

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

Syllabus: V92: B.Sc. (PCM) {2015 Pattern}

Designed as per the UGC Template for
5512002 - B.Sc. – Physical Science – Physics, Chemistry, Mathematics

2015

Updated on
24th July 2018

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

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Syllabus Updated on 24 July 2018

SYLLABUS FOR: V92 - B.Sc. (PCM) {2015 PATTERN}

BASIC INFORMATION

1. **Mode of Education:** Blended Mode of Education, that is, where **theory** component of teaching-learning is offered in online / distance mode **and practical** activity component of teaching-learning is offered in full face-to-face mode under guidance and supervision of qualified and experienced teacher at study center
2. **Minimum Programme Duration:** 3 years after HSC (12th) or Equivalent
3. **Required Study Efforts:**
 - a. Total **378** Hours of Teaching-Learning support from the University **and** total **282** Hours of Self-Study, that is, total **660** Hours of total study efforts (including Self-Study) during **each** semester.
4. **Medium of Instruction:** English
5. **Profile of Prospective Students:** Prospective students include In-Service Science Teachers from Schools **and** all others, who have successfully completed HSC (12th) or Equivalent
6. **Attendance:** **Minimum 75 % attendance only for all Activity type of courses (Course 05, 06 and 07).**

ESSENTIAL PRE-REQUISITES FOR ADMISSION

1. **Availability of minimum 09 days in each semester** to perform all specified Practical Activities at allotted study center laboratory, as **minimum 75% attendance is essential** for all Activity Courses, that is, Course 05, 06 and 07.

ABBREVIATIONS USED

Abbreviations used are explained below alphabetically:

1. AECC: Ability Enhancement Compulsory Course	17. SAQ: Short Answer Question
2. ASC: Additional Services Charges	18. SC: Study Center
3. C: Credit	19. SCF: Study Center Fee
4. Cat: Category	20. SEC: Skill Enhancement Course
5. CAT: Continuous Assessment Test	21. Sem: Semester
6. CC: Core Course	22. SIM: Self-Instructional Material
7. CS: Counseling Sessions	23. T: Theory
8. DSE: Discipline Specific Elective	24. TB: Text-Book
9. EE: End Examination	25. TM: Total Marks
10. EF: Examination Fee	26. UF: University Fee
11. F-T-F: Face To Face	27. UG: Under-Graduate
12. LVCL: Live Virtual Class Lecture	28. VL: Video Lecture
13. MCQ: Multiple Choice Question	29. W: Week
14. ML: Mobile TAB Ready Lecture	30. WB: Work-Book
15. P: Practical	31. WL: Website Link
16. QB: Question-Bank	

ELIGIBILITY AND FEES

Admission Eligibility	Certification Eligibility	Fees and Deposit / Year (UF + SCF) is payable to university along with admission form.	
		Description	INR ₹
HSC (10+2) or equivalent pass	Min "P (Pass)" or better grade in all 42 courses (subjects) of total 132 credits at Semesters 01-06.	University Fee (UF) for 2 semesters during each academic year {includes Exam Fee for first compulsory End Exam attempt}	2,000
		Study Center Fee (SCF) for 2 semesters during each academic year	4,000
		Additional Services Charges (ASC)	NA
		Exam Fee (EF) for each attempt during a semester, for any one or more course(s), applicable only for repeater students	500
		Total Fees for 2 semesters during each academic year	6,000
		Refundable Library Deposit (Payable only when student choose to avail Library Facility at the SC)	1,500
		Refundable Lab Deposit (Compulsory for All Students)	1,500

SEMESTERS AND COURSES

SN	Code	Name	CAT	EE	TM	Type	Cat	Credits
Semester 01: 22 CPs								
01	AEC111	English Communication	20	80	100	T	AECC	4
02	S34121	Physics – 01	20	80	100	T	CC01	4
03	S37131	Chemistry – 01	20	80	100	T	CC02	4
04	S41141	Mathematics – 01	20	80	100	T	CC03	4
05	S34122	Physics – 01 Practical	10	40	50	P	CC01	2
06	S37132	Chemistry – 01 Practical	10	40	50	P	CC02	2
07	S41142	Mathematics – 01 Practical	10	40	50	P	CC03	2
Semester 02: 22 CPs								
08	AEC211	Environmental Science	20	80	100	T	AECC	4
09	S34221	Physics – 02	20	80	100	T	CC01	4
10	S37231	Chemistry – 02	20	80	100	T	CC02	4
11	S41241	Mathematics – 02	20	80	100	T	CC03	4
12	S34222	Physics – 02 Practical	10	40	50	P	CC01	2
13	S37232	Chemistry – 02 Practical	10	40	50	P	CC02	2
14	S41242	Mathematics – 02 Practical	10	40	50	P	CC03	2
Semester 03: 22 CPs								

SN	Code	Name	CAT	EE	TM	Type	Cat	Credits
15	SEC311	IT and ELearning Skills	20	80	100	T	SEC	4
16	S34321	Physics – 03	20	80	100	T	CC01	4
17	S37331	Chemistry – 03	20	80	100	T	CC02	4
18	S41341	Mathematics – 03	20	80	100	T	CC03	4
19	S34322	Physics – 03 Practical	10	40	50	P	CC01	2
20	S37332	Chemistry – 03 Practical	10	40	50	P	CC02	2
21	S41342	Mathematics – 03 Practical	10	40	50	P	CC03	2
Semester 04: 22 CPs								
22	SEC411	Research Methodology	20	80	100	T	SEC	4
23	S34421	Physics – 04	20	80	100	T	CC01	4
24	S37431	Chemistry – 04	20	80	100	T	CC02	4
25	S41441	Mathematics – 04	20	80	100	T	CC03	4
26	S34422	Physics – 04 Practical	10	40	50	P	CC01	2
27	S37432	Chemistry – 04 Practical	10	40	50	P	CC02	2
28	S41442	Mathematics – 04 Practical	10	40	50	P	CC03	2
Semester 05: 22 CPs								
29	SEC511	Financial and Investment Skills	20	80	100	T	SEC	4
30	S34521	Physics Elective – 0501	20	80	100	T	DSE01	4
31	S37531	Chemistry Elective – 0501	20	80	100	T	DSE02	4
32	S41541	Mathematics Elective – 0501	20	80	100	T	DSE03	4
33	S34522	Physics Elective – 0501 Practical	10	40	50	P	DSE01	2
34	S37532	Chemistry Elective – 0501 Practical	10	40	50	P	DSE02	2
35	S41542	Mathematics Elective – 0501 Practical	10	40	50	P	DSE03	2
Semester 06: 22 CPs								
36	SEC611	Personality and Career Skills	20	80	100	T	SEC	4
37	S34621	Physics Elective – 0601	20	80	100	T	DSE01	4
38	S37631	Chemistry Elective – 0601	20	80	100	T	DSE02	4
39	S41641	Mathematics Elective – 0601	20	80	100	T	DSE03	4
40	S34622	Physics Elective – 0601 Practical	10	40	50	P	DSE01	2
41	S37632	Chemistry Elective – 0601 Practical	10	40	50	P	DSE02	2
42	S41642	Mathematics Elective – 0601 Practical	10	40	50	P	DSE03	2

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 $(56/100) \times 10$ 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

Course Type → Evaluation Type ↓	Theory	Practical
Continuous Assessment Test (CAT) with following all features: (01) Close-Book, With Supervision (02) At specified Date, Time and Exam Center (03) During May or Nov	“Continuous Assessment Test (CAT)” of total 20 marks and 04 “Short Answer Questions (SAQs)” each of 05 marks (4 out of 5 SAQs on all 04 Credits), during 45 Minutes. (20%)	“Continuous Assessment Test (CAT)” of total 10 marks and 02 “Short Answer Questions (SAQs)” each of 05 marks (2 out of 3 SAQs on all 04 Credits), during 20 Minutes. (20%)

Course Type → Evaluation Type ↓	Theory	Practical		
End Examination (EE) with following all features: (01) Close-Book, With Supervision (02) At specified Date, Time and Exam Center (03) During Jun or Dec	During first 2 weeks of Dec or Jun of each year, "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 180 Minutes. (80%)	During last 2 weeks of Dec or Jun of each year, at and by respective Study Center "End Examination (EE)" of total 40 Marks (80%)		
			By Internal Examiner	By External Examiner
		Activity Journal	Out of Max 10 Marks	Out of Max 10 Marks
		Activity Completion	Out of Max 05 Marks	Out of Max 05 Marks
		Viva-Voce	Out of Max 05 Marks	Out of Max 05 Marks
Total Marks	Out of Max 20 Marks	Out of Max 20 Marks		

- 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.
- Only 1 attempt** for CAT and EE for each course, shall be allowed in each semester.
- Only best of past performance shall be reported in transcript or mark statement.**
- Total student evaluation for**
 - Each** semester shall be for **550** marks.
 - Each** year shall be for **1100** marks
 - Each** regular UG degree shall be for **3300** marks.

SUCCESSFUL COMPLETION OF COURSE OR PROGRAMME

- "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.**
- "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.

PROGRAMME STRUCTURE

V92 - B.Sc. (Regular) : Discipline Electives – “Physics”, “Chemistry” and “Mathematics”																						
Total Semesters: 06 , Total Credits: 132 , Total Number of Courses: 24 Theory + 18 Practical = 42																						
Type	Theory																Practical					
Credit →	Co1	Co2	Co3	Co4	Co5	Co6	Co7	Co8	Co9	Co10	Co11	Co12	Co13	Co14	Co15	Co16	Co17	Co18	Co19	Co20	Co21	Co22
Week →	Wo1		Wo2		Wo3		Wo4		Wo5		Wo6		Wo7		Wo8		Wo9		Wo10		Wo11	
Cat →	AECC / SEC				CC01 – Physics,				CC02 – Chemistry,				CC03 – Mathematics,				CC01-P		CC02-P		CC03-P	
Sem ↓	04 Credits				04 Credits				04 Credits				04 Credits				02 Credits		02 Credits		02 Credits	
S01 22 Credits	AECC 01 AEC111: English Communication				CC01-01 S34121: Physics-01				CC02-01 S37131: Chemistry-01				CC03-01 S41141: Mathematics-01				CC01-01 P S34122		CC02-01 P S37132		CC03-01 P S41142	
S02 22 Credits	AECC 02 AEC211: Environmental Science				CC01-02 S34221: Physics-02				CC02-02 S37231: Chemistry-02				CC03-02 S41241: Mathematics-02				CC01-02 P S34222		CC02-02 P S37232		CC03-02 P S41242	
S03 22 Credits	SEC 01 SEC311: IT and ELearning Skills				CC01-03 S34321: Physics-03				CC02-03 S37331: Chemistry-03				CC03-03 S41341: Mathematics-03				CC01-03 P S34322		CC02-03 P S37332		CC03-03 P S41342	
S04 22 Credits	SEC 02 SEC411: Research Methodology				CC01-04 S34421: Physics-04				CC02-04 S37431: Chemistry-04				CC03-04 S41441: Mathematics-04				CC01-04 P S34422		CC02-04 P S37432		CC03-04 P S41442	
S05 22 Credits	SEC 03 SEC511: Financial and Investment Skills				DSE01-01: Any One from the Selected Discipline (1) S34521: Physics Elective - 0501				DSE02-01: Any One from the Selected Discipline (1) S37531: Chemistry Elective - 0501				DSE03-01: Any One from the Selected Discipline (1) S41541: Mathematics Elective -0501				DSE01-01 P S34522		DSE02-01 P S37532		DSE03-01 P S41542	
S06 22 Credits	SEC 04 SEC611: Personality and Career Skills				DSE01-02: Any One from the Selected Discipline (1) S34621: Physics Elective - 0601				DSE02-02: Any One from the Selected Discipline (1) S37631: Chemistry Elective – 0601				DSE03-02: Any One from the Selected Discipline (1) S41641: Mathematics Elective - 0601				DSE01-02 P S34622		DSE02-02 P S37632		DSE03-02 P S41642	

CURRICULUM DESIGN ASPECTS

For **Each Theory** type of Course there shall be

Time Schedule	Learning Resource and Teaching-Learning (04 Days / Week)	Interaction (02 Day / Week)	Evaluation and Feedback
<p>(1) Total 16 weeks/Semester for Teaching-Learning (11 weeks for Regular + 05 weeks for Backlog Clearing)</p>	<p>(1) 01 E-Book in Self-Instructional Material (SIM) format. (Print Media) (Study of 8 ± 1 pages / Day)</p> <p>(2) For some courses, 72 - 96 "Mobile Lecture Modules (LM)", each of 5 ± 2 Minutes may be developed. (Audio-Visual Media) (02 LMs / Day) {Total Duration of 96 LMs = 12 Hours}</p>	<p>(1) 08 Face-To-Face counseling sessions (CS) at respective study center, each of 60 Minutes, 02 for each credits {Total Duration of 8 CSs = 8 Hours}</p>	<p>(1) Closed Book, With supervision, at specified Date, Time and Exam Center "Continuous Assessment Test (CAT)" of total 20 Marks and 04 out of 05 "Short Answer Questions (SAQs)" each of 05 marks (4 out of 5 SAQs on all 04 Credits), during 45 Minutes.</p> <p>(2) Closed Book, With supervision, at specified Date, Time and Exam Center "End Examination (EE)" of total 80 Marks and 16 out of 20 "Short Answer Questions (SAQs)" each of 05 marks (4 out of 5 SAQs on each Credit), during 180 Minutes.</p> <p>(3) Separate and independent passing @ 40% in EE and (CAT+EE) shall be essential.</p>

For Each **Practical** type of Course there shall be

Time Schedule	Learning Resource and Teaching-Learning (04 Days / Week)	Interaction (02 Day / Week)	Evaluation and Feedback		
<p>(1) Total 16 weeks/Semester for Teaching-Learning (11 weeks for Regular + 05 weeks for Backlog Clearing)</p>	<p>(1) 01 E-Book in Self-Instructional Material (SIM) format. (Print Media) (Study of 8 ± 1 pages / Day) (2) For some courses, 12 Mobile / TAB ready or Video Lectures, each of 20 ± 05 Minutes may be developed. (Audio-Visual Media) (01 Lectures / Day) {Total Duration of 12 Lectures = 06 Hours}</p>	<p>(1) 12 Face-To-Face counseling sessions (CS) at respective study center, each of 120 Minutes, 01 for each practical activity (Synchronous Interaction) {Total Duration of 12 CSs = 24 Hours} (3) On each day, 02 CSs may be planned in morning session and 02 CSs may be planned in afternoon session.</p>	<p>(1) Closed Book, With supervision, at specified Date, Time and Exam Center “Continuous Assessment Test (CAT)” of total 10 Marks and 02 out of 03 “Short Answer Questions (SAQs)” each of 05 marks (2 out of 3 SAQs on all 04 Credits), during 20 Minutes. (2) Closed Book, With supervision, during last 2 weeks of Dec or Jun of each year, at and by respective Study Center “End Examination (EE)” by Internal and External Examiners, for total 40 Marks</p>		
				<p>By Internal Examiner</p>	<p>By External Examiner</p>
			Activity Journal	Maximum 10 Marks	Maximum 10 Marks
			Activity Completion	Maximum 05 Marks	Maximum 05 Marks
			Viva-Voce	Maximum 05 Marks	Maximum 05 Marks
			Total Marks	Maximum 20 Marks	Maximum 20 Marks
			<p>(3) Separate and independent passing @ 40% in EE and (CAT+EE) shall be essential.</p>		

DETAIL SYLLABUS

SEMESTER 01

AEC111: ENGLISH COMMUNICATION

PROGRAMME INFORMATION

SN	Description	Details
1	University	Yashwantrao Chavan Maharashtra Open University Nashik - 422 222, Maharashtra, India Website: http://www.ymou.ac.in/ and http://ymou.digitaluniversity.ac
2	School	School of Architecture, Science and Technology
3	Discipline	Science
4	Level	UG
5	Course Used in	V92: B.Sc.(PCM)
6	Designed for Full Compliance to these UGC Documents:	(1) Instructional Template (2) Templates of Syllabi for CBCS

COURSE INFORMATION

Sem	Code	Course Name	Credits	CAT	EE	TM	Type	Category
01	AEC111	English Communication	4	20	80	100	T	AECC

PRESUMED KNOWLEDGE AND LEARNING OBJECTIVES

Presumed Knowledge	Learning Objectives
For successful completion of this course, student should have successfully completed: <ul style="list-style-type: none">❖ HSC (10+2) or equivalent from a recognized Board. OR❖ 10+3 Diploma (any stream) awarded by any State Board of Technical Education.	After successful completion of this course, student should be able to <ul style="list-style-type: none">❖ Communicate effectively❖❖❖

SYLLABUS FOR THEORY UNITS

UN	Detailed Syllabus of the Unit	Credit
01-01	Introduction: Theories of Communication, Types and modes of Communication Language of Communication: Personal, Barriers and Strategies, Intra Personal, Inter Personal and Group Communication Speaking Skills: Monologue, Dialogue, Group Discussion, Effective Communication/ Mis-Communication	Credit 01

01-02	Understanding the Basis of Verbal Communication: Organizing Your Messages, Using Vocal Elements Effectively, Understanding Nonverbal Language, Developing Credibility, Giving and Receiving Feedback, Overcoming Barriers to Communication, Communicating Ethically, Understanding Cross-Cultural Issues	
01-03	Working with Customers: Understanding Customer Service Basics, Communicating Empathetically, Asking Question to Understand Problems, Denying Request, Coping with Angry Customers	
01-04	Developing Professional Telephone Skills: Exploring Professional Telephone Communication, Placing Telephone Calls, Receiving Telephone Calls, Using Voice Mail, Leaving Professional Messages, Taking Calls for Other People, Screening, Holding, and Transferring Calls, Developing Cell Phone Etiquette	
01-05	Improving Informal Communication: Communicating Informally, Listening Actively, Speaking Persuasively, Negotiating Effectively, Managing Conflict, Participating in Meeting, Dealing with Office Politics, Making Proper Introductions	
02-01	Reading and Understanding: Close Reading, Comprehension, Summary Paraphrasing, Analysis and Interpretation, Translation(from Indian language to English and vice-versa) Literary/Knowledge Texts Writing Skills: Documenting, Report Writing, Making notes, Letter Writing	Credit 02
02-02	Uncovering the Secrets of Clear writing: Clarifying Written Communication, Writing Solid Sentences, Developing Effective Paragraphs, Mastering Punctuation	
02-03	Communicating with E-Mail and Memos: Understanding E-Mail Message and Memos, Composing the Main Elements of Message, Creating Professional E-Mail Message, Constructing Professional Memos, Writing Request Messages, Writing Response Messages, Writing Bad- News Messages, Technology Tools	
02-04	Developing Reports and Proposals: Understanding Reports and Proposals, Planning a Report or Proposals, Writing Proposals	
02-05	Writing for Employment: Writing Effective Cover Letters, Planning Resumes, Writing Chronological Resumes, Writing Functional Resumes, Requesting Letters of Reference, Sending Follow-Up Messages, Accepting or Rejecting Job Offers	
03-01	Identifying and Defining Problems: Understanding Problem Solving, Analyzing Problems, Determining Causes, Simplifying Complex Problems, Identifying and Managing Risks, Avoiding Problem-Solving Traps	Credit 03
03-02	Solving the Problem: Gathering and Analyzing Data, Developing Alternatives, Evaluating Options, Implementing the Solution, Monitoring and Managing the Solution, Using Adaptive Techniques, Developing Ethical Solution	
03-03	Thinking Critically: Understanding Critical Thinking, Assessing the Credibility of an Argument, Becoming a Critical Thinker	
03-04	Group Decision Making and Problem Solving: Understanding Group Dynamics, Evolving From a Group to a Team, Using Divergent Thinking, Using Convergent Thinking, Avoiding Common Group Traps, Working with Large Group	
03-05	-	

