Er. PERUMAL MANIMEKALAI COLLEGE OF ENGINEERING

(An Autonomous Institution–Affiliated to Anna University, Chennai)

Koneripalli, Hosur – 635117.

PMC TECH

INSPIRE TO INNOVATE

ACADEMIC REGULATIONS 2023(R23)

Curriculum & Syllabi

(Version 1)

B.Tech. Chemical Engineering

Applicable from 2023 -24 onwards

REGULATIONS 2023 - AUTONOMOUS
CHOICE BASED CREDIT SYSTEM
B.TECH. CHEMICAL ENGINEERING

CURRICULUM AND SYLLABI FOR I TO VIII SEMESTERS

PROGRAMMEEDUCATIONALOBJECTIVES (PEOs):

Chemical engineering graduates will

PEO 1: Choose their careers as employment or take up higher studies or entrepreneurship.

PEO 2: Engage in design and manufacturing of innovative products, processes for the upliftment of the society for the sustainable development and ecosystem.

PEO 3: Function effectively as a leader in the modern work environment with human values and ethics along with lifelong learning.

PROGRAMME OUTCOMES (POs):

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an Engineering specialization to the solution of complex engineering problems.
2. **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication:** Communicate effectively on complex engineering activities with the Engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES (PSO'S)

The chemical engineering graduates with a capability:

PSO1: To understand the core scientific and engineering principles for the design, manufacturing and operation of chemical processes and equipment's

PSO2: To engage in the design, modelling, simulation and development of chemical engineering products/processes

PEO/PO course

PEO	POs												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
PEO1	3	3	2	1	2	1	3	3	3	3	3	1	2	2
PEO2	3	3	3	1	2	2	3	3	2	2	3	1	3	3
PEO3	3	3	3	2	1	1	3	2	2	3	3	2	2	2

REGULATIONS 2023 - AUTONOMOUS
CHOICE BASED CREDIT SYSTEM
B.TECH CHEMICAL ENGINEERING
CURRICULUM AND SYLLABI FOR I TO VIII SEMESTERS

SEMESTER - I

S.No	Course Code	Course Name	Category	Periods Per Week			Total Contact Periods	Credits
				L	T	P		
0		Induction Programme – 2 Weeks	-	-	-	-		0
THEORY								
1	PUCC1HM01	Professional English - I	HM	2	-	-	2	2
2	PUCC1BS01	Matrices and Calculus	BS	3	1	-	4	4
3	PUCC1BS02	Engineering Physics	BS	3	-	-	3	3
4	PUCC1BS03	Engineering Chemistry	BS	3	-	-	3	3
5	PUCC1BE01	Engineering Graphics	BE	2	4	-	6	4
6	PUCC1HM02	Heritage of Tamils/தமிழர்மரபு	HM	1	-	-	1	1
PRACTICALS								
7	PUCC1PL01	Professional English – I Laboratory	HM	-	-	4	4	2
8	PUCC1PL02	Physics and Chemistry Laboratory	BS	-	-	4	4	2
9	PUCC1HM03	Wellness	HM	-	-	1	1	0
Total				14	5	9	28	21

SEMESTER – II

S.No	Course Code	Course Name	Category	Periods Per Week			Total Contact Periods	Credits
				L	T	P		
THEORY								
1	PUCC2HM04	Professional English - II	HM	2	-	-	2	2
2	PUCC2BS04	Statistics and Numerical Methods	BS	3	1	-	4	4
3	PUCC2BS05	Engineering Materials	BS	3	-	-	3	3
4	PUCH2BE02	Basic Electrical & Electronics Engineering	PC	3	-	-	3	3
5	PUCC2BE03	Introduction to Chemical Engineering	BE	3	-	-	3	3
6	PUCC2BE04	Problem Solving using Python Programming	BE	2	-	-	2	2
7	PUCC2HM05	Tamils and Technology தமிழரும்தொழில்நுட்பமும்	HM	1	-	-	1	1
PRACTICALS								
8	PUCC2PL03	Professional English – II Laboratory	HM	-	-	4	4	2
9	PUCC2PL04	Problem Solving using Python Programming Laboratory	BE	-	-	4	4	2
10	PUCC2PL05	Civil and Mechanical Engineering Practices Laboratory	BE	-	-	2	2	1
11	PUCC2PL06	Electrical and Electronics Engineering Practices Laboratory	BE	-	-	2	2	1
12	PUCC2HM06	Wellness	HM	-	-	1	1	0
Total				17	1	13	31	24

SEMESTER – III

S.No	Course Code	Course Name	Category	Periods Per Week			Total Contact Periods	Credits
				L	T	P		
THEORY								
1	PUCC3BS06	Transforms and Partial Differential Equations	BS	3	1	-	4	4
2	PUCH3PC01	Mechanics of Solids	PC	3	1	-	4	4
3	PUCH3PC02	Chemical Process Calculations	PC	3	1	-	4	4
4	PUCH3PC03	Fluid Mechanics for Chemical Engineers	PC	3	1	-	4	4
5	PUCH3PC04	Mechanical Operations	PC	3	1	-	4	4
6	PUCC3MCXX	Mandatory Course – I (Non-Credit)	MC	2	-	-	2	0
PRACTICALS								
7	PUCH3PL01	Fluid Mechanics Laboratory	PC	-	-	4	4	2
8	PUCH3PL02	Mechanical Operations Laboratory	PC	-	-	4	4	2
9	PUCC3HM07	Extension Activities	HM	-	-	1	1	0
Total				20	5	9	31	24

SEMESTER – IV

S.No	Course Code	Course Name	Category	Periods Per Week			Total Contact Periods	Credits
				L	T	P		
THEORY								
1	PUCC4BS07	Environmental Science & Sustainability	BS	3	-	-	3	3
2	PUCH4PC05	Mass Transfer I	PC	3	1	-	4	4
3	PUCH4PC06	Heat Transfer	PC	3	1	-	4	4
4	PUCH4PC07	Chemical Engineering thermodynamics	PC	3	1	-	4	4
5	PUCH4PC08	Chemical Technology	PC	3	-	-	3	3
6	PUCC4MCXX	Mandatory Course – II (Non-Credit)	MC	2	-	-	2	0
PRACTICALS								
7	PUCH4PL03	Technical Analysis Lab.	PC	-	-	4	4	2
8	PUCH4PL04	Heat Transfer Lab.	PC	-	-	4	4	2
9	PUCH4IP01	In-plant Training/Internship *	SD	-	-	-	-	-
10	PUCC4HM08	Extension Activities	HM	-	-	1	1	0
Total				17	3	13	29	22

- In-plant-Training/ Internship – 2 Weeks of training each during 4th/5th/6th Semester – During college hours or semester vacation
- Total 4 weeks of Training – 2 Credits

SEMESTER - V

S.No	Course Code	Course Name	Category	Periods Per Week			Total Contact Periods	Credits
				L	T	P		
THEORY								
1	PUCC5HM09	Universal Human Values & Ethics	HM	3	-	-	3	3
2	PUCH5PC09	Chemical Reaction Engineering	PC	3	1	-	4	4
3	PUCH5PC10	Mass Transfer II	PC	3	1	-	4	4
4	PUCH5PEXX	Professional Elective – I	PE	3	-	-	3	3
5	PUCH5PEXX	Professional Elective – II	PE	3	-	-	3	3
6	PUCH5IL01	Industry Lecture	SD	1	-	-	1	0
PRACTICALS								
7	PUCH5PL05	Chemical Reaction Engineering Lab.	PC	-	-	4	4	2
8	PUCH5PL06	Mass Transfer Lab.	PC	-	-	4	4	2
9	PUCC5PD01	Professional Development	SD	-	-	4	4	1
10	PUCH5IP02	In-plant Training/Internship *	SD	-	-	-	-	-
Total				16	2	12	30	22

- In-plant-Training/ Internship– 2 Weeks of training each during $4^{th}/5^{th}/6^{th}$ Semester – During college hours or semester vacation
- Total 4 weeks of Training – 2 Credits

SEMESTER - VI

S.No	Course Code	Course Name	Category	Periods Per Week			Total Contact Periods	Credits
				L	T	P		
THEORY								
1	PUCH6PC11	Process Dynamics and Control	PC	3	1	-	4	4
2	PUCH6PEXX	Professional Elective – III	PE	3	-	-	3	3
3	PUCH6PEXX	Professional Elective – IV	PE	3	-	-	3	3
4		Open Elective – I (Management)	OE	3	-	-	3	3
5		Open Elective – II	OE	3	-	-	3	3
6	PUCH6IL02	Industry Lecture	SD	1	-	-	1	0
PRACTICALS								
8	PUCH6PL07	Computational Chemical Engineering Lab.	PC	-	-	4	3	1.5
9	PUCH6PL08	Process Control Lab.	PC	-	-	4	3	1.5
10	PUCC6PD02	Professional Development	SD	-	-	4	4	1
11	PUCH6IP03	In-plant Training/Internship *	SD	-	-	-	-	-
	PUCC6VA01	Technical Skill Development – I	SD	-	-	2	2	1
Total				16	1	14	29	21

- In-plant-Training/ Internship– 2 Weeks of training each during $4^{th}/5^{th}/6^{th}$ Semester – During college hours or semester vacation, Total 4 weeks of Training – 2 Credits
- Open Elective – I has to choose from the Management verticals

SEMESTER - VII

S.No	Course Code	Course Name	Category	Periods Per Week			Total Contact Periods	Credits
				L	T	P		
THEORY								
1	PUCH7PC12	Process equipment design and drawing	PC	3	-	2	5	4
2	PUCH7PC13	Transport Phenomena	PC	3	1	-	4	4
3	PUCH7PEXX	Professional Elective – V	PE	3	-	-	3	3
4		Open Elective – III	OE	3	-	-	3	3
5		Open Elective – IV	OE	3	-	-	3	3
PRACTICALS								
6	PUCC7VA02	Technical Skill Development II	SD	-	-	2	2	1
7	PUCH7PR01	Project Phase – I	PROJECT	-	-	2	2	1
		Total		15	1	6	22	19

SEMESTER - VIII

S.No	Course Code	Course Name	Category	Periods Per Week			Total Contact Periods	Credits
				L	T	P		
PROJECT								
1	PUCH8PR02	Project Phase – II / Internship*	PROJECT	-	-	24	24	10
		Total		-	-	24	24	12

- Project – Mandatory
- Internship – Optional (Preferred) – 3 Months to 6 Months

SUMMARY

B.Tech., Chemical Engineering										
S.No	Subject Area	I	II	III	IV	V	VI	VII	VIII	Total Credits
		Credits Per Semester								
1	HM	5	5			3			13	HM
2	BS	12	9	4	3				28	BS
3	BE	4	7						11	BE
4	PC		3	20	19	12	7	8	70	PC
5	PE					6	6	3	15	PE
6	OE						6	6	12	OE
7	PR							11	11	PR
8	SD					2	3	1	6	SD
Total		Total	21	24	24	22	22	23	29	165

TOTAL NUMBER OF CREDITS TO BE EARNED FOR AWARD OF THE DEGREE = 165

HM	Humanities, Management, Wellness & Extension
BS	Basic Science
BE	Basic Engineering
PC	Professional Core
PE	Professional Elective
OE	Open Elective
MC	Mandatory Non-Credit
PR	Project
SD	Professional Development, In-plant Training/Internship, Industry Lecture, Value added courses

PUCC1HM01	PROFESSIONAL ENGLISH – I	L T P C
		2 0 0 2

COURSE OBJECTIVE

- Improve the language proficiency of students in English with an emphasis on Vocabulary, Grammar, Listening, Speaking, Reading and Writing skills.
- Equip students to study academic subjects more effectively by using the theoretical and practical components of English syllabus
- Develop communication skills in formal and informal situations.

UNIT I: INTRODUCTION TO COMMUNICATION 6

EFFECTIVE COMMUNICATION :

What is effective communication? (Explain using activities) What are the seven C's of effective communication? What are key language skills? What is LSRW? How does one develop language and communication skills?

FUNDAMENTALSOFCOMMUNICATION :

Reading-Reading Brochures (technical context), telephone messages/social media messages relevant to technical contexts and emails.. Writing-Writing emails/letters introducing one-self Grammar - Present Tense (simple and progressive); Question types: Wh/ Yes or No/ and Tags. Vocabulary- Synonyms and Antonyms, Abbreviations & Acronyms (as used in technical contexts).

UNIT II: NARRATION AND SUMMATION 6

Reading - Reading biographies, travelogues, newspaper reports, Excerpts from literature, and travel &technical blogs. Writing - Guided writing-- Paragraph writing Short Report on an event (field trip etc.)Grammar –Past tense (simple); Subject-Verb Agreement; and Prepositions. Vocabulary - Word forms(prefixes & suffixes); Phrasal verbs

UNIT III: DESCRIPTION OF A PROCESS/PRODUCT 6

Reading—Reading advertisements, gadget reviews; user manuals. Writing-Writing definitions; instructions; and Product/Process description. Grammar-Imperatives: Degrees of comparison; Present & Past Perfect Tenses. Vocabulary-Compound Nouns, Homonyms and Homophones, discourse markers (connectives & sequence words).

UNIT IV: CLASSIFICATION AND RECOMMENDATIONS 6

Reading—Newspaper articles; Journal reports–and Non Verbal Communication (tables, pie charts etc...). Writing—Note-making/Note taking (*Study skills to be taught, not tested); Writing recommendations; Transferring information from non-verbal (chart, graph etc, to verbal mode) Grammar—Articles; Pronouns-Possessive & Relative pronouns. Vocabulary-Collocations; Fixed/ Semi-fixed expressions.

UNIT V: EXPRESSION 6

Reading – Reading editorials; and Opinion Blogs; Writing – Essay Writing (Descriptive or narrative).Grammar – Future Tenses, Punctuation; Negation (Statements & Questions); and Simple, Compound & ComplexSentences.Vocabulary-Cause&EffectExpressions–ContentvsFunctionwords.

TOTAL: 30 PERIODS

COURSEOUTCOMES:

Course Outcomes	Upon completion of this course, the student will be able to	Cognitive Level
CO1	Apply Elements of communication to LSRW on self-introduction and introduction of others	Apply
CO2	Comprehend Complex academic texts for narrating experience and events	Understand
CO3	Describe nonverbal process and products transferring into verbal texts	Understand
CO4	Prepare Journal reports and newspaper article	Apply
CO5	Write descriptive and narrative essay	Apply

CO – PO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	-	-	-	-	-	3	-	2	3	3	1	3	-	-
2	-	-	-	-	-	2	-	1	3	3	-	3	-	-
3	-	-	-	-	-	2	-	2	3	3	-	3	-	-
4	-	-	-	-	-	2	-	1	3	3	1	3	-	-
5	-	-	-	-	-	1	-	1	2	2	-	1	-	-

1-low, 2-medium, 3-high, '-' - no correlation

TEXT BOOK:

1. Faculty, Department of English, Anna University, English for Engineers & Technologists, Orient Blackswan Private Ltd. 2020
2. Dr. Veena Selvam, Dr. Sujatha Priyadarshini, Dr. Deepa Mary Francis, Dr. KN. Shoba, and Dr. Lourdes Joevani, Department of English, Anna University, English for Science & Technology, Cambridge University Press, 2021.

REFERENCES:

1. Meenakshi Raman & Sangeeta Sharma, Technical Communication – Principles and Practices, Oxford Univ. Press, New Delhi. 2016.
2. M. Ashraf Rizvi, Effective Technical Communication, McGraw Hill, 2017.
3. Michael Swan, Practical English Usage, Oxford, 2016.
4. N P Sudharshana , C Savitha, English for Engineers, Cambridge University Press, 2018.
5. Sajitha Jai Prakash, Sowmya Jayaprakash, Technical Communication English – I, Himalaya Publishing House, 2018

WEBSITE REFERENCE:

1. http://www.indiabix.com/group-discussion/topics-with-answers/

2. http://www.dailywriting tips .com/

NPTEL/ SWAYAM/ MOOC REFERENCE:

1. https://digimat.in/nptel/courses/video/109106067/L04.html (better Spoken English)
2. https://onlinecourses.nptel.ac.in/noc20_hs14/preview **(speak effectively)**

PUCC1BS01	MATRICES AND CALCULUS	L T P C
		3 1 0 4

COURSE OBJECTIVE

- To develop the use of matrix algebra techniques that is needed by engineers for practical applications.
- To familiarize the students with differential calculus.
- To familiarize the student with functions of several variables. This is needed in many branches of engineering.
- To make the students understand various techniques of integration.
- To acquaint the student with mathematical tools needed in evaluating multiple integrals and their applications.

UNIT I: MATRICES **9+3**

Types of matrices- Eigenvalues and Eigenvectors of a real matrix – Characteristic equation – Properties of Eigenvalues and Eigenvectors - Cayley - Hamilton theorem- Reduction of a quadratic form to canonical form by orthogonal transformation-Nature of quadratic-Application: Stretching of an elastic membrane.

UNIT II: DIFFERENTIAL CALCULUS **9+3**

Representation of functions - Limit of a function-L-Hospital rule - Continuity - Derivatives - Differentiation rules (sum, product, quotient, chain rules) - Implicit differentiation - Logarithmic differentiation- Applications: Maxima and Minima of functions of one variable-production quantity for optimization technique-volume optimization of cone circumscribed around the sphere-rectangular fencing problems (Not for Examination).

UNIT III: FUNCTIONS OF SEVERAL VARIABLES **9+3**

Partial differentiation – Homogeneous functions and Euler's theorem – Total derivative – Change of variables – Jacobians – Partial differentiation of implicit functions – Taylor's series for functions of two variables – Applications: Maxima and minima of functions of two variables and Lagrange's method of undetermined multipliers. Applications: Find the size of the rectangular prism which gives minimum surface area for fixed volume. Find the breadth and depth of the rectangular beam cut from a cylindrical rod for maximum strength.

