVD: Explore additional details and reinforce learning, with this optional learning resource!			
ZGY024 -CD1			
Web Links: Explore additional details and reinforce learning, with this optional learning resource!			
ZGY024-WL1			

ZGY025 IMMUNOLOGY (PRACXTICAL)

PROGRAMME INFORMATION

SN	Description	Details
1	University	Yashwantrao Chavan Maharashtra Open University Nasik - 422 222, Maharashtra, India Website: http://www.ycmou.ac.in/and http://ycmou.digitaluniversity.ac/
2	School	School of Architecture, Science and Technology
3	Discipline	Science
4	Level	PG
5	Course Used in	Vxx: M.Sc.(Zoology)

COURSE INFORMATION

Sem	Code	Course Name	CR	CST	ST	CA	EE	TM	Type
01	ZGY025	Immunology (Practical)	2	8	120	20	80	100	p

PRESUMED KNOWLEDGE AND LEARNING OBJECTIVES

Presumed Knowledge	Learning Objectives
For successful completion of this course, student should have successfully complete: • BSc with Zoology or equivalent from a recognized University/Board	After successful completion of this course, student should be able to • Develop technical skill • To empower our students with practical skills to comprehend the physiology and other functions of each ad every vital systems

UNITS

UN	Name of the Unit	CSs	Questions
1-1 1-2 1-3 1-4 1-5	**Blood Film preparation and identification of cells.** **Total count and differential count of leukocyte** **Determination of total red blood cell and white blood cells in the blood sample** **Estimation of serum proteins** **Estimation of Albumin and globulin**	CR 01	Student is required to answer 4 of 5 SAQ, each of 5 marks, on each CR
2-1 2-2 2-3 2-4 2-5 2-5 2-6	**Histology of lymphocyte organs** **Blood groups** **Widal test** **Pregnancy test** **Immune diffusion** **Immune electrophoresis** **ELISA- demonstration**	CR 02	Student is required to answer 4 of 5 SAQ, each of 5 marks, on each CR

Detailed Syllabus

UN	Detailed Syllabus of the Unit	CR
1-1	**Blood film preparation and identification of cells:** introduction, Aims, objective, Material, p[procedure (Preparation of Blood Smear, Staining with Ginemsa), Examination of blood Film and identification of leukocytes.	CR 01
1-2	**Total Count and differential count of leukocytes:** introduction, Aim, objective, Material, producer, precautions	
1-3	**Determination of total red blood cells and white blood cells in the blood sample** :.Determination of total red blood cells present in the given sample of blood(introduction, Aim, Objective, Apparatuses, producer, Calculations, precautions) Determination of total white blood cells present in the blood sample (introduction, aim, objective, apparatus, procedure, calculations, precaution	
1-4	**Estimation of total serum proteins: Introduction,** Aim, Objective, Principle, Reagents, Procedure , Estimation.	
1-5	**Estimation of albumin and globulin**: Introduction, Aim, Objective, Principle, Reagents, Procedure, Calculation.	
2-1	**Histology of lymphoid organs:** Introduction, Aim, Objective, Primary lymphoid organs- thymus and bursa of fabricius, Secondary lymphoid organs-lymph node and spleen.	CR 02
2-2	**Blood groups** : Introduction, Aim, Objectives, Principle, Materials, Procedure, Observation, Report.	
2-3	**Widal test for typhoid fever:** Introduction, Aim, Objectives, Principle, Materials, Procedure, Observation, Report.	
2-4	Pregnancy test: Introduction, Aim, Objective, Principle, Materials, Procedure, Report.	
2-5	**Immuno diffusion**: Introduction, Aim, Objective, Principle, Materials, Procedure, Report**.**	
2-6	**Immuno electrophoresis:** Introduction, Aim, Objective, Principle, Reagents and Equipment, procedure.	
2-7	**Enzyme linked immunosorbent assay:** Introduction, Aim, Objective, Principle, Materials, Reagents, Procedure, Report.	