04-01	Working in Groups and Teams: Understanding the Role of Team in Organizations, Defining the types of Groups and Teams, Recognizing Differences Between Groups and Teams, Ensuring Team Success, Working with Distributed Teams	Credit 04
04-02	Exploring Team Roles and Processes: Recognizing the Need for Team Leadership, Selecting Team Member, Choosing the Optional Team Size, Defining Common Team Roles, Establishing Team Rules, Clarifying Team Objectives, Making Collective Decisions	
04-03	Building and Developing Teams: Understanding the Benefits of Working in Teams, Fostering Relationships, Overcoming Resistance, Using Team- Building Activities, Dealing with Difficult Team Member, Benefits of professional networking	
04-04	Presenting yourself Professionally: Meeting Business Casual Standards, Maintaining a Professional Wardrobe, Practicing good Grooming and Hygiene, Improving Your Speech	
04-05	Developing Your Interpersonal Skills: Networking Professionally, Showing Basic Office Courtesies, Recovering from difficult interpersonal situations, Displaying Optimism and Enthusiasm, Developing Diplomacy Skills, Interacting with others, Respecting social protocols	

LEARNING RESOURCE DETAILS

LR Code	Title Author	Edition Year	ISBN Publisher
YCMOU SLM eBooks			
AEC111-W01	https://goo.gl/ytrJWe	2016	- YCMOU
Reference Books			
AEC111-R01	Soft Skills for Everyone Jeff Butterfield	2010	978-81-315-1467-2 CENGAGE

S34121: PHYSICS - 01

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	UG
5	Course Used in	V92: B.Sc.(PCM)
6	Designed for Full Compliance to these UGC Documents:	(1) Instructional Template (2) Templates of Syllabi for CBCS

COURSE INFORMATION

Sem	Code	Course Name	Credits	CAT	EE	TM	Type	Category
01	S34121	Physics - 01	4	20	80	100	T	CC01
01	S34122	Physics - 01 Practical	2	10	40	50	P	CC01

PRESUMED KNOWLEDGE AND LEARNING OBJECTIVES

Presumed Knowledge	Learning Objectives
<p>For successful completion of this course, student should have successfully completed:</p> <ul style="list-style-type: none"> ❖ HSC (10+2) or equivalent from a recognized Board. OR ❖ 10+3 Diploma (any stream) awarded by any State Board of Technical Education. 	<p>After successful completion of this course, student should be able to</p> <ul style="list-style-type: none"> ❖ ❖ ❖ ❖

SYLLABUS FOR THEORY UNITS

UN	Detailed Syllabus of the Unit	Credit
01-01	Ordinary Differential Equations: 1 st order homogeneous differential equations. 2 nd order homogeneous differential equations with constant coefficients.	Credit 01
01-02	Laws of Motion: Frames of reference. Newton's Laws of motion. Dynamics of a system of particles. Centre of Mass.	
01-03	-	
01-04	-	
01-05	-	

02-01	Vectors: Vector algebra. Scalar and vector products. Derivatives of a vector with respect to a parameter.	Credit 02
02-02	Momentum and Energy: Conservation of momentum. Work and energy. Conservation of energy. Motion of rockets.	
02-03	Rotational Motion: Angular velocity and angular momentum. Torque. Conservation of angular momentum.	
02-04	-	
02-05	-	
03-01	Gravitation: Newton's Law of Gravitation. Motion of a particle in a central force field (motion is in a plane, angular momentum is conserved, areal velocity is constant). Kepler's Laws (statement only). Satellite in circular orbit and applications. Geosynchronous orbits. Weightlessness. Basic idea of global positioning system (GPS).	Credit 03
03-02	Oscillations: Simple harmonic motion. Differential equation of SHM and its solutions. Kinetic and Potential Energy, Total Energy and their time averages. Damped oscillations.	
03-03	-	
03-04	-	
03-05	-	
04-01	Elasticity: Hooke's law - Stress-strain diagram - Elastic moduli-Relation between elastic constants - Poisson's Ratio-Expression for Poisson's ratio in terms of elastic constants - Work done in stretching and work done in twisting a wire - Twisting couple on a cylinder - Determination of Rigidity modulus by static torsion - Torsional pendulum-Determination of Rigidity modulus and moment of inertia - q , η and σ by Searles method	Credit 04
04-02	Special Theory of Relativity: Constancy of speed of light. Postulates of Special Theory of Relativity. Length contraction. Time dilation. Relativistic addition of velocities.	
04-03	-	
04-04	-	
04-05	-	

S34122: PHYSICS – 01 PRACTICAL

PRACTICAL ACTIVITIES

UN	Name of the Unit	Credit
01-01	Measurements of length (or diameter) using Vernier caliper, screw gauge and travelling microscope.	01
01-02	To determine the Height of a Building using a Sextant.	
01-03	To determine the Moment of Inertia of a Flywheel.	
01-04	To determine the Young's Modulus of a Wire by Optical Lever Method.	
01-05	To determine the Modulus of Rigidity of a Wire by Maxwell's needle.	
02-01	To determine the Elastic Constants of a Wire by Searle's method.	02
02-02	To determine g by Bar Pendulum.	
02-03	To determine g by Kater's Pendulum.	
02-04	To determine g and velocity for a freely falling body using Digital Timing Technique	
02-05	To study the Motion of a Spring and calculate (a) Spring Constant (b) Value of g	

LEARNING RESOURCE DETAILS

LR Code	Title Author	Edition Year	ISBN Publisher
YCMOU SLM eBooks			
T34121-W01	https://goo.gl/ytrJWe	2016	- YCMOU
Reference Books			
T34121-R01	Physics for Degree Students BSc First Year C L Arora, Dr P S Hemne	2014	9789384857042 S.Chand
T34121-R02	Physics for Degree Students BSc Second year C L Arora, Dr P S Hemne	2014	9789384857059 S Chand
T34121-R03	Physics for Degree Students BSc Third year C L Arora, Dr P S Hemne	2014	9789384857066 S Chand
T34121-R04	College Physics @ https://goo.gl/89ehG7		1-947172-01-8 OpenStax
T34121-R05	University Physics 01 @ https://goo.gl/mWksdh		1-947172-20-4 OpenStax
T34121-R06	University Physics 02 @ https://goo.gl/1xnA6H		1-947172-21-2 OpenStax
T34121-R07	University Physics 03 @ https://goo.gl/43tgzM		1-947172-22-0 OpenStax
T34121-R08	PhET Simulations @ https://goo.gl/spSWTM	2017	- PhET

S37131: CHEMISTRY - 01

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	UG
5	Course Used in	V92: B.Sc.(PCM)
6	Designed for Full Compliance to these UGC Documents:	(1) Instructional Template (2) Templates of Syllabi for CBCS

COURSE INFORMATION

Sem	Code	Course Name	Credits	CAT	EE	TM	Type	Category
01	S37131	Chemistry - 01	4	20	80	100	T	CC02
01	S37132	Chemistry - 01 Practical	2	10	40	50	P	CC02

PRESUMED KNOWLEDGE AND LEARNING OBJECTIVES

Presumed Knowledge	Learning Objectives
For successful completion of this course, student should have successfully completed: <ul style="list-style-type: none"> ❖ 10+2 or equivalent from a recognized Board. OR ❖ 10+3 Diploma (any stream) awarded by any State Board of Technical Education. 	After successful completion of this course, student should be able to <ul style="list-style-type: none"> ❖ ❖ ❖ ❖

SYLLABUS FOR THEORY UNITS

UN	Detailed Syllabus of the Unit	Credit
01-01	Atomic Structure: Review of: Bohr's theory and its limitations, dual behaviour of matter and radiation, de Broglie's relation, Heisenberg Uncertainty principle. Hydrogen atom spectra. Need of a new approach to Atomic structure.	Credit 01

01-02	Quantum mechanics: What is Quantum mechanics? Time independent Schrodinger equation and meaning of various terms in it. Significance of ψ and ψ^2 , Schrödinger equation for hydrogen atom. Radial and angular parts of the hydrogenic wavefunctions (atomic orbitals) and their variations for 1s, 2s, 2p, 3s, 3p and 3d orbitals (Only graphical representation). Radial and angular nodes and their significance. Radial distribution functions and the concept of the most probable distance with special reference to 1s and 2s atomic orbitals. Significance of quantum numbers, orbital angular momentum and quantum numbers ml and ms. Shapes of s, p and d atomic orbitals, nodal planes. Discovery of spin, spin quantum number (s) and magnetic spin quantum number (ms).	
01-03	Electronic configurations of the atoms: Rules for filling electrons in various orbitals, Electronic configurations of the atoms. Stability of half-filled and completely filled orbitals, concept of exchange energy. Relative energies of atomic orbitals, Anomalous electronic configurations.	
01-04	-	
01-05	-	
02-01	Ionic Bonding: General characteristics of ionic bonding. Energy considerations in ionic bonding, lattice energy and solvation energy and their importance in the context of stability and solubility of ionic compounds. Statement of Born-Landé equation for calculation of lattice energy, Born-Haber cycle and its applications, polarizing power and polarizability. Fajan's rules, ionic character in covalent compounds, bond moment, dipole moment and percentage ionic character.	Credit 02
02-02	Covalent bonding: VB Approach: Shapes of some inorganic molecules and ions on the basis of VSEPR and hybridization with suitable examples of linear, trigonal planar, square planar, tetrahedral, trigonal bipyramidal and octahedral arrangements.	
02-03	Resonance and resonating structures: Concept of resonance and resonating structures in various inorganic and organic compounds.	
02-04	MO Approach: Rules for the LCAO method, bonding and antibonding MOs and their characteristics for s-s, s-p and p-p combinations of atomic orbitals, nonbonding combination of orbitals, MO treatment of homonuclear diatomic molecules of 1st and 2nd periods (including idea of s-p mixing) and heteronuclear diatomic molecules such as CO, NO and NO+. Comparison of VB and MO approaches.	
02-05	-	
03-01	Physical Effects, Electronic Displacements: Inductive Effect, Electromeric Effect, Resonance and Hyperconjugation. Cleavage of Bonds: Homolysis and Heterolysis.	Credit 03
03-02	Structure, shape and reactivity of organic molecules: Nucleophiles and electrophiles.	
03-03	Reactive Intermediates: Carbocations, Carbanions and free radicals.	
03-04	Strength of organic acids and bases: Comparative study with emphasis on factors affecting pK values. Aromaticity: Benzenoids and Hückel's rule.	

03-05	Stereochemistry: Conformations with respect to ethane, butane and cyclohexane. Interconversion of Wedge Formula, Newmann, Sawhorse and Fischer representations. Concept of chirality (upto two carbon atoms). Configuration: Geometrical and Optical isomerism; Enantiomerism, Diastereomerism and Meso compounds). Threo and erythro; D and L; cis - trans nomenclature; CIP Rules: R/ S (for upto 2 chiral carbon atoms) and E / Z Nomenclature (for upto two C=C systems).	
04-01	Aliphatic Hydrocarbons: Functional group approach for the following reactions (preparations & reactions) to be studied in context to their structure.	Credit 04
04-02	Alkanes: (Upto 5 Carbons). Preparation: Catalytic hydrogenation, Wurtz reaction, Kolbe's synthesis, from Grignard reagent. Reactions: Free radical Substitution: Halogenation.	
04-03	Alkenes: (Upto 5 Carbons) Preparation: Elimination reactions: Dehydration of alkenes and dehydrohalogenation of alkyl halides (Saytzeff's rule); cis alkenes (Partial catalytic hydrogenation) and trans alkenes (Birch reduction). Reactions: cis-addition (alk. KMnO_4) and trans-addition (bromine), Addition of HX (Markownikoff's and anti-Markownikoff's addition), Hydration, Ozonolysis, oxymecuration-demercuration, Hydroboration-oxidation.	
04-04	Alkynes: (Upto 5 Carbons) Preparation: Acetylene from CaC_2 and conversion into higher alkynes; by dehalogenation of tetra halides and dehydrohalogenation of vicinal-dihalides.	
04-05	Reactions: formation of metal acetylides, addition of bromine and alkaline KMnO_4 , ozonolysis and oxidation with hot alk. KMnO_4 .	

S37132: CHEMISTRY – 01 PRACTICAL

PRACTICAL ACTIVITIES

UN	Name of the Unit	Credit
01-01	Estimation of sodium carbonate and sodium hydrogen carbonate present in a mixture.	01
01-02	Estimation of oxalic acid by titrating it with KMnO_4 .	
01-03	Estimation of water of crystallization in Mohr's salt by titrating with KMnO_4 .	
01-04	Estimation of Fe (II) ions by titrating it with $\text{K}_2\text{Cr}_2\text{O}_7$ using internal indicator.	
01-05	Estimation of Cu (II) ions iodometrically using $\text{Na}_2\text{S}_2\text{O}_3$.	
02-01	Detection of extra elements (N, S, Cl, Br, I) in organic compounds (containing upto two extra elements)	02
02-02	Separation of mixtures by Chromatography: Measure the R_f value in each case (combination of two compounds to be given) (a) Identify and separate the components of a given mixture of two amino acids (glycine, aspartic acid, glutamic acid, tyrosine or any other amino acid) by paper chromatography (b) Identify and separate the sugars present in the given mixture by paper chromatography.	

LEARNING RESOURCE DETAILS

LR Code	Title Author	Edition Year	ISBN Publisher
YCMOU SLM eBooks			
T37131-W01	https://goo.gl/ytrjWe	2016	- YCMOU
Reference Books			
T37131-R01	Chemistry for Degree Students (B.Sc. Sem.-I, CBCS) R L Madan	2016	9789352533039 S Chand
T37131-R02	Chemistry @ https://goo.gl/29PGRb	2017	1-947172-09-3 OpenStax
T37131-R03	Chemistry: Atoms First @ https://goo.gl/e58NiX	2017	1-947172-18-2 OpenStax
T37131-R04	Organic Chemistry with a Biological Emphasis @ https://goo.gl/2W5m8E	2016	BCCampus
T37131-R05	Analytical Chemistry @ https://goo.gl/BPaxaz	2010	BCCampus
T37131-R06	Introductory Chemistry @ https://goo.gl/WrDfrM	2011	BCCampus
T37131-R07	Concept Development Studies in Chemistry @ https://goo.gl/LbQigG	2007	BCCampus
T37131-R08	PhET Simulations @ https://goo.gl/rcFu5P	2016	- YCMOU

S41141: MATHEMATICS - 01

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	UG
5	Course Used in	V92: B.Sc.(PCM)
6	Designed for Full Compliance to these UGC Documents:	(1) Instructional Template (2) Templates of Syllabi for CBCS

COURSE INFORMATION

Sem	Code	Course Name	Credits	CAT	EE	TM	Type	Category
01	S41141	Mathematics - 01	4	20	80	100	T	CC03
01	S41142	Mathematics - 01 Practical	2	10	40	50	P	CC03

PRESUMED KNOWLEDGE AND LEARNING OBJECTIVES

Presumed Knowledge	Learning Objectives
<p>For successful completion of this course, student should have successfully completed:</p> <ul style="list-style-type: none"> ❖ HSC (10+2) or equivalent from a recognized Board. OR ❖ 10+3 Diploma (any stream) awarded by any State Board of Technical Education. 	<p>After successful completion of this course, student should be able to</p> <ul style="list-style-type: none"> ❖ ❖ ❖ ❖

SYLLABUS FOR THEORY UNITS

UN	Detailed Syllabus of the Unit	Credit
01-01	Limit and Continuity (ϵ and δ definition), Types of discontinuities, Differentiability of functions,	Credit 01
01-02		
01-03		
01-04		
01-05		
02-01	Successive differentiation, Leibnitz's theorem, Partial differentiation, Euler's theorem on homogeneous functions.	Credit 02

02-02	Tangents and normals, Curvature, Asymptotes, Singular points, Tracing of curves.	
02-03		
02-04		
02-05		
03-01	Parametric representation of curves and tracing of parametric curves, Polar coordinates and tracing of curves in polar coordinates.	Credit 03
03-02	Rolle's theorem, Mean Value theorems, Taylor's theorem with Lagrange's and Cauchy's forms of remainder	
03-03		
03-04		
03-05		
04-01	Taylor's series, Maclaurin's series of $\sin x$, $\cos x$, e^x , $\log(1+x)$, $(1+x)^m$, Maxima and Minima, Indeterminate forms.	Credit 04
04-02		
04-03		
04-04		
04-05		

S41142: MATHEMATICS – 01 PRACTICAL

PRACTICAL ACTIVITIES

UN	Name of the Unit	Credit
01-01	Home Assignment 01 on Limit	01
01-02	Home Assignment 02 on Differentiation, Tangents and Normals	
02-01	Home Assignment 03 on Curves	02
02-02	Home Assignment 04 on Rolle's, Mean Value and Taylor's theorem	

LEARNING RESOURCE DETAILS

LR Code	Title Author	Edition Year	ISBN Publisher
YCMOU SLM eBooks			
T41141-W01	https://goo.gl/vtrJWe	2016	- YCMOU
Reference Books			
T41141-R01	Mathematics For Degree Students BSc First Year Dr P K Mittal	2010	9788121932400 S Chand

T41141-R02	Mathematics For Degree Students BSc Second Year Dr P K Mittal	2011	9788121935548 S Chand
T41141-R03	Prealgebra @ https://goo.gl/ertyM5		
T41141-R04	Elementary Algebra @ https://goo.gl/mVWVMU		
T41141-R05	Intermediate Algebra @ https://goo.gl/A6vPSz		
T41141-R06	College Algebra @ https://goo.gl/DyUnu4		
T41141-R07	Algebra and Trigonometry @ https://goo.gl/VVL9X5		
T41141-R08	Precalculus @ https://goo.gl/JCAMcW		
T41141-R09	Calculus Volume 1 @ https://goo.gl/Zh5S5y		
T41141-R10	Calculus Volume 2 @ https://goo.gl/GTe9Co		
T41141-R11	Calculus Volume 3 @ https://goo.gl/rPza4U		
T41141-R12	A First Course in Linear Algebra - https://goo.gl/wjrzQv		
T41141-R13	Calculus: Early Transcendentals - https://goo.gl/VzsG1A		
T41141-R14	Precalculus: Stitz Zeager - https://goo.gl/mGrXxW		
T41141-R15	Brief Calculus - https://goo.gl/jm93sH		
T41141-R16	Elementary Differential Equations with Boundary Value Problems - https://goo.gl/YNxwyj		
T41141-R17	PhET Simulations @ https://goo.gl/S4HZVM	2017	