UNIT IV: INTEGRAL CALCULUS **9+3**

Definite and Indefinite integrals - Substitution rule - Techniques of Integration: Integration by parts, Trigonometric integrals, Trigonometric substitutions, Integration of rational functions by partial fraction - Improper integrals - Applications: Hydrostatic force and pressure, moments and centers of mass.

UNIT V: MULTIPLE INTEGRALS **9+3**

Double integrals – Change of order of integration – Double integrals in polar coordinates – Area enclosed by plane curves – Triple integrals – Volume of solids – Applications: Moments and centres of mass, moment of inertia.

TOTAL: 45 PERIODS

COURSEOUTCOMES:

Course Outcomes	Upon completion of this course, the student will be able to	Cognitive Level
CO1	Use the matrix algebra methods for solving practical problems	Apply
CO2	Apply differential calculus tools in solving various application problems	Apply
CO3	Able to analyze differential calculus ideas on several variable functions.	Analyze
CO4	Apply different methods of integration in solving practical problems.	Apply
CO5	Apply multiple integral ideas in solving areas, volumes and other practical problem	Apply

CO – PO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	3	2	2	-	-	-	-	-	-	-	1	3	3
2	3	3	3	2	-	-	-	-	-	-	-	1	3	3
3	3	3	-	3	-	-	-	-	-	-	-	1	3	3
4	3	3	2	2	-	-	-	-	-	-	-	1	3	3
5	3	3	2	-	-	-	-	-	-	-	-	1	3	3

1-low, 2-medium, 3-high, '-' - no correlation

TEXT BOOK:

1. Kreyszig.E, "Advanced Engineering Mathematics", John Wiley and Sons, 10th Edition, New Delhi, 2016.

REFERENCES:

1. Anton. H, Bivens. I and Davis. S, "Calculus", Wiley, 10th Edition, 2016
2. Jain . R.K. and Iyengar. S.R.K., "Advanced Engineering Mathematics", Narosa Publications, New Delhi, 5th Edition, 2016.
3. Ramana. B.V., "Higher Engineering Mathematics", McGraw Hill Education Pvt. Ltd, New Delhi, 2016.
4. Thomas. G. B., Hass. J, and Weir. M.D, "Thomas Calculus", 14th Edition, Pearson India, 2018.

WEBSITE REFERENCE:

1. https://3lihandam69.files.wordpress.com/2018/10/calculus-10th-edition-anton.pdf - Calculus 10th Edition anton.pdf
2. https://www.hzu.edu.in/engineering/Higher%20Engineering%20Mathematics.pdf - Higher Engineering Mathematics, Sixth Edition.
3. https://dl.konkur.in/post/Book/Paye/Thomas-Calculus-14th-Edition-%5Bkonkur.in%5D.pdf
4. https://archive.org/details/advanced-engneering-maths - High advanced Engineering Mathematics

NPTEL/ SWAYAM/ MOOC REFERENCE:

1. NPTEL: Matrix theory, Prof. Chandra, R. Murthy Indian institute of Science -Bangalore.
2. NPTEL: Basic Calculus, Prof. Arindama Singh Department of Mathematics -IIT Madras
3. SWAYAM: Online course – Integral and Vector Calculus, Prof. Hari Shankar Mahato, IIT -Kharagpur.

PUCC1BS02	ENGINEERING PHYSICS	L T P C
		3 0 0 3

COURSE OBJECTIVE

- To make the students effectively to achieve an understanding of mechanics.
- To enable the students to gain knowledge of electromagnetic waves and its applications.
- To introduce the basics of oscillations, optics and lasers.
- Equipping the students to be successfully understand the importance of quantum physics.
- To motivate the students towards the applications of quantum mechanics.

UNIT I MECHANICS 9

Multi-particle dynamics: Center of mass (CM) – CM of continuous bodies – motion of the CM – kinetic energy of system of particles. Rotation of rigid bodies: Rotational kinematics – rotational kinetic energy and moment of inertia - theorems of M .I – moment of inertia of continuous bodies – Radius of gyration – M.I of a diatomic molecule - rotational energy state of a rigid diatomic molecule - torque – conservation of angular momentum – gyroscope - torsional pendulum.

UNIT II ELECTROMAGNETIC WAVES 9

The Maxwell's equations - wave equation; Plane electromagnetic waves in vacuum, Conditions on the wave field - properties of electromagnetic waves: speed, amplitude, phase, orientation and waves in matter - Producing electromagnetic waves - Energy and momentum in EM waves: Intensity, momentum and radiation pressure - Cell-phone reception - Reflection and transmission of electromagnetic waves from a non-conducting medium-vacuum interface for normal incidence.

UNIT III OSCILLATIONS, OPTICS AND LASERS 9

Simple harmonic motion - resonance - waves on a string - standing waves - traveling waves – Energy transfer of a wave - sound waves - Doppler effect - reflection and refraction of light waves – total internal reflection - interference - interferometers - air wedge experiment. Theory of laser - characteristics - Spontaneous and stimulated emission - Einstein's coefficients – population inversion - Nd-YAG laser, CO2 laser, semiconductor laser - Basic applications of lasers in industry.

UNIT IV BASIC QUANTUM MECHANICS 9

Photons and light waves - Electrons and matter waves –Compton effect - The Schrodinger equation (Time dependent and time independent forms) - meaning of wave function - Normalization –Free particle - particle in a infinite potential well: 1D,2D and 3D Boxes- Normalization, probabilities and the correspondence principle

UNIT V APPLIED QUANTUM MECHANICS 9

The harmonic oscillator(qualitative)- Barrier penetration and quantum tunneling(qualitative)- Tunneling microscope - Resonant diode - Finite potential wells (qualitative)- Bloch's theorem for particles in a periodic potential –Kronig-Penney model and origin of energy bands.

TOTAL: 45 PERIODS

COURSEOUTCOMES:

Course Outcomes	Upon completion of this course, the student will be able to	Cognitive Level
CO1	Comprehend the basics and importance of mechanics	Understand
CO2	Illustrate the properties of electromagnetic waves and its propagation in vacuum and medium.	Understand
CO3	Demonstrate a strong foundational knowledge in oscillations, optics and lasers	Understand
CO4	Explain the concepts of quantum physics	Understand
CO5	Comprehend and apply quantum mechanical principles towards the formation of energy bands	Understand

CO – PO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	2	2	-	-	-	-	-	-	-	--	1	3	2
2	3	3	1	1	1	1	-	-	-	-	-	-	3	3
3	3	2	2	-	1	1	-	-	-	-	-	1	3	2
4	3	3	1	1	-	-	-	-	-	-	-	-	3	3
5	3	3	2	-	2	-	-	-	-	-	-	-	3	3

1-low, 2-medium, 3-high, '-' - no correlation

NPTEL/ SWAYAM/ WEBSITE REFERENCE:

1. https://nptel.ac.in/courses/112104114 - Dynamics of Machines, IIT Kanpur, Prof.Amitabha Ghosh
2. https://onlinecourses.nptel.ac.in/noc19_ph08/preview - Introduction to Electromagnetic Theory by Dr. Manoj Kumar Harbola, IIT Kanpur
3. https://nptel.ac.in/courses/115105104, Modern Optics, IIT Kharagpur, Prof. Partha Roy Choudhury
4. https://archive.nptel.ac.in/courses/115/106/115106119/ - Waves & Oscillations, Coordinated by IIT Madras

PUCC1BS03	ENGINEERING CHEMISTRY	L T P C
		3 0 0 3

COURSE OBJECTIVE

- To inculcate sound understanding of water quality parameters and water treatment techniques.
- To impart knowledge on the basic principles and properties of polymers and composites
- To introduce the basic concepts of corrosion, alloys and corrosion preventive methods
- To facilitate the understanding of different type of fuels, their preparation, properties and combustion characteristics.
- To familiarize the students with the operating principles, working processes, applications of energy conversion and storage devices.

UNIT I WATER AND ITS TREATMENT 9

Water: Sources and impurities, Water quality parameters: Definition and significance of - colour, odour, turbidity, pH, hardness, alkalinity, TDS, COD and BOD, fluoride and arsenic. Hardness – types: temporary and permanent – expression of hardness in terms of $CaCO_3$. Municipal water treatment: primary treatment and disinfection (UV, Ozonation, break-point chlorination). Boiler troubles: Scale and sludge, Boiler corrosion, Caustic embrittlement, Priming & foaming. Treatment of boiler feed water: Internal treatment (phosphate, colloidal, sodium aluminate and Calgon conditioning) and External treatment – Ion exchange demineralization and zeolite process. Desalination of brackish water: Reverse Osmosis.

UNIT II POLYMER CHEMISTRY AND COMPOSITES 9

Polymers-definition-types: thermoplastics and thermosetting plastics, polymerization-types-addition and condensation polymerization-free radical polymerization mechanism-Plastics, classification-preparation, properties and uses of PVC, Teflon, polycarbonate, nylon 6,6, PET-Rubber- types- synthetic rubber-butyl rubber- vulcanization of rubber, Composites-definition, types polymer matrix composites-FRP only

UNIT III CORROSION AND ALLOYS 9

CORROSION: causes- factors- types- chemical, electrochemical corrosion (galvanic, differential aeration), corrosion control - material selection and design aspects – electrochemical protection – sacrificial anode method and impressed current cathodic method.

ALLOYS: Introduction- Definition- Properties of alloys- Significance of alloying, Functions and effect of alloying elements- Ferrous alloys- Nichrome and Stainless steel – heat treatment of steel; Non-ferrous alloys – brass and bronze.

UNIT IV FUELS AND COMBUSTION 9

FUELS: Introduction: Classification of fuels; Coal and coke: Analysis of coal (proximate and ultimate), Carbonization, Manufacture of metallurgical coke (Otto Hoffmann method). Petroleum and Diesel: Manufacture of synthetic petrol (Bergius process), Knocking - octane number, diesel oil – cetane number; Power alcohol and biodiesel.

COMBUSTION OF FUELS: Introduction: Calorific value - higher and lower calorific values, Ignition temperature: spontaneous ignition temperature, Explosive range; Flue gas analysis-ORSAT Method. CO_2 emission and carbon foot print.

UNIT V ENERGY SOURCES AND STORAGE DEVICES 9

NUCLEAR ENERGY: light water nuclear power plant, breeder reactor. Solar energy conversion: Principle, working and applications of solar cells; Recent developments in solar cell materials. Wind energy; Geothermal energy. **BATTERIES:** Types of batteries, Primary battery- dry cell, Secondary battery-lead acid battery and lithium-ion- battery; Electric vehicles – working principles; Fuel cells: H2-O2 fuel cell, microbial fuel cell; Super capacitors: Storage principle, types and examples.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Course Outcomes	Upon completion of this course, the student will be able to	Cognitive Level
CO1	Explain the types of water and water treatment techniques	Understand
CO2	Demonstrate the knowledge of polymers and composites	Understand
CO3	Apply the knowledge of corrosion and alloys	Understand
CO4	Explain the types of fuels and the manufacturing of secondary fuels	Understand
CO5	Illustrate the types of energy sources	Understand

CO – PO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	2	1	1	1	1	1	1	-	1	-	2	3	2
2	3	2	1	1	1	1	1	1	-	1	-	2	3	2
3	3	2	1	1	1	1	1	1	-	1	-	2	3	2
4	3	2	2	1	1	1	2	1	-	1	-	2	3	2
5	3	2	2	1	1	1	2	1	-	1	-	2	3	2

1-low, 2-medium, 3-high, '-' - no correlation

TEXT BOOK:

1. P. C. Jain and Monica Jain, "Engineering Chemistry", 17th Edition, Dhanpat Rai Publishing Company (P) Ltd, New Delhi, 2018.
2. S.S. Dara, "A Text book of Engineering Chemistry", S. Chand Publishing, 12th Edition, 2018.

REFERENCES:

1. O.G. Palanna, "Engineering Chemistry" McGraw Hill Education (India) Private Limited, 2nd Edition, 2017.
2. Friedrich Emich, "Engineering Chemistry", Scientific International PVT, LTD, New Delhi, 2014.
3. Shikha Agarwal, "Engineering Chemistry-Fundamentals and Applications", Cambridge University Press, Delhi, Second Edition, 2019.
4. O.V. Roussak and H.D. Gesser, Applied Chemistry-A Text Book for Engineers and Technologists, Springer Science Business Media, New York, 2nd Edition, 2013.
5. Gowariker V.R., Viswanathan N.V. and Jayadev Sreedhar, "Polymer Science", New Age International Pvt Ltd. Chennai, 2009.

WEBSITE REFERENCE:

1. https://vlab.amrita.edu/?sub=2&brch=193&sim=1548&cnt=1 - Water analysis-Determination of Chemical parameters (Theory): Inorganic Chemistry Virtual Lab: Chemical Sciences: Amrita Vishwa Vidyapeetham Virtual Lab
2. https://www.chemistryviews.org/debating-the-everyday-impact-of-polymer-materials - Debating the Everyday Impact of Polymer Materials – Chemistry Views
3. https://batteryuniversity.com – Learn about batteries
4. https://wiseinternational.org/nuclear-energy -Nuclear Energy Wise international

NPTEL/ SWAYAM/ MOOC REFERENCE:

1. NPTEL: Basic courses-Sem 1 and 2 - Engineering Chemistry-I

PUCC1BE01	ENGINEERING GRAPHICS	L T P C
		2 4 0 4

COURSE OBJECTIVE

- Drawing engineering curves
- Drawing freehand sketch of simple objects
- Drawing orthographic projection of solids and section of solids.
- Drawing development of solids
- Drawing isometric and perspective projections of simple solids.

CONCEPTS AND CONVENTIONS (Not for Examination)

Importance of graphics in engineering applications - Use of drafting instruments - BIS conventions and specifications — Size, layout and folding of drawing sheets — Lettering and dimensioning.

UNIT - I PLANE CURVES AND FREEHAND SKETCHING **6+12**

Basic Geometrical constructions, Curves used in engineering practices: Conics — Construction of ellipse, parabola and hyperbola by eccentricity method — Construction of cycloid — construction of involutes of square and circle — Drawing of tangents and normal to the above curves. Visualization concepts and Free Hand sketching: Visualization principles Representation of Three-Dimensional objects – Layout of views- Freehand sketching of multiple views from pictorial views of objects

UNIT - II PROJECTION OF POINTS, LINES AND PLANE SURFACES **6+12**

Orthographic projection- principles-Principal planes-First angle projection-projection of points. Projection of straight lines (only First angle projections) inclined to both the principal planes -Determination of true lengths and true inclinations by rotating line method and traces. Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method. Introduction to Basic Commands in auto CAD (Not for examination).

UNIT - III PROJECTION OF SOLIDS **6+12**

Projection of simple solids like prisms, pyramids, cylinder, cone and truncated solids when the axis is inclined to one of the principal planes and parallel to the other by rotating object method. Practicing three-dimensional modelling of simple objects by CAD Software (Not for examination).

UNIT- IV PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES **6+12**

Section of simple solids like prisms, pyramids, cylinder, cone and truncated solids when the axis is inclined to one of the principal planes and parallel to the other by rotating object method. Development of lateral surfaces of solids with cut-outs and holes. Practicing three-dimensional modelling of simple objects by CAD Software (Not for examination).

UNIT -V ISOMETRIC AND PERSPECTIVE PROJECTIONS **6+12**

Principles of isometric projection — isometric scale - isometric projections of simple solids and truncated solids - Prisms, pyramids, cylinders, cones- combination of two solid objects in simple vertical positions - Perspective projection of simple solids-Prisms, pyramids and cylinders by visual ray method. Practicing three-dimensional modelling of isometric projection of simple objects by CAD Software (Not for examination).

TOTAL: (L=30; T=60) 90 PERIODS

COURSE OUTCOMES:

Course Outcomes	Upon completion of this course, the student will be able to	Cognitive Level
CO1	Use BIS conventions and specifications for engineering drawing and construct the conic curves, involutes and cycloid.	Apply
CO2	Solve practical problems involving projection of lines and plane surfaces.	Apply
CO3	Draw the projections of 3D primitive objects like prisms, pyramids, cylinders and cones.	Apply
CO4	Develop the lateral surfaces of simple and truncated solids.	Analyze
CO5	Draw the orthographic, isometric and perspective projections of simple solids.	Analyze

CO – PO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	2	2	-	1	-	-	1	-	-	-	2	2	2
2	3	2	2	1	2	-	-	1	-	-	-	1	2	2
3	3	2	1	-	2	-	-	1	-	-	-	2	2	2
4	3	2	2	-	2	-	-	-	1	-	-	2	2	2
5	3	2	1	1	2	-	-	1	-	-	-	2	2	2

1-low, 2-medium, 3-high, '-' - no correlation

TEXT BOOK:

1. Venugopal K. and Prabhu Raja V., "Engineering Graphics", 15th Edition, New Age International Pvt. Ltd., New Delhi, 2018.
2. Natrajan K.V., "A Text Book of Engineering Graphics", Dhanalakshmi Publishers, Chennai, 2018.

REFERENCES:

1. Parthasarathy N. S. and Vela Murali, "Engineering Graphics", Oxford University, Press, New Delhi, 2015.
2. Basant Agrawal, Agrawal C.M., "Engineering Drawing", 2nd Edition, McGraw Hill Education, 2019.
3. Gopalakrishnana K.R. "Engineering Drawing", Volume. I & II, Subhas Publications, Bengaluru, 2014.
4. Bhatt N.D. and Panchal V.M., "Engineering Drawing", Charotar Publishing House, 53rd Edition, 2019.

PUBLICATION OF BUREAU OF INDIAN STANDARDS:

1. IS10711 — 2001: Technical products Documentation — Size and layout of drawing sheets.
2. IS 9609 (Parts 0 & 1) — 2001: Technical products Documentation —Lettering.
3. IS 10714 (Part 20) — 2001 & SP 46 — 2003: Lines for technical drawings.