Learning Resource Details

LR Code	Title Author	Edition Year	ISBN Publisher
Course Website Link for (1) Mobile and Online Lectures, (2) Discussion Forum for online interaction and (3) Self-Test for each CR Block, Continuous Assessment Test and End Examination			
ZGY025	Immunology		
Text-Books			
ZGY025	Immunology Dr. U. Shameem, Dr. D. Govinda Rao	2006	Dr. B.R. Ambedkar Open University, Hyderabad
Reference-Books: Explore additional details and reinforce learning, with this optional learning resource!			
CD / DVD: Explore additional details and reinforce learning, with this optional learning resource!			
ZGY025-CD1			
Web Links: Explore additional details and reinforce learning, with this optional learning resource!			
ZGY025-WL1			

ZGY026: ANIMAL BIOTECHNOLOGY (PRACTICAL)

PROGRAMME INFORMATION

SN	Description	Details
1	University	Yashwantrao Chavan Maharashtra Open University Nasik - 422 222, Maharashtra, India Website: http://www.ycmou.ac.in/and http://ycmou.digitaluniversity.ac/
2	School	School of Architecture, Science and Technology
3	Discipline	Science
4	Level	PG
5	Course Used in	Vxx: M.Sc.(Zoology)

COURSE INFORMATION

Sem	Code	Course Name	CR	CST	ST	CA	EE	TM	Type
01	ZGY026	Animal Biotechnology (Practical)	2	8	120	20	80	100	p

PRESUMED KNOWLEDGE AND LEARNING OBJECTIVES

Presumed Knowledge	Learning Objectives
For successful completion of this course, student should have successfully complete: • BSc with Zoology or equivalent from a recognized University/Board.	After successful completion of this course, student should be able to • Classify and solve integral equations • Apply integral equations to solve ODEs

UNITS

UN	Name of the Unit	CSs	Questions
1-1 1-2 1-3 1-4 1-5 1-6	**Fundamental Techniques of Biotechnology** **General Histology and Cell Tissue Culture** **Cell Culture** **The Stem cell** **Propagation and maintenance of tissue culture** **Cell culture from cell line** **Cellular aspects of tumors cell.**	CR 01	Student is required to answer 4 of 5 SAQ, each of 5 marks, on each CR
2-1 2-2 2-3 2-5 2-6 2-7	**Applied Biotechnology** **Microbiology – testing and evaluation of coliform bacteria** **Phytoplankton and Zooplanktons** **Production of Pathogen-free plants through meristem culture** **Vermitechnology** **Penicillin production and testing of antimicrobial activity** **Enzyme immobilization**	CR 02	Student is required to answer 4 of 5 SAQ, each of 5 marks, on each CR