SEMESTER 02

AEC211: ENVIRONMENTAL SCIENCE

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	UG
5	Course Used in	V92: B.Sc.(PCM)
6	Designed for Full Compliance to these UGC Documents:	(1) Instructional Template (2) Templates of Syllabi for CBCS

COURSE INFORMATION

Sem	Code	Course Name	Credits	CAT	EE	TM	Type	Category
01	AEC211	Environmental Science	4	20	80	100	T	AECC

PRESUMED KNOWLEDGE AND LEARNING OBJECTIVES

Presumed Knowledge	Learning Objectives
For successful completion of this course, student should have successfully completed: <ul style="list-style-type: none">❖ 10+2 or equivalent from a recognized Board. OR❖ 10+3 Diploma (any stream) awarded by any State Board of Technical Education.	After successful completion of this course, student should be able to <ul style="list-style-type: none">❖ realign their lives so as to protect and preserve environment❖❖❖

SYLLABUS FOR THEORY UNITS

UN	Detailed Syllabus of the Unit	Credit
01-01	The Multidisciplinary Nature Of Environmental Studies: Definition, Scope And Importance – Definition, Scope, Importance, Need For Public Awareness - Institutions in Environment, People in Environment	Credit 01

01-02	Natural Resources: Introduction, Renewable And Non-Renewable Resources - Natural resources and associated problems, Non-renewable resources, Renewable resources, Forest Resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forests and tribal people, Water Resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams – benefits and problems. Mineral Resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies. Food Resources: World food problems, Changes in land use by agriculture and grazing, Effects of modern agriculture, Fertilizer/ pesticide problems, Water logging and salinity. Energy Resources: Increasing energy needs, Renewable/ nonrenewable, Use of Alternate energy sources, Case studies, Land resources: Land as a resource, land degradation, man-induced landslides, soil erosion and desertification. Role Of An Individual In Conservation Of Natural Resources, Equitable Use Of Resources For Sustainable Lifestyles	
01-03	Ecosystems: Concept of an ecosystem, Understanding ecosystems, Ecosystem degradation, Resource utilization, Structure and functions of an ecosystem, Producers, consumers and decomposers, Energy flow in the ecosystem, The water cycle, The Carbon cycle, The Oxygen cycle, The Nitrogen cycle, The energy cycle, Integration of cycles in nature, Ecological succession, Food chains, Food webs and Ecological pyramids, The food chains, The food webs, The ecological pyramids, Introduction, Types, Characteristic features, Structure and functions, Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems (ponds, lakes, streams, rivers, estuaries, oceans)	
01-04	-	
01-05	-	
02-01	Biodiversity And Its Conservation: Introduction – Definition: Genetic, Species, Ecosystem Diversity, Genetic diversity, Species diversity, Ecosystem diversity, Biogeographic Classification Of India, Value Of Biodiversity: Consumptive, Productive Use, Social, Ethical, Aesthetic And Option Values, Consumptive value, Productive value, Social value, Ethical value, Aesthetic value, Option value, Biodiversity At Global, National And Local Levels, India As A Mega Diversity Nation, Hotspots Of Biodiversity, Threats To Biodiversity: Habitat Loss, Poaching Of Wildlife, Man-Wildlife Conflicts, Endangered And Endemic Species Of India, Common Plant species, Common Animal species, Conservation Of Biodiversity: In-Situ And Ex-Situ, In-situ conservation, Ex-situ conservation	Credit 02
02-02	Environmental Pollution: Definition, Causes, Effects And Control Measures of, Air Pollution, Water Pollution, Soil Pollution, Marine Pollution, Noise Pollution, Thermal Pollution, Nuclear hazards, Solid Waste Management: Causes, Effects And Control Measures, Urban And Industrial Waste, Role Of Individuals In Pollution Prevention, Pollution Case Studies, Disaster Management: Floods, Earthquakes, Cyclones, Landslides	
02-03	-	
02-04	-	
02-05	-	

03-01	<p>Social Issues And The Environment: From Unsustainable To Sustainable Development, Urban Problems Related To Energy, Water Conservation, Rain Water Harvesting, Watershed Management, Water conservation, Rain water harvesting, Watershed management, Resettlement And Rehabilitation Of People; Its Problems And Concerns. Case Studies, Environmental Ethics: Issues And Possible Solutions, Resource consumption patterns and the need for their equitable utilization, Equity – Disparity in the Northern and Southern countries, Urban – rural equity issues, The need for Gender Equity, Preserving resources for future generations, The rights of animals, The ethical basis of environment education and awareness, The conservation ethic and traditional value systems of India, Climate Change, Global Warming, Acid Rain, Ozone Layer Depletion, Nuclear Accidents And Nuclear Holocaust. Case Studies, Climate change, Global warming, Acid rain, Ozone layer depletion, Nuclear Accidents and Nuclear Holocaust, Wasteland Reclamation, Consumerism And Waste Products, Environment Protection Act, Air (Prevention And Control Of Pollution) Act, Water (Prevention And Control of Pollution) Act, Wildlife Protection Act, Forest Conservation Act, Issues Involved In Enforcement of Environmental Legislation, Environment Impact Assessment (EIA), Citizens actions and action groups, Public Awareness, Using an Environmental Calendar of Activities, What can I do?</p>	Credit 03
03-02	-	
03-03	-	
03-04	-	
03-05	-	
04-01	<p>Human Population And The Environment: Population Growth, Variation Among Nations, Global population growth, Population Explosion – Family Welfare Program, Methods of sterilization, Urbanization, Environmental And Human Health, Environmental health, Climate and health, Infectious diseases, Water-related diseases, Risks due to chemicals in food, Cancer and environment, Human Rights, Equity, Nutrition, health and human rights, Intellectual Property Rights and Community Biodiversity Registers, Value Education, Environmental Values, Valuing Nature, Valuing cultures, Social justice, Human heritage, Equitable use of Resources, Common Property Resources, Ecological degradation, HIV/AIDS, Women And Child Welfare, Role Of Information Technology In Environment And Human Health</p>	Credit 04
04-02	<p>Field Work: Visit To A Local Area To Document Environmental Assets, River / Forest / Grasslands / Hill / Mountain, Visit To A Local Polluted Site, Study Of Common Plants, Insects, Birds, Study of Simple Ecosystems</p>	
04-03	-	
04-04	-	
04-05	-	

LEARNING RESOURCE DETAILS

LR Code	Title Author	Edition Year	ISBN Publisher
YCMOU SLM eBooks			
AEC211-W01	https://goo.gl/ytrJWe	2016	- YCMOU
Reference Books			
AEC211-R01	Environmental Studies @ https://goo.gl/YQQV6y Erach Bharucha	2004	UGC

S34221: PHYSICS - 02

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	UG
5	Course Used in	V92: B.Sc.(PCM)
6	Designed for Full Compliance to these UGC Documents:	(1) Instructional Template (2) Templates of Syllabi for CBCS

COURSE INFORMATION

Sem	Code	Course Name	Credits	CAT	EE	TM	Type	Category
01	S34221	Physics - 02	4	20	80	100	T	CC01
01	S34222	Physics - 02 Practical	2	10	40	50	P	CC01

PRESUMED KNOWLEDGE AND LEARNING OBJECTIVES

Presumed Knowledge	Learning Objectives
<p>For successful completion of this course, student should have successfully completed:</p> <ul style="list-style-type: none"> ❖ 10+2 or equivalent from a recognized Board. OR ❖ 10+3 Diploma (any stream) awarded by any State Board of Technical Education. 	<p>After successful completion of this course, student should be able to</p> <ul style="list-style-type: none"> ❖ ❖ ❖ ❖

SYLLABUS FOR THEORY UNITS

UN	Detailed Syllabus of the Unit	Credit
01-01	<p>Vector Analysis: Review of vector algebra (Scalar and Vector product), gradient, divergence, Curl and their significance, Vector Integration, Line, surface and volume integrals of Vector fields, Gauss-divergence theorem and Stoke's theorem of vectors (statement only).</p> <p>Electrostatics - 01: Electrostatic Field, electric flux, Gauss's theorem of electrostatics. Applications of Gauss theorem- Electric field due to point charge, infinite line of charge, uniformly charged spherical shell and solid sphere, plane charged sheet, charged conductor.</p>	Credit 01
01-02		
01-03		

01-04		
01-05		
02-01	Electrostatics – 02: Electric potential as line integral of electric field, potential due to a point charge, electric dipole, uniformly charged spherical shell and solid sphere. Calculation of electric field from potential. Capacitance of an isolated spherical conductor. Parallel plate, spherical and cylindrical condenser. Energy per unit volume in electrostatic field. Dielectric medium, Polarization, Displacement vector. Gauss's theorem in dielectrics. Parallel plate capacitor completely filled with dielectric.	Credit 02
02-02		
02-03		
02-04		
02-05		
03-01	Magneto-statics: Biot-Savart's law & its applications- straight conductor, circular coil, solenoid carrying current. Divergence and curl of magnetic field. Magnetic vector potential. Ampere's circuital law.	Credit 03
03-02	Magnetic properties of materials: Magnetic intensity, magnetic induction, permeability, magnetic susceptibility. Brief introduction of dia-, para- and ferromagnetic materials.	
03-03		
03-04		
03-05		
04-01	Electromagnetic Induction: Faraday's laws of electromagnetic induction, Lenz's law, self and mutual inductance, L of single coil, M of two coils. Energy stored in magnetic field.	Credit 04
04-02	Maxwell's equations and Electromagnetic wave propagation: Equation of continuity of current, Displacement current, Maxwell's equations, Poynting vector, energy density in electromagnetic field, electromagnetic wave propagation through vacuum and isotropic dielectric medium, transverse nature of EM waves, polarization.	
04-03		
04-04		
04-05		

S34222: PHYSICS – 02 PRACTICAL

PRACTICAL ACTIVITIES

UN	Name of the Unit	Credit
01-01	To use a Multimeter for measuring (a) Resistances, (b) AC and DC Voltages, (c) DC Current, and (d) checking electrical fuses.	01
01-02	Ballistic Galvanometer: (i) Measurement of charge and current sensitivity (ii) Measurement of CDR (iii) Determine a high resistance by Leakage Method (iv) To determine Self Inductance of a Coil by Rayleigh's Method.	
01-03	To compare capacitances using De'Sauty's bridge.	
01-04	Measurement of field strength B and its variation in a Solenoid (Determine dB/dx).	
01-05	To study the Characteristics of a Series RC Circuit.	
02-01	To study the a series LCR circuit and determine its (a) Resonant Frequency, (b) Quality Factor	02
02-02	To study a parallel LCR circuit and determine its (a) Anti-resonant frequency and (b) Quality factor Q	
02-03	To determine a Low Resistance by Carey Foster's Bridge.	
02-04	To verify the Thevenin and Norton theorem	
02-05	To verify the Superposition, and Maximum Power Transfer Theorem	

LEARNING RESOURCE DETAILS

LR Code	Title Author	Edition Year	ISBN Publisher
YCMOU SLM eBooks			
T34221-W01	https://goo.gl/ytrJWe	2016	- YCMOU
Reference Books			
T34221-R01	Physics for Degree Students BSc First Year C L Arora, Dr P S Hemne	2014	9789384857042 S.Chand
T34221-R02	Physics for Degree Students BSc Second year C L Arora, Dr P S Hemne	2014	9789384857059 S Chand
T34221-R03	Physics for Degree Students BSc Third year C L Arora, Dr P S Hemne	2014	9789384857066 S Chand
T34221-R04	College Physics @ https://goo.gl/89ehG7		1-947172-01-8 OpenStax
T34221-R05	University Physics 01 @ https://goo.gl/mWksdh		1-947172-20-4 OpenStax
T34221-R06	University Physics 02 @ https://goo.gl/1xnA6H		1-947172-21-2 OpenStax
T34221-R07	University Physics 03 @ https://goo.gl/43tzgM		1-947172-22-0 OpenStax
T34221-R08	PhET Simulations @ https://goo.gl/spSWTM	2017	- PhET

S37231: CHEMISTRY - 02

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	UG
5	Course Used in	V92: B.Sc.(PCM)
6	Designed for Full Compliance to these UGC Documents:	(1) Instructional Template (2) Templates of Syllabi for CBCS

COURSE INFORMATION

Sem	Code	Course Name	Credits	CAT	EE	TM	Type	Category
01	S37231	Chemistry - 02	4	20	80	100	T	CC02
01	S37232	Chemistry - 02 Practical	2	10	40	50	P	CC02

PRESUMED KNOWLEDGE AND LEARNING OBJECTIVES

Presumed Knowledge	Learning Objectives
<p>For successful completion of this course, student should have successfully completed:</p> <ul style="list-style-type: none"> ❖ 10+2 or equivalent from a recognized Board. OR ❖ 10+3 Diploma (any stream) awarded by any State Board of Technical Education. 	<p>After successful completion of this course, student should be able to</p> <ul style="list-style-type: none"> ❖ ❖ ❖ ❖

SYLLABUS FOR THEORY UNITS

UN	Detailed Syllabus of the Unit	Credit
01-01	Chemical Energetics: Review of thermodynamics and the Laws of Thermodynamics. Important principles and definitions of thermochemistry. Concept of standard state and standard enthalpies of formations, integral and differential enthalpies of solution and dilution. Calculation of bond energy, bond dissociation energy and resonance energy from thermochemical data. Variation of enthalpy of a reaction with temperature – Kirchoff's equation. Statement of Third Law of thermodynamics and calculation of absolute entropies of substances.	Credit 01
01-02	Chemical Equilibrium - 01: Free energy change in a chemical reaction. Thermodynamic derivation of the law of chemical equilibrium. Distinction between ΔG and ΔG_0 , Le Chatelier's principle. Relationships between K_p , K_c and K_x for reactions involving ideal gases.	

01-03	-	
01-04	-	
01-05	-	
02-01	Ionic Equilibria: Strong, moderate and weak electrolytes, degree of ionization, factors affecting degree of ionization, ionization constant and ionic product of water. Ionization of weak acids and bases, pH scale, common ion effect. Salt hydrolysis-calculation of hydrolysis constant, degree of hydrolysis and pH for different salts. Buffer solutions. Solubility and solubility product of sparingly soluble salts – applications of solubility product principle.	Credit 02
02-02		
02-03	-	
02-04	-	
02-05	-	
03-01	Organic Chemistry-2: Functional group approach for the following reactions (preparations & reactions) to be studied in context to their structure. Aromatic hydrocarbons: Preparation (Case benzene): from phenol, by decarboxylation, from acetylene, from benzene sulphonic acid. Reactions: (Case benzene): Electrophilic substitution: nitration, halogenation and sulphonation. Friedel-Craft's reaction (alkylation and acylation) (upto 4 carbons on benzene). Side chain oxidation of alkyl benzenes (upto 4 carbons on benzene).	Credit 03
03-02	Alkyl and Aryl Halides: Alkyl Halides (Upto 5 Carbons) Types of Nucleophilic Substitution (SN1, SN2 and SNi) reactions. Preparation: from alkenes and alcohols. Reactions: hydrolysis, nitrite & nitro formation, nitrile & isonitrile formation. Williamson's ether synthesis: Elimination vs substitution.	
03-03	Aryl Halides Preparation: (Chloro, bromo and iodo-benzene case): from phenol, Sandmeyer & Gattermann reactions. Reactions (Chlorobenzene): Aromatic nucleophilic substitution (replacement by -OH group) and effect of nitro substituent. Benzyne Mechanism: KNH2/NH3 (or NaNH2/NH3). Reactivity and Relative strength of C-Halogen bond in alkyl, allyl, benzyl, vinyl and aryl halides.	
03-04	-	
03-05	-	
04-01	Alcohols: Preparation: Preparation of 1o, 2o and 3o alcohols: using Grignard reagent, Ester hydrolysis, Reduction of aldehydes, ketones, carboxylic acid and esters. Reactions: With sodium, HX (Lucas test), esterification, oxidation (with PCC, alk. KMnO4, acidic dichromate, conc. HNO3). Oppeneauer oxidation Diols: (Upto 6 Carbons) oxidation of diols. Pinacol-Pinacolone rearrangement.	Credit 04
04-02	Phenols: (Phenol case) Preparation: Cumene hydroperoxide method, from diazonium salts. Reactions: Electrophilic substitution: Nitration, halogenation and sulphonation. Reimer-Tiemann Reaction, Gattermann-Koch Reaction, Houben-Hoesch Condensation, Schotten – Baumann Reaction.	
04-03	Ethers (aliphatic and aromatic): Cleavage of ethers with HI.	