4. IS 11669 — 1986 & SP 46 —2003: Dimensioning of Technical Drawings.
5. IS 15021 (Parts 1 to 4) — 2001: Technical drawings — Projection Methods

SPECIAL POINTS APPLICABLE TO UNIVERSITY EXAMINATIONS ON ENGINEERING GRAPHICS:

1. There will be five questions, each of either-or type covering all units of the syllabus.
2. All questions will carry equal marks of 20 each making a total of 100.
3. The answer paper shall consist of drawing sheets of A3 size only. The students will be permitted to use appropriate scale to fit solution within A3 size.
4. The examination will be conducted in appropriate sessions on the same day.

NPTEL/ SWAYAM/ MOOC REFERENCE:

1. https://nptel.ac.in/courses/112102304
2. https://nptel.ac.in/courses/112103019
3. https://archive.nptel.ac.in/courses/112/102/112102304/
4. https://users.encs.concordia.ca/~nrskumar/Index_files/Mech211/Full%20Lecture/Lecture%201.pdf

PMC TECH

PUCC1HM02	HERITAGE OF TAMILS	L T P C
		1 0 0 1

UNIT I: LANGUAGE AND LITERATURE 3

Language Families in India-Dravidian Languages–Tamil as a Classical Language-Classical Literature in Tamil–Secular Nature of Sangam Literature–Distributive Justice in Sangam Literature –Management Principles in Thirukural -Tamil Epics and Impact of Buddhism & Jainism in Tamil Land –Bakthi Literature Azhwars and Nayanmars -Forms of minor Poetry-Development of Modern literature in Tamil-Contribution of Bharathiyar and Bharathidhasan.

UNIT II: HERITAGE- ROCK ART PAINTINGS TO MODERN ART–SCULPTURE 3

Hero stone to modern sculpture - Bronze icons - Tribes and their handicrafts - Art of temple carmaking--MassiveTerracottasculptures,Villagedeities,ThiruvalluvarStatueatKanyakumari,Making of musical instruments - Mridhangam, Parai, Veenai, Yazh and Nadhaswaram - Role of Temples in Social and Economic Life of Tamils.

UNIT III: FOLK AND MARTIAL ARTS 3

Therukoothu, Karagattam, Villu Pattu, Kaniyan Koothu, Oyillattam, Leather puppetry, Silambattam, Valari, Tiger dance-Sports and Games of Tamils.

UNIT IV: THINAI CONCEPT OF TAMILS 3

Flora and Fauna of Tamils & Aham and Puram Concept from Tholkappiyam and Sangam Literature -Aram Concept of Tamils - Education and Literacy during Sangam Age - Ancient Cities and Ports of Sangam Age-Export and Import during Sangam Age-Overseas Conquest of Cholas

UNIT V: CONTRIBUTION OF TAMILS TO INDIAN NATIONAL MOVEMENT AND INDIAN CULTURE 3

Contribution of Tamils to Indian Freedom Struggle – The Cultural Influence of Tamils over the other parts of India — Self-Respect Movement – Role of Siddha Medicine in Indigenous Systems of Medicine–Inscriptions & Manuscripts–Print History of Tamil Books.

TOTAL: 15 PERIODS

TEXT-CUM-REFERENCE BOOK:

1. தமிழக வரலாறு –மக்களும் பண்பாடும் – கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும்
2. கணினித் தமிழ் – முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்).
3. கீழடி –வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4. பொருநை – ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils – The Classical Period (Dr.S.Singaravelu) (Published by: International\ statute of Tamil Studies.
7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D.Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies).
9. Keeladi – 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text book and Educational Services Corporation, Tamil Nadu)
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author).
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Refernece Book.

PUCC1PL01	PROFESSIONAL ENGLISH-I LABORATORY	L T P C
		0 0 4 2

COURSE OBJECTIVE

- To improve the communicative competence of learners
- To develop various listening strategies to comprehend various types of audio materials like lectures, discussions, videos etc.
- To use language efficiently in expressing their opinions via various media

LIST OF ACTIVITIES

UNIT – I 12

Activity 1	Listening for general information-specific details - Audio / video : Gap Filling Activity
Activity 2	Creating a Brochure (technical context), Preparing Emails and letter of introduction
Activity 3	Telephone etiquette , making telephone calls, Self-Introduction; Introducing a friend;
Activity 4	Role play : Politeness strategies- making polite requests, making polite offers, replying to polite requests and offers- understanding basic instructions(filling out a bank application for example)

UNIT – II 12

Activity 1	Listening to anecdotes / stories /Short films
Activity 2	Hints development
Activity 3	Listening to biographies/ News/ documentaries and interviews with celebrities: Narrating personal experiences / events
Activity 4	Listening the audio of field trips : Engaging in small talk- Describing experiences and feelings

UNIT – III 12

Activity 1	Listen to advertisements, gadget reviews and user manuals
Activity 2	Role play – Advertisement and reviews
Activity 3	Listening to product and process descriptions
Activity 4	Presenting a product :Giving instruction to use the product- explaining uses and purposes

UNIT – IV 12

Activity 1	Listen to data Interpretation (Graphs & chart) :
Activity 2	Prepare and describe the chart (pie chart,Bar chart, Flow chart & Tabular Chart)
Activity 3	listen to technical / general passage and Take Note
Activity 4	prepare a journal / an article

UNIT – V 12

Activity 1	Listening to TED Talks / debates /group discussion
Activity 2	Participate in debate
Activity 3	Participate in Group discussion
Activity 4	Presenting Technical / General Topic.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

Course Outcomes	Upon completion of this course, the student will be able to	Cognitive Level
CO1	Create Email and letter of introduction in formal and informal.	Apply
CO2	Communicate effectively about personal experiences and events.	Apply
CO3	Make Presentation on products and technical processes effectively.	Apply
CO4	Transcode visual content appropriately.	Apply
CO5	Participate in group discussion or debates.	Apply

CO – PO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	-	-	-	-	-	3	-	1	2	3	-	3	-	-
2	-	-	-	-	-	2	-	2	2	3	-	3	-	-
3	-	-	-	-	-	2	-	2	3	3	-	2	-	-
4	-	-	-	-	-	2	-	1	3	3	-	2	-	-
5	-	-	-	-	-	2	-	2	3	3	-	3	-	-

1-low, 2-medium, 3-high, '-' - no correlation

TEXT BOOK:

1. Faculty, Anna university, Orient Blackswan, "English for Engineers and Technologists" Volume I, 2022.
2. Cambridge University Press, "English for Science & Technology - II", 2023.

REFERENCE:

1. Adrian Wallwork, Springer, "English for Academic Correspondence and Socializing" 2011.
2. Stella Cortrell, Red Globe Press, "The Study Skills Handbook", 2019.
3. Mathew Richardson, Charlie Creative Lab, "Advanced Communication Skills" , 2020.
4. Jack C. Richards, "Interchange", Cambridge University Press , Fifth Edition, 2017
5. Mathew Richardson, Charlie Creative Lab ,"Advanced Communication Skills" , 2020

PUCC1PL02	PHYSICS AND CHEMISTRY LABORATORY	L T P C
	PHYSICS LABORATORY: (Any seven experiments to be conducted)	0 0 4 2

COURSE OBJECTIVE

- To learn the proper use of various kinds of physics laboratory equipment.
- To learn how data can be collected, presented and interpreted in a clear and concise manner.
- To learn problem solving skills related to physics principles and interpretation of experimental data.
- To determine error in experimental measurements and techniques used to minimize such error.
- To make the student as an active participant in each part of all lab exercises.

LIST OF EXPERIMENTS

1. Torsional pendulum - Determination of rigidity modulus of wire and moment of inertia of regular and irregular objects.
2. Simple harmonic oscillations of cantilever.
3. Non-uniform bending - Determination of Young's modulus
4. Uniform bending – Determination of Young's modulus
5. Laser- Determination of the wave length of the laser using grating
6. Air wedge - Determination of thickness of a thin sheet/wire
7. a) Optical fibre -Determination of Numerical Aperture and acceptance angle
   b) Compact disc- Determination of width of the groove using laser.
8. Acoustic grating- Determination of velocity of ultrasonic waves in liquids.
9. Ultrasonic interferometer – determination of the velocity of sound and compressibility of liquids
10. Post office box -Determination of Band gap of a semiconductor.
11. Photoelectric effect
12. Michelson Interferometer.
13. Melde's string experiment
14. Experiment with lattice dynamics kit.

TOTAL:30PERIODS

COURSE OUTCOMES:

Course Outcomes	Upon completion of this course, the student will be able to	Cognitive Level
CO1	Demonstrate the functioning of various physics laboratory equipment.	Apply
CO2	Use graphical models to analyze laboratory data.	Analyze
CO3	Use mathematical models as a medium for quantitative reasoning and describing physical reality.	Analyze
CO4	Access, process and analyze scientific information.	Analyze
CO5	Solve problems individually and collaboratively.	Apply

CO – PO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	1	-	-	1	-	-	1	2	-	--	1	3	1
2	3	2	-	1	1	1	-	1	1	-	-	1	3	2
3	3	1	-	-	1	1	-	1	1	-	-	1	3	1
4	3	1	-	1	1	1	-	1	1	-	-	1	3	1
5	3	1	-	-	2	-	-	1	2	-	-	1	3	1

1-low, 2-medium, 3-high, '-' - no correlation

CHEMISTRY LABORATORY: (Any seven experiments to be conducted)

COURSE OBJECTIVE

- To inculcate experimental skills to test basic understanding of water quality parameters, such as, acidity, alkalinity, hardness, DO, chloride and copper.
- To induce the students to familiarize with electroanalytical techniques such as, pH metry, potentiometry and conductometry in the determination of impurities in aqueous solutions.
- To demonstrate the analysis of metals and alloys.
- To demonstrate the synthesis of nanoparticles

LIST OF EXPERIMENTS

1. Preparation of Na_2CO_3 as a primary standard and estimation of acidity of a water sample using the primary standard.
2. Determination of types and amount of alkalinity in water sample. – Split the first experiment into two.
3. Determination of total, temporary & permanent hardness of water by EDTA method.
4. Determination of DO content of water sample by Winkler's method.
5. Determination of chloride content of water sample by Argentometric method.
6. Estimation of copper content of the given solution by Iodometry.
7. Estimation of TDS of a water sample by gravimetry.
8. Determination of strength of given hydrochloric acid using pH meter.
9. Determination of strength of acids in a mixture of acids using conductivity meter.
10. Conductometric titration of barium chloride against sodium sulphate (precipitation titration)
11. Estimation of iron content of the given solution using potentiometer.
12. Estimation of sodium /potassium present in water using flame photometer.
13. Preparation of nanoparticles (TiO_2/ZnO/CuO) by Sol-Gel method.
14. Estimation of Nickel in steel
15. Proximate analysis of Coal

TOTAL: 30 PERIODS

COURSE OUTCOMES:

Course Outcomes	Upon completion of this course, the student will be able to	Cognitive Level
CO1	To analyze the quality of water samples with respect to their acidity, alkalinity, hardness and DO.	Analyze
CO2	To determine the amount of metal ions through volumetric and spectroscopic techniques	Analyze
CO3	To analyze and determine the composition of alloys	Analyze
CO4	To learn simple method of synthesis of nanoparticles	Analyze
CO5	To quantitatively analyze the impurities in solution by electroanalytical techniques	Analyze

CO – PO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	1	-	-	1	-	-	1	2	-	--	1	3	1
2	3	2	-	1	1	1	-	1	1	-	-	1	3	2
3	3	1	-	-	1	1	-	1	1	-	-	1	3	1
4	3	1	-	1	1	1	-	1	1	-	-	1	3	1
5	3	1	-	-	2	-	-	1	2	-	-	1	3	1

1-low, 2-medium, 3-high, '-' - no correlation

SYLLABUS FOR SEMESTER – II

PUCC2HM04	PROFESSIONAL ENGLISH – II	L T P C
		2 0 0 2

COURSE OBJECTIVE

- To engage learners in meaningful language activities to improve their reading and writing skills
- To help learners understand the purpose, audience, contexts of different types of writing
- To demonstrate an understanding of job applications and interviews for internship and placements

UNIT I: MAKING COMPARISONS 6

Reading - Reading advertisements, user manuals, brochures; Writing – Professional emails, Email etiquette-Compare and Contrast Essay; Grammar–Mixed Tenses, Prepositional phrases

UNIT II: EXPRESSING CAUSAL RELATIONS IN SPEAKING AND WRITING 6

Reading – Reading longer technical texts– Cause and Effect Essays, and Letters/emails of complaint, Writing-Writing responses to complaints. Grammar – Active Passive Voice transformations, Infinitive and Gerunds

UNIT III: PROBLEM SOLVING 6

Reading- Case Studies, excerpts from literary texts, news reports etc. Writing –Letter to the Editor, Checklists, Problem solution essay/Argumentative Essay. Grammar – Error correction; If conditional sentences

UNIT IV: REPORTING OF EVENTS AND RESEARCH 6

Reading –Newspaper articles; Writing – Recommendations, Transcoding, Accident Report, Survey Report Grammar–Reported Speech, Modals

UNIT V: THE ABILITY TO PUT IDEAS OR INFORMATION COGENTLY 6

Reading – Company profiles, Statement of Purpose, (SOP), an excerpt of interview with professionals; Writing–Job/Internship application–Cover letter & Resume; Grammar–Numerical adjectives, Relative Clauses.

TOTAL: 30 PERIODS

COURSE OUTCOMES:

Course Outcomes	Upon completion of this course, the student will be able to	Cognitive Level
CO1	Compare and Contrast products and ideas in technical texts.	Apply
CO2	Identify cause and effect in longer text for technical communication	Apply
CO3	Analyze problems in order to ensure solutions in oral and written professional communication	Analyze
CO4	Presenting oral and written Report of Events and Technical process	Apply
CO5	Prepare job applications and resume	Apply

CO – PO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1						1	-	1	2	3	-	2	-	-
2						1	-	1	2	3	-	1	-	-
3						1	-	1	3	3	-	1	-	-
4						2	-	1	3	3	-	2	-	-
5						2	-	1	3	3	-	3	-	-

1-low, 2-medium, 3-high, '-' - no correlation

TEXTBOOKS:

1. Elizabeth Tebeaux, Sam Dragga, The Essentials of Technical Communication, Oxford University Press, 2017
2. Raman. Meenakshi, Sharma. Sangeeta. Professional English. Oxford university press. New Delhi.2019.

REFERENCES:

1. Dr. Veena Selvam, Dr. Sujatha Priyadarshini, Dr. Deepa Mary Francis, Dr. KN. Shoba, and Dr. Lourdes Joevani, Department of English, Anna University., English for Science & Technology Cambridge University Press 2021.
2. Kieran Morgan & Sanja Spajic, Technical Writing Process, Better On Paper Publications, 2015.
3. Krishna Mohan, Meera Banerji, "Developing Communication Skills", Trinity Press, 2017.
4. Phillip, A. Laplante, Technical Writing: A Practical Guide for Engineers and Scientists , CRC Press; 2 edition, 2018.
5. Gerald J. Alred, Walter E. Oliu, Charles T. Brusaw, Handbook of Technical Writing, Bedford/St. Martin's; 12th edition, 2018.

WEBSITE REFERENCE:

1. IELTS: https://ieltstrainingonline.com/british-council-practice-ielts-reading-actual-tests/
2. http://www.englishdaily626.com/c-errors.php?010 (common errors)

NPTEL/ SWAYAM/ MOOC REFERENCE:

1. https://nptel.ac.in/courses/109105144 (employment communication)
2. https://onlinecourses.nptel.ac.in/noc22_hs05/preview (effective Writing)
3. https://www.slideshare.net/Punitayadav19/cv-writing-nptelpdf (resume Preparation)

PUCC2BS04	STATISTICS AND NUMERICAL METHODS	L T P C
		3 1 0 4

COURSE OBJECTIVE

- This course aims at providing the necessary basic concepts of a few statistical and numerical methods and give procedures for solving numerically different kinds of problems occurring in engineering and technology.
- To acquaint the knowledge of testing of hypothesis for small and large samples which plays an important role in real life problems.
- To introduce the basic concepts of solving algebraic and transcendental equations.
- To introduce the numerical techniques of interpolation in various intervals and numerical techniques of differentiation and integration which plays an important role in engineering and technology disciplines.
- To acquaint the knowledge of various techniques and methods of solving ordinary differential equations.

UNIT I TESTING OF HYPOTHESIS **9+3**

Sampling distributions - Tests for single mean, proportion and difference of means (Large and small samples) – Tests for single variance and equality of variances – Chi square test for goodness of fit – Independence of attributes -Application: Real life problems in varies field.

UNIT II DESIGN OF EXPERIMENTS **9+3**

One way and two-way classifications - Completely randomized design – Randomized block design – Latin square design – 2 Square factorial designs.

UNIT III SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS **9+3**

Solution of algebraic and transcendental equations – Newton Raphson method- Solution of linear system of equations - Gauss elimination method – Pivoting – Gauss Jordan method – Iterative methods of Gauss Jacobi and Gauss Seidel - Eigenvalues of a matrix by Power method.