DETAILED SYLLABUS

UN	Detailed Syllabus of the Unit	CR
1-1	**General Histology And Cell Tissue Culture**: Introduction, Aim, Objectives, Procedure- fixation, processing, embedding, sectioning, Staining Procedure- studying the histopathology of brain using haematoxylin and eosin stain, Preparation of Haemotoxylean, Preparation of eosin (stock solution), Observation and results, Histological study Connective tissue-fibroblasts, adipocytes, Morphages, collagen, fibro collage nous tissue, Epithelial Tissue-Stratified squamous epithelium, Simple columnar epithelium, pse0075dostratified columnar epithelium, Cuboidal epithelium, Simple squamous epithelium, Glandular epithelium, Liver and Pancreas, Liver, Pancreas, Muscle, Smooth muscle, Cardiac muscle, Skeletal muscle, Nervous Tissue- Nerve cell, Axon, Dendrites Observation and record.	
1-2	**Cell Culture**: Introduction, Aim, Material and method, Material, Equipment, Reagents, Work Area and Equipment, Preservation and storage, Maintenance, Procedure To Sanitize the Laminar hood, Resuscitation of frozen Cell lines, procedure, Subculture of Adherent(monolayer) cell lines, procedure, Key Points, Sub Culture Short Protocol And Splitting Guide, Daily Culture Check , Cell Culture Splits, Trypsinizing T25 Flasks, T25 or Two 6-Well plates, T25 to 12-35 mm Dishes, Culture and Passage Cells, Freezing Cells Observation and Results.	
1-3	**The Stem Cell**: Introduction, Aim, Protocol for the culturing of bone marrow stem cells, Materials and Methods, Materials, Equipment, Reagents, Reagent setup, Procedure, Isolation of Bone marrow(BM) from Murine (Mice), Culture of Messenchymal Stem cells from isolated Murine Bone Marrow(BM), Contamination, Anticipated results , Protocol for the culturing for cord blood stem cells, Materials and Methods, Materials, Equipment, Reagent, Reagent setup, Procedure, Isolation of Human UCB Stem Cell Lineages, Mononuclear cell enrichment by Density gradient method, CD34+ cell enrichment, Cell Culture and Expectation, Nucleated Cell Count, Viability and CD34 Cell analysis, Immune cytochemistry, Flow Cytometry, Cytokine-induced expansion, Directed engineering towards the pancreatic phenotype , Immunocytochemistry, Materials and Equipments required, Materials, Reagents, Equipment, Procedure for Immunocyto chemistry, Observation and Results .	CR 01
1-4	**Propagation And Maintenance of Tissue Culture**: Introduction, Aim, Material and Methods, Material, Equipment, Reagents, Procedure, Sterile condition, Protocol for isolation of Chick embryo, Collagenase Disaggregation in collagens, Disaggregation , Observation and Result.	
1-5	**Cell Culture From Cell line:** Introduction, Aim, Basic techniques-The 'Do's and Don' ts' of cell culture, Aseptic Technique and Good Cell Culture Practice, Resuscitation of frozen cell Lines, Subculture of Adherent Cell Lines, Subculture of Semi- Adherent cell Lines, Subculture of Suspension Cell Line, Cell Qualification, Cryopreservation of cell Lines, Subculture Short Protocol and Splitting Guide, Establishment Maintenance and Cloning of Human primary cell Stains, Observation and Result.	
1-6	**Cellular Aspects of Tumors Cell:** Introduction, Aim, Materials and Methods, Morphological Characteristics Feature of Transformed cells in culture, Differences between benign and Malignant tumors in histological sections, Different characteristics features of the Glioma and Neuoblastoma from the histological sections, Observation and Result.	
2-1	**Microbiology – Testing and evaluation of coliform bacteria :** introduction, Determination of total bacteria population by stranded plate count technique, Bacterial examination of water by multiple-tube fermentation test, Detection of coliforms to determine water purity using membrane filter method, observation,result.	CR 02
2-2	**Phytoplankton's and zooplanktons :** introduction, food cycle in fresh water pond, Qualitative Estimation of plankton, material required, procedure for plankton identification, Qualitative estimation of planktons, materials required, procedure, Calculation and result	
2-3	**Procedure of pathogen- :**free plants through merited culture : introduction, materials required, procedure, observation and results, Exercise**.**	

2-4	**Vermi technology :** introduction, source of raw materials, initial conditioning of waste, watering the beds, harvesting of vermicompost, harvesting of cocoons and newly emeged earthworms**,** packing of vermin compost, vermicompost Tea, Vermiwash, Estimation of nitrogen, estimation of organic carbon, Estimation of Acid phoshatase, Estmation of alkaline phosphate, estimation of phosphorous by Fiske-Subbarow method	
2-5	**Enzyme immobilization :** introduction, pricpiles of enzymes immobilization, types of immobilization, Diastase Enzyme Immobilization-Alginate immobilization, ∝-Amylase Enzyme Immobilization-Alginate, Immobilization using sodium akginate with calcium chloride, Activity studies of immobilized enzyme, Effect of temperature on free and immobilized lipase, Effect of ph on free and immobilized lipase, Kinetic studies of immobilized lipase, tempature studies, ph studies, observation, result & record.	