04-04	Aldehydes and ketones (aliphatic and aromatic): (Formaldehyde, acetaldehyde, acetone and benzaldehyde) Preparation: from acid chlorides and from nitriles. Reactions – Reaction with HCN, ROH, NaHSO ₃ , NH ₂ -G derivatives. Iodoform test. Aldol Condensation, Cannizzaro's reaction, Wittig reaction, Benzoin condensation. Clemensen reduction and Wolff Kishner reduction. Meerwein-Ponndorf Verley reduction.	
04-05	-	

S37232: CHEMISTRY – 02 PRACTICAL

PRACTICAL ACTIVITIES

UN	Name of the Unit	Credit
01-01	Determination of heat capacity of calorimeter for different volumes.	01
01-02	Determination of enthalpy of neutralization of hydrochloric acid with sodium hydroxide.	
01-03	Determination of enthalpy of ionization of acetic acid.	
01-04	Determination of integral enthalpy of solution of salts (KNO ₃ , NH ₄ Cl).	
01-05	Determination of enthalpy of hydration of copper sulphate.	
01-06	Study of the solubility of benzoic acid in water and determination of ΔH .	
02-01	Ionic equilibria - pH measurements a) Measurement of pH of different solutions like aerated drinks, fruit juices, shampoos and soaps (use dilute solutions of soaps and shampoos to prevent damage to the glass electrode) using pH-meter. b) Preparation of buffer solutions: (i) Sodium acetate-acetic acid (ii) Ammonium chloride-ammonium hydroxide Measurement of the pH of buffer solutions and comparison of the values with theoretical values.	02
02-02	1. Purification of organic compounds by crystallization (from water and alcohol) and distillation.	
02-03	2. Criteria of Purity: Determination of melting and boiling points.	
02-04	3. Preparations: Mechanism of various reactions involved to be discussed. Recrystallisation, determination of melting point and calculation of quantitative yields to be done. (a) Bromination of Phenol/Aniline (b) Benzoylation of amines/phenols (c) Oxime and 2,4-dinitrophenylhydrazone of aldehyde/ketone	

LEARNING RESOURCE DETAILS

LR Code	Title Author	Edition Year	ISBN Publisher
YCMOU SLM eBooks			
T37231-W01	https://goo.gl/ytrjWe	2016	- YCMOU
Reference Books			
T37231-R01	Chemistry for Degree Students (B.Sc. Sem.-II, CBCS) R L Madan	2016	9789352533046 S Chand
T37231-R02	Chemistry @ https://goo.gl/29PGRb	2017	1-947172-09-3 OpenStax
T37231-R03	Chemistry: Atoms First @ https://goo.gl/e58NiX	2017	1-947172-18-2 OpenStax
T37231-R04	Organic Chemistry with a Biological Emphasis @ https://goo.gl/2W5m8E	2016	BCCampus
T37231-R05	Analytical Chemistry @ https://goo.gl/BPaxaz	2010	BCCampus
T37231-R06	Introductory Chemistry @ https://goo.gl/WrDfrM	2011	BCCampus
T37231-R07	Concept Development Studies in Chemistry @ https://goo.gl/LbQigG	2007	BCCampus
T37231-R08	PhET Simulations @ https://goo.gl/rcFu5P	2016	- YCMOU

S41241: MATHEMATICS - 02

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	UG
5	Course Used in	V92: B.Sc.(PCM)
6	Designed for Full Compliance to these UGC Documents:	(1) Instructional Template (2) Templates of Syllabi for CBCS

COURSE INFORMATION

Sem	Code	Course Name	Credits	CAT	EE	TM	Type	Category
01	S41241	Mathematics - 02	4	20	80	100	T	CC03
01	S41242	Mathematics - 02 Practical	2	10	40	50	P	CC03

PRESUMED KNOWLEDGE AND LEARNING OBJECTIVES

Presumed Knowledge	Learning Objectives
<p>For successful completion of this course, student should have successfully completed:</p> <ul style="list-style-type: none"> ❖ 10+2 or equivalent from a recognized Board. OR ❖ 10+3 Diploma (any stream) awarded by any State Board of Technical Education. 	<p>After successful completion of this course, student should be able to</p> <ul style="list-style-type: none"> ❖ ❖ ❖ ❖

SYLLABUS FOR THEORY UNITS

UN	Detailed Syllabus of the Unit	Credit
01-01	First order exact differential equations. Integrating factors, rules to find an integrating factor. First order higher degree equations solvable for x, y, p.	Credit 01
01-02		
01-03		
01-04		
01-05		

02-01	Methods for solving higher-order differential equations. Basic theory of linear differential equations, Wronskian, and its properties. Solving a differential equation by reducing its order.	Credit 02
02-02		
02-03		
02-04		
02-05		
03-01	Linear homogenous equations with constant coefficients, Linear non-homogenous equations, The method of variation of parameters, The Cauchy-Euler equation, Simultaneous differential equations, Total differential equations.	Credit 03
03-02		
03-03		
03-04		
03-05		
04-01	Order and degree of partial differential equations, Concept of linear and non-linear partial differential equations, Formation of first order partial differential equations, Linear partial differential equation of first order, Lagrange's method, Charpit's method. Classification of second order partial differential equations into elliptic, parabolic and hyperbolic through illustrations only.	Credit 04
04-02		
04-03		
04-04		
04-05		

S41242: MATHEMATICS – 02 PRACTICAL

PRACTICAL ACTIVITIES

UN	Name of the Unit	Credit
01-01	Home Assignment 01 on First order exact differential equations	01
01-02	Home Assignment 02 on Higher-order differential equations	
02-01	Home Assignment 03 on Linear equations	02
02-02	Home Assignment 04 on Partial differential equations	

LEARNING RESOURCE DETAILS

LR Code	Title Author	Edition Year	ISBN Publisher
YCMOU SLM eBooks			
T41241-W01	https://goo.gl/ytrJWe	2016	- YCMOU
Reference Books			
T41241-R01	Mathematics For Degree Students BSc First Year Dr P K Mittal	2010	978-81-121-9324-00 S Chand
T41241-R02	Mathematics For Degree Students BSc Second Year Dr P K Mittal	2010	81-219-3554-7 S Chand
T41241-R03	Mathematics for Degree Students BSc Third Year Dr P K Mittal	2010	81-219-3554-4 S Chand
T41241-R04	Prealgebra @ https://goo.gl/ertyM5		
T41241-R05	Elementary Algebra @ https://goo.gl/mVWVMU		
T41241-R06	Intermediate Algebra @ https://goo.gl/A6vPSz		
T41241-R07	College Algebra @ https://goo.gl/DyUnu4		
T41241-R08	Algebra and Trigonometry @ https://goo.gl/VVL9X5		
T41241-R09	Precalculus @ https://goo.gl/JCAMcW		
T41241-R10	Calculus Volume 1 @ https://goo.gl/Zh5S5y		
T41241-R11	Calculus Volume 2 @ https://goo.gl/GTe9Co		
T41241-R12	Calculus Volume 3 @ https://goo.gl/rPza4U		
T41241-R13	A First Course in Linear Algebra - https://goo.gl/wjrzQv		
T41241-R14	Calculus: Early Transcendentals - https://goo.gl/VzsG1A		
T41241-R15	Precalculus: Stitz Zeager - https://goo.gl/mGrXxW		
T41241-R16	Brief Calculus - https://goo.gl/jm93sH		
T41241-R17	Elementary Differential Equations with Boundary Value Problems - https://goo.gl/YNxwyj		
T41241-R18	PhET Simulations @ https://goo.gl/S4HZVM	2017	

SEMESTER 03

SEC311: IT AND ELEARNING SKILLS

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	UG
5	Course Used in	V92: B.Sc.(PCM)
6	Designed for Full Compliance to these UGC Documents:	(1) Instructional Template (2) Templates of Syllabi for CBCS

COURSE INFORMATION

Sem	Code	Course Name	Credits	CAT	EE	TM	Type	Category
01	SEC311	IT and ELearning Skills	4	20	80	100	T	SEC

PRESUMED KNOWLEDGE AND LEARNING OBJECTIVES

Presumed Knowledge	Learning Objectives
For successful completion of this course, student should have successfully completed: <ul style="list-style-type: none">❖ 10+2 or equivalent from a recognized Board. OR <ul style="list-style-type: none">❖ 10+3 Diploma (any stream) awarded by any State Board of Technical Education.	After successful completion of this course, student should be able to <ul style="list-style-type: none">❖ Use computer at basic level❖ Use various software at basic level❖ Use ELearning for effective learning

SYLLABUS FOR THEORY UNITS

UN	Detailed Syllabus of the Unit	Credit
01-01	Block Diagram of a Computer , Functions of the Different Units: Input unit, Output unit, Memory unit, CPU (ALU+CU)	Credit 01
01-02	Input & Output Devices. Input Devices: a) Keyboard, b) Point and draw devices Mouse, track ball, light pen, c) Data scanning devices Image scanner, OCR, OMR, Bar code reader, card reader d) Voice Recognition Devices Output Devices: Monitor, Projectors, Printers	
01-03	Memory: Cache Memory, Primary Memory: i) RAM a) How data is stored in a RAM b) DRAM and SRAM ii) ROM a) ROM BIOS / Firmware b) Types of ROM	

01-04	Secondary Memories: I) Hard disk - a) Structure of a hard disk, how data is stored in a hard disk, concept of Tracks, sectors, clusters, cylinders b) Formatting of hard disk. ii) CD /DVD [data storage mechanism]	
01-05	--	
02-01	Functions of Operating System. Types of Operating System - MS Windows, Linux, and Macintosh.	Credit 02
02-02	Utility Programs: Antivirus, CD/DVD burner, VLC media player, Adobe Reader Web browsers a) Mozilla Firefox b) Google Chrome c) Internet Explorer / Edge	
02-03	Word-processing	
02-04	Presentation	
02-05	Spreadsheet	
03-01	E-Learning definition, scope, trends, attributes & opportunities	Credit 03
03-02	Pedagogical designs for e-learning	
03-03	Assessment, feedback, and e-moderation	
03-04	Online learning management systems	
03-05	--	
04-01	Digital learning objects	Credit 04
04-02	Online learning course development models	
04-03	Management and implementation of e-learning	
04-04	Evaluating the impacts of e-learning	
04-05	--	

LEARNING RESOURCE DETAILS

LR Code	Title Author	Edition Year	ISBN Publisher
YCMOU SLM eBooks			
SEC111-W01	https://goo.gl/ytrJWe	2016	- YCMOU
Reference Books			
SEC311-R01	ELearning: A Guidebook of Principles, Procedures and Practices @ http://cemca.org.in/ckfinder/userfiles/files/e-learning_guidebook.pdf Som Naidu	2 nd 2006	81-88770-04-3 CEMCA

S34321: PHYSICS - 03

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	UG
5	Course Used in	V92: B.Sc.(PCM)
6	Designed for Full Compliance to these UGC Documents:	(1) Instructional Template (2) Templates of Syllabi for CBCS

COURSE INFORMATION

Sem	Code	Course Name	Credits	CAT	EE	TM	Type	Category
01	S34321	Physics - 03	4	20	80	100	T	CC01
01	S34322	Physics - 03 Practical	2	10	40	50	P	CC01

PRESUMED KNOWLEDGE AND LEARNING OBJECTIVES

Presumed Knowledge	Learning Objectives
<p>For successful completion of this course, student should have successfully completed:</p> <ul style="list-style-type: none"> ❖ 10+2 or equivalent from a recognized Board. OR ❖ 10+3 Diploma (any stream) awarded by any State Board of Technical Education. 	<p>After successful completion of this course, student should be able to</p> <ul style="list-style-type: none"> ❖ ❖ ❖ ❖

SYLLABUS FOR THEORY UNITS

UN	Detailed Syllabus of the Unit	Credit
01-01	Thermodynamic Description of system 01: Zeroth Law of thermodynamics and temperature. First law and internal energy, conversion of heat into work, Various Thermodynamical Processes, Applications of First Law: General Relation between CP & CV, Work Done during Isothermal and Adiabatic Processes, Compressibility & Expansion Coefficient, Reversible & irreversible processes	Credit 01
01-02		
01-03		
01-04		
01-05		

02-01	Thermodynamic Description of system 02: Second law & Entropy, Carnot's cycle & theorem, Entropy changes in reversible & irreversible processes, Entropy-temperature diagrams, Third law of thermodynamics, Unattainability of absolute zero.	Credit 02
02-02	Thermodynamic Potentials: Enthalpy, Gibbs, Helmholtz and Internal Energy functions, Maxwell's relations & applications - Joule-Thompson Effect, Clausius-Clapeyron Equation, Expression for (CP – CV), CP/CV, TdS equations	
02-03		
02-04		
02-05		
03-01	Kinetic Theory of Gases: Derivation of Maxwell's law of distribution of velocities and its experimental verification, Mean free path (Zeroth Order), Transport Phenomena: Viscosity, Conduction and Diffusion (for vertical case), Law of equipartition of energy (no derivation) and its applications to specific heat of gases; mono-atomic and diatomic gases.	Credit 03
03-02	Theory of Radiation: Blackbody radiation, Spectral distribution, Concept of Energy Density, Derivation of Planck's law, Deduction of Wien's distribution law, Rayleigh-Jeans Law, Stefan Boltzmann Law and Wien's displacement law from Planck's law	
03-03		
03-04		
03-05		
04-01	Statistical Mechanics: Phase space, Macrostate and Microstate, Entropy and Thermodynamic probability, Maxwell-Boltzmann law - distribution of velocity - Quantum statistics - Fermi-Dirac distribution law - electron gas - Bose-Einstein distribution law - photon gas - comparison of three statistics	Credit 04
04-02		
04-03		
04-04		
04-05		

S34322: PHYSICS – 03 PRACTICAL

PRACTICAL ACTIVITIES

UN	Name of the Unit	Credit
01-01	To determine Mechanical Equivalent of Heat, J, by Callender and Barne's constant flow method.	01
01-02	Measurement of Planck's constant using black body radiation.	
01-03	To determine Stefan's Constant.	
01-04	To determine the coefficient of thermal conductivity of copper by Searle's Apparatus.	
01-05	To determine the Coefficient of Thermal Conductivity of Cu by Angstrom's Method.	
02-01	To determine the coefficient of thermal conductivity of a bad conductor by Lee and Charlton's disc method.	02
02-02	To determine the temperature co-efficient of resistance by Platinum resistance thermometer.	
02-03	To study the variation of thermo emf across two junctions of a thermocouple with temperature.	
02-04	To record and analyze the cooling temperature of an hot object as a function of time using a thermocouple and suitable data acquisition system	
02-05	To calibrate Resistance Temperature Device (RTD) using Null Method/Off-Balance Bridge	

LEARNING RESOURCE DETAILS

LR Code	Title Author	Edition Year	ISBN Publisher
YCMOU SLM eBooks			
T34321-W01	https://goo.gl/ytrJWe	2016	- YCMOU
Reference Books			
T34321-R01	Physics for Degree Students BSc First Year C L Arora, Dr P S Hemne	2014	9789384857042 S.Chand
T34321-R02	Physics for Degree Students BSc Second year C L Arora, Dr P S Hemne	2014	9789384857059 S Chand
T34321-R03	Physics for Degree Students BSc Third year C L Arora, Dr P S Hemne	2014	9789384857066 S Chand
T34321-R04	College Physics @ https://goo.gl/89ehG7		1-947172-01-8 OpenStax
T34321-R05	University Physics 01 @ https://goo.gl/mWkSdh		1-947172-20-4 OpenStax
T34321-R06	University Physics 02 @ https://goo.gl/1xnA6H		1-947172-21-2 OpenStax
T34321-R07	University Physics 03 @ https://goo.gl/43tgzM		1-947172-22-0 OpenStax
T34321-R08	PhET Simulations @ https://goo.gl/spSWTM	2017	- PhET

S37331: CHEMISTRY - 03

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	UG
5	Course Used in	V92: B.Sc.(PCM)
6	Designed for Full Compliance to these UGC Documents:	(1) Instructional Template (2) Templates of Syllabi for CBCS

COURSE INFORMATION

Sem	Code	Course Name	Credits	CAT	EE	TM	Type	Category
01	S37331	Chemistry - 03	4	20	80	100	T	CC02
01	S37332	Chemistry - 03 Practical	2	10	40	50	P	CC02

PRESUMED KNOWLEDGE AND LEARNING OBJECTIVES

Presumed Knowledge	Learning Objectives
For successful completion of this course, student should have successfully completed: <ul style="list-style-type: none"> ❖ 10+2 or equivalent from a recognized Board. OR ❖ 10+3 Diploma (any stream) awarded by any State Board of Technical Education. 	After successful completion of this course, student should be able to <ul style="list-style-type: none"> ❖ ❖ ❖ ❖

SYLLABUS FOR THEORY UNITS

UN	Detailed Syllabus of the Unit	Credit
01-01	Thermodynamics of ideal solutions: Ideal solutions and Raoult's law, deviations from Raoult's law – non-ideal solutions. Vapour pressure-composition and temperature composition curves of ideal and non-ideal solutions. Distillation of solutions. Lever rule. Azeotropes.	Credit 01
01-02	Partial miscibility of liquids: Critical solution temperature; effect of impurity on partial miscibility of liquids. Immiscibility of liquids- Principle of steam distillation. Nernst distribution law and its applications, solvent extraction.	

01-03	Phase Equilibrium: Phases, components and degrees of freedom of a system, criteria of phase equilibrium. Gibbs Phase Rule and its thermodynamic derivation. Derivation of Clausius – Clapeyron equation and its importance in phase equilibria. Phase diagrams of one-component systems (water and sulphur) and two component systems involving eutectics, congruent and incongruent melting points (lead-silver, FeCl ₃ -H ₂ O and Na-K only).	
01-04		
01-05		
02-01	Conductance: Conductivity, equivalent and molar conductivity and their variation with dilution for weak and strong electrolytes. Kohlrausch law of independent migration of ions. Transference number and its experimental determination using Hittorf and Moving boundary methods. Ionic mobility. Applications of conductance measurements: determination of degree of ionization of weak electrolyte, solubility and solubility products of sparingly soluble salts, ionic product of water, hydrolysis constant of a salt. Conductometric titrations (only acid-base).	
02-02	Electrochemistry: Reversible and irreversible cells. Concept of EMF of a cell. Measurement of EMF of a cell. Nernst equation and its importance. Types of electrodes. Standard electrode potential. Electrochemical series. Thermodynamics of a reversible cell, calculation of thermodynamic properties: ΔG , ΔH and ΔS from EMF data. Calculation of equilibrium constant from EMF data. Concentration cells with transference and without transference. Liquid junction potential and salt bridge. pH determination using hydrogen electrode and quinhydrone electrode. Potentiometric titrations -qualitative treatment (acid-base and oxidation-reduction only).	Credit 02
02-03		
02-04		
02-05		
03-01	Organic Chemistry: Functional group approach for the following reactions (preparations & reactions) to be studied in context to their structure. Carboxylic acids and their derivatives. Carboxylic acids (aliphatic and aromatic). Preparation: Acidic and Alkaline hydrolysis of esters. Reactions: Hell – Vohlard - Zelinsky Reaction. Carboxylic acid derivatives (aliphatic): (Upto 5 carbons) Preparation: Acid chlorides, Anhydrides, Esters and Amides from acids and their interconversion. Reactions: Comparative study of nucleophilicity of acyl derivatives. Reformatsky Reaction, Perkin condensation.	
03-02	Amines and Diazonium Salts. Amines (Aliphatic and Aromatic): (Upto 5 carbons) Preparation: from alkyl halides, Gabriel's Phthalimide synthesis, Hofmann Bromamide reaction. Reactions: Hofmann vs. Saytzeff elimination, Carbylamine test, Hinsberg test, with HNO ₂ , Schotten – Baumann Reaction. Electrophilic substitution (case aniline): nitration, bromination, sulphonation. Diazonium salts: Preparation: from aromatic amines. Reactions: conversion to benzene, phenol, dyes.	Credit 03
03-03		
03-04		

03-05		
04-01	Amino Acids, Peptides and Proteins: Preparation of Amino Acids: Strecker synthesis using Gabriel's phthalimide synthesis. Zwitterion, Isoelectric point and Electrophoresis. Reactions of Amino acids: ester of –COOH group, acetylation of –NH ₂ group, complexation with Cu ²⁺ ions, ninhydrin test. Overview of Primary, Secondary, Tertiary and Quaternary Structure of proteins. Determination of Primary structure of Peptides by degradation Edmann degradation (N-terminal) and C-terminal (thiohydantoin and with carboxypeptidase enzyme). Synthesis of simple peptides (upto dipeptides) by N-protection (t-butyloxycarbonyl and phthaloyl) & C-activating groups and Merrifield solid-phase synthesis.	Credit 04
04-02	Carbohydrates: Classification, and General Properties, Glucose and Fructose (open chain and cyclic structure), Determination of configuration of monosaccharides, absolute configuration of Glucose and Fructose, Mutarotation, ascending and descending in monosaccharides. Structure of disaccharides (sucrose, cellobiose, maltose, lactose) and polysaccharides (starch and cellulose) excluding their structure elucidation.	
04-03		
04-04		
04-05		