UNIT IV INTERPOLATION, NUMERICAL DIFFERENTIATION AND NUMERICAL INTEGRATION **9+3**

Lagrange's and Newton's divided difference interpolations – Newton's forward and backward difference interpolation – Approximation of derivates using interpolation polynomials – Numerical single and double integrations using Trapezoidal and Simpson's 1/3 rules- Applications: Application of numerical differentiation and integration

UNIT V NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS **9+3**

Single step methods: Taylor's series method – Euler's method - Modified Euler's method – Fourth order Runge- Kutta method for solving first order differential equations - Multi step methods: Milne's predictor corrector methods for solving first order differential equations- Application of numerical solution of ordinary differential equations

TOTAL: 60 PERIODS

COURSE OUTCOMES:

Course Outcomes	Upon completion of this course, the student will be able to	Cognitive Level
CO1	Apply the concept of testing of hypothesis for small and large samples in real life problems.	Apply
CO2	Apply the basic concepts of classifications of design of experiments in the field of agriculture	Apply
CO3	Appreciate the numerical techniques of interpolation in various intervals and apply the numerical techniques of differentiation and integration for engineering problems	Evaluate
CO4	Understand the knowledge of various techniques and methods for solving first and second order ordinary differential equations	Understand
CO5	Solve the partial and ordinary differential equations with initial and boundary conditions by using certain techniques with engineering applications	Apply

CO – PO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1						1	-	1	2	3	-	2	-	-
2						1	-	1	2	3	-	1	-	-
3						1	-	1	3	3	-	1	-	-
4						2	-	1	3	3	-	2	-	-
5						2	-	1	3	3	-	3	-	-

1-low, 2-medium, 3-high, '-' - no correlation

TEXTBOOKS:

1. Grewal, B.S., and Grewal, J.S., "Numerical Methods in Engineering and Science", Khanna Publishers, 10th Edition, New Delhi, 2015.
2. Johnson, R.A., Miller, I and Freund J., "Miller and Freund's Probability and Statistics for Engineers", Pearson Education, Asia, 8th Edition, 2015.46

REFERENCES:

1. Burden, R.L and Faires, J.D, "Numerical Analysis", 9th Edition, Cengage Learning, 2016.
2. Devore. J.L., "Probability and Statistics for Engineering and the Sciences", Cengage Learning, New Delhi, 8th Edition, 2014.
3. Spiegel. M.R., Schiller. J. and Srinivasan. R.A., "Schaum's Outlines on Probability and Statistics ", Tata McGraw Hill Edition, 4th Edition, 2012.
4. Walpole. R.E., Myers. R.H., Myers. S.L. and Ye. K., "Probability and Statistics for Engineers and Scientists", 9th Edition, Pearson Education, Asia, 2010.

WEBSITE REFERENCE:

1. https://learnengineering.in/ma3251-statistics-and-numerical-methods/ - Learn Engineering
2. https://lms.su.edu.pk/download?filename=1588490822-walpole-probability-statistics-for-engineers-scientists-9th-edition.pdf&lesson=15012 – Probability & Statistics for Engineers and Scientist

NPTEL/ SWAYAM/ MOOC REFERENCE:

1. NPTEL: Introduction to testing Hypothesis, Prof. Arun, K Tangirala, IIT Madras
2. NPTEL: Numerical Methods, Prof. Ameeya kumar Nayak, Sanjeev Kumar - IIT Roorkee.
3. SWAYAM: Numerical Analysis, Prof. S. Baskar , IIT Bombay.

PUCC2BS05	ENGINEERING MATERIALS	L T P C
		3 0 0 3

COURSE OBJECTIVE

- To make the students to understand the basics of crystallography and its importance in studying materials properties.
- To understand the electrical properties of materials including free electron theory, applications of quantum
- To insist knowledge on physics of semiconductors, determination of charge carriers and device applications
- To establish a sound of knowledge on different optical properties of materials, optical displays and applications
- To introduce the preparation, properties and applications of ceramics, composites and Nanomaterials.

UNIT I CRYSTAL PHYSICS **9**

Single Crystals: Unit Cell-Crystal System-Bravais Lattices-Crystal structures: BCC, FCC and HCP – Directions and planes: Miller indices-inter-planar distances - linear and planar densities – Crystal imperfections: Point defects - edge and screw dislocations – grain and twin boundaries - Burgers vector – nucleation and growth – homogeneous and heterogeneous nucleation.

UNIT II CONDUCTING MATERIALS **9**

Classical free electron theory: Expression for electrical conductivity – Thermal conductivity, expression - Quantum free electron theory: Tunneling – degenerate states – Fermi- Dirac statistics – Density of energy states – Electron in periodic potential – Energy bands in solids: Tight binding approximation - Electron effective mass – concept of hole.

UNIT III SEMICONDUCTING MATERIALS **9**

Intrinsic Semiconductors – Energy band diagram – direct and indirect band gap semiconductors – Carrier concentration in intrinsic semiconductors – extrinsic semiconductors – Carrier concentration in N-type & P-type semiconductors – Variation of carrier concentration with temperature – Carrier transport in Semiconductors: Drift, mobility and diffusion – Hall effect and devices – Ohmic contacts – Schottky diode

UNIT IV OPTICAL PROPERTIES OF MATERIALS **9**

Classification of optical materials – Optical absorption and emission, charge injection and recombination. Absorption and emission in Metals, Insulators and Semiconductors – Optoelectronic devices: light detectors and solar cells – light emitting diode – laser diode - OLED – Electro-optics and nonlinear optics: Modulators and switching devices.

UNIT V NEW ENGINEERING MATERIALS **9**

Ceramics: Types and applications- refractories, abrasives and cements – Composites: classification, role of matrix and reinforcement - Fiber reinforced composites – carbon-carbon composites – Nanomaterials: types, physical, chemical and mechanical properties — synthesis of nano-materials: physical vapor deposition (PVD) and chemical vapor deposition (CVD). Carbon nanotubes: properties and applications

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Course Outcomes	Upon completion of this course, the student will be able to	Cognitive Level
CO1	Explain the basics of crystallography and its importance in materials properties	Understand
CO2	Illustrate the electrical properties of Conducting materials and their applications	Understand
CO3	Comprehend the concepts of semiconductor physics and functioning of semiconductor devices	Understand
CO4	Illustrate optical properties of materials and working principles of various optical devices	Understand
CO5	Demonstrate preparation, properties and applications of ceramics, composites and nano-materials	Apply

CO – PO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	2	2	-	-	-	-	-	-	-	--	1	3	2
2	3	3	1	1	1	1	-	-	-	-	-	1	3	3
3	3	2	2	-	1	1	-	-	-	-	-	1	3	2
4	3	3	1	1	1	-	-	-	-	-	-	1	3	3
5	3	3	2	-	2	-	-	-	-	-	-	1	3	3

1-low, 2-medium, 3-high, '-' - no correlation

TEXTBOOKS:

1. V.Raghavan. Materials Science and Engineering: A First Course, Prentice Hall India Learning Private Limited, 2015.
2. Safa Kasap, Principles of Electronic Materials and Devices, Mc-Graw Hill, 2018.

REFERENCES:

1. R. Balasubramaniam, Callister's Materials Science and Engineering. Wiley (Indian Edition), 2014.
2. Wendelin Wright and Donald Askeland, Essentials of Materials Science and Engineering, CL Engineering, 2013.
3. Pallab Bhattacharya, Semiconductor Optoelectronic Devices, Pearson, 2017.
4. Wahab, M.A. "Solid State Physics: Structure and Properties of Materials", Narosa Publishing House, 2009.

NPTEL/ SWAYAM/ WEBSITE REFERENCE:

1. https://onlinecourses.nptel.ac.in/noc19_cy35/preview - Chemical Crystallography by By Prof. Angshuman Roy Choudhury, IISER Mohali
2. https://archive.nptel.ac.in/courses/113/102/113102080/ -Introduction to Materials science and Engineering by Prof. Rajesh Prasad, IIT Delhi.
3. https://onlinecourses.nptel.ac.in/noc20_ph10/preview - Electronic Theory of Solids, by Prof. ArghyaTaraphder, IIT Kharagpur
4. https://nptel.ac.in/courses/112107086 - Engineering Materials and Processing Techniques by Prof. Inderdeep Singh, IIT Roorke
5. https://onlinecourses.nptel.ac.in/noc19_mm13/preview - Advanced Materials and Processes by Prof. Jayanta Das, IIT Kharagpur

PUCH2BE03	INTRODUCTION TO CHEMICAL ENGINEERING	L T P C
		3 0 0 3

COURSE OBJECTIVE

To acquaint the students with the fundamentals of Chemical Engineering and to build their perspective in a whole some manner

UNIT I – INTRODUCTION 9

Chemical Engineering in day to life with examples, Origin and growth of chemical Engineers in chemical process industries, unit operations and unit processes concepts, scaling up or down, un its and dimensions, application of mathematics in chemical Engg, recent developments in chemical process industries

UNIT II – INTRODUCTION TO MATERIAL AND ENERGY BALANCES 9

Basic concepts of material and energy balances, energy and mass transport, and kinetics of chemical reactions. Introduction to heat and mass transfer. Process flow sheeting and symbols.

UNIT III – FLUID FLOW 9

Nature of fluid, Viscosity, Flow field, Conservation of mass and energy. Frictional losses, pumping of fluids. Dimensional Analysis and Correlations.

UNITIV– CHEMICAL ENGINEERING COMPUTER SOFTWARE TOOLS AND APPLICATIONS 9

Introduction to Process Engineering Design Software (HYSYS and PRO II) , Computations Using Microsoft Excel, Computer-Aided Design & Drafting, Piping and Equipment Design Software

UNIT V – CAREER DIVERSITIES IN CHEMICAL ENGINEERING 9

Career Development Leading to Specialization, Chemical Engineering Job Titles/Options, Chemical and Process Engineers, Commissioning Engineer, Process Control/Automation Engineer, Process Safety Engineer, Research & Development Engineer Pharmaceutical Engineer/Pharmaceutical Process Engineer.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Course Outcomes	Upon completion of this course, the student will be able to	Cognitive Level
CO1	Correlate the day to day life with the principles of ChE	Understand
CO2	Access the mass and energy involved in chemical plants	Apply
CO3	Have an insight into area where a chemical engineering major role	Apply
CO4	Carryout modelling and simulation using computer software tools	Understand
CO5	Identify their right future and gain confidence, outline about the program me as a whole.	Understand

CO – PO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	2	2	1	2							2	2	1
2	3	2	2	1	2							2	2	1
3	3	2	3	1	2							2	2	1
4	3	2	3	1	2							2	2	1
5	3	2	3	1	2							2	2	1

1-low, 2-medium, 3-high, '-' - no correlation

TEXT BOOKS

1. Pushpavanam,S. "Introduction to Chemical Engineering", PHI Learning Pvt. Ltd. (2012).
2. Ghosal, S.K., Sanyal, S.K., Datta,S., "Introduction to Chemical Engineering", Tata McGraw-Hill Publishing Company Ltd., New Delhi(1997).

REFERENCES:

1. Rao, M.G., Sittig,M., "Dryden's Outlines of Chemical Technology", East-West Press(1997).
2. Perry,R.H.,Green,D.W.,"Perry'sChemicalEngineers'Handbook",McGraw-HillBookCompany(2008)
3. Anderson, L.B, Wenzel ,L.A., "Introduction to chemical engineering", McGraw-Hill Book company, Inc.,New York(1961)

NPTEL/WEBSITE REFERENCE:

1. https://ebooks.inflibnet.ac.in/ftp02/chapter/introduction to material and energy balance https://chemmeng.iisc.ac.in/kumaran/courses/chap1.pdf
2. https:www.academia.edu/60186686/Introduction to chemical Engineering

PUCC2BE02	BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING	L T P C
		3 0 0 3

COURSE OBJECTIVE

- To introduce the basics of electric circuits and analysis
- To impart knowledge in the basics of working principles and application of electrical machines
- To introduce analog devices and their characteristics
- To educate on the fundamental concepts of digital electronics
- To introduce the functional elements and working of measuring instruments

UNIT I - DC CIRCUITS 9

DC Circuits: Circuit Components: Conductor, Resistor, Inductor, Capacitor – Ohm's Law - Kirchhoff's Laws –Independent– Simple problems- Nodal Analysis, Mesh analysis with Independent sources only (Steady state)

UNITII - AC CIRCUITS 9

Introduction to AC Circuits and Parameters: Waveforms, Average value, RMS Value, Instantaneous power, real power, reactive power and apparent power, power factor – Steady state analysis of RLC circuits (Simple problems only) Operating Principle of single phase Energy Meter

UNITIII -ELECTRICAL MACHINES 9

Construction and Working principle - DC Generator & DC motor. Types and Applications. Transformer-Construction, Working principle and Applications, Working principle of Stepper Motor and Single phase, induction Motors

UNITIV - ANALOG ELECTRONICS 9

Semiconductor Materials: Silicon &Germanium – PN Junction Diodes, Zener Diode –Characteristics Applications – Bipolar Junction Transistor, MOSFET, SCR I-V Characteristics and Applications, Rectifier

UNIT V - DIGITAL ELECTRONICS 9

Review of number systems, Binary codes, Logic gates, Boolean algebra, Half Adder & Full Adder, Multiplexer & De-Multiplexer, Encoder& Decoder. (Qualitative Treatment only)

TOTAL:45PERIODS

COURSE OUTCOMES:

Course Outcomes	Upon completion of this course, the student will be able to	Cognitive Level
CO1	Understand the basic knowledge in DC circuits with passive components	Understand
CO2	Understand the basic knowledge in AC circuits	Understand
CO3	Explain the working principle and applications of electrical machines	Remember
CO4	Analyze the characteristics of analog electronic devices	Analyze
CO5	Explain the basic concepts of digital electronics	Remember

CO – PO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	2	1	-	-	-	-	1	-	-	-	2	2	2
2	2	2	1	-	-	-	-	1	-	-	-	2	2	2
3	2	1	1	-	-	-	-	1	-	-	-	2	2	1
4	2	2	1	-	-	-	-	1	-	-	-	2	2	2
5	2	2	1	-	-	-	-	1	-	-	-	2	2	2

1-low, 2-medium, 3-high, '-' - no correlation

TEXT BOOKS:

1. Kothari DP and I.J Nagrath, "Basic Electrical and Electronics Engineering", Second Edition, McGraw Hill Education, 2020

2. S.K.Bhattacharya "Basic Electrical and Electronics Engineering", Pearson Education, Second Edition, 2017.

REFERENCES:

1. James A .Svoboda, Richard C. Dorf, "Dorf's Introduction to Electric Circuits", Wiley, 2018.
2. Sedha R.S., "A textbook book of Applied Electronics", S. Chand & Co., 2018

WEBSITE REFERENCE:

1. https://www.electricaleasy.com/
2. https://easyengineering.net/be3251-basic-electrical-and-electronics-engineering-notes

NPTEL/ SWAYAM/ MOOC REFERENCE:

1. NPTEL: https://nptel.ac.in/courses/117106108 - Basic Electrical Circuits

PUCC2BE04	PROBLEM SOLVING AND PYTHON PROGRAMMING	L T P C
		2 0 0 2

COURSE OBJECTIVE

- The objective of this course is to familiarize the students with to know the design of algorithm and efficiency, to understand variables, expressions and statements, to explore flow of data and its executions, to study the compound data types, to know about class and objects in python.

UNIT I: - COMPUTER-PROBLEM-SOLVING 6

Introduction: Top Down Design, Implementation of Algorithms, Program verification, Efficiency of algorithms.

UNIT II:-DATA-TYPES, EXPRESSIONS, STATEMENTS 6

Python interpreter and interactive mode, debugging; values and types: int, float, Boolean, string, and list; variables, expressions, statements, tuple assignment, precedence of operators, comments, Errors.

UNIT III - CONTROL FLOW, FUNCTIONS, STRINGS 6

Conditionals: Boolean values and operators, conditional, chained conditional; Iteration: while, for, break, continue, pass, Random Number Generation; Functions: return values, parameters, local and global scope, function composition, recursion; Strings: slices, immutability, functions and methods, module.

UNIT IV - LISTS, TUPLES, DICTIONARIES 6

Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list; Tuples: tuple assignment, tuple as return value; Dictionaries: operations and methods; advanced list processing – list comprehension; Illustrative programs: Word histogram, Most Common Words, Word Frequency analysis.

UNIT -V: FILES, MODULES, PACKAGES 6

Files and Exceptions : text files, reading and writing files, errors and exceptions, handling exceptions, Pickling; Modules & Packages- Writing a Module- Library Files-Numpy-Pandas

TOTAL:30 PERIODS

COURSE OUTCOMES:

Course Outcomes	Upon completion of this course, the student will be able to	Cognitive Level
CO1	Identify Computer problems with its algorithmic design and solutions.	Remember
CO2	Illustrate simple Python data types, Expressions and Operators.	Remember
CO3	Execute simple Python programs using conditionals, looping statement and Functions for solving problems.	Apply
CO4	Identify Compound Data Types using List, Tuple and Dictionaries Python programs.	Apply
CO5	Infer the Object Oriented Concepts.	Remember

CO – PO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	3	2	1	1	-	-	1	2	2	-	-	2	2
2	3	3	3	2	3	-	-	1	2	2	-	-	3	2
3	3	3	3	2	3	-	-	1	2	2	-	-	3	2
4	3	3	3	2	3	-	-	1	2	2	-	-	3	2
5	3	3	3	2	3	-	-	1	2	2	-	-	3	2

1-low, 2-medium, 3-high, '-' - no correlation

TEXT BOOK:

1. Allen B. Downey, "Think Python: How to Think like a Computer Scientist", 2nd Edition, O'Reilly Publishers, 2016.

REFERENCES:

1. Paul Deitel and Harvey Deitel, "Python for Programmers", Pearson Education, 1st Edition, 2021.
2. G Venkatesh and MadhavanMukund, "Computational Thinking: A Primer for Programmers and Data Scientists", 1st Edition,Notion-Press,2021.
3. John V Guttag,"Introduction to Computation and Programming Using Python: With Applications to Computational Modeling and Understanding Data'', Third Edition, MIT Press.
4. Eric Matthes, "Python Crash Course, A Hands – on Project Based Introduction to Programming", 2nd Edition, No Starch-Press,2019.
5. R.G.Dromey,"How to solve it by Computer",Pearson India 2007

WEBSITE REFERENCE:

1. https://www.vlab.co.in/broad-area-computer-science-and-engineering
2. "Python for Everybody" at Coursera Online Courses. https://www.coursera.org/courses?query=python%20for%20beginners

NPTEL/ SWAYAM/ MOOC REFERENCE:

1. The Joy of Computing using Python, IIT Ropar ,Prof. Sudarshan Iyengar NPTEL Courses. https://onlinecourses.nptel.ac.in/nc21_cs32/preview

PUCC2HM05	TAMILS AND TECHNOLOGY	L T P C
		1 0 0 1

UNIT I: WEAVINGAND CERAMIC TECHNOLOGY 3

Weaving Industry during Sangam Age–Ceramic technology–Black and Red Ware Potteries (BRW) – Graffition Potteries.