Learning Resource Details

LR Code	Title Author	Edition Year	ISBN Publisher
Course Website Link for (1) Mobile and Online Lectures, (2) Discussion Forum for online interaction and (3) Self-Test for each CR Block, Continuous Assessment Test and End Examination			
ZGY026	Animal Biotechnology		
Text-Books			
ZGY026	Animal Biotechnology Prof. P. Prakash Babu, Dr. A. Padmini. Prof. A.Indira, Prof. Jayraj, Prof. Radha D.Kale	Reprint 2013	Dr. B.R. Ambedkar Open University, Hyderabad
Reference-Books:			
CD / DVD: Explore additional details and reinforce learning, with this optional learning resource!			
ZGY026-CD1			
Web Links: Explore additional details and reinforce learning, with this optional learning resource!			
ZGY026-WL1			

ZGY027 TOXICOLOGY (PRACTICAL)

PROGRAMME INFORMATION

SN	Description	Details
1	University	YashwantraoChavan Maharashtra Open University Nasik - 422 222, Maharashtra, India Website: http://www.ycmou.ac.in/and http://ycmou.digitaluniversity.ac/
2	School	School of Architecture, Science and Technology
3	Discipline	Science
4	Level	PG
5	Course Used in	Vxx: M.Sc.(Zoology)

COURSE INFORMATION

Sem	Code	Course Name	CR	CST	ST	CA	EE	TM	Type
01	ZGY027	Toxicology (Practical)	2	8	120	20	80	100	p

PRESUMED KNOWLEDGE AND LEARNING OBJECTIVES

Presumed Knowledge	Learning Objectives
For successful completion of this course, student should have successfully complete: • BSc with Zoology or equivalent from a recognized University/Board.	After successful completion of this course, student should be able to • Develop technical skill • To empower our students with practical skills to comprehend the physiology and other functions of each ad every vital systems

UNITS

UN	Name of the Unit	CSs	Questions
1-1 1-2 1-3 1-4 1-5 1-6	**Computation of toxicity- Probity Analysis** **Estimation of contact toxicity of insecticide film.** **Evaluation of efficacy of mosquito repellent coils** **Evaluation of efficacy of mosquito repellent creams** **Testing efficacy of household insecticides** **Detection of insecticide resistance in hellicoverpa armigera**	CR 01	Student is required to answer 4 of 5 SAQ, each of 5 marks, on each CR
2-1 2-2 2-3 2-4 2-5 2-6 2-7 2-8	**Nerve cells in insects** **Mixed Function oxidizes (MFO) Assay** **Assay of carboxyl esterase** **Estimation of acetyl cholinesterase in insects** **Emulsion Stability test** **Determination of pesticide residues in water** **Determination of pesticide residues in Soil** **Determination of pesticides in fat**	CR 02	Student is required to answer 4 of 5 SAQ, each of 5 marks, on each CR

DETAILED SYLLABUS

UN	Detailed Syllabus of the Unit (Exercises word should not be mentioned here as it is a part of each unit)	CR
1-1	**Computation of toxicity- probity Analysis:** Aim, Objectives, Materials, Procedure,(Method 1: Graphical Method, Method 2Aritjematical Estimation) Exercise, references, model Examination Questions.	CR 01
1-2	**Estimation of contact toxicity of insecticide films:** Aim, objectives, materials, procedure (preparation of stock solutions, preparation of insecticide concentrations for tests), Observations, References, model examination questions.	
1-3	**Evaluation of efficicacy of mosquito Repellent coils :** Aims, objectives, materials, procedure, observations, references, model examination questions	
1-4	**Evaluation of mosquito repellent creams:** aims, objectives, materials, procedure, observations reference, model examination questions.	
1-5	**Testing efficiency of household insecticide:** Aim, Objectives materials, procedure, observations, references, model examination questions.	
1-6	**Detection of insecticide resistance in helicoverpa armigera (hubn):** Aims, objectives, Materials, Procedure, observations, eferances, model examination questions.	
2-1	**Observation of nerve cells in insects :** Aims, objectives, materials, procedure, observations, reference, Model examination questions	CR 02
2-2	**Mixed function oxidizes (MFO) assay:** Aims, objectives, materials, procedure, observations, and reference. Model examination questions,	
2-3	**Carboxyl esterase's assay :** Aim, objectives, materials, procedure, observations, reference, Model examination questions	
2-4	**Determination of acetyl cholinesterase in insects** : Aim, objectives, materials, procedure, observations, reference, Model examination questions	
2-5	**Emulsion stability test :** Aim, objectives, materials, procedure, observations, reference, Model examination questions	
2-6	**Determination of pesticide residues in water :** Aim, objectives, materials, procedure, observations, reference, Model examination questions	
2-7	**Determination of pesticide residues in Soil** : Aim, objectives, materials, procedure, observations, reference, Model examination questions	
2-8	**Determination of pesticide residues in Fat :** Aim, principle, objectives, materials(Apparatus, pesticides, Reagents) procedure (Glorisil Column Cleanup, chromatography) observations, reference, Model examination questions	