PRACTICAL ACTIVITIES

UN	Name of the Unit	Credit
01-01	<p>Distribution: Study of the equilibrium of one of the following reactions by the distribution method:</p> $I_2(aq) + I^-(aq) \rightleftharpoons I_3^-(aq)$ $Cu^{2+}(aq) + xNH_3(aq) \rightleftharpoons [Cu(NH_3)_x]^{2+}$	01
01-02	<p>Phase equilibria:</p> <p>a) Construction of the phase diagram of a binary system (simple eutectic) using cooling curves.</p> <p>b) Determination of the critical solution temperature and composition of the phenol water system and study of the effect of impurities on it.</p> <p>c) Study of the variation of mutual solubility temperature with concentration for the phenol water system and determination of the critical solubility temperature.</p>	
01-03	<p>Conductance</p> <p>I. Determination of cell constant</p> <p>II. Determination of equivalent conductance, degree of dissociation and dissociation constant of a weak acid.</p> <p>III. Perform the following conductometric titrations:</p>	
01-04	<p>i. Strong acid vs. strong base</p> <p>ii. Weak acid vs. strong base</p> <p>Potentiometry: Perform the following potentiometric titrations:</p> <p>i. Strong acid vs. strong base</p> <p>ii. Weak acid vs. strong base</p> <p>iii. Potassium dichromate vs. Mohr's salt</p>	
02-01	I Systematic Qualitative Organic Analysis of Organic Compounds possessing monofunctional groups (-COOH, phenolic, aldehydic, ketonic, amide, nitro, amines) and preparation of one derivative.	02
02-02	<p>II</p> <p>1. Separation of amino acids by paper chromatography</p> <p>2. Determination of the concentration of glycine solution by formylation method.</p> <p>3. Titration curve of glycine</p> <p>4. Action of salivary amylase on starch</p> <p>5. Effect of temperature on the action of salivary amylase on starch.</p> <p>6. Differentiation between a reducing and a nonreducing sugar.</p>	

LEARNING RESOURCE DETAILS

LR Code	Title Author	Edition Year	ISBN Publisher
YCMOU SLM eBooks			
T37331-W01	https://goo.gl/ytrJWe	2016	- YCMOU

Reference Books			
T37331-R01	Chemistry for Degree Students (B.Sc. Sem.-III, CBCS) R L Madan	2016	9789352535200 S Chand
T37331-R02	Chemistry @ https://goo.gl/29PGRb	2017	1-947172-09-3 OpenStax
T37331-R03	Chemistry: Atoms First @ https://goo.gl/e58NiX	2017	1-947172-18-2 OpenStax
T37331-R04	Organic Chemistry with a Biological Emphasis @ https://goo.gl/2W5m8E	2016	BCCampus
T37331-R05	Analytical Chemistry @ https://goo.gl/BPaxaz	2010	BCCampus
T37331-R06	Introductory Chemistry @ https://goo.gl/WrDfirM	2011	BCCampus
T37331-R07	Concept Development Studies in Chemistry @ https://goo.gl/LbQigG	2007	BCCampus
T37331-R08	PhET Simulations @ https://goo.gl/rcFu5P	2016	- YCMOU

S41341: MATHEMATICS - 03

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	UG
5	Course Used in	V92: B.Sc.(PCM)
6	Designed for Full Compliance to these UGC Documents:	(1) Instructional Template (2) Templates of Syllabi for CBCS

COURSE INFORMATION

Sem	Code	Course Name	Credits	CAT	EE	TM	Type	Category
01	S41341	Mathematics - 03	4	20	80	100	T	CC03
01	S41342	Mathematics - 03 Practical	2	10	40	50	P	CC03

PRESUMED KNOWLEDGE AND LEARNING OBJECTIVES

Presumed Knowledge	Learning Objectives
<p>For successful completion of this course, student should have successfully completed:</p> <ul style="list-style-type: none"> ❖ 10+2 or equivalent from a recognized Board. OR ❖ 10+3 Diploma (any stream) awarded by any State Board of Technical Education. 	<p>After successful completion of this course, student should be able to</p> <ul style="list-style-type: none"> ❖ ❖ ❖ ❖

SYLLABUS FOR THEORY UNITS

UN	Detailed Syllabus of the Unit	Credit
01-01	Finite and infinite sets, examples of countable and uncountable sets. Real line, bounded sets, suprema and infima, completeness property of \mathbb{R} , Archimedean property of \mathbb{R} , intervals. Concept of cluster points and statement of Bolzano-Weierstrass theorem.	Credit 01
01-02		
01-03		
01-04		
01-05		

02-01	Real Sequence, Bounded sequence, Cauchy convergence criterion for sequences. Cauchy's theorem on limits, order preservation and squeeze theorem, monotone sequences and their convergence (monotone convergence theorem without proof).	Credit 02
02-02		
02-03		
02-04		
02-05		
03-01	Infinite series. Cauchy convergence criterion for series, positive term series, geometric series, comparison test, convergence of p-series, Root test, Ratio test, alternating series, Leibnitz's test (Tests of Convergence without proof). Definition and examples of absolute and conditional convergence.	Credit 03
03-02		
03-03		
03-04		
03-05		
04-01	Sequences and series of functions, Pointwise and uniform convergence. Mn-test, Mtest, Statements of the results about uniform convergence and integrability and differentiability of functions, Power series and radius of convergence.	Credit 04
04-02		
04-03		
04-04		
04-05		

S41342: MATHEMATICS – 03 PRACTICAL

PRACTICAL ACTIVITIES

UN	Name of the Unit	Credit
01-01	Home Assignment for Credit 01	01
01-02	Home Assignment for Credit 02	
02-01	Home Assignment for Credit 03	02
02-02	Home Assignment for Credit 04	

LEARNING RESOURCE DETAILS

LR Code	Title Author	Edition Year	ISBN Publisher
YCMOU SLM eBooks			
T41341-W01	https://goo.gl/ytrJWe	2016	- YCMOU
Reference Books			
T41341-R01	Mathematics For Degree Students BSc First Year Dr P K Mittal	2010	978-81-121-9324-00 S Chand
T41341-R02	Mathematics For Degree Students BSc Second Year Dr P K Mittal	2010	81-219-3554-7 S Chand
T41341-R03	Mathematics for Degree Students BSc Third Year Dr P K Mittal	2010	81-219-3554-4 S Chand
T41341-R04	Prealgebra @ https://goo.gl/ertyM5		
T41341-R05	Elementary Algebra @ https://goo.gl/mVWVMU		
T41341-R06	Intermediate Algebra @ https://goo.gl/A6vPSz		
T41341-R07	College Algebra @ https://goo.gl/DyUnu4		
T41341-R08	Algebra and Trigonometry @ https://goo.gl/VVL9X5		
T41341-R09	Precalculus @ https://goo.gl/JCAMcW		
T41341-R10	Calculus Volume 1 @ https://goo.gl/Zh5S5y		
T41341-R11	Calculus Volume 2 @ https://goo.gl/GTe9Co		
T41341-R12	Calculus Volume 3 @ https://goo.gl/rPza4U		
T41341-R13	A First Course in Linear Algebra - https://goo.gl/wjrzQv		
T41341-R14	Calculus: Early Transcendentals - https://goo.gl/VzsG1A		
T41341-R15	Precalculus: Stitz Zeager - https://goo.gl/mGrXxW		
T41341-R16	Brief Calculus - https://goo.gl/jm93sH		
T41341-R17	Elementary Differential Equations with Boundary Value Problems - https://goo.gl/YNxwyj		
T41341-R18	PhET Simulations @ https://goo.gl/S4HZVM	2017	

SEMESTER 04

SEC411: RESEARCH METHODOLOGY

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	UG
5	Course Used in	V92: B.Sc.(PCM)
6	Designed for Full Compliance to these UGC Documents:	(1) Instructional Template (2) Templates of Syllabi for CBCS

COURSE INFORMATION

Sem	Code	Course Name	Credits	CAT	EE	TM	Type	Category
01	SEC411	Research Methodology	4	20	80	100	T	SEC

PRESUMED KNOWLEDGE AND LEARNING OBJECTIVES

Presumed Knowledge	Learning Objectives
For successful completion of this course, student should have successfully completed: <ul style="list-style-type: none">❖ 10+2 or equivalent from a recognized Board. OR❖ 10+3 Diploma (any stream) awarded by any State Board of Technical Education.	After successful completion of this course, student should be able to <ul style="list-style-type: none">❖ Describe various aspects of research at basic level❖❖❖

SYLLABUS FOR THEORY UNITS

UN	Detailed Syllabus of the Unit	Credit
01-01	Meaning of Research: Meaning of Research, Types of Research- Basic Research, Applied Research, Exploratory Research, Conclusive Research, Descriptive Research, Analytical Research, Quantitative Research, Qualitative Research, Steps in Research	Credit 01
01-02	Scientific Inquiry: Science and Common Sense, Science and common sense difference, Methods of Knowing	
01-03	Research Interdisciplinary Approach: philosophical and social foundation of research, reasoning, interdisciplinary approach	
01-04	Ethics in Research:	

01-05	Survey Research: What is Survey Research, Definition of Survey, Types of Survey	
02-01	Experiment: Variables, Types, Laboratory Experiment, Field Experiment	Credit 02
02-02	Case Study: Ex-post-facto, Documentary, Content Analysis	
02-03	Framing Aim, Objectives and Hypothesis: framing Aim, Objectives and Hypothesis for different types of research studies - Survey studies, co-relational studies, and cross-sectional studies	
02-04	Population and Sample Part I: non-probability sampling - Purposive Sampling, Incidental Sampling, Snow – ball Sampling, Quota Sampling, Judgmental Sampling	
02-05	Population and Sample Part II: Probability Sampling-Simple random sampling with replacement, Simple random sampling without replacement, Systematic sampling, Stratified sampling, Stratified random sampling, Random Sampling Technique, Cluster Sampling	
03-01	Tools of Data Collection Part I: Observation Method, Interview/Schedule	Credit 03
03-02	Tools of Data Collection Part II: Construction of a Scale, Development of a Test	
03-03	Analysis of Qualitative Data: Content Analysis, Communalities of Response	
03-04	Analysis of Quantitative Data: Discrete data, Continuous data, Tabular Presentation- One-way Table, Two-way Table, Three-way Table, Manifold Table. Graphical Presentation - Frequency Polygon, Frequency Histogram, Pie Diagram	
03-05	Hypothesis Testing Chi Square Test: what is Chi square test, Its use , Steps, 2x2 Contingency Table	
04-01	Measures of Central Tendency: Mean, Median, Mode, Standard Deviation	Credit 04
04-02	Normal Probability Curve (NPS): what is NPS, Applications of NPC	
04-03	Independent and Dependent Variables: Correlation coefficient	
04-04	Selection of Statistical Techniques: How to Select different statistical technique for Research design depending upon the nature of data	
04-05	Interpretation of Results and Discussion:	

LEARNING RESOURCE DETAILS

LR Code	Title Author	Edition Year	ISBN Publisher
YCMOU SLM eBooks			
SEC411-W01	https://goo.gl/ytrJWe	2016	- YCMOU
Reference Books			
SEC411-R01	Research Methodology Methods and Techniques C R Kothari		978-81-224-2488-1 New Age
SEC411-R02	Fundamentals of Research Methodology and Statistics Yogesh Kumar Singh		978-81-224-2418-8 New Age
SEC411-R03	Research Methodology Video Playlist Link: https://goo.gl/41lEzH	2016	- YCMOU

S34421: PHYSICS - 04

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	UG
5	Course Used in	V92: B.Sc.(PCM)
6	Designed for Full Compliance to these UGC Documents:	(1) Instructional Template (2) Templates of Syllabi for CBCS

COURSE INFORMATION

Sem	Code	Course Name	Credits	CAT	EE	TM	Type	Category
01	S34421	Physics - 04	4	20	80	100	T	CC01
01	S34422	Physics - 04 Practical	2	10	40	50	P	CC01

PRESUMED KNOWLEDGE AND LEARNING OBJECTIVES

Presumed Knowledge	Learning Objectives
<p>For successful completion of this course, student should have successfully completed:</p> <ul style="list-style-type: none"> ❖ 10+2 or equivalent from a recognized Board. OR ❖ 10+3 Diploma (any stream) awarded by any State Board of Technical Education. 	<p>After successful completion of this course, student should be able to</p> <ul style="list-style-type: none"> ❖ ❖ ❖ ❖

SYLLABUS FOR THEORY UNITS

UN	Detailed Syllabus of the Unit	Credit
01-01	Superposition of Two Collinear Harmonic oscillations: Linearity and Superposition Principle. (1) Oscillations having equal frequencies and (2) Oscillations having different frequencies (Beats).	Credit 01
01-02	Superposition of Two Perpendicular Harmonic Oscillations: Graphical and Analytical Methods. Lissajous Figures with equal and unequal frequency and their uses.	
01-03	Waves Motion- General: Transverse waves on a string. Travelling and standing waves on a string. Normal Modes of a string. Group velocity, Phase velocity. Plane waves. Spherical waves, Wave intensity.	
01-04		

01-05		
02-01	Fluids: Surface Tension: Synclastic and anticlastic surface - Excess of pressure - Application to spherical and cylindrical drops and bubbles - variation of surface tension with temperature - Jaegar's method. Viscosity: Viscosity - Rate flow of liquid in a capillary tube - Poiseuille's formula - Determination of coefficient of viscosity of a liquid - Variations of viscosity of a liquid with temperature lubrication. Physics of low pressure - production and measurement of low pressure - Rotary pump - Diffusion pump - Molecular pump - Knudsen absolute gauge - penning and pirani gauge – Detection of leakage.	Credit 02
02-02	Sound: Simple harmonic motion - forced vibrations and resonance - Fourier's Theorem - Application to saw tooth wave and square wave - Intensity and loudness of sound - Decibels - Intensity levels - musical notes - musical scale. Acoustics of buildings: Reverberation and time of reverberation - Absorption coefficient - Sabine's formula - measurement of reverberation time - Acoustic aspects of halls and auditoria.	
02-03		
02-04		
02-05		
03-01	Wave Optics: Electromagnetic nature of light. Definition and Properties of wave front. Huygens Principle.	Credit 03
03-02	Interference: Interference: Division of amplitude and division of wavefront. Young's Double Slit experiment. Lloyd's Mirror and Fresnel's Biprism. Phase change on reflection: Stokes' treatment. Interference in Thin Films: parallel and wedge-shaped films. Fringes of equal inclination (Haidinger Fringes); Fringes of equal thickness (Fizeau Fringes). Newton's Rings: measurement of wavelength and refractive index.	
03-03	Michelson's Interferometer: Idea of form of fringes (no theory needed), Determination of wavelength, Wavelength difference, Refractive index and Visibility of fringes.	
03-04		
03-05		
04-01	Diffraction: Fraunhofer diffraction: Single slit; Double Slit. Multiple slits & Diffraction grating. Fresnel Diffraction: Half-period zones. Zone plate. Fresnel Diffraction pattern of a straight edge, a slit and a wire using half-period zone analysis.	Credit 04
04-02	Polarization: Transverse nature of light waves. Plane polarized light – production and analysis. Circular and elliptical polarization	
04-03		
04-04		
04-05		

S34422: PHYSICS – 04 PRACTICAL

PRACTICAL ACTIVITIES

UN	Name of the Unit	Credit
01-01	To investigate the motion of coupled oscillators	01
01-02	To determine the Frequency of an Electrically Maintained Tuning Fork by Melde's Experiment and to verify $\lambda_2 = T$ Law.	
01-03	To study Lissajous Figures	
01-04	Familiarization with Schuster's focussing; determination of angle of prism.	
01-05	To determine the Coefficient of Viscosity of water by Capillary Flow Method (Poiseuille's method).	
01-06	To determine the Refractive Index of the Material of a given Prism using Sodium Light.	
01-07	To determine Dispersive Power of the Material of a given Prism using Mercury Light	
02-01	To determine the value of Cauchy Constants of a material of a prism.	02
02-02	To determine the Resolving Power of a Prism.	
02-03	To determine wavelength of sodium light using Fresnel Biprism.	
02-04	To determine wavelength of sodium light using Newton's Rings.	
02-05	To determine the wavelength of Laser light using Diffraction of Single Slit.	
02-06	To determine wavelength of (1) Sodium & (2) spectrum of Mercury light using plane diffraction Grating	
02-07	To determine the Resolving Power of a Plane Diffraction Grating.	
02-08	To measure the intensity using photosensor and laser in diffraction patterns of single and double slits.	

LEARNING RESOURCE DETAILS

LR Code	Title Author	Edition Year	ISBN Publisher
YCMOU SLM eBooks			
T34421-W01	https://goo.gl/ytrJWe	2016	- YCMOU
Reference Books			
T34421-R01	Physics for Degree Students BSc First Year C L Arora, Dr P S Hemne	2014	9789384857042 S.Chand
T34421-R02	Physics for Degree Students BSc Second year C L Arora, Dr P S Hemne	2014	9789384857059 S Chand
T34421-R03	Physics for Degree Students BSc Third year C L Arora, Dr P S Hemne	2014	9789384857066 S Chand
T34421-R04	College Physics @ https://goo.gl/89ehG7		1-947172-01-8 OpenStax
T34421-R05	University Physics 01 @ https://goo.gl/mWkSdh		1-947172-20-4 OpenStax
T34421-R06	University Physics 02 @ https://goo.gl/1xnA6H		1-947172-21-2 OpenStax
T34421-R07	University Physics 03 @ https://goo.gl/43tzgM		1-947172-22-0 OpenStax

T34421-R08	PhET Simulations @ https://goo.gl/spSWTM	2017	- PhET
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S37431: CHEMISTRY - 04

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	UG
5	Course Used in	V92: B.Sc.(PCM)
6	Designed for Full Compliance to these UGC Documents:	(1) Instructional Template (2) Templates of Syllabi for CBCS

COURSE INFORMATION

Sem	Code	Course Name	Credits	CAT	EE	TM	Type	Category
01	S37431	Chemistry - 04	4	20	80	100	T	CC02
01	S37432	Chemistry - 04 Practical	2	10	40	50	P	CC02

PRESUMED KNOWLEDGE AND LEARNING OBJECTIVES

Presumed Knowledge	Learning Objectives
<p>For successful completion of this course, student should have successfully completed:</p> <ul style="list-style-type: none"> ❖ 10+2 or equivalent from a recognized Board. OR ❖ 10+3 Diploma (any stream) awarded by any State Board of Technical Education. 	<p>After successful completion of this course, student should be able to</p> <ul style="list-style-type: none"> ❖ ❖ ❖ ❖

SYLLABUS FOR THEORY UNITS

UN	Detailed Syllabus of the Unit	Credit
01-01	Transition Elements (3d series): General group trends with special reference to electronic configuration, variable valency, colour, magnetic and catalytic properties, ability to form complexes and stability of various oxidation states (Latimer diagrams) for Mn, Fe and Cu. Lanthanoids and actinoids: Electronic configurations, oxidation states, colour, magnetic properties, lanthanide contraction, separation of lanthanides (ion exchange method only).	Credit 01
01-02		
01-03		
01-04		
01-05		

02-01	Coordination Chemistry: Valence Bond Theory (VBT): Inner and outer orbital complexes of Cr, Fe, Co, Ni and Cu (coordination numbers 4 and 6). Structural and stereoisomerism in complexes with coordination numbers 4 and 6. Drawbacks of VBT. IUPAC system of nomenclature.	Credit 02
02-02	Crystal Field Theory: Crystal field effect, octahedral symmetry. Crystal field stabilization energy (CFSE), Crystal field effects for weak and strong fields. Tetrahedral symmetry. Factors affecting the magnitude of D. Spectrochemical series. Comparison of CFSE for Oh and Td complexes, Tetragonal distortion of octahedral geometry. Jahn-Teller distortion, Square planar coordination.	
02-03		
02-04		
02-05		
03-01	Kinetic Theory of Gases: Postulates of Kinetic Theory of Gases and derivation of the kinetic gas equation. Deviation of real gases from ideal behaviour, compressibility factor, causes of deviation. van der Waals equation of state for real gases. Boyle temperature (derivation not required). Critical phenomena, critical constants and their calculation from van der Waals equation. Andrews isotherms of CO ₂ . Maxwell Boltzmann distribution laws of molecular velocities and molecular energies (graphic representation – derivation not required) and their importance. Temperature dependence of these distributions. Most probable, average and root mean square velocities (no derivation). Collision cross section, collision number, collision frequency, collision diameter and mean free path of molecules. Viscosity of gases and effect of temperature and pressure on coefficient of viscosity (qualitative treatment only).	Credit 03
03-02	Liquids: Surface tension and its determination using stalagmometer. Viscosity of a liquid and determination of coefficient of viscosity using Ostwald viscometer. Effect of temperature on surface tension and coefficient of viscosity of a liquid (qualitative treatment only).	
03-03		
03-04		
03-05		
04-01	Solids: Forms of solids. Symmetry elements, unit cells, crystal systems, Bravais lattice types and identification of lattice planes. Laws of Crystallography - Law of constancy of interfacial angles, Law of rational indices. Miller indices. X-Ray diffraction by crystals, Bragg's law. Structures of NaCl, KCl and CsCl (qualitative treatment only). Defects in crystals. Glasses and liquid crystals.	Credit 04
04-02	Chemical Kinetics: The concept of reaction rates. Effect of temperature, pressure, catalyst and other factors on reaction rates. Order and molecularity of a reaction. Derivation of integrated rate equations for zero, first and second order reactions (both for equal and unequal concentrations of reactants). Half-life of a reaction. General methods for determination of order of a reaction. Concept of activation energy and its calculation from Arrhenius equation.	