UNIT II: DESIGNANDCONSTRUCTION TECHNOLOGY 3

Designing and Structural construction House & Designs in household materials during Sangam Age – Building materials and Herostones of Sangam age— Details of Stage Constructions in Silappathikaram - Sculptures and Temples of Mamallapuram - Great Temples of Cholas and otherworship places - Temples of Nayaka Period - Type study (Madurai Meenakshi Temple)-Thirumalai Nayakar Mahal -Chetti Nadu Houses,Indo –Saracenic architecture at Madras during British Period.

UNIT III: MANUFACTURING TECHNOLOGY 3

Art of Ship Building - Metallurgical studies - Iron industry - Iron smelting, steel -Copper and gold- Coins as source of history - Minting of Coins – Beads making-industries Stone beads -Glass beads - Terracotta beads - Shell beads/ bone beats - Archeological evidences - Gem stone types described in Silappathikaram.

UNIT IV: AGRICULTUREAND IRRIGATION TECHNOLOGY 3

Dam, Tank, ponds, Sluice, Significance of Kumizhi Thoompu of Chola Period, Animal Husbandry -Wells designed for cattle use - Agriculture and Agro Processing - Knowledge of Sea - Fisheries —Pearl-Conchediving-Ancient Knowledge of Ocean-Knowledge Specific Society.

UNIT V: SCIENTIFICTAMIL & TAMIL COMPUTING 3

Development of Scientific Tamil-Tamil computing–Digitalization of Tamil Books–Development of Tamil Software — Tamil Virtual Academy — Tamil Digital Library — Online Tamil Dictionaries — Sorkuvai Project.

TOTAL: 15PERIODS

TEXT-CUM-REFERENCE BOOK:

1. கணினித் தமிழ். –மக்களும் பண்பாடும் – கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கலவியியல் பணிகள் கழகம்).
2. முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்).
3. கீழடி – வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4. பொருநை – ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils – The Classical Period (Dr.S.Singaravelu) (Published by: International\ statute of Tamil Studies.
7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D.Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by:International Institute of Tamil Studies).
9. Keeladi – 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text book and Educational Services Corporation, Tamil Nadu)

10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author).

11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)

12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Refernece Book.

PMC TECH

PUCC2PL03	PROFESSIONAL ENGLISH – II LABORATORY	L T P C
		0 0 4 2

COURSE OBJECTIVE

- To identify varied group discussion skills and apply them to take part in effective discussions in a professional context.
- To analyse concepts and problems and make effective presentations explaining them clearly and precisely.
- To be able to use appropriate language structures to write emails, reports and essays

LIST OF ACTIVITIES

UNIT I: **12**

Activity 1	Reading Advertisement and Group activity
Activity 2	Writing Professional Emails
Activity 3	Group activity : create simple user manuals
Activity 4	writing compare and contrast essay

UNIT II: **12**

Activity 1	Reading longer text and identify the main ideas
Activity 2	Writing cause and effect essay
Activity 3	Reading complaint letter
Activity 4	Writing Responding letter

UNIT III: **12**

Activity 1	Reading Case Studies
Activity 2	Discussion and presentation on Case studies
Activity 3	Excerpts from literary texts or news reports
Activity 4	Group Activity : Create simple News report

UNIT IV: **12**

Activity 1	Reading Article from newspaper
Activity 2	Group Activity :Writing article
Activity 3	Reading types of reports
Activity 4	pair activity : writing Survey / Accident Report

UNIT V: **12**

Activity 1	Reading company profile
Activity 2	Role play activity – Create company profile
Activity 3	Reading Types of Resume
Activity 4	Create Cover letter and resume

TOTAL: 60PERIODS

COURSE OUTCOMES:

COURSE OUTCOMES	Upon completion of this course, the student will be able to	Cognitive Level
CO1	Write professional emails	Apply
CO2	Prepare complaint and responding letter	Apply
CO3	Discuss and analyse problems from various perspectives to arrive solutions	Analyze
CO4	Write short articles with precision	Apply
CO5	Create company profile	Apply

CO – PO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1						1	-	1	3	3	-	3	-	-
2						2	-	2	3	3	-	3	-	-
3						2	-	2	3	3	-	3	-	-
4						2	-	1	3	3	-	2	-	-
5						3	-	1	3	3	-	3	-	-

1-low, 2-medium, 3-high, '-' - no correlation

TEXT BOOK:

1. Department of English, Anna University, English for Engineers & Technologists ,Orient Blackswan, 2021.
2. Cambridge University Press , English for Science& Technology ,2021.

REFERENCES:

1. Raman. Meenakshi, Sharma. Sangeeta , Professional English, Oxford university press.NewDelhi.2019
2. Stella Cortrell , Red Globe Press, "The Study Skills Handbook" , 2019
3. Mathew Richardson , Charlie Creative Lab ,"Advanced Communication Skills" , 2020.
4. Jack C.Richards , "Interchange", Cambridge University Press , Fifth Edition, 2017
5. Mathew Richardson, Charlie Creative Lab ,"Advanced Communication Skills" , 2020

PUCC2PL04 PROBLEM SOLVING USING PYTHON PROGRAMMING LAB	L T P C
	0 0 4 2

COURSE OBJECTIVE

- The objective of this course is to familiarize the students with to know the design of algorithm and efficiency, to understand variables, expressions and statements, to explore flow of data and its executions, to study the compound data types, to know about class and objects in python.

LIST OF EXERCISES

1. Use Linux shell commands, use Python in interactive mode, and an editor
    a. os.system()
    b. subprocess.run()
    c. subprocess.Popen()
    d. os.utime()
2. Write simple python programs for
    a. Area of a geometric shape
    b. Simple interest
    c. Solve quadratic equation
    d. Net salary
3. Write programs using conditional statements for
    a. Leap year
    b. Simple calculator
    c. Grade of the total mark
4. Develop programs using loops and nested loops for
    a. Multiplication table
    b. Sum of a series
    c. Print patterns
5. Develop programs using functions for
    a. Sine and cosine series
    b. Pythagorean triplets
6. Develop programs using recursion for
    a. Efficient power of a number
    b. Factorial
    c. Fibonacci number
7. Develop programs using strings for
    a. Palindrome
    b. Finding substring
8. Develop programs using lists and tuples
    a. linear search
    b. binary search

c. selection sort
d. insertion sort
e. quicksort

9. Develop matrix manipulations programs using nested lists.

10. Develop simple programs using dictionaries

1. frequency histogram
2. nested dictionary

11. Develop programs using Files.

a. read files
b. write files

12. Develop programs to perform any task by reading arguments from command line.

13. Implement a simple application using appropriate datatypes and files

Total Periods: 60

COURSE OUTCOMES:

COURSE OUTCOMES	Upon completion of this course, the student will be able to	Cognitive Level
CO1	Execute simple Python data types, Expressions and Operators.	Apply
CO2	Write simple Python programs using conditionals, looping statement and Functions for solving problems.	Apply
CO3	Represent Compound Data Types using List, Tuple and Dictionaries Python programs.	Apply
CO4	Read and write data from/to files in Python programs and Object Oriented Concepts.	Apply
CO5	Implement a simple application using appropriate datatypes and files	Apply

CO – PO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	2	3	3	1	3	-	-	-	3	-	-	-	3	1
2	2	3	3	1	3	-	-	-	3	-	-	-	3	1
3	2	3	3	1	3	-	-	-	3	-	-	-	3	1
4	2	3	3	1	3	-	-	-	3	-	-	-	3	1
5	2	3	3	1	3	-	-	-	3	-	-	-	3	1

1-low, 2-medium, 3-high, '-' - no correlation

TEXT BOOK:

1. Allen B. Downey, "Think Python: How to Think like a Computer Scientist", 2nd Edition, O'Reilly Publishers, 2016.

REFERENCES:

1. Paul Deitel and Harvey Deitel, "Python for Programmers", Pearson Education, 1st Edition, 2021.

2. G Venkatesh and MadhavanMukund, "Computational Thinking: A Primer for Programmers and Data Scientists", 1st Edition,Notion-Press,2021.

3. John V Guttag,"Introduction to Computation and Programming Using Python: With Applications to Computational Modeling and Understanding Data", Third Edition, MIT Press.

4. Eric Matthes, "Python Crash Course, A Hands – on Project Based Introduction to Programming", 2nd Edition, No Starch-Press,2019.

5. R.G.Dromey,"How to solve it by Computer", Pearson India 2007

WEBSITE REFERENCE:

1. https://www.vlab.co.in/broad-area-computer-science-and-engineering
2. "Python for Everybody" at Coursera Online Courses. https://www.coursera.org/courses?query=python%20for%20beginners

NPTEL/ SWAYAM/ MOOC REFERENCE:

1. The Joy of Computing using Python, IIT Ropar ,Prof. SudarshanIyengar NPTEL Courses. https://onlinecourses.nptel.ac.in/noc21_cs32/preview

PUCC2PL05	CIVIL AND MECHANICAL ENGINEERING PRACTICES LABORATORY	L T P C
		0 0 2 1

COURSE OBJECTIVE

- Drawing pipe line plan; laying and connecting various pipe fittings used in common household plumbing work; Sawing; planning; making joints in wood materials used in common house hold wood work.
- Welding various joints in steel plates using arc welding work; Machining various simple processes like turning, drilling, tapping in parts

  Assembling simple mechanical assembly of common household equipment's; Making a tray out of metal sheet using sheet metal work

GROUP – A CIVIL PRACTICE **12**

PLUMBING WORK:

a) Connecting various basic pipe fittings like valves, taps, coupling, unions, reducers, elbows and other components which are commonly used in household.

b) Preparing plumbing line sketches.

c) Laying pipe connection to the suction side of a pump

d) Laying pipe connection to the delivery side of a pump.

e) Connecting pipes of different materials: Metal, plastic and flexible pipes used in house hold appliances.

WOOD WORK:

a) Sawing,

b) Planning and

c) Making joints like T-Joint,

d) Mortise joint

e) Tenon joint and Dovetail joint.

Wood Work Study:

a) Studying joints in door panels and wooden furniture

b) Studying common industrial trusses using models.

GROUP - B MECHANICAL PRACTICES **18**

WELDING WORK:

a) Welding of Butt Joints, Lap Joints, and Tee Joints using arc welding.

b) Practicing gas welding.

BASIC MACHINING WORK:

a) Simple Turning.

b) Simple Drilling.

c) Simple Tapping.

d) Simple Grinding

ASSEMBLY WORK:

a) Assembling a centrifugal pump.

b) Assembling a household mixer.

c) Assembling an air conditioner.

SHEET METAL WORK:

a) Making of a square tray and Rectangle tray

FOUNDRY WORK:

a) Demonstrating basic foundry operations.

(b) Smithy operations, upsetting, swaging, setting down and bending. Example – Exercise – Production of hexagonal headed bolt.

(c) Fitting – Exercises – Preparation of square fitting and V – fitting models.

TOTAL: 30 PERIODS

COURSE OUTCOMES:

COURSE OUTCOMES	Upon completion of this course, the student will be able to	Cognitive Level
CO1	Draw pipe line plan; lay and connect various pipe fittings used in common household Plumbing work.	Apply
CO2	Make joints in wood materials used in common household wood work.	Apply
CO3	Perform various machining operation in a lathe, drilling and Milling.	Apply
CO4	Perform the various welding processes and know about its applications.	Apply
CO5	Demonstrate the various foundry and fitting Exercises and know about its applications.	Apply

CO – PO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	-	2	-	1	-	-	-	-	-	-	2	2	1
2	3	-	3	-	2	-	-	-	-	-	-	1	2	2
3	3	1	1	-	2	1	1	1	-	-	-	3	2	2
4	3	1	2	-	3	1	1	1	1	-	-	3	2	2
5	3	-	1	1	2	-	-	-	-	-	-	2	2	2

1-low, 2-medium, 3-high, '-' - no correlation

TEXT BOOKS/REFERENCE BOOKS:

1. Willis H. Wagner, Howard "Bud" Smith, and Mark W. Huth Modern Carpentry, 12th Edition, 2015
2. P.C.Sharma, Production Technology (Manufacturing Process): Manufacturing Process, S.Chand publisher, 2006
3. Robert W. Messler, Reverse Engineering: Mechanisms, Structures, Systems & Materials, McGraw-Hill Education, 2014
4. K.Jeyachandran, S.Natarajan& S, Balasubramanian, "A Primer on Engineering
5. Practices Laboratory", Anuradha Publications, (2007).
6. Steam Generators and Waste Heat Boilers: For Process and Plant Engineers (Mechanical Engineering) by V. Ganapathy

PUCC2PL06	ELECTRICAL AND ELECTRONICS ENGINEERING PRACTICES LABORATORY	L T P C
		0 0 2 1

COURSE OBJECTIVE

- To enable the students to understand the behaviour of semiconductor device based on experimentation.
- Be exposed to active and passive circuit elements.
- Familiarize the operation and characteristics of transistor like BJT and FET.
- Explore the characteristics of amplifier gain and frequency response.
- Learn the required functionality of positive and negative feedback systems.

Electrical Engineering Practices **15**

a) Introduction to switches, fuses, indicators and lamps - Basic switch board wiring with lamp, fan and three pin socket
b) Staircase wiring
c) Fluorescent Lamp wiring with introduction to CFL and LED types.
d) Energy meter wiring and related calculations/ calibration
e) Measurement of electrical quantities – voltage, current, power &power factor in RLC circuit.
f) Measurement of resistance to earth of electrical equipment
g) Study of Iron Box / Fan Regulator / emergency lamp wiring and assembly

Electronics Engineering Practices **15**

a)Study of Electronic components and equipments – Resistor, colour coding measurement of AC signal parameter (peak-peak, rms period, frequency) using CRO.
b) Verification truth table of logic gates AND, OR, NOT and NAND,NOR
c) Generation of Clock Signal.
d) Soldering practice – simple electronic circuits and checking continuity&Assembling and testing electronic components on a small PCB
e) Study elements of smart phone./ LED TV/ computer/ laptop

TOTAL:30 PERIODS

COURSE OUTCOMES:

COURSE OUTCOMES	Upon completion of this course, the student will be able to	Cognitive Level
CO1	Wire various electrical joints in common house hold electrical works	Apply
CO2	Solder and test simple electronic circuits, Assemble and test simple electronic components on PCB	Apply

CO – PO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
2	3	3	3	3	3	3	3	3	3	3	3	3	3	3

1-low, 2-medium, 3-high, '-' - no correlation

SYLLABUS FOR III SEMESTER

PUCC3BSO6	TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS	L	T	P	C
		3	1	0	4

COURSE OBJECTIVES:

1	To introduce the basic concepts of PDE for solving standard partial differential equations.
2	To introduce Fourier series analysis which is central to many applications in engineering apart from its use in solving boundary value problems.
3	To acquaint the student with Fourier series techniques in solving heat flow problems used in various situations
4	To acquaint the student with Fourier, transform techniques used in wide variety of situations.
5	To introduce the effective mathematical tools for the solutions of partial differential equations that model several physical processes and to develop Z transform techniques for discrete time systems.

UNIT – I	PARTIAL DIFFERENTIAL EQUATIONS	9+3

Formation of partial differential equations - Solutions of standard types of first order partial differential equations - First order partial differential equations reducible to standard types- Lagrange's linear equation (multiplier method only)

UNIT – II	FOURIER SERIES	9+3

Dirichlet's conditions - General Fourier series - Odd and even functions - Half range sine series and cosine series - Parseval's identity - Harmonic analysis.

UNIT – III	APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS	9+3

Classification of PDE - Fourier series solutions of one-dimensional wave equation - One dimensional equation of heat conduction - Steady state solution of two-dimensional equation of heat conduction (Cartesian coordinates only).

UNIT – IV	FOURIER TRANSFORMS	9+3

Fourier transform pair -Fourier sine and cosine transforms -Properties - Transforms of simple functions - Parseval's identity.

UNIT – V	Z – TRANSFORMS	9+3

Z-transforms - Elementary properties - Initial and final value theorems - Inverse Z-transform using partial fraction, residues and Convolution theorem.

TOTAL: 60 PERIODS

COURSE OUTCOMES		Cognitive Level
CO1	Understand how to solve the given standard partial differential equations.	Understand
CO2	Solve differential equations using Fourier series analysis which plays a vital role in engineering applications.	Analyse
CO3	Appreciate the physical significance of Fourier series techniques in solving one- and two-dimensional heat flow problems and one-dimensional wave equations.	Understand
CO4	Understand the mathematical principles on transforms and partial differential equations would provide them the ability to formulate and solve some of the physical problems of engineering.	Understand
CO5	Use the effective mathematical tools for the solutions of partial differential equations by using Z-transform techniques for discrete time systems.	K3, Applying

TEXT BOOKS:	
1	Grewal B.S., "Higher Engineering Mathematics", 44thEdition, Khanna Publishers, New Delhi, 2018.
2	Kreyszig E, "Advanced Engineering Mathematics ", 10th Edition, John Wiley, New Delhi, India, 2016.

REFERENCEBOOKS:	
1	Bali. N.P and Manish Goyal, "A Textbook of Engineering Mathematics", 10th Edition, Laxmi Publications Pvt. Ltd, 2015.
2	James. G., "Advanced Modern Engineering Mathematics", 4thEdition, Pearson Education, New Delhi, 2016.
3	Ramana. B.V., "Higher Engineering Mathematics", McGraw Hill Education Pvt. Ltd, New Delhi, 2018.