LEARNING RESOURCE DETAILS

LR Code	Title Author	Edition Year	ISBN Publisher
Course Website Link for (1) Mobile and Online Lectures, (2) Discussion Forum for online interaction and (3) Self-Test for each CR Block, Continuous Assessment Test and End Examination			
ZGY027	Toxicology		
Text-Books			
ZGY027	Toxicology Prof.M. Sriramulu, Prof. T.B. Gour, Dr. Ch. Srinivasa Rao	2010	Dr. B.R. Ambedkar Open University, Hyderabad
Reference-Books: Explore additional details and reinforce learning, with this optional learning resource!			
CD / DVD: Explore additional details and reinforce learning, with this optional learning resource!			
ZGY027-CD1			
Web Links: Explore additional details and reinforce learning, with this optional learning resource!			
ZGY027-WL1			

ZGY028 Applied Entomology (Practical)

Programme Information

SN	Description	Details
1	University	Yashwantrao Chavan Maharashtra Open University Nasik - 422 222, Maharashtra, India Website: http://www.ycmou.ac.in/and http://ycmou.digitaluniversity.ac/
2	School	School of Architecture, Science and Technology
3	Discipline	Science
4	Level	PG
5	Course Used in	Vxx: M.Sc.(Zoology)

Course Information

Sem	Code	Course Name	CR	CST	ST	CA	EE	TM	Type
01	ZGY028	Applied Entomology (Practical)	2	8	120	20	80	100	p

Presumed Knowledge and Learning Objectives

Presumed Knowledge	Learning Objectives
For successful completion of this course, student should have successfully complete: • BSc with Zoology or equivalent from a recognized University/Board.	After successful completion of this course, student should be able to • Develop technical skill • To empower our students with practical skills to comprehend the physiology and other functions of each ad every vital systems

Units

UN	Name of the Unit	CSs	Questions
	General histology and cell Tissue culture	CR 01	Student is required to answer 4 of 5 SAQ, each of 5 marks, on each CR
1-1	**External characters of typical insect (viz. Grasshopper)**		
1-2	**Demonstration of chitin in the Integument**		
1-3	**Identification of some common orders of class insect.**		
1-4	**Identification important pests and their symptoms of damage**		
1-5	**Identification of important pests stored grains-and their symptoms of damage**		
1-6	**Important pests of horticulture; crops-and their symptoms if damage**		
1-7	**Attractions by insect sex pheromones**		
2-1	**Forensic Entomology Practical**	CR 02	Student is required to answer 4 of 5 SAQ, each of 5 marks, on each CR
2-2	**Excavation of an Active Termite Mound**		
2-3	**Collocation of silk Gland, Appendages, Digestive system**		
2-4	**Dissection of Mouth parts of Insects.**		
2-5	**Dissection of silk gland appendages digestive system.**		
2-6	**Visit to biological control laboratory**		