04-03	Theories of Reaction Rates: Collision theory and Activated Complex theory of bimolecular reactions. Comparison of the two theories (qualitative treatment only).	
04-04		
04-05		

S37432: CHEMISTRY – 04 PRACTICAL

PRACTICAL ACTIVITIES

UN	Name of the Unit	Credit
01-01	<p>Semi-micro qualitative analysis (using H₂S or other methods) of mixtures - not more than four ionic species (two anions and two cations, excluding insoluble salts) out of the following:</p> <p>Cations : NH₄⁺, Pb²⁺, Bi³⁺, Cu²⁺, Cd²⁺, Fe³⁺, Al³⁺, Co²⁺, Ni²⁺, Mn²⁺, Zn²⁺, Ba²⁺, Sr²⁺, Ca²⁺, K⁺</p> <p>Anions : CO₃²⁻, S²⁻, SO₃²⁻, S₂O₃²⁻, NO₃⁻, CH₃COO⁻, Cl⁻, Br⁻, I⁻, NO₃⁻, SO₄²⁻, PO₄³⁻, BO₃³⁻, C₂O₄²⁻, F⁻</p> <p>(Spot tests should be carried out wherever feasible)</p> <ol style="list-style-type: none"> Estimate the amount of nickel present in a given solution as bis (dimethylglyoximate) nickel(II) or aluminium as oximate in a given solution gravimetrically. Estimation of (i) Mg²⁺ or (ii) Zn²⁺ by complexometric titrations using EDTA. Estimation of total hardness of a given sample of water by complexometric titration. 	01
02-01	(I) Surface tension measurement (use of organic solvents excluded). <ol style="list-style-type: none"> Determination of the surface tension of a liquid or a dilute solution using a stalagmometer. Study of the variation of surface tension of a detergent solution with concentration. 	02
02-02	(II) Viscosity measurement (use of organic solvents excluded). <ol style="list-style-type: none"> Determination of the relative and absolute viscosity of a liquid or dilute solution using an Ostwald's viscometer. Study of the variation of viscosity of an aqueous solution with concentration of solute. 	
02-03	(III) Chemical Kinetics: Study the kinetics of the following reactions. <ol style="list-style-type: none"> Initial rate method: Iodide-persulphate reaction Integrated rate method: <ol style="list-style-type: none"> Acid hydrolysis of methyl acetate with hydrochloric acid. Saponification of ethyl acetate. Compare the strengths of HCl and H₂SO₄ by studying kinetics of hydrolysis of methyl acetate 	

LEARNING RESOURCE DETAILS

LR Code	Title Author	Edition Year	ISBN Publisher
YCMOU SLM eBooks			
T37431-W01	https://goo.gl/ytrJWe	2016	- YCMOU
Reference Books			
T37431-R01	Chemistry for Degree Students (B.Sc. Sem.-IV, CBCS) R L Madan	2016	9789352535194 S Chand
T37431-R02	Chemistry @ https://goo.gl/29PGRb	2017	1-947172-09-3 OpenStax
T37431-R03	Chemistry: Atoms First @ https://goo.gl/e58NiX	2017	1-947172-18-2 OpenStax
T37431-R04	Organic Chemistry with a Biological Emphasis @ https://goo.gl/2W5m8E	2016	BCCampus
T37431-R05	Analytical Chemistry @ https://goo.gl/BPaxaz	2010	BCCampus
T37431-R06	Introductory Chemistry @ https://goo.gl/WrDfrM	2011	BCCampus
T37431-R07	Concept Development Studies in Chemistry @ https://goo.gl/LbQigG	2007	BCCampus
T37431-R08	PhET Simulations @ https://goo.gl/rcFu5P	2016	- YCMOU

S41441: MATHEMATICS - 04

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	UG
5	Course Used in	V92: B.Sc.(PCM)
6	Designed for Full Compliance to these UGC Documents:	(1) Instructional Template (2) Templates of Syllabi for CBCS

COURSE INFORMATION

Sem	Code	Course Name	Credits	CAT	EE	TM	Type	Category
01	S41441	Mathematics - 04	4	20	80	100	T	CC03
01	S41442	Mathematics - 04 Practical	2	10	40	50	P	CC03

PRESUMED KNOWLEDGE AND LEARNING OBJECTIVES

Presumed Knowledge	Learning Objectives
For successful completion of this course, student should have successfully completed: <ul style="list-style-type: none"> ❖ 10+2 or equivalent from a recognized Board. OR ❖ 10+3 Diploma (any stream) awarded by any State Board of Technical Education. 	After successful completion of this course, student should be able to <ul style="list-style-type: none"> ❖ ❖ ❖ ❖

SYLLABUS FOR THEORY UNITS

UN	Detailed Syllabus of the Unit	Credit
01-01	Definition and examples of groups, examples of abelian and non-abelian groups, the group Z_n of integers under addition modulo n and the group $U(n)$ of units under multiplication modulo n . Cyclic groups from number systems, complex roots of unity, circle group	Credit 01
01-02		
01-03		
01-04		
01-05		

02-01	The general linear group $GL_n(n, \mathbb{R})$, groups of symmetries of (i) an isosceles triangle, (ii) an equilateral triangle, (iii) a rectangle, and (iv) a square, the permutation group $Sym(n)$, Group of quaternions. Subgroups, cyclic subgroups, the concept of a subgroup generated by a subset and the commutator subgroup of group	Credit 02
02-02		
02-03		
02-04		
02-05		
03-01	Examples of subgroups including the center of a group. Cosets, Index of subgroup, Lagrange's theorem, order of an element, Normal subgroups: their definition, examples, and characterizations, Quotient groups. Definition and examples of rings, examples of commutative and non-commutative rings: rings from number systems	Credit 03
03-02		
03-03		
03-04		
03-05		
04-01	\mathbb{Z}_n the ring of integers modulo n , ring of real quaternions, rings of matrices, polynomial rings, and rings of continuous functions. Subrings and ideals, Integral domains and fields, examples of fields: \mathbb{Z}_p , \mathbb{Q} , \mathbb{R} , and \mathbb{C} . Field of rational functions.	Credit 04
04-02		
04-03		
04-04		
04-05		

S41442: MATHEMATICS – 04 PRACTICAL

PRACTICAL ACTIVITIES

UN	Name of the Unit	Credit
01-01	Home Assignment for Credit 01	01
01-02	Home Assignment for Credit 02	
02-01	Home Assignment for Credit 03	02
02-02	Home Assignment for Credit 04	

LEARNING RESOURCE DETAILS

LR Code	Title Author	Edition Year	ISBN Publisher
YCMOU SLM eBooks			
T41441-W01	https://goo.gl/ytrJWe	2016	- YCMOU
Reference Books			
T41441-R01	Mathematics For Degree Students BSc First Year Dr P K Mittal	2010	978-81-121-9324-00 S Chand
T41441-R02	Mathematics For Degree Students BSc Second Year Dr P K Mittal	2010	81-219-3554-7 S Chand
T41441-R03	Mathematics for Degree Students BSc Third Year Dr P K Mittal	2010	81-219-3554-4 S Chand
T41441-R04	Prealgebra @ https://goo.gl/ertyM5		
T41441-R05	Elementary Algebra @ https://goo.gl/mVWVMU		
T41441-R06	Intermediate Algebra @ https://goo.gl/A6vPSz		
T41441-R07	College Algebra @ https://goo.gl/DyUnu4		
T41441-R08	Algebra and Trigonometry @ https://goo.gl/VVL9X5		
T41441-R09	Precalculus @ https://goo.gl/JCAMcW		
T41441-R10	Calculus Volume 1 @ https://goo.gl/Zh5S5y		
T41441-R11	Calculus Volume 2 @ https://goo.gl/GTe9Co		
T41441-R12	Calculus Volume 3 @ https://goo.gl/rPza4U		
T41441-R13	A First Course in Linear Algebra - https://goo.gl/wjrzQv		
T41441-R14	Calculus: Early Transcendentals - https://goo.gl/VzsG1A		
T41441-R15	Precalculus: Stitz Zeager - https://goo.gl/mGrXxW		
T41441-R16	Brief Calculus - https://goo.gl/jm93sH		
T41441-R17	Elementary Differential Equations with Boundary Value Problems - https://goo.gl/YNxwyj		
T41441-R18	PhET Simulations @ https://goo.gl/S4HZVM	2017	

SEMESTER 05

SEC511: FINANCIAL AND INVESTMENT SKILLS

PROGRAMME INFORMATION

SN	Description	Details
1	University	Yashwantrao Chavan Maharashtra Open University Nashik - 422 222, Maharashtra, India Website: http://www.ycmou.ac.in/
2	School	School of Architecture, Science and Technology
3	Discipline	Science
4	Level	UG
5	Course Used in	V92: B.Sc.(PCM)
6	Designed for Full Compliance to these UGC Documents:	(1) Instructional Template (2) Templates of Syllabi for CBCS

COURSE INFORMATION

Sem	Code	Course Name	Credits	CAT	EE	TM	Type	Category
01	SEC511	Financial and Investment Skills	4	20	80	100	T	SEC

PRESUMED KNOWLEDGE AND LEARNING OBJECTIVES

Presumed Knowledge	Learning Objectives
For successful completion of this course, student should have successfully completed: <ul style="list-style-type: none">❖ 10+2 or equivalent from a recognized Board. OR <ul style="list-style-type: none">❖ 10+3 Diploma (any stream) awarded by any State Board of Technical Education.	After successful completion of this course, student should be able to <ul style="list-style-type: none">❖❖❖❖

SYLLABUS FOR THEORY UNITS

UN	Detailed Syllabus of the Unit	Credit
01-01	Introduction to Stock Markets - 01: The Need to Invest, Regulators, Financial Intermediaries, The IPO Markets	Credit 01
01-02	Introduction to Stock Markets - 02: The Stock Markets, The Stock Markets Index, Commonly Used Jargons, The Trading Terminal	
01-03	Introduction to Stock Markets - 03: Clearing and Settlement Process, Five Corporate Actions and Its Impact on Stock Prices, Key Events and Their Impact on Markets, Getting started!	
01-04	--	
01-05	--	

02-01	Fundamental Analysis - 01: Introduction to Fundamental Analysis, Mindset of an Investor, How to Read the Annual Report of a Company	Credit 02
02-02	Fundamental Analysis - 02: Understanding the P&L Statement, Understanding Balance Sheet Statement, The Cash Flow statement, The Financial Ratio Analysis	
02-03	Fundamental Analysis - 03: The Investment Due Diligence, Equity Research, Discounted Cash Flow (DCF) and Time Value of Money, The follies of DCF Analysis, Margin of Safety, When to sell? How many stocks in the portfolio?	
02-04	--	
02-05	--	
03-01	Technical Analysis - 01: Background, Introducing Technical Analysis, The Chart Types, Getting Started with Candlesticks	Credit 03
03-02	Technical Analysis - 02: Single Candlestick patterns, Multiple candlestick patterns, The Support and Resistance	
03-03	Technical Analysis - 03: Volumes, Moving Averages, Indicators, The Fibonacci Retracements, The Dow Theory, Getting Started	
03-04	--	
03-05	--	
04-01	Markets and Taxation: Introduction, Basics, Classifying Your Market Activity, Taxation for Investors, Taxation for Traders, Turnover, Balance Sheet, and P&L, ITR Forms	Credit 04
04-02	Trading Psychology and Risk Management: Risk, Equity Curve, Expected Returns, Portfolio Optimization, Value at Risk, Position Sizing for Active Trader	
04-03	Mutual Funds: Concept of Mutual Funds, Structure of Mutual Funds in India, Classification of Mutual Funds, Evaluation and Selection of Mutual Funds, Portfolio Management Process, Taxation of Mutual Funds, Investment Checklist	
04-04	Financial Planning: Planning, Investing, Insurance, Tax, Retirement, Loans, Credit Cards, Real Estate, Fixed Income	
04-05	--	

LEARNING RESOURCE DETAILS

LR Code	Title Author	Edition Year	ISBN Publisher
YCMOU SLM eBooks			
SEC511-W01	https://goo.gl/ytrJWe	2016	- YCMOU
Reference Books			
SEC511-R01	Zerodha Varsity @ https://goo.gl/E2inve		ISBN Publisher

S34521: PHYSICS ELECTIVE - 0501

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	UG
5	Course Used in	V92: B.Sc.(PCM)
6	Designed for Full Compliance to these UGC Documents:	(1) Instructional Template (2) Templates of Syllabi for CBCS

COURSE INFORMATION

Sem	Code	Course Name	Credits	CAT	EE	TM	Type	Category
01	S34521	Physics Elective - 0501	4	20	80	100	T	DSE01
01	S34522	Physics Elective - 0501 Practical	2	10	40	50	P	DSE 01

PRESUMED KNOWLEDGE AND LEARNING OBJECTIVES

Presumed Knowledge	Learning Objectives
<p>For successful completion of this course, student should have successfully completed:</p> <ul style="list-style-type: none"> ❖ 10+2 or equivalent from a recognized Board. OR ❖ 10+3 Diploma (any stream) awarded by any State Board of Technical Education. 	<p>After successful completion of this course, student should be able to</p> <ul style="list-style-type: none"> ❖ ❖ ❖ ❖

SYLLABUS FOR THEORY UNITS

UN	Detailed Syllabus of the Unit	Credit
01-01	Digital Circuits: Difference between Analog and Digital Circuits. Binary Numbers. Decimal to Binary and Binary to Decimal Conversion, AND, OR and NOT Gates (Realization using Diodes and Transistor). NAND and NOR Gates as Universal Gates. XOR and XNOR Gates.	Credit 01
01-02	Boolean Algebra: De Morgan's Theorems. Boolean Laws. Simplification of Logic Circuit using Boolean Algebra. Fundamental Products. Minterms and Maxterms. Conversion of a Truth Table into an Equivalent Logic Circuit by (1) Sum of Products Method and (2) Karnaugh Map.	
01-03	Binary Addition and Subtraction: Binary Addition. Binary Subtraction using 2's Complement Method).Half Adders and Full Adders and Subtractors, 4-bit binary Adder-Subtractor	

01-04		
01-05		
02-01	Semiconductor Devices and Amplifiers: Semiconductor Diodes: p and n type semiconductors. Barrier Formation in PN Junction Diode. Qualitative Idea of Current Flow Mechanism in Forward and Reverse Biased Diode. PN junction and its characteristics. Static and Dynamic Resistance. Principle and structure of (1) LEDs (2) Photodiode (3) Solar Cell.	Credit 02
02-02	Bipolar Junction transistors: n-p-n and p-n-p Transistors. Characteristics of CB, CE and CC Configurations. Active, Cutoff, and Saturation Regions. Current gains α and β . Relations between α and β . Load Line analysis of Transistors. DC Load line and Q point. Voltage Divider Bias Circuit for CE Amplifier. h-parameter Equivalent Circuit. Analysis of a single-stage CE amplifier using Hybrid Model. Input and Output Impedance. Current, Voltage and Power Gains. Class A, B, and C Amplifiers	
02-03		
02-04		
02-05		
03-01	Operational Amplifiers (Black Box approach): Characteristics of an Ideal and Practical Op-Amp (IC 741), Open-loop & Closed-loop Gain. CMRR, concept of Virtual ground. Applications of Op-Amps: (1) Inverting and Non-inverting Amplifiers, (2) Adder, (3) Subtractor, (4) Differentiator, (5) Integrator, (6) Zero Crossing Detector.	Credit 03
03-02	Sinusoidal Oscillators: Barkhausen's Criterion for Self-sustained Oscillations. Determination of Frequency of RC Oscillator	
03-03		
03-04		
03-05		
04-01	Introduction to CRO: Block Diagram of CRO. Applications of CRO: (1) Study of Waveform, (2) Measurement of Voltage, Current, Frequency, and Phase Difference.	Credit 04
04-02	Power Supply: Half-wave Rectifiers. Centre-tapped and Bridge Full-wave Rectifiers Calculation of Ripple Factor and Rectification Efficiency, Basic idea about capacitor filter, Zener Diode and Voltage Regulation	
04-03	Timer IC: IC 555 Pin diagram and its application as Astable & Monostable Multivibrator	
04-04		
04-05		

S34522: PHYSICS ELECTIVE – 0501 PRACTICAL

PRACTICAL ACTIVITIES

UN	Name of the Unit	Credit
01-01	To measure (a) Voltage, and (b) Frequency of a periodic waveform using a CRO	01
01-02	To verify and design AND, OR, NOT and XOR gates using NAND gates.	
01-03	To minimize a given logic circuit.	
01-04	Half adder, Full adder and 4-bit Binary Adder.	
01-05	Adder-Subtractor using Full Adder I.C.	
01-06	To design an astable multivibrator of given specifications using 555 Timer.	
01-07	To design a monostable multivibrator of given specifications using 555 Timer.	
01-08	To study IV characteristics of PN diode, Zener and Light emitting diode	
02-01	To study the characteristics of a Transistor in CE configuration.	02
02-02	To design a CE amplifier of a given gain (mid-gain) using voltage divider bias.	
02-03	To design an inverting amplifier of given gain using Op-amp 741 and study its frequency response.	
02-04	To design a non-inverting amplifier of given gain using Op-amp 741 and study its Frequency Response.	
02-05	To study a precision Differential Amplifier of given I/O specification using Op-amp.	
02-06	To investigate the use of an op-amp as a Differentiator	
02-07	To design a Wien Bridge Oscillator using an op-amp.	