WEBSITE REFERENCE / NPTEL/ SWAYAM/ MOOC REFERENCE:	
1	https://nptel.ac.in/courses/111/103/111103021/
2	https://archive.nptel.ac.in/courses/111/107/111107111/
3	https://archive.nptel.ac.in/courses/111/105/111105123/
4	https://freevideolectures.com/course/3244/advanced-engineeringmathematics
5	https://ocw.mit.edu/resources/res-6-007-signals-and-systems spring2011/lecture-notes/

CO-PO MAPPING

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	1	2	1	-	-	-	2	2	-	2	1	1
CO2	3	3	1	2	1	-	-	-	2	2	-	2	1	1
CO3	3	3	1	2	1	-	-	-	2	2	-	2	1	1
CO4	3	3	1	2	1	-	-	-	2	2	-	2	1	1
CO5	3	3	1	2	1	-	-	-	2	2	-	2	1	1

1-low, 2-medium, 3-high, '-' - no correlation

PUCH3PC01	MECHANICS OF SOLIDS	L T P C
		3 1 0 4

COURSE OBJECTIVE

- To impart knowledge on designing the support column, beams, pipelines, storage tanks and reaction columns and tanks after undergoing this course. This is precursor for the study on process equipment design and drawing.

UNITI -STRESS, STRAINAND DEFORMATIONOFSOLIDS **12**

Rigid bodies and deformable solids – forces on solids and supports – equilibrium and stability –strength and stiffness – tension, compression and shear stresses – Hooke's law and simpleproblems–compoundbars–thermalstresses–elasticconstantsandpoission'sratio.

UNIT II -TRANSVERSE LOADING ON BEAMS **12**

Beams –support conditions–types of Beams –transverse loading on beams–shear force and bending moment in beams–analysis of cantilevers, simply — supported beams and over hanging beams – relationships between loading, S.F. and B.M. In beams and their applications–S.F.& B.M. diagrams.

UNIT III -DEFLECTIONS OF BEAMS **12**

Double integration method-Macaulay's method-Area –moment theorems for computation of slopes and deflections in beams.

UNIT IV -STRESSES IN BEAMS **12**

.Theory of simple bending – assumptions and derivation of bending equation (M/I=F/Y= E/R)– analysis of stresses in beams–loads carrying capacity of beams–proportioning beam sections – leaf springs – flitched beams – shear stress distribution in beams – determination of shear stress in flanged beams

UNIT V - TORSIONAND COLUMNS **12**

Torsion of circular shafts — derivation of torsion equation ($T/J = fs/R = C\theta/L$) — stress and deformation in circular and hollow shafts–stresses and deformation in circular and hollow shafts–stepped shafts–shafts fixed at both ends–stresses in helical springs–deflection of springs–spring constant. Axially loaded short columns–columns of unsymmetrical sections–Euler's theory of long columns–critical loads for prismatic columns with different end conditions–effect of eccentricity.

TOTAL: 60 PERIODS

COURSE OUTCOMES	Upon completion of this course, the student will be able to	Cognitive Level
CO1	The basic concepts of stress, strain and deformation of solids	Understand
CO2	The concept of transverse loading on statistically deterministic beams and its relationship	Application
CO3	Understand the concept of slope and deflection in beams through Double Integration,	Understand
CO4	Understand the stress distribution concept like bending and shear stresses in beams and leaf springs	Understand
CO5	The stress and deformation in shafts, analysis of columns by Euler's theory and effect of eccentricity	Understand

CO – PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	2	1	-	-	2	2	-	2	-	-	-	1	1
2	3	2	1	1	-	2	2	-	2	-	-	-	1	1
3	3	2	1	1	-	2	2	-	2	-	-	-	1	1
4	3	2	1	1	-	2	2	-	2	-	-	-	1	1
5	3	2	1	-	-	2	2	-	2	-	-	-	1	1

1-low, 2-medium, 3-high, '-' - no correlation

TEXTBOOK:

1. Bansal, R.K,StrengthofMaterials, LaxmiPublications(P) Ltd., FourthEdition2010
2. S.Chand, R.K.Rajput, "A text book of Strength of Materials" Sriram book hub,2018
3. Junarkar, S. B., Mechanics of Structure Vol.1, 21st Edition, Character Publishing House,Anand, Indian, (1995).

REFERENCES:

1. Elangovan A. ,ThinmaVisaiIyal (Mechanics of Solids in Tamil), Anna University, Madras, 1995

NPTEL/ SWAYAM/ MOOC REFERENCE:

- Mechanics of Solids-https://archive.nptel.ac.in/courses/105/104/105104160/

PUCH3PC02	CHEMICAL PROCESS CALCULATIONS	L T P C
		3 1 0 4

COURSE OBJECTIVE

- To enable the students to acquire knowledge on laws of chemistry and its application to solution of mass and energy balance equations for single and network of units and introduce to process simulators.

UNITI – UNITS AND DIMENSIONS **12**

Base and derived Units-Composition of Mixture and solutions- calculations of pressure, volume and temperature using ideal gas law. Use of partial pressure and pure component volume in gas calculations, applications of real gas relationship in gas calculation

UNIT II – MATERIAL BALANCE **12**

Stoichiometric principles, Application of material balance to unit operations like distillation, evaporation, crystallization, drying etc., - Material balance with chemical reaction - Limiting and excess reactants-recycle-by pass and purging-Unsteady state material balances.

UNIT III – HUMIDITY AND SATURATION **12**

Calculation of absolute humidity, molal humidity, relative humidity and percentage humidity – Use of humidity in condensation and drying-Humidity chart, dew point.

UNIT IV – ENGRGY BALANCE **12**

Heat capacity of solids, liquids, gases and solutions, use of mean heat capacity in heat calculations, problems involving sensible heat and latent heats, evaluation of enthalpy. Standard heat of reaction, heats of formation, combustion, solution, mixing etc., calculation of standard heat of reaction – Effect of pressure and temperature on heat of reaction -Energy balance for systems with and without chemical reaction-Unsteady state energy balances.

UNIT V - COMBUSTION **12**

Determination of Composition by Orsat analysis of products of combustion of solid, liquid and gas fuels - Calculation of excess air from orsat technique, problems on Sulphur and Sulphur burning compounds – Application of Process simulators in energy and material balance problems.

TOTAL: 60 PERIODS

COURSE OUTCOMES	Upon completion of this course, the student will be able to	Cognitive Level
CO1	Understand the concepts of dimensional consistency and effective application of units and dimensions.	Understand
CO2	Analyze a problem statement and balance the material flowing through single and various operations	Application
CO3	Understand the gas behavior and its properties	Understand
CO4	Understand general energy balance, simplify and apply to open and closed systems	Understand
CO5	Write material and energy balance for unsteady state how material and energy balances are formulated for equation-	Understand

CO – PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	2	1	-	-	2	2	-	2	-	-	-	1	1
2	3	2	1	1	-	2	2	-	2	-	-	-	1	1
3	3	2	1	1	-	2	2	-	2	-	-	-	1	1
4	3	2	1	1	-	2	2	-	2	-	-	-	1	1
5	3	2	1	-	-	2	2	-	2	-	-	-	1	1

1-low, 2-medium, 3-high, '-' - no correlation

TEXTBOOK:

1. Bhatt,B.L.,Vora,S.M.,"Stoichiometry",4th Edition,TataMcGraw-Hill(2004)
2. K.V.Narayanan., B.Lakshmikutty., Stoichiometry and Process calculations, PHI 2nd Edition (2016)

.

REFERENCES:

1. Himmelblau,D.M.,"BasicPrinciplesandCalculationsinChemicalEngineering",EEEEighth Edition,PrenticeHallInc.,2012
2. HougenOA,WatsonKMandRagatzRA,"Chemicalprocessprinciples"PartI,CBSpublishers,Second edition,2004.

NPTEL/ SWAYAM/ MOOC REFERENCE:

- https://archive.nptel.ac.in/courses/103/103/103103165/

PUCH3PC03	FLUID MECHANICS FOR CHEMICAL ENGINEERS	L T P C
		3 1 0 4

COURSE OBJECTIVE

- To enable the students to acquire a sound knowledge on fluid properties, fluid statics, dynamic characteristics of fluid flow for through pipes and porous medium, flow measurement and fluid machineries.

UNITI – INTRODUCTION TO FLUID MECHANICS **12**

Methods of analysis and description – fluid as a continuum–Velocity and stress field-Newtonian and non-Newtonian fluids–Classification of fluid motion. Fluid statics – basic equation - equilibrium of fluid element – pressure variation in a static fluid -application to manometer – Differential analysis of fluid motion – continuity, equation of motions, Bernoulli equation.

UNIT II – DIMENSIONAL ANALYSIS **12**

The principle of dimensional homogeneity — dimensional analysis, Rayleigh method and the Pi-theorem-non-dimensional action of the basic equations-similitude-relationship between dimensional analysis and similitude-use of dimensional analysis for scale up studies

UNIT III – FLOW THROUGH PIPES AND FLOW CONDITIONS **12**

Reynolds number regimes, internal flow - flow through pipes — pressure drop under laminar and turbulent flow conditions — major and minor losses; Line sizing; External flows.

UNIT IV- BOUNDARY LAYER AND TRANSPORTATION OF FLUIDS **12**

Boundary layer concepts, boundary layer thickness under laminar and turbulent flow conditions-Flow over a sphere –friction and pressure drag-flow through fixed and fluidized beds.

UNIT V – FLOW MEASUREMENT DEVICES AND PUPMS **12**

Flow measurement - Constant and variable head meters; Velocity measurement techniques; Types, characteristics and sizing of valves; Classification of Pumps- Gravity settling

TOTAL: 60 PERIODS

COURSE OUTCOMES	Upon completion of this course, the student will be able to	Cognitive Level
CO1	Understand the fundamental properties of fluids, stress-strain relationship in fluids, and its characteristics under static conditions and establish force balance in static systems.	Understand
CO2	Apply Bernouli principle, and compute pressure variation in static fluid.	Application
CO3	Use of dimensional analysis to derive relationships among process or system variables. Further they would develop dimensionless groups that help in scale-up studies.	Understand
CO4	Understand the different types of flow conditions in fixed bed and fluidized beds.	Understand
CO5	Describe function of flow metering devices, apply Bernoulli equation to determine the performance of flow-metering devices and also analyze the performance aspects of fluid machinery such as pumps, compressors and valves.	Understand

CO – PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	2	1	-	-	2	2	-	2	-	-	-	1	1
2	3	2	1	1	-	2	2	-	2	-	-	-	1	1
3	3	2	1	1	-	2	2	-	2	-	-	-	1	1
4	3	2	1	1	-	2	2	-	2	-	-	-	1	1
5	3	2	1	-	-	2	2	-	2	-	-	-	1	1

1-low, 2-medium, 3-high, '-' - no correlation

TEXTBOOK:

1. NoeldeNevers,"Fluid Mechanics for Chemical Engineers", Third Edition,McGraw-Hill,(2017).
2. Cengel., John M. Cimbala., Fluid Mechanics: fundamentals and Applications. 2019

REFERENCES:

1. White,F.M.,"FluidMechanics ",IVEdition,McGraw-HillInc.,1999.
2. James O Wilkes and Stacy G Bike, "Fluid Mechanics for Chemical Engineers' Prentice HallPTR(InternationalseriesinChemicalEngineering)(1999)

NPTEL/ SWAYAM/ MOOC REFERENCE:

https://archive.nptel.ac.in/courses/103/104/103104044/

PUCH3PC04	MECHANICAL OPERATIONS	L T P C
		3 1 0 4

COURSE OBJECTIVE

- To impart knowledge in the field of particle size reduction and also construction and working of equipment's used for mechanical operations.

UNIT I – PARTICLECHARACTERIZATIONANDMEASUREMENT **12**

General characteristics of solids, different techniques of size analysis- Static - Image analysis and Dynamic analysis - Light scattering techniques, shape factor, surface area determination, estimation of particle size. Advanced particle size analysis techniques. Screening methods and equipment, screen efficiency, ideal and actual screens

UNIT II – PARTICLESIZEREDUCTIONAND SIZEENLARGEMENT **12**

Laws of size reduction, energy relationships in size reduction, methods of size reduction, classification of equipments, crushers, grinders, disintegrators for coarse, intermediate and fine grinding, power requirement, work index; Advanced size reduction techniques - Nanoparticle fabrication - Top-down approach-Bottom-up approach.Sizeenlargement-Importanceofsizeenlargement,principleofgranulation,briquetting, palletization, and flocculation.

UNIT III – PARTICLESEPARATION (GAS-SOLIDANDLIQUID-SOLIDSYSTEM) **12**

Gravity settling, sedimentation, thickening, elutriation, double cone classifier, rake classifier, bowl classifier. Centrifugal separation-continuous centrifuges, super centrifuges, design of basket centrifuges; industrial dust removing equipment, cyclones and hydro cyclones, electrostatic and magnetic separators, heavy media separations, floatation, jigging.

UNIT IV – FILTRATIONANDFILTRATION EQUIPMENTS **12**

Theory of filtration, Batch and continuous filters, Flow through filter cake and filter media, compressible and incompressible filter cakes, filtration equipments - selection, operation and design of filters and optimum cycle of operation, filter aids

UNIT V – MIXINGAND PARTICLEHANDLING **12**

Mixing and agitation - Mixing of liquids (with or without solids), mixing of powders, selection of suitable mixers, power requirement for mixing. Storage and conveying of solids - Bunkers, silos, bins and hoppers, transportation of solids in bulk, Powder hazards, conveyer selection, different types of conveyers and their performance characteristics.

TOTAL: 60 PERIODS

COURSE OUTCOMES	Upon completion of this course, the student will be able to	Cognitive Level
CO1	Understand and determine various properties of particulates	Understand
CO2	Gain Preliminary understanding on Size Reduction and Size Enlargement	Application
CO3	Understand various separation and purification techniques employed in solid particles	Understand
CO4	Enhance their knowledge on Filtration Process	Understand
CO5	Understand Handling, Storage and Transportation of Solids and Obtain knowledge on various unit operations and their applications	Understand

CO – PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	2	1	-	-	2	2	-	2	-	-	-	1	1
2	3	2	1	1	-	2	2	-	2	-	-	-	1	1
3	3	2	1	1	-	2	2	-	2	-	-	-	1	1
4	3	2	1	1	-	2	2	-	2	-	-	-	1	1
5	3	2	1	-	-	2	2	-	2	-	-	-	1	1

1-low, 2-medium, 3-high, '-' - no correlation

TEXTBOOK:

1. Gavhane K A., Unit Operations-1 First Edition , NiraliPrakashan (2016)
2. McCabe, W.L., Smith, J.C., and Harriot, P., "Unit Operations in Chemical Engineering", 7th Edn., McGraw-Hill, 2005.
3. Badger W.L. and Banchero J.T., "Introduction to Chemical Engineering", Tata McGraw Hill, 1997.

REFERENCES:

4. Coulson, J.M. and Richardson, J.F., "Chemical Engineering" Vol. II, 4th Edn., Asian Books Pvt. Ltd., India, 1998.

NPTEL/ SWAYAM/ MOOC REFERENCE:

https://archive.nptel.ac.in/courses/103/107/103107123/

PUCH3PL01	FLUID MECHANICS LABORATORY	L T P C
		3 1 0 2

COURSE OBJECTIVE

- To enable the students to learn experimentally to calibrate flow meters, find pressure loss for fluid flows and determine pump characteristics

LIST OF EXPERIMENTS

1.Viscosity measurement of Non-Newtonian fluids
2.Calibration of constant and variable head meters
3.Calibration of weirs and notches
4.Opendrum orifice and draining time
5.Flow through straight pipe
6.Flow through annular pipe
7.Flow through helical coil and spiral coil
8.Lossesin pipe fittings and valves
9.Characteristic curves of pumps (Centrifugal/Gear/Reciprocating)
10.Pressure drop studies in packed column
11.Hydrodynamics of fluidized bed
12.Drag coefficient of solid particle

***Minimum 10 experiments shall be offered**

TOTAL: 60 PERIODS

COURSE OUTCOMES	Upon completion of this course, the student will be able to	Cognitive Level
CO1	Identify and characterize off low patterns and regimes	Understand
CO2	Calibrate flow measurement devices	Application
CO3	Correlate the difference between fixed and fluidized bed columns and its application.	Understand

CO – PO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	2	1	-	-	2	2	-	2	-	-	-	1	1
2	3	2	1	1	-	2	2	-	2	-	-	-	1	1
3	3	2	1	1	-	2	2	-	2	-	-	-	1	1

1-low, 2-medium, 3-high, '-' - no correlation

PUCH3PL02	MECHANICAL OPERATIONS LABORATORY	L T P C
		3 1 0 2

COURSE OBJECTIVE

- Develop sound practical knowledge on different types of mechanical operations equipments.

LISTOF EXPERIMENTS

1.Sieve analysis
2.Batch filtration studies using a Leaf filter
3.Batch filtration studies using a Plate and Frame Filter press
4.Characteristics of batch Sedimentation
5.Reductionratio in Jaw Crusher
6.Reduction ratio in Ball mill
7.Separation characteristics of Cyclone separator
8.Reduction ratio of Roll Crusher
9.Separation characteristics of Elutriator
10.Reduction ratio of Drop weight crusher
11.Size separation using Sub-Sieving

***Minimum 10 experiments shall be offered**

TOTAL: 60 PERIODS

COURSE OUTCOMES	Upon completion of this course, the student will be able to	Cognitive Level
CO1	Determine the size analysis in solid- solid separation systems	Understand
CO2	Capability to select different solid - fluid separation equipments	Application
CO3	Understand the technical methods related to unit operations in process plant	Understand

CO – PO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	2	1	-	-	2	2	-	2	-	-	-	1	1
2	3	2	1	1	-	2	2	-	2	-	-	-	1	1
3	3	2	1	1	-	2	2	-	2	-	-	-	1	1

1-low, 2-medium, 3-high, '-' - no correlation

PUCC3MC01	MANDATORY COURSES – I	L T P C
	WOMEN AND GENDER STUDIES	3 0 0 3

COURSE OBJECTIVE

1. To provide an effective educational program that will equip students to utilize the frameworks of various disciplines in order to analyze women, gender and sexuality in meaningful ways.
2. To produce interdisciplinary/intersectional student research that addresses political and practical issues of gender in relation to race, ethnicity, class, sexuality, privilege and power.
3. To prepare students to meet the needs of an increasingly ethnically and gender-diverse workplace.