DETAILED SYLLABUS

UN	Detailed Syllabus of the Unit	CR
1-1	**External characters of a typical:** introduction, apparatus/ materials/chemicals, procedure(The head, the thorax, the abdomen), observations and records, types of wings, (Wings coupling apparatus) legs of insect (A typical leg, types of legs) end to end session	
1-2	**Demonstration of chitin in the integument:** introductions, apparatuses/ materials/chemicals required procedure, observation and records.	
1-3	**Identification of some common orders of class insect :** introduction, aooratuse/ materials/chemicals required, insect collecting nets, aspirator, killing battles, mounting and preserving insects, procedure (order thysanuram, Ephemeroptera, odonoata, otyhoptera phasimda, dermaptera, dictypoptera, isopteran, mallaphaga, siphunculata, hemiptera, Coleoptera, Lepidoptera, hymenoptera)	
1-4	**Identification of Important pests-and their symptoms of damage :** introduction, apparatus/materials/chemicals required, important parts asnd atheir symptoms of damage, (reice f\gall midges\, rice gundhy buf\g, reice green leaf hopper, sorghum shootfly, sorghum stem borer, sorghum earhead bug, sorghum mif\dgem Ragi Pink borer, red gram pod borer, lentil pod borerrrm red gram pod fly, sugarcane pyrila, castor semi-looper, Ground hunt leaf minr, Hairy caterpillars, cotton aphid, cotton pink boll worms, tobacco caterpillar, cotton whitefly, obdrvation and record)	CR 01
1-5	**Identification of important pests stored grains and their symptoms of damage**: introduction, materials and method, important pests of stored grains(red flour beetle, rice moth, Angoumois grain moth, pulse beetle) observation and record	
1-6	**Important pests of horticulture crops-and their symptoms of damage:** introduction, apparatus/materials/chemicals required(okra shoot and fruit borer, brinjal shoot and fruit borer, brinjal epilachna beetle, Diamond –back moth, chili thrips, scirtothrips dorsalis hood, Grapevine meal bug, mango hopper, citrus leaf miner, ciatrus butterfly, coconut black headed caterpillar, observation and records, model examination questions	
1-7	**Attraction by insect sex pheromones:** instructions, Apparatus. required, observations and records	
2-1	**Forensic entomology :** introductions, procedure(collection of specimens, apparatus/ materials/chemicals required, preparing the bait, setting the bait, observations, record, identification insects and the adult flies(materials, procedure, observation and record) procedure a report discussion, end to end session	
2-2	**Excavation of an active termite mound :** introduction, materials & methods, procedure, observations and record, supposing theory materials(social organization, scientific classification, termite nests	
2-3	**Collection and identification of mosquito vectors:** introduction, procedure for mosquito collection, material(insect collecting nets, Aspirator, killing bottles), adult mosquito collection(collection with aspirator, animal or human bait collections, spray sheet collections) Mosquito larvae collections(the shallow skim, partial submersion, complete submersion, dipper as a background, ”flow in: method, scraping, simple scoop, precautions, observations and recodes, model examination questions, supporting theory materials, scientific classification, development, Differences among species	CR02
2-4	**Types of mouth parts of insects:** introductions, apparatus/ materials/ chemicals required, procedure(chewing and biting type-grasshopper, piercing and sucking type-bug, piercing and sucking type-mosquito, sponging type-house fly, siphoning type-moth /butterfly, types of mouthparts, observations and records, model examination questions.	
2-5	**Disection of silk gland, appendages, digestive system** : introduction, materials requires, dissection of silk gland, dissection of spiraclesm appendages, caudal horn (dissection of spiracles, dissection of appendages, dissection of caudal horn, observation and precaution, model examination question	

2-6	**Visit to biological control laboratory (to observe the multiplication of insect parasitoids) :** introduction(biology and life cycle of trichogramma, using trichogtramma in a biological control program, mass rearing of trichogramma, release basic, relapse rates, observations and records, model examination questions	

Learning Resource Details

LR Code	Title Author	Edition Year	ISBN Publisher
Course Website Link for (1) Mobile and Online Lectures, (2) Discussion Forum for online interaction and (3) Self-Test for each CR Block, Continuous Assessment Test and End Examination			
ZGY028	Applied entomology		
Text-Books			
ZGY028	Applied entomology Prof. T.B. Gour, Dr. J. Sathyuanarayna	2009	Dr. B.R. Ambedkar Open University, Hyderabad
Reference-Books: Explore additional details and reinforce learning, with this optional learning resource!			
CD / DVD: Explore additional details and reinforce learning, with this optional learning resource!			
ZGY028-CD1			
Web Links: Explore additional details and reinforce learning, with this optional learning resource!			
ZGY028-WL1			

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