LEARNING RESOURCE DETAILS

LR Code	Title Author	Edition Year	ISBN Publisher
YCMOU SLM eBooks			
T34521-W01	https://goo.gl/ytrJWe	2016	- YCMOU
Reference Books			
T34521-R01	Physics for Degree Students BSc First Year C L Arora, Dr P S Hemne	2014	9789384857042 S.Chand
T34521-R02	Physics for Degree Students BSc Second year C L Arora, Dr P S Hemne	2014	9789384857059 S Chand
T34521-R03	Physics for Degree Students BSc Third year C L Arora, Dr P S Hemne	2014	9789384857066 S Chand
T34521-R04	Integrated Electronics, J. Millman and C.C. Halkias	1991	TMH
T34521-R05	Electronic devices and circuits, S. Salivahanan and N. Suresh Kumar	2012	TMH
T34521-R06	Microelectronic Circuits, M.H. Rashid	2 nd Ed 2011	Cengage Learning

T34521-R07	Modern Electronic Instru'n & Measurement Tech., Helfrick & Cooper	1990	PHI Learning
T34521-R08	Digital Principles & Applications, A.P. Malvino, D.P. Leach & Saha	7 th Ed 2011	TMH
T34521-R09	Microelectronic circuits, A.S. Sedra, K.C. Smith, A.N. Chandorkar	6 th Ed 2014	OUP
T34521-R10	Fundamentals of Digital Circuits, A. Anand Kumar	2 nd Ed 2009	PHI Learning
T34521-R11	OP-AMP and Linear Digital Circuits, R.A. Gayakwad	4 th Ed 2000	PHI Learning
T34521-R12	Basic Electronics: A text lab manual, P B Zbar, A P Malvino, M A Miller	1994	Mc-Graw Hill
T34521-R13	Electronic Principle, Albert Malvino	2008	TMH
T34521-R14	College Physics @ https://goo.gl/89ehG7		1-947172-01-8 OpenStax
T34521-R15	University Physics 01 @ https://goo.gl/mWkSdh		1-947172-20-4 OpenStax
T34521-R16	University Physics 02 @ https://goo.gl/1xnA6H		1-947172-21-2 OpenStax
T34521-R17	University Physics 03 @ https://goo.gl/43tgzM		1-947172-22-0 OpenStax
T34521-R18	PhET Simulations @ https://goo.gl/spSWTM	2017	- PhET

S37531: CHEMISTRY ELECTIVE - 0501

PROGRAMME INFORMATION

SN	Description	Details
1	University	Yashwantrao Chavan Maharashtra Open University Nashik - 422 222, Maharashtra, India Website: http://www.ymou.ac.in/ and http://ymou.digitaluniversity.ac
2	School	School of Architecture, Science and Technology
3	Discipline	Science
4	Level	UG
5	Course Used in	V92: B.Sc.(PCM)
6	Designed for Full Compliance to these UGC Documents:	(1) Instructional Template (2) Templates of Syllabi for CBCS

COURSE INFORMATION

Sem	Code	Course Name	Credits	CAT	EE	TM	Type	Category
01	S37531	Chemistry Elective - 0501	4	20	80	100	T	DSE02
01	S37532	Chemistry Elective - 0501 Practical	2	10	40	50	P	DSE02

PRESUMED KNOWLEDGE AND LEARNING OBJECTIVES

Presumed Knowledge	Learning Objectives
<p>For successful completion of this course, student should have successfully completed:</p> <ul style="list-style-type: none"> ❖ 10+2 or equivalent from a recognized Board. OR ❖ 10+3 Diploma (any stream) awarded by any State Board of Technical Education. 	<p>After successful completion of this course, student should be able to</p> <ul style="list-style-type: none"> ❖ ❖ ❖ ❖

SYLLABUS FOR THEORY UNITS

UN	Detailed Syllabus of the Unit	Credit
01-01	Introduction to Molecular Modelling; Introduction. Useful Concepts in Molecular Modelling: Coordinate Systems. Potential Energy Surfaces. Molecular Graphics. Surfaces. Computer Hardware and Software. The Molecular Modelling Literature.	Credit 01
01-02	Force Fields 01: Fields. Bond Stretching. Angle Bending. Introduction to nonbonded interactions. Electrostatic interactions.	
01-03		
01-04		
01-05		

02-01	Force Fields 02: van der Waals Interactions. Hydrogen bonding in Molecular Mechanics. Force Field Models for the Simulation of Liquid Water. Energy Minimization and Computer Simulation: Minimization and related methods for exploring the energy surface. Non-derivative method, First and second order minimization methods. Computer simulation methods. Simple thermodynamic properties and Phase Space. Boundaries. Analyzing the results of a simulation and estimating Errors.	Credit 02
02-02		
02-03		
02-04		
02-05		
03-01	Molecular Dynamics & Monte Carlo Simulation: Molecular Dynamics Simulation Methods. Molecular Dynamics using simple models. Molecular Dynamics with continuous potentials. Molecular Dynamics at constant temperature and pressure. Metropolis method. Monte Carlo simulation of molecules. Models used in Monte Carlo simulations of polymers.	Credit 03
03-02		
03-03		
03-04		
03-05		
04-01	Structure Prediction and Drug Design: Structure prediction - Introduction to comparative Modeling. Sequence alignment. Constructing and evaluating a comparative model. Predicting protein structures by 'Threading', Molecular docking. Structure based de novo ligand design, Drug Discovery – Chemoinformatics – QSAR.	Credit 04
04-02		
04-03		
04-04		
04-05		

S37532: CHEMISTRY ELECTIVE – 0501 PRACTICAL

PRACTICAL ACTIVITIES

UN	Name of the Unit	Credit
01-01	i. Compare the optimized C-C bond lengths in ethane, ethene, ethyne and benzene. Visualize the molecular orbitals of the ethane σ bonds and ethene, ethyne, benzene and pyridine π bonds.	01
01-02	ii. (a) Perform a conformational analysis of butane. (b) Determine the enthalpy of isomerization of cis and trans 2-butene.	
01-03	iii. Visualize the electron density and electrostatic potential maps for LiH, HF, N ₂ , NO and CO and comment. Relate to the dipole moments. Animate the vibrations of these molecules.	
01-04	iv. (a) Relate the charge on the hydrogen atom in hydrogen halides with their acid character. (b) Compare the basicities of the nitrogen atoms in ammonia, methylamine, dimethylamine and trimethylamine.	
02-01	v. (a) Compare the shapes of the molecules: 1-butanol, 2-butanol, 2-methyl-1-propanol, and 2-methyl-2-propanol. Note the dipole moment of each molecule. (b) Show how the shapes affect the trend in boiling points: (118 °C, 100 °C, 108 °C, 82 °C, respectively).	02
02-02	vi. Build and minimize organic compounds of your choice containing the following functional groups. Note the dipole moment of each compound: (a) alkyl halide (b) aldehyde (c) ketone (d) amine (e) ether (f) nitrile (g) thiol (h) carboxylic acid (i) ester (j) amide.	
02-03	vii. (a) Determine the heat of hydration of ethylene. (b) Compute the resonance energy of benzene by comparison of its enthalpy of hydrogenation with that of cyclohexene.	
02-04	viii. Arrange 1-hexene, 2-methyl-2-pentene, (E)-3-methyl-2-pentene, (Z)-3-methyl-2-pentene, and 2,3-dimethyl-2-butene in order of increasing stability.	
02-05	ix. (a) Compare the optimized bond angles H ₂ O, H ₂ S, H ₂ Se. (b) Compare the HAH bond angles for the second row dihydrides and compare with the results from qualitative MO theory. Note: Software: ChemSketch, ArgusLab (www.planaria-software.com), TINKER 6.2 (dasher.wustl.edu/ffe), WebLab Viewer, Hyperchem, or any similar software.	

LEARNING RESOURCE DETAILS

LR Code	Title Author	Edition Year	ISBN Publisher
YCMOU SLM eBooks			
T37531-W01	https://goo.gl/ytrJWe	2016	- YCMOU
Reference Books			
T37531-R01	Chemistry for Degree Students (B.Sc. Sem.-V/VI, CBCS) R L Madan	2016	9789352535859 S Chand
T37531-R02	Chemistry @ https://goo.gl/29PGRb	2017	1-947172-09-3 OpenStax
T37531-R03	Chemistry: Atoms First @ https://goo.gl/e58NiX	2017	1-947172-18-2 OpenStax

T37531-R04	Organic Chemistry with a Biological Emphasis @ https://goo.gl/2W5m8E	2016	BCCampus
T37531-R05	Analytical Chemistry @ https://goo.gl/BPaxaz	2010	BCCampus
T37531-R06	Introductory Chemistry @ https://goo.gl/WrDfrM	2011	BCCampus
T37531-R07	Concept Development Studies in Chemistry @ https://goo.gl/LbQigG	2007	BCCampus
T37531-R08	PhET Simulations @ https://goo.gl/rcFu5P	2016	- YCMOU

S41541: MATHEMATICS ELECTIVE - 0501

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	UG
5	Course Used in	V92: B.Sc.(PCM)
6	Designed for Full Compliance to these UGC Documents:	(1) Instructional Template (2) Templates of Syllabi for CBCS

COURSE INFORMATION

Sem	Code	Course Name	Credits	CAT	EE	TM	Type	Category
01	S41541	Mathematics Elective - 0501	4	20	80	100	T	DSE03
01	S41542	Mathematics Elective - 0501 Practical	2	10	40	50	P	DSE03

PRESUMED KNOWLEDGE AND LEARNING OBJECTIVES

Presumed Knowledge	Learning Objectives
<p>For successful completion of this course, student should have successfully completed:</p> <ul style="list-style-type: none"> ❖ 10+2 or equivalent from a recognized Board. OR ❖ 10+3 Diploma (any stream) awarded by any State Board of Technical Education. 	<p>After successful completion of this course, student should be able to</p> <ul style="list-style-type: none"> ❖ ❖ ❖ ❖

SYLLABUS FOR THEORY UNITS

UN	Detailed Syllabus of the Unit	Credit
01-01	R, R ₂ , R ₃ as vector spaces over R. Standard basis for each of them. Concept of Linear Independence and examples of different bases. Subspaces of R ₂ , R ₃ .	Credit 01
01-02		
01-03		
01-04		
01-05		
02-01	Translation, Dilation, Rotation, Reflection in a point, line and plane. Matrix form of basic geometric transformations. Interpretation of eigen values and eigen vectors for such transformations and eigen spaces as invariant subspaces.	Credit 02
02-02		

02-03		
02-04		
02-05		
03-01	Types of matrices. Rank of a matrix. Invariance of rank under elementary transformations. Reduction to normal form, Solutions of linear homogeneous and non-homogeneous equations with number of equations and unknowns upto four.	Credit 03
03-02		
03-03		
03-04		
03-05		
04-01	Matrices in diagonal form. Reduction to diagonal form upto matrices of order 3. Computation of matrix inverses using elementary row operations. Rank of matrix. Solutions of a system of linear equations using matrices. Illustrative examples of above concepts from Geometry, Physics, Chemistry, Combinatorics and Statistics.	Credit 04
04-02		
04-03		
04-04		
04-05		

S41542: MATHEMATICS ELECTIVE - 0501

PRACTICAL ACTIVITIES

UN	Name of the Unit	Credit
01-01	Home Assignment for Credit 01	01
01-02	Home Assignment for Credit 02	
02-01	Home Assignment for Credit 03	02
02-02	Home Assignment for Credit 04	

LEARNING RESOURCE DETAILS

LR Code	Title Author	Edition Year	ISBN Publisher
YCMOU SLM eBooks			
T41541-W01	https://goo.gl/ytrJWe	2016	- YCMOU
Reference Books			
T41541-R01	Mathematics For Degree Students BSc First Year Dr P K Mittal	2010	978-81-121-9324-00 S Chand
T41541-R02	Mathematics For Degree Students BSc Second Year Dr P K Mittal	2010	81-219-3554-7 S Chand
T41541-R03	Mathematics for Degree Students BSc Third Year Dr P K Mittal	2010	81-219-3554-4 S Chand

T41541-R04	Prealgebra @ https://goo.gl/ertyM5		
T41541-R05	Elementary Algebra @ https://goo.gl/mVWVMU		
T41541-R06	Intermediate Algebra @ https://goo.gl/A6vPSz		
T41541-R07	College Algebra @ https://goo.gl/DyUnu4		
T41541-R08	Algebra and Trigonometry @ https://goo.gl/VVL9X5		
T41541-R09	Precalculus @ https://goo.gl/JCAMcW		
T41541-R10	Calculus Volume 1 @ https://goo.gl/Zh5S5y		
T41541-R11	Calculus Volume 2 @ https://goo.gl/GTe9Co		
T41541-R12	Calculus Volume 3 @ https://goo.gl/rPza4U		
T41541-R13	A First Course in Linear Algebra - https://goo.gl/wjrzQv		
T41541-R14	Calculus: Early Transcendentals - https://goo.gl/VzsG1A		
T41541-R15	Precalculus: Stitz Zeager - https://goo.gl/mGrXxW		
T41541-R16	Brief Calculus - https://goo.gl/jm93sH		
T41541-R17	Elementary Differential Equations with Boundary Value Problems - https://goo.gl/YNxwyj		
T41541-R18	PhET Simulations @ https://goo.gl/S4HZVM	2017	

SEMESTER 06

SEC611: PERSONALITY AND CAREER SKILLS

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	UG
5	Course Used in	V92: B.Sc.
6	Designed for Full Compliance to these UGC Documents:	(1) Instructional Template (2) Templates of Syllabi for CBCS

COURSE INFORMATION

Sem	Code	Course Name	Credits	CAT	EE	TM	Type	Category
01	SEC611	Personality and Career Skills	4	20	80	100	T	SEC

PRESUMED KNOWLEDGE AND LEARNING OBJECTIVES

Presumed Knowledge	Learning Objectives
For successful completion of this course, student should have successfully completed: <ul style="list-style-type: none">❖ 10+2 or equivalent from a recognized Board. OR <ul style="list-style-type: none">❖ 10+3 Diploma (any stream) awarded by any State Board of Technical Education.	After successful completion of this course, student should be able to <ul style="list-style-type: none">❖❖❖❖

SYLLABUS FOR THEORY UNITS

UN	Detailed Syllabus of the Unit	Credit
01-01	Soft Skills: What are soft skills? Importance of soft skills, Selling your soft skills, Attributes regarded as soft skill, Soft skills, Social soft skills, Thinking soft skills, Negotiating, Exhibiting your soft skill, Identifying your soft skills, Improving your soft skills, Train yourself, Top 60 soft skills, Practicing soft skills, Measuring attitude	Credit 01
01-02	Self-Discovery: Introduction, Importance of knowing yourself, Process of knowing yourself, SWOT analysis, Benefits of SWOT analysis, Using SWOT analysis, SWOT analysis grid, Questions to complete the grid	

01-03	Developing Positive Attitude: Introduction, Meaning, Features of attitudes, Attitude and behavior, Formation of attitudes, Change of attitudes, What can you do to change attitude? Ways of changing attitude in a person, Attitude in a workplace, The power of positive attitude, Developing positive attitude, Obstacles in developing positive attitude, Staying positive, Examples of positive attitudes, Positive attitude and its results, Staying negative, Examples of negative attitude, Overcoming negative attitude, Negative attitude and its results	
01-04	Forming Values: Introduction, Meaning, What is a value? A core of values, Values relating to education, Values relating to self and others, Values relating to civic responsibilities, Values and attitudes, Importance of values, Formation of values, Types of values, Terminal and instrumental values, Power of values, Personal values, Cultural values, Social values, Values some examples	
01-05	--	
02-01	Improving Perception: Introduction, Meaning, Factors influencing perception, Perceptual process, Improving perception, Perception and its application in organizations	
02-02	Career Planning: Introduction, Benefits of career planning, Guidelines for choosing a career, Myths about choosing a career, Tips for successful career planning, Developing career goals, Final thoughts on career planning	Credit 02
02-03	The Art of Writing E-mail: Introduction, The mail magic, Use appropriate salutations, Make the subject matter significant, Keep a dictionary close by, Use commas, Use smileys, When in doubt, preface – include previous message, Shorten the file attachments, Reread before pressing the “send” button, Be polite and reciprocate good deeds, Anticipate, empathize, understand	
02-04	Body Language: Introduction, Body talk, Voluntary and involuntary body language, Forms of body language, Parts of body language, Origin of body language, Uses of body language, Body language in building industrial relations, Reasons to study body language, Improving your body language, Types of body language, Gender differences, Female interest and body language, Shaking hands with women, Interpreting body language	
02-05	--	
03-01	Team Building and Teamwork: Introduction, Meaning, Aspects of team building, Skills needed for teamwork, A model of team building, Team vs group, Characteristics of effective team, Role of a team Leader, Role of Team Members, Nine persons a successful team should have, Inter-group collaboration, Advantages of inter-group collaboration, Difficulties faced in inter-group collaboration, Factors shaping inter-group collaboration	Credit 03
03-02	Group Discussion: Introduction, Meaning of GD, Why group discussion? Characters tested in a GD, Tips on GD, Types of GD, Skills required in a GD, Consequences of GD, Behavior in GD, Essential elements of GD, Different characters in GD, Traits tested in GD, GD etiquette, Areas to be concentrated while preparing for a GD, Initiating a GD, Techniques to initiate a GD, Non-verbal communication in GD, Movement and gestures to avoided in a GD, Topics for GD	