UNITI: CONCEPTS **9**

Sex Vs. Gender, Masculinity, Femininity, Socialization, Matriarchy, Patriarchy, Public/ Private, Essentialism, Binaryism, Power, Hegemony, Hierarchy, Stereotype, Gender Roles, Female, Feminine, Feminist, Gender Relation, Deconstruction, Resistance, Sexual Division Of Labour.

UNITII: FEMINIST THEORY **9**

Feminist thinkers and theories: Liberal, Marxist, Socialist, Radical, Psychoanalytic, Postmodernist, Indian Feminism, Eco-feminism.

UNITIII: WOMEN'S MOVEMENTS: GLOBAL, NATIONAL AND LOCAL **9**

Rise of Feminism in Europe and America. Women's Movement in India.

UNITIV: GENDER AND LANGUAGE **9**

Linguistic Forms and Gender. Gender and narratives.

UNIT V: GENDER AND REPRESENTATION **9**

Advertising and popular visual media. - Gender and Representation in Alternative Media. - Gender and social media.

TOTAL: 45PERIODS

COURSEOUTCOMES: (Each unit – one outcome, total 5 outcomes)
At the end of the course, the students will be able:

COs	Course Outcome (CO)	Cognitive Level
CO-1	Define and Evaluate gender as a social construct.	Understand
CO-2	Identify the ways gender, power, privilege, and oppression play out across a range of cultures and human experiences.	Understand
CO-3	Demonstrate an understanding of gender as it intersects with sexuality, race, ethnicity, religion, class and other critical variables.	Understand
CO-4	Analyze human interactions and social/political systems using a "gender lens".	Apply
CO-5	Conduct scholarly research on key gender issues and/or debates in the present modern era.	Apply

TEXT BOOK:

1. Junaid Dani & Harpreet Haur, Women, Gender and Modern Society, Peridot Literary Books, 2023, ISBN: 9789390393893
2. Melissa J. Gillis and Andrew T. Jacobs, Introduction to Women's and Gender Studies, Oxford University Press, 2019, ISBN: 9780190064235

REFERENCES:

1. Afshar, Haleh. (1991) (Ed), Women, Development and Survival in the Third World, Longman, New York
2. John, Mary (2008) Women's Studies in India: A Reader, Pengiun Books India
3. Sarkar, Tankia and Sumit Sarkar ed., 2007, Women and Social Reform in Modern India (Vol. 1 and Vol. 2), Permanent Black
4. Jain, Jasbir ed., 2014, Women's Writing: Text & Context, Rawat Publication
5. Radha Kumar, The History Of Doing; An illustrated account of women's movement and feminism in india-1800-1900, Zubaan Publications, 2015
6. Flavia Agnes. (1999). Law and Gender Inequality.The Politics of Women's Rights in India. (Oxford University Press: India

WEBSITE REFERENCE:

1. https://en.wikipedia.org/wiki/Gender_studies
2. https://www.wellesley.edu/departments-programs/department/womens-and-gender-studies

NPTEL/ SWAYAM/ MOOC REFERENCE:

https://nptel.ac.in/courses/109103122
https://www.youtube.com/watch?v=lI8pyUSg4ns&list=PL2QYOrBMOd7-

PUCC3MC02	MANDATORY COURSES – I	L T P C
	ELEMENTS OF LITERATURE	3 0 0 3

COURSE OBJECTIVE

1. Students will be able to understand the relevance of literature in human life and appreciate its aspects in developing finer sensibilities.
2. Stimulate the interest of the students and sharpen their critical sensibility so that they may appreciate the beauty and richness of the texts they study.

UNIT I: POETRY 9

Poet – Persona/Speaker – Lines – Stanzas – Themes – Types of Poetry Figurative Language: Simile – Metaphor – Irony – Personification – other Literary devices

UNITII: PROSE 9

Author – Character – Plot – Setting – Themes – Types of Prose Narrative Techniques: Flashback – Foreshadowing – Irony – Figurative Devices

UNITIII: DRAMA 9

Playwright – Plot – Dialogue – Characters – Setting –Audience – Themes; Types of Drama: Comedy – Tragedy – Modern Drama – Indian Drama; Dramatic Techniques: Dramatic Irony – Situational Irony

UNITIV: FICTION & NOVEL 9

Bildungsroman, Picaresque, Epistolary, Stream-of-Consciousness, Novel of Social Reality, Psychological Novel , Historical Novel, Science Fiction, Gothic Novel and Graphic Novel

UNIT V: LITERARY CRITICISM 9

Definition - Classical and medieval criticism - Renaissance criticism - Baroque criticism - Enlightenment criticism - 19th-century Romantic criticism - The New Criticisms – Eco Criticism

TOTAL: 45PERIODS

COURSEOUTCOMES: (Each unit – one outcome, total 5 outcomes)
At the end of the course, the students will be able:

COs	KL	Course Outcome (CO)	Cognitive Level
CO-1	K3	Analyze the various elements of poetry and develop their critical thinking skills.	Apply
CO-2	K2	Comprehend Complex academic texts for narrating experience and events.	Understand
CO-3	K2	To understand the nature of the dramatic genres including comedy, romance, tragedy, and history.	Understand
CO-4	K3	To analyze the texts and understand the modernist techniques in the narratives & to develop critical thinking and close reading of texts.	Apply
CO-5	K3	Critically view literary artifacts& apply high seriousness as guiding principles in appreciating literature.	Apply

CO – PO Mapping

Course Outcomes	Programme Outcomes (Pos)											
	PO-1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	2	2	1	3	3	-	3
CO2	-	-	-	-	-	2	2	1	3	3	-	3
CO3	-	-	-	-	-	2	2	1	3	3	-	3
CO4	-	-	-	-	-	2	2	1	3	3	-	3
CO5	-	-	-	-	-	3	2	1	3	3	-	3

*For Entire Course, PO /PSO Mapping; 1 (Low); 2(Medium); 3(High) Contribution to PO/PSO

TEXT BOOK:

1. NozarNiazi& Rama Gautam, How To Study Literature : Stylistic And Pragmatic Approaches, Prentice Hall of India; 1st edition, 2010, ISBN – 10: 8120340612

2. Mahdi Javidshad, AmirhosseinNemati, An Outline Of The Norton Anthology Of English Literature, Arb Publications, 2024,ISBN-10: 9382527559

REFERENCES:

1. David Green, The Winged World, Macmillan Education, 2016, ISBN-10: 9352521005

Patricia Waugh,Literary Theory and Criticism, Oxford University Press,2006.

2. George. K. M., Modern Indian Literature – An Anthology, SahityaAkademi, 1994, ISBN: 8172017839

3. X. J. Kennedy, Dana Gioia, Literature: An Introduction to Fiction, Poetry, Drama, and Writing, Pearson; 13th edition, 2015, ISBN – 10: 0321971663

4. About Edgar V. Roberts, Literature: An Introduction to Reading and Writing, Pearson; 6th edition, 2014, ISBN – 10: 032194478X

WEBSITE REFERENCE:

1. https://www.britannica.com/art/literature
2. https://www.worldhistory.org/literature/
3. https://www.ereadingworksheets.com/e-reading-worksheets/all-reading-worksheets-list/
4. https://www.readingandwritinghaven.com/10-of-the-best-literary-analysis-activities-to-elevate-thinking

NPTEL/ SWAYAM/ MOOC REFERENCE:

1. https://onlinecourses.nptel.ac.in/noc22_hs01/preview
2. https://archive.nptel.ac.in/courses/109/106/109106124/

PUCC3MC03	MANDATORY COURSES – I	L T P C
	FILM APPRECIATION	**3 0 0 3**

COURSE OBJECTIVE

1. To understand the relevance of Films and Movies in human life and appreciate its aspects in developing analytical sense.
2. To stimulate the interest of the students and sharpen their critical sensibility so that they can appreciate the aesthetics of films practically.

UNITI: THE COMPONENT OF FILMS **9**

The material and equipment - The story, screenplay and script -The actors, crew members, and the director - The process of film making & structure of a film

UNITII: EVOLUTION OF FILM LANGUAGE **9**

Film language, form, movement etc. - Early cinema… silent film (Particularly French) - The emergence of feature films: Birth of a Nation – Talkies

UNITIII: FILM THEORIES AND CRITICISM/APPRECIATION **9**

Realist theory; Auteurists - Psychoanalytic, Ideological, Feminists - How to read films? - Film Criticism / Appreciation

UNITIV: DEVELOPMENT OF FILMS **9**

Representative Soviet films - Representative Japanese films - Representative Italian films - Representative Hollywood film and the studio system

UNIT V: INDIAN FILMS **9**

The early era - The important films made by the directors - The regional films - The documentaries in India

TOTAL: 45PERIODS

COURSE OUTCOMES: (Each unit – one outcome, total 5 outcomes)
At the end of the course, the students will be able:

COs	Course Outcome (CO)	Cognitive Level
CO-1	Analyze the various Components of Films and develop their critical thinking skills.	Apply
CO-2	To understand the evolutionary levels of Films and analyze its linguistic nature.	Understand
CO-3	To understand the nature of the Film genres including comedy, romance, tragedy, and history and appreciate it as criticism.	Understand
CO-4	To analyze the history of filmsat universal level.	Apply
CO-5	To Understand the native film techniques and appreciate it.	Understand

CO – PO Mapping

Course Outcomes	Programme Outcomes (Pos)											
	PO-1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1						2	2	1	3	3	-	3
CO2						2	2	1	3	3	-	3
CO3						2	2	1	3	3	-	3
CO4						2	2	1	3	3	-	3
CO5						3	2	1	3	3	-	3

*For Entire Course, PO /PSO Mapping; 1 (Low); 2(Medium); 3(High) Contribution to PO/PSO

TEXT BOOK:

1. Jill Nelmes, An Introduction to Film Studies, Routledge, 2012, ISBNL: 9780415582599
2. Barnouw, E. and Krishnaswamy, S. ,Indian Film (2nd edn), Oxford University Press, New York, 1980

REFERENCES:

1. Chatterji, Gayatri , Mother India , BFI Classics, BFI, London, 2002.
2. Chopra, Anupama ,Sholay: The Making of a Classic, Penguin Books India, New Delhi, 2000.
3. Desai, Jigna , Beyond Bollywood: The Cultural Politics of South Asian Diasporic Film, Routledge, New York and London, 2004.
4. Ganti, Tejaswini , Bollywood: A Guidebook to Popular Hindi Cinema, Routledge, New York and London, 2004.
5. Pendakur, Manjunath , Indian Popular Cinema: Industry, Ideology, and Consciousness , Hampton Press, Cresshill, NJ, 2003.
6. Rai, Amit S. , Untimely Hollywood: Globalization and India's New Media Assemblage , Duke University Press, Durham, NC and London, 2009.
7. Rajadhyaksha, Ashish and Willeman, Paul (eds), Encylopaedia of Indian Cinema (2nd edn), British Film Institute, London, 1999.

WEBSITE REFERENCE:

1. https://testbook.com/objective-questions/mcq-on-cinema--626bb8c22de86486d8920d08
2. https://www.videomaker.com/how-to/directing/film-history/an-introduction-to-film-studies/
3. https://www.youtube.com/watch?v=g3qFVVjzQFA
4. https://www.filmconnection.com/reference-library/how-the-internet-has-changed-movies-and-the-movie-business/

NPTEL/ SWAYAM/ MOOC REFERENCE:

1. https://onlinecourses.nptel.ac.in/noc21_hs17/preview
2. https://onlinecourses.swayam2.ac.in/cec23_ge0
3. https://www.ftii.ac.in/p/courses8/preview

PUCC3MC04	MANDATORY COURSES – I	L T P C
	THE CONSTITUTION OF INDIA	3 0 0 3

COURSE OBJECTIVE

1. To create an awareness in students on the Constitution of India.
2. To understand the function wings of the Government, fundamental rights and duties of citizens.
3. To analyse the powers of central, state, and local government, and strengthen constitutional institutions.

UNIT I: INTRODUCTION TO INDIAN CONSTITUTION 9

Constitution meaning of the term - The making of the Indian Constitution – Sources and constitutional history – Salient features of Indian Constitution - Philosophy of Constituent Assembly - Citizenship, Preamble, Fundamental Rights and Duties, Directive Principles of State Policy.

UNIT II: THE UNION: EXECUTIVE, LEGISLATIVE AND JUDICIARY 9

Union Government and its Administration Structure: Role, power and position of President and Vice President; PM and Council of ministers, Cabinet and Central Secretariat: Powers and Functions of Lok Sabha, Rajya Sabha, The Supreme Court and High Court

UNIT III: THE STATES AND THE UNION TERRITORIES 9

State Government and its Administration:Governor-RoleandPosition–CMandCouncilofministers,State Secretariat: Organisation,StructureandFunctions–RelationbetweentheUnionandtheStates.

UNIT IV: LOCAL ADMINISTRATION 9

District's Administration Head-Role and Importance, Municipalities-Mayorandrole of Elected Representative – Panchayati Raj: Functions PRI: Zilla Panchayat, 73rd and 74th amendments; Elected officials and their roles - Block level Organizational Hierarchy, Village level - Role of Elected and Appointed officials – Importance of grass-root democracy

UNIT V: EMERGENCY PROVISIONS AND THE MAJOR FUNCTIONARIES 9

Emergency: Proclamation of Emergency, types of emergency–Election Commission–Union Service Public Commission –Planning Commission (NITI).

TOTAL: 45 PERIODS

COURSEOUTCOMES: (Each unit – one outcome, total 5 outcomes)
At the end of the course, the students will be able:

COs	Course Outcome (CO)	Cognitive Level
CO-1	Describe historical background of the constitution making and its importance for building a democratic India.	Apply
CO-2	Explain the functioning of three wings of the Union government i.e., executive, legislative and judiciary.	Understand
CO-3	Explain the functions of State Government and the Union Territories and compare with the Union.	Understand
CO-4	Analyse the decentralization of power between central, state and local self-government.	Apply
CO-5	Apply the knowledge in strengthening of the constitutional institutions like CAG, NITI Election Commission and USPC for sustaining democracy.	Apply

CO – PO Mapping

Course Outcomes	Programme Outcomes (Pos)											
	PO-1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	2	2	1	3	3	-	3
CO2	-	-	-	-	-	2	2	1	3	3	-	3
CO3	-	-	-	-	-	2	2	1	3	3	-	3
CO4	-	-	-	-	-	2	2	1	3	3	-	3
CO5	-	-	-	-	-	3	2	1	3	3	-	3

*For Entire Course, PO /PSO Mapping; 1 (Low); 2(Medium); 3(High) Contribution to PO/PSO

TEXT BOOK:

1. Sujit Choudhry, Madhav Khosla, The Oxford Handbook of the Indian Constitution, Oxford University Press Indian Ltd. 2016, ISBN: 9780198787334
2. Mahendra P Singh, Constitution of India, Eastern Book Company, 2024, ISBN: 9789351453512

REFERENCES:

1. Fali S. Nariman, You Must Know Your Constitution, Hay House Publishers India, 2023, ISBN-10 : 8195991726
2. P M Bakshi, Constitution of India, Lexis Nexis, 19th edition 2023

WEBSITE REFERENCE:

1.https://cdnbbsr.s3waas.gov.in/s380537a945c7aaa788ccfcdf1b99b5d8f/uploads/2023/05/2023050195.pdf

2.https://books.google.co.in/books?hl=en&lr=&id=d0knDAAAQBAJ&oi=fnd&pg=PP1&dq=online+material+on+the+constitution+of+india&ots=NCBHUYUqJn&sig=gKBTjU0Wua3EBaYI3GUn9CarZXQ#v=onepage&q=online%20material%20on%20the%20constitution%20of%20india&f=false

3.https://en.bharatpedia.org/wiki/Constitution_of_India

NPTEL/ SWAYAM/ MOOC REFERENCE:

1.https://onlinecourses.nptel.ac.in/noc24_lw05/preview

2.https://archive.nptel.ac.in/courses/129/106/129106003/

3.https://legalaffairs.nalsar.ac.in/students/student/course-details/1/courses

SYLLABUS FOR IV SEMESTER

PUCC4BS07	ENVIRONMENTAL SCIENCE & SUSTAINABILITY	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

1	To introduce the basic concepts of environment, ecosystems and biodiversity and emphasize on the biodiversity of India and its conservation
2	To impart knowledge on the causes, effects and control or prevention measures of environmental pollution and natural disasters.
3	To facilitate the understanding of global and Indian scenario of renewable and non-renewable resources, causes of their degradation and measures to preserve them.
4	To familiarize the concept of sustainable development goals and appreciate the interdependence of economic and social aspects of sustainability, recognize and analyze climate changes, concept of carbon credit and the challenges of environmental management.
5	To inculcate and embrace sustainability practices and develop a broader understanding on green materials, energy cycles and analyze the role of sustainable urbanization

UNIT – I	ENVIRONMENT AND BIODIVERSITY	9

Definition, scope and importance of environment – need for public awareness. Eco-system and Energy flow– ecological succession. Types of biodiversity: genetic, species and ecosystem diversity– values of biodiversity, India as a mega-diversity nation – hot-spots of biodiversity – threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ

UNIT – II	ENVIRONMENTAL POLLUTION	9

Causes, Effects and Preventive measures of Water, Soil, Air and Noise Pollutions. Solid, Hazardous and E-Waste management. Case studies on Occupational Health and Safety Management system (OHASMS). Environmental protection, Environmental protection acts.

UNIT – III	RENEWABLE SOURCES OF ENERGY	9

Energy management and conservation, New Energy Sources: Need of new sources. Different types new energy sources. Applications of- Hydrogen energy, Ocean energy resources, Tidal energy conversion. Concept, origin and power plants of geothermal energy.

UNIT – IV	SUSTAINABILITY AND MANAGEMENT	9

Development, GDP, Sustainability- concept, needs and challenges-economic, social and aspects of sustainability-from unsustainability to sustainability-millennium development goals, and protocols-Sustainable Development Goals-targets, indicators and intervention areas Climate change- Global, Regional and local environmental issues and possible solutions-case studies. Concept of Carbon Credit, Carbon Footprint. Environmental management in industry-A case study

UNIT – V	SUSTAINABILITY PRACTICES	9
Zero waste and R concept, Circular economy, ISO 14000 Series, Material Life cycle assessment, Environmental Impact Assessment. Sustainable habitat: Green buildings, green materials, Energy efficiency, Sustainable transports. Sustainable energy: Non-conventional Sources, Energy Cycles-carbon cycle, emission and sequestration, Green Engineering: Sustainable urbanization- Socio-economic and technological change		
		TOTAL: 45 PERIODS

COURSE OUTCOMES		**Cognitive Level**
CO1	To recognize and understand the functions of environment, ecosystems and biodiversity and their conservation.	, Understanding
CO2	To identify the causes, effects of environmental pollution and natural disasters and contribute to the preventive measures in the society.	, Understanding
CO3	To identify and apply the understanding of renewable and non-renewable resources and contribute to the sustainable measures to preserve them for future generations.	, Understanding
CO4	To recognize the different goals of sustainable development and apply them for suitable technological advancement and societal development.	, Understanding
CO5	To demonstrate the knowledge of sustainability practices and identify green materials, energy cycles and the role of sustainable urbanization.	, Understanding

TEXT BOOKS:	
1	Anubha Kaushik and C. P. Kaushik's "Perspectives in Environmental Studies", 6th Edition, New Age International Publishers, 2018.
2	Benny Joseph, 'Environmental Science and Engineering', Tata McGraw-Hill, New Delhi, 2016..

REFERENCE BOOKS:	
1	Gilbert M. Masters, 'Introduction to Environmental Engineering and Science', 2nd edition, Pearson Education, 2004.
2	Allen, D. T. and Shonnard, D. R., Sustainability Engineering: Concepts, Design and Case Studies, Prentice Hall.
3	Bradley. A.S; Adebayo, A.O., Maria, P. Engineering applications in sustainable design and development, Cengage learning.

WEBSITE REFERENCE / NPTEL/ SWAYAM/ MOOC REFERENCE:	
1	Energy Flow in the Ecosystem: Get Details - Embibe – Energy flow in Ecosystem
2	Biodiversity Conservation - Different Methods And Strategies (byjus.com) – Conservation of

	biodiversity
3	Air Pollution: Types, Causes, Effects and Control Measures - Embibe – Air pollution
4	Complex Ecosystem Dynamics - Course (swayam2.ac.in) - Complex Ecosystem Dynamics

CO-PO MAPPING

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	-	-	-	2	3	-	-	-	-	2	1	1
CO2	3	2	-	-	-	3	3	-	-	-	-	2	1	1
CO3	3	-	1	-	-	2	2	-	-	-	-	2	1	1
CO4	3	2	1	1	-	2	2	-	-	-	-	2	1	1
CO5	3	2	1	-	-	2	2	-	-	-	-	1	1	1

PMC TECH

PUCH4PC05	MASS TRANSFER- I	L T P C
		3 1 0 4

COURSE OBJECTIVE

- Learn and determine mass transfer rates under laminar and turbulent conditions and apply these concepts in the design of humidification columns, dryers and crystallizers.

UNITI – MOLECULARDIFFUSION **12**

Introduction to mass transfer operations. Molecular diffusion in gases, liquids and solids. Diffusivity measurement and prediction; multi-component diffusion

UNIT II –CONVECTIVE TRANSFER AND INTERPHASE MASS TRANSFER **12**

Eddy diffusion, concept of mass transfer coefficients, theories of mass transfer, different transport analogies, application of correlations for mass transfer coefficients, inter phase mass transfer, relationship between individual and overall mass transfer coefficients.NTU and NTP concepts, Stage-wise and differential contractors

UNIT III –HUMIDIFICATION OPERATIONS **12**

Humidification — Equilibrium, humidity chart, adiabatic and wet bulb temperatures; humidification operations; theory and design of cooling towers, dehumidifiers and humidifiers using enthalpy transfer unit concept.

UNITIV- DRYING **12**

Drying — Equilibrium. Classification of dryers, batch drying — Mechanism and time of cross through circulation drying, theoretical estimation of drying rate and time. Continuous dryers — material and energy balance. Advance drying techniques such as freeze drying, micro wave drying.

UNIT V – CRYSTALLIZATION **12**

Crystal geometry. Equilibrium, yield and purity of products, theory of super saturation, nucleation and crystal growth, classification of crystallizers, design of batch crystallizers and continuous crystallizers

TOTAL: 60 PERIODS

COURSE OUTCOMES	Upon completion of this course, the student will be able to	Cognitive Level
CO1	Understand the fundamentals types and mechanism of mass transfer operations	Understand
CO2	Understand the theories of mass transfer and the concept of inter-phase mass transfer	Application
CO3	Understand the concept and mechanism of drying operations	Understand
CO4	Understand the concept of crystallization process and identification of suitable crystallizer	Understand
CO5	Formulate to solve material balances for unit operations such as humidification, drying and crystallization operations	Understand

CO – PO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	2	1	-	-	2	2	-	2	-	-	-	1	1
2	3	2	1	1	-	2	2	-	2	-	-	-	1	1
3	3	2	1	1	-	2	2	-	2	-	-	-	1	1
4	3	2	1	1	-	2	2	-	2	-	-	-	1	1
5	3	2	1	-	-	2	2	-	2	-	-	-	1	1

1-low, 2-medium, 3-high, '-' - no correlation

TEXTBOOK:

1. Treybal,R.E.,"MassTransferOperations",3rdEdition,McGraw-Hill,2017.
2. Narayanan K.V.and Lakshmikutty,B"Mass Transfer Theory and Applications", 1st Edition, CBSPublishers&DistributorsPvtLtd,NewDelhi,2014.

REFERENCES:

1. McCabe, W.L.,Smith,J.C.,and Harriot,P.,"Unit OperationsinChemical Engineering", 7th Edition., McGraw-Hill, 2005
2. Coulson,J.M and Richardson, J.F., "Chemical Engineering" Vol. I&II, 5th Edn., Asian Books Pvt.Ltd., India, 2002

NPTEL/ SWAYAM/ MOOC REFERENCE:

https://archive.nptel.ac.in/course/103/103/103103145/

PUCH4PC06	HEAT TRANSFER	L T P C
		3 1 0 4

COURSE OBJECTIVE

To understand fundamental concepts of heat transfer viz., conduction, convection, radiation, boiling and condensation and its application to the students

UNIT I – IMPORTANCE OF HEAT TRANSFER IN CHEMICAL ENGINEERING OPERATIONS **12**

Importance of heat transfer in Chemical Engineering operations -Modes of heat transfer ; One dimensional steady state heat conduction through plane and composite walls, hollow cylinder and spheres - Thermal conductivity measurement-effect of temperature on thermal conductivity; Heat transfer in extended surfaces; Transient heat conduction

UNIT II – CONVECTION AND DIMENSIONAL ANALYSIS **12**

Concepts of heat transfer by convection - Natural and forced convection, Hydrodynamic and thermal Boundary layers; analogies between transfer of momentum and heat- Reynold's analogy, Prandtl and Colburn analogy. Dimensional analysis in heat transfer, heat transfer coefficient for flow through a pipe, flow past flat plate.

UNIT III – HEAT EXCHANGERS **12**

Heat Exchangers— classification and design, overall and individual film coefficients, mean temperature difference, LMTD correction factor for multiple pass exchanger, NTU and efficiency of Heat exchangers

UNIT IV- BOILING AND CONDENSATION **12**

Heat transfer to fluids with phase change - heat transfer from condensing vapours, drop wise and film wise condensation, Nusselt equation for vertical and horizontal tubes, condensation of superheated vapours, Heat transfer to boiling liquids-mechanism of boiling, nucleate boiling and film boiling

UNIT V – EVAPORATION AND RADIATION **12**

Evaporation- single and multiple effect operation, material and Energy balance in evaporators, boiling point elevation, Duhring's rule. Radiation heat transfer - Black body radiation, Emissivity, Stefan –Boltzmann law, Plank's law, radiation between surfaces

TOTAL: 60 PERIODS

COURSE OUTCOMES	Upon completion of this course, the student will be able to	Cognitive Level
CO1	Understand the fundamentals, types and mechanism of heat transfer operations	Understand
CO2	Understand convective heat transfer and use of heat transfer coefficients for laminar and turbulent flows	Application
CO3	Students will be able to calculate and use overall heat transfer coefficients in designing heat exchangers	Understand
CO4	The course provides the student with knowledge about heat transfer with phase change (boiling and condensation) and evaporation	Understand
CO5	Students will understand radiative heat transfer including black body radiation and Kirchoff's law, and will be able to solve radiative problems apply knowledge of heat transfer to solve thermal engineering problems	Understand

CO – PO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	2	1	-	-	2	2	-	2	-	-	-	1	1
2	3	2	1	1	-	2	2	-	2	-	-	-	1	1
3	3	2	1	1	-	2	2	-	2	-	-	-	1	1
4	3	2	1	1	-	2	2	-	2	-	-	-	1	1
5	3	2	1	-	-	2	2	-	2	-	-	-	1	1

1-low, 2-medium, 3-high, '-' - no correlation

TEXTBOOK:

1. B.K.Dutta, Heat transfer principles and applications, PHIL earning PVT Ltd, 2016
2. Gavhane K A., Heat transfer, Third Edition , NiraliPrakashan (2016)
3. Kern, D.Q., "Process Heat Transfer ", McGraw-Hill, 1999.

REFERENCES:

1. McCabe, W.L.,Smith,J.C.,and Harriot,P.,"Unit Operations inChemical Engineering", 7th Edition., McGraw-Hill, 2005

NPTEL/ SWAYAM/ MOOC REFERENCE:

https://archive.nptel.ac.in/course/103/105/103105140/

PUCH4PC07	CHEMICAL ENGINEERING THERMODYNAMICS	L T P C
		3 1 0 4

COURSE OBJECTIVE

Learn PVT behavior of fluids, laws of thermodynamics, thermodynamic property relations and their application to fluid flow, power generation and refrigeration processes

UNIT I – THERMODYNAMICS LAWS **12**

Terminologies of thermodynamics, the variables and quantities of thermodynamics, characteristics of systems and processes, energy classifications, point and path functions, energy in transition work and heat. Zeroth law; temperature scales

UNIT II – PVT BEHAVIOUR OF FLUIDS **12**

The first law of thermodynamics, statements of first law for the flow and non-flow processes. PVT behaviour of fluids; Mathematical representation of PVT behaviour; generalized compressibility factor correlation; generalized equations of state

UNIT III – REFRIGERATION AND CARNOT CYCLE **12**

Joule's experiment, energy balance for closed systems, mass and energy balance for open systems, Statements of the second law of thermodynamics, heat engine and refrigerator, Carnot cycle and Carnot theorems, thermodynamic temperature scale, entropy and its calculation, second law of thermodynamics for a control volume, Third law of thermodynamics, entropy from a microscopic point of view.

UNITIV- THERMODYNAMICS PROPERTIES OF SOLUTION **12**

Thermodynamic properties – internal energy, enthalpy, Helmholtz free energy, Gibbs free energy; thermodynamic property relations – Maxwell relations – partial derivatives and Jacobian method;residualproperties;thermodynamicpropertytablesanddiagrams

UNIT V –COMPRESSION AND EXPANSION **12**

Thermodynamic aspects of compression, expansion processes and duct flow of compressible fluids, steam power plant.

TOTAL: 60 PERIODS

COURSE OUTCOMES	Upon completion of this course, the student will be able to	Cognitive Level
CO1	Understand the fundamental concepts of thermodynamics and its related functions	Understand
CO2	Relate PVT behavior of fluids and understand the real gas behavior	Application
CO3	Apply second law and analyses the feasibility of system/devices	Application
CO4	Analyse the thermodynamic property relations and their application to fluid flow	Understand
CO5	Develop the significance of thermodynamic potentials and their use in the analysis of processes and formulate thermodynamic formulations and the working of compressors and expanders	Understand

CO – PO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	2	1	-	-	2	2	-	2	-	-	-	1	1
2	3	2	1	1	-	2	2	-	2	-	-	-	1	1
3	3	2	1	1	-	2	2	-	2	-	-	-	1	1
4	3	2	1	1	-	2	2	-	2	-	-	-	1	1
5	3	2	1	-	-	2	2	-	2	-	-	-	1	1

1-low, 2-medium, 3-high, '-' - no correlation

TEXTBOOK:

1. NarayananK.V" A Text Book of Chemical Engineering Thermodynamics" Prentice Hall of India Pvt.Ltd, 2ndedition, 2013
2. Gavhane K A., Chemical Engineering Thermodynamics,Third Edition , NiraliPrakashan (2016)

REFERENCES:

1. Sandler,S.I.,"Chemical and Engineering Thermodynamics",IV Edition,Wiley,2006.
2. Kevin Douglas, Fundamentals of Chemical Engineering Thermodynamics, TimothyAnderson,2015

NPTEL/ SWAYAM/ MOOC REFERENCE:

https://archive.nptel.ac.in/course/103/105/103105140/

PUCH4PC08	CHEMICAL TECHNOLOGY	L T P C
		3 1 0 3

COURSE OBJECTIVE

To impart knowledge on various aspects of production engineering and make the student understand the practical methods of production in a chemical factory.

UNITI – SULFUR, SULFURICACID AND CEMENT **9**

Sulfur, Raw materials Sources, Mining and production of Sulfur – Sulfuric acid, Methods of production of Sulfuric acid–Contact process–Chamber process. Cement–properties of Cement–Methods of production–Over all factors for Cement industry.

UNIT II – FERTILIZER INDUSTRY **9**

Major Components of Fertilizer industries – Nitrogen industries, ammonia, nitric acid, urea – Phosphorus industries, Phosphoric acid, Single Super Phosphate, DAP, MAP and NPK – Potassiumchloride,PotassiumSulphate–LiquidFertilizers–BioFertilizers

UNIT III – PULP, PAPER, SUGAR AND STARCH INDUSTRIES **9**

Pulp–Methods of production–Comparison of pulping processes. Paper–types of paper products, Raw materials, Methods of production. Sugar–Methods of production–byproducts of the Sugar industry–Starch–Methods of production, Starch derivations.

UNIT IV-PETROLEUM AND PETROCHEMICAL INDUSTRIES **9**

Petroleum–Chemical Composition, Classification of crude petroleum, Petroleum Refinery products –Petroleum Conversion processes–Pyrolysis and Cracking, Reforming Polymerization, isomerization and Alkylation – petrochemicals – methanol, chloro methanol, Acetylene and ethylene,Isopropanol,Acrylonitrile,Butadiane–ChemicalsfromAromatics-Benzene,TolueneandXylene

UNIT V – FUEL AND INDUSTRIAL GASES **9**

Fuel Gases – Natural gas, Liquefied natural gas, Synthesis Gas – Industrial gases – Carbon dioxide, hydrogen, nitrogen and oxygen–Argon

TOTAL: 45 PERIODS

COURSE OUTCOMES	Upon completion of this course, the student will be able to	Cognitive Level
CO1	Understand the various unit operations and processes with their symbols	Understand
CO2	Apply the various chemical reactions involved in the process	Application
CO3	Students will know to draw the process Flow sheet and understand the major engineering problems encountered in the processes	Understand
CO4	To learn manufacturing processes of organic and In organic Chemicals and its applications	Understand
CO5	Students will understand the role of chemical Engineering in the process plants.	Understand

CO – PO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	2	1	-	-	2	2	-	2	-	-	-	1	1
2	3	2	1	1	-	2	2	-	2	-	-	-	1	1
3	3	2	1	1	-	2	2	-	2	-	-	-	1	1
4	3	2	1	1	-	2	2	-	2	-	-	-	1	1
5	3	2	1	-	-	2	2	-	2	-	-	-	1	1

1-low, 2-medium, 3-high, '-' - no correlation

TEXTBOOK:

1. Dryden,C.E,Outlines of Chemical technology,IIEd.,AffiliateEastWestpress,2003.
2. Moulin,J.A.,M.Makkee,and Diepen,A.V.,Chemical Process Technology, Wiley,Secondedition2013.

REFERENCES:

1. Austin,G.T., Shreve's"ChemicalProcessIndustries",5th ed.,McGraw-Hill,2017

NPTEL/ SWAYAM/ MOOC REFERENCE:

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PUCH4PL03	TECHNICAL ANALYSIS LABORATORY	L T P C
		3 1 0 2

COURSE OBJECTIVE

- To learn basic principles involved in estimation and characterization of industrially important materials.

LISTOF EXPERIMENTS

Experiments:

I. Soap Analysis
a. Estimation of total fatty acid
b. Estimation of percentage alkali content
II. Oil Analysis
a. Estimation of free acid
b. Determination of Saponification value
c. Determination of iodine value
III. Cement Analysis
a. Estimation of Silica content
b. Estimation of mixed oxide content
c. Estimation of calcium oxide content
d. Estimation of calcium oxide by rapid method
IV. Coal Analysis
a. Estimation of Sulphur present in coal
b. Ultimate analysis of coal
c. Proximate analysis of coal
V. Analysis of Bleaching Powder
a. Estimation of available chlorine
VI. Analysis of Glycerol Estimation of purity of glycerol
VII. Analysis of fuels
a. Flashpoint
b. Fire point
c. Cloud point
d. Pour point
e. Aniline point.

***Minimum 10 experiments shall be offered**

TOTAL: 60 PERIODS

COURSE OUTCOMES	Upon completion of this course, the student will be able to	Cognitive Level
CO1	Understand the estimation and analysis of Soap.	Understand
CO2	Understand the estimation and analysis of Cement Analysis	Application
CO3	Understand the estimation