03-03	Etiquette and Manners: Etiquette introduction, Modern etiquette, Benefits of etiquette, Classification of etiquette, Accompanying women, Taboo topics, Proposing the toast. Manners Introduction, Poor manners noticed in youth, Why should you practice good manners? Practicing good manners, Manners at the wheel: driving, Manners in the flight, Respecting the sacred, Visiting holy places, Dealing with the challenged, Attending funeral, Professional manners, Social Skills or manners, Getting along with people, Manners to get respect from others	
03-04	--	
03-05	--	
04-01	Preparing Resume: Introduction, Meaning, The terms, The purpose of Resume writing, Types of resumes, Interesting facts about resume, Resume writing tips, Resume preparation-the dos, Resume preparation-the don'ts, Resume checkup, Design of a Resume, The content of the resume, Electronic resume tips, References, Power words, Common resume blunders, Key skills that can be mentioned in the resume, Cover letters, Cover letter tips	Credit 04
04-02	Interview Skills: Introduction, Why an interview? Types of interview, Interview panel, Types of questions asked, Reasons for selecting a candidate, Reasons for rejecting a candidate, On the day of interview, On to the interview table, Attending job fair, Common mistakes to avoid, Post-interview etiquette, How does one follow up? Telephonic interview, Dress code at interview, Typical questions asked, Interview mistakes, Quick tips, How to present well in interview, Job interview – basic tips, How to search for job effectively, Quotes to remember about interview	
04-03	Time Management: Introduction, The 80:20 rule, Take a good look at the people around you, Examine your work, Sense of time management, Time is money, Features of time, Three secrets of time management, Time management matrix, Analysis of time matrix, Effective scheduling, Grouping of activities, Five steps to successful time management, Difficulties in time management, Evils of not planning, Interesting facts about time, Ideal way of spending a day, Time wasters, Time savers, Realizing the value of time, Time circle planner	
04-04	Stress Management: Introduction, Meaning, At one level stress may be a positive aid to performance, At one stress may be a negative aid to performance, Effects of stress, Kinds of stress, Sources of stress, Few other common sources of stress, Case study, Behavior identified with stress, Assessing the existence of stress, What are the signs of stress? Spotting stress in you, Stress management tips	
04-05	--	

LEARNING RESOURCE DETAILS

LR Code	Title Author	Edition Year	ISBN Publisher
YCMOU SLM eBooks			
SEC611-W01	https://goo.gl/ytrJWe	2016	- YCMOU
Reference Books			
SEC611-RO1	Soft Skills Know Yourself & Know the World Dr K Alex	1 st Ed 2009	8121931924 S Chand

S34621: PHYSICS ELECTIVE - 0601

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	UG
5	Course Used in	V92: B.Sc.(PCM)
6	Designed for Full Compliance to these UGC Documents:	(1) Instructional Template (2) Templates of Syllabi for CBCS

COURSE INFORMATION

Sem	Code	Course Name	Credits	CAT	EE	TM	Type	Category
01	S34621	Physics Elective - 0601	4	20	80	100	T	DSE01
01	S34622	Physics Elective - 0601 Practical	2	10	40	50	P	DSE01

PRESUMED KNOWLEDGE AND LEARNING OBJECTIVES

Presumed Knowledge	Learning Objectives
<p>For successful completion of this course, student should have successfully completed:</p> <ul style="list-style-type: none"> ❖ 10+2 or equivalent from a recognized Board. OR ❖ 10+3 Diploma (any stream) awarded by any State Board of Technical Education. 	<p>After successful completion of this course, student should be able to</p> <ul style="list-style-type: none"> ❖ ❖ ❖ ❖

SYLLABUS FOR THEORY UNITS

UN	Detailed Syllabus of the Unit	Credit
01-01	Embedded system introduction: Introduction to embedded systems and general purpose computer systems, architecture of embedded system, classifications, applications and purpose of embedded systems, challenges and design issues in embedded systems, operational and non-operational quality attributes of embedded systems, elemental description of embedded processors and microcontrollers.	Credit 01
01-02	Review of microprocessors: Organization of Microprocessor based system, 8085 μ p pin diagram and architecture, concept of data bus and address bus, 8085 programming model, instruction classification, subroutines, stacks and its implementation, delay subroutines, hardware and software interrupts.	
01-03		

01-04		
01-05		
02-01	8051 microcontroller: Introduction and block diagram of 8051 microcontroller, architecture of 8051, overview of 8051 family, 8051 assembly language programming, Program Counter and ROM memory map, Data types and directives, Flag bits and Program Status Word (PSW) register, Jump, loop and call instructions.	Credit 02
02-02	8051 I/O port programming: Introduction of I/O port programming, pin out diagram of 8051 microcontroller, I/O port pins description and their functions, I/O port programming in 8051, (Using Assembly Language), I/O programming: Bit manipulation.	
02-03		
02-04		
02-05		
03-01	Programming of 8051: 8051 addressing modes and accessing memory using various addressing modes, assembly language instructions using each addressing mode, arithmetic & logic instructions, 8051 programming in C:- for time delay and I/O operations and manipulation, for arithmetic & logic operations, for ASCII and BCD conversions.	Credit 03
03-02	Timer and counter programming: Programming 8051 timers, counter programming.	
03-03	Interfacing 8051 microcontroller to peripherals: Parallel and serial ADC, DAC interfacing, LCD interfacing	
03-04		
03-05		
04-01	Serial port programming with and without interrupt: Introduction to 8051 interrupts, programming timer interrupts, programming external hardware interrupts and serial communication interrupt, interrupt priority in the 8051	Credit 04
04-02	Programming Embedded Systems: Structure of embedded program, infinite loop, compiling, linking and locating, downloading and debugging.	
04-03	Embedded system design and development: Embedded system development environment, file types generated after cross compilation, disassembler/ decompiler, simulator, emulator and debugging, embedded product development life-cycle, trends in embedded industry.	
04-04		
04-05		

S34622: PHYSICS ELECTIVE – 0601 PRACTICAL

PRACTICAL ACTIVITIES

UN	Name of the Unit	Credit
01-01	To find that the given numbers is prime or not.	01
01-02	To find the factorial of a number.	
01-03	Write a program to make the two numbers equal by increasing the smallest number and decreasing the largest number.	
01-04	Use one of the four ports of 8051 for O/P interfaced to eight LED's. Simulate binary counter (8 bit) on LED's.	
01-05	Program to glow first four LED then next four using TIMER application.	
01-06	Program to rotate the contents of the accumulator first right and then left.	
02-01	Program to run a countdown from 9-0 in the seven segment LED display.	02
02-02	To interface seven segment LED display with 8051 microcontroller and display 'HELP' in the seven segment LED display.	
02-03	To toggle '1234' as '1324' in the seven segment LED.	
02-04	Interface stepper motor with 8051 and write a program to move the motor through a given angle in clock wise or counter clockwise direction.	
02-05	Application of embedded systems: Temperature measurement, some information on LCD display, interfacing a keyboard.	

LEARNING RESOURCE DETAILS

LR Code	Title Author	Edition Year	ISBN Publisher
YCMOU SLM eBooks			
T34621-W01	https://goo.gl/ytrJWe	2016	- YCMOU
Reference Books			
T34621-R01	Embedded Systems: Architecture, Prog & Design, R. Kamal	2008	TMH
T34621-R02	The 8051 Microcontroller and Embedded Systems Using Assembly and C M.A. Mazidi, J.G. Mazidi, and R.D. McKinlay	2 nd Ed 2007	Pearson
T34621-R03	Embedded Microcomputer System: Real Time Interfacing J.W. Valvano	2000	Brooks/Cole
T34621-R04	Embedded Systems and Robots, Subrata Ghoshal	2009	Cengage
T34621-R05	Introduction to embedded system, K V Shibu	1 st Ed 2009	McGraw Hill
T34621-R06	Microcontrollers in practice, I. Susnea and M. Mitescu	2005	Springer

T34621-R07	Embedded Systems: Design & applications, S F Barrett	1 st Ed 2008	Pearson
T34621-R08	Embedded Microcomputer systems: Real time interfacing, J W Valvano	2011	Cengage
T34621-R09	College Physics @ https://goo.gl/89ehG7		1-947172-01-8 OpenStax
T34621-R10	University Physics 01 @ https://goo.gl/mWkSdh		1-947172-20-4 OpenStax
T34621-R11	University Physics 02 @ https://goo.gl/1xnA6H		1-947172-21-2 OpenStax
T34621-R12	University Physics 03 @ https://goo.gl/43tgzM		1-947172-22-0 OpenStax
T34621-R13	PhET Simulations @ https://goo.gl/spSWTM	2017	- PhET

S37631: CHEMISTRY ELECTIVE - 0601

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	UG
5	Course Used in	V92: B.Sc.(PCM)
6	Designed for Full Compliance to these UGC Documents:	(1) Instructional Template (2) Templates of Syllabi for CBCS

COURSE INFORMATION

Sem	Code	Course Name	Credits	CAT	EE	TM	Type	Category
01	S37631	Chemistry Elective - 0601	4	20	80	100	T	DSE02
01	S37632	Chemistry Elective - 0601 Practical	2	10	40	50	P	DSE02

PRESUMED KNOWLEDGE AND LEARNING OBJECTIVES

Presumed Knowledge	Learning Objectives
For successful completion of this course, student should have successfully completed: <ul style="list-style-type: none">❖ 10+2 or equivalent from a recognized Board. OR <ul style="list-style-type: none">❖ 10+3 Diploma (any stream) awarded by any State Board of Technical Education.	After successful completion of this course, student should be able to <ul style="list-style-type: none">❖❖❖❖

SYLLABUS FOR THEORY UNITS

UN	Detailed Syllabus of the Unit	Credit
01-01	Introduction to Green Chemistry: What is Green Chemistry? Need for Green Chemistry. Goals of Green Chemistry. Limitations/ Obstacles in the pursuit of the goals of Green Chemistry	Credit 01

01-02	<p>Principles of Green Chemistry and Designing a Chemical synthesis: Twelve principles of Green Chemistry with their explanations and examples and special emphasis on the following:</p> <ul style="list-style-type: none"> ▪ Designing a Green Synthesis using these principles; Prevention of Waste/ byproducts; maximum incorporation of the materials used in the process into the final products , Atom Economy, calculation of atom economy of the rearrangement, addition, substitution and elimination reactions. ▪ Prevention/ minimization of hazardous/ toxic products reducing toxicity. risk = (function) hazard × exposure; waste or pollution prevention hierarchy. ▪ Green solvents– supercritical fluids, water as a solvent for organic reactions, ionic liquids, fluoruous biphasic solvent, PEG, solventless processes, immobilized solvents and how to compare greenness of solvents. 	
01-03		
01-04		
01-05		
02-01	<p>Principles of Green Chemistry and Designing a Chemical synthesis: Twelve principles of Green Chemistry with their explanations and examples and special emphasis on the following:</p> <ul style="list-style-type: none"> ▪ Energy requirements for reactions – alternative sources of energy: use of microwaves and ultrasonic energy. ▪ Selection of starting materials; avoidance of unnecessary derivatization – careful use of blocking/protecting groups. ▪ Use of catalytic reagents (wherever possible) in preference to stoichiometric reagents; catalysis and green chemistry, comparison of heterogeneous and homogeneous catalysis, biocatalysis, asymmetric catalysis and photocatalysis. ▪ Prevention of chemical accidents designing greener processes, inherent safer design, principle of ISD “What you don’t have cannot harm you”, greener alternative to Bhopal Gas Tragedy (safer route to carcarbaryl) and Flixiborough accident (safer route to cyclohexanol) subdivision of ISD, minimization, simplification, substitution, moderation and limitation. ▪ Strengthening/ development of analytical techniques to prevent and minimize the generation of hazardous substances in chemical processes. 	Credit 02
02-02		
02-03		
02-04		
02-05		

03-01	<p>Examples of Green Synthesis/ Reactions and some real world cases</p> <ol style="list-style-type: none"> 1. Green Synthesis of the following compounds: adipic acid, catechol, disodium iminodiacetate (alternative to Strecker synthesis) 2. Microwave assisted reactions in water: Hofmann Elimination, methyl benzoate to benzoic acid, oxidation of toluene and alcohols; microwave assisted reactions in organic solvents Diels-Alder reaction and Decarboxylation reaction 3. Ultrasound assisted reactions: sonochemical Simmons-Smith Reaction (Ultrasonic alternative to Iodine) 4 Surfactants for carbon dioxide – replacing smog producing and ozone depleting solvents with CO₂ for precision cleaning and dry cleaning of garments. 5 Designing of Environmentally safe marine antifoulant. 6 Rightfit pigment: synthetic azopigments to replace toxic organic and inorganic pigments. 	Credit 03
03-02		
03-03		
03-04		
03-05		
04-01	<p>Examples of Green Synthesis/ Reactions and some real world cases</p> <ol style="list-style-type: none"> 7 An efficient, green synthesis of a compostable and widely applicable plastic (poly lactic acid) made from corn. 8 Healthier fats and oil by Green Chemistry: Enzymatic interesterification for production of no Trans-Fats and Oils 9 Development of Fully Recyclable Carpet: Cradle to Cradle Carpeting 	Credit 04
04-02	<p>Future Trends in Green Chemistry: Oxidation reagents and catalysts; Biomimetic, multifunctional reagents; Combinatorial green chemistry; Proliferation of solventless reactions; co crystal controlled solid state synthesis (C₂S₃); Green chemistry in sustainable development.</p>	
04-03		
04-04		
04-05		

S37632: CHEMISTRY ELECTIVE – 0601 PRACTICAL

PRACTICAL ACTIVITIES

UN	Name of the Unit	Credit
01-01	1. Safer starting materials: Preparation and characterization of nanoparticles of gold using tea leaves.	01
01-02	2. Using renewable resources: Preparation of biodiesel from vegetable/ waste cooking oil.	
01-03	3. Avoiding waste: Principle of atom economy. <input type="checkbox"/> Use of molecular model kit to simulate the reaction to investigate how the atom economy can illustrate Green Chemistry. <input type="checkbox"/> Preparation of propene by various methods can be studied (I) $\text{Triethylamine ion} + \text{OH}^- \rightarrow \text{propene} + \text{triethylpropene} + \text{water}$ $\xrightarrow{\text{H}_2\text{SO}_4, \Delta}$ (II) $1\text{-propanol} \rightarrow \text{propene} + \text{water}$ <input type="checkbox"/> Other types of reactions, like addition, elimination, substitution and rearrangement should also be studied for the calculation of atom economy.	
02-01	4. Use of enzymes as catalysts: Benzoin condensation using Thiamine Hydrochloride as a catalyst instead of cyanide.	02
02-02	5. Alternative Green solvents: Extraction of D-limonene from orange peel using liquid CO ₂ prepared from dry ice. Mechanochemical solvent free synthesis of azomethines	
02-03	6. Alternative sources of energy: (1) Solvent free, microwave assisted one pot synthesis of phthalocyanine complex of copper (II). (2) Photoreduction of benzophenone to benzopinacol in the presence of sunlight.	

LEARNING RESOURCE DETAILS

LR Code	Title Author	Edition Year	ISBN Publisher
YCMOU SLM eBooks			
T37631-W01	https://goo.gl/ytrJwE	2016	- YCMOU
Reference Books			
T37431-R01	Chemistry for Degree Students (B.Sc. Sem.-V/VI, CBCS) R L Madan	2016	9789352535859 S Chand
T37431-R02	Chemistry @ https://goo.gl/29PGRb	2017	1-947172-09-3 OpenStax
T37431-R03	Chemistry: Atoms First @ https://goo.gl/e58NiX	2017	1-947172-18-2 OpenStax
T37431-R04	Organic Chemistry with a Biological Emphasis @ https://goo.gl/2W5m8E	2016	BCCampus
T37431-R05	Analytical Chemistry @ https://goo.gl/BPaxaz	2010	BCCampus
T37431-R06	Introductory Chemistry @ https://goo.gl/WrDfrM	2011	BCCampus
T37431-R07	Concept Development Studies in Chemistry @ https://goo.gl/LbQigG	2007	BCCampus
T37431-R08	PhET Simulations @ https://goo.gl/rcFu5P	2016	-

S41641: MATHEMATICS ELECTIVE - 0601

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	UG
5	Course Used in	V92: B.Sc.(PCM)
6	Designed for Full Compliance to these UGC Documents:	(1) Instructional Template (2) Templates of Syllabi for CBCS

COURSE INFORMATION

Sem	Code	Course Name	Credits	CAT	EE	TM	Type	Category
01	S41641	Mathematics Elective - 0601	4	20	80	100	T	DSE01
01	S41642	Mathematics Elective - 0601 Practical	2	10	40	50	P	DSE01

PRESUMED KNOWLEDGE AND LEARNING OBJECTIVES

Presumed Knowledge	Learning Objectives
<p>For successful completion of this course, student should have successfully completed:</p> <ul style="list-style-type: none"> ❖ 10+2 or equivalent from a recognized Board. OR ❖ 10+3 Diploma (any stream) awarded by any State Board of Technical Education. 	<p>After successful completion of this course, student should be able to</p> <ul style="list-style-type: none"> ❖ ❖ ❖ ❖

SYLLABUS FOR THEORY UNITS

UN	Detailed Syllabus of the Unit	Credit
01-01	Algorithms, Convergence, Bisection method, False position method, Fixed point iteration method	Credit 01
01-02		
01-03		
01-04		
01-05		
02-01	Newton's method, Secant method, LU decomposition, Gauss-Jacobi, Gauss-Siedel and SOR iterative methods.	Credit 02

02-02		
02-03		
02-04		
02-05		
03-01	Lagrange and Newton interpolation: linear and higher order, finite difference operators.	Credit 03
03-02		
03-03		
03-04		
03-05		
04-01	Numerical differentiation: forward difference, backward difference and central Difference. Integration: trapezoidal rule, Simpson's rule, Euler's method.	Credit 04
04-02		
04-03		
04-04		
04-05		

S41642: MATHEMATICS ELECTIVE – 0601 PRACTICAL

PRACTICAL ACTIVITIES

UN	Name of the Unit	Credit
01-01	Home Assignment for Credit 01	01
01-02	Home Assignment for Credit 02	
02-01	Home Assignment for Credit 03	02
02-02	Home Assignment for Credit 04	

LEARNING RESOURCE DETAILS

LR Code	Title Author	Edition Year	ISBN Publisher
YCMOU SLM eBooks			
T41641-W01	https://goo.gl/ytrJWe	2016	- YCMOU
Reference Books			
T41641-R01	Mathematics For Degree Students BSc First Year Dr P K Mittal	2010	978-81-121-9324-00 S Chand
T41641-R02	Mathematics For Degree Students BSc Second Year Dr P K Mittal	2010	81-219-3554-7 S Chand

T41641-R03	Mathematics for Degree Students BSc Third Year Dr P K Mittal	2010	81-219-3554-4 S Chand
T41641-R04	Prealgebra @ https://goo.gl/ertyM5		
T41641-R05	Elementary Algebra @ https://goo.gl/mVWVMU		
T41641-R06	Intermediate Algebra @ https://goo.gl/A6vPSz		
T41641-R07	College Algebra @ https://goo.gl/DyUnu4		
T41641-R08	Algebra and Trigonometry @ https://goo.gl/VVL9X5		
T41641-R09	Precalculus @ https://goo.gl/JCAMcW		
T41641-R10	Calculus Volume 1 @ https://goo.gl/Zh5S5y		
T41641-R11	Calculus Volume 2 @ https://goo.gl/GTe9Co		
T41641-R12	Calculus Volume 3 @ https://goo.gl/rPza4U		
T41641-R13	A First Course in Linear Algebra - https://goo.gl/wjrzQv		
T41641-R14	Calculus: Early Transcendentals - https://goo.gl/VzsG1A		
T41641-R15	Precalculus: Stitz Zeager - https://goo.gl/mGrXxW		
T41641-R16	Brief Calculus - https://goo.gl/jm93sH		
T41641-R17	Elementary Differential Equations with Boundary Value Problems - https://goo.gl/YNxwyj		
T41641-R18	PhET Simulations @ https://goo.gl/S4HZVM	2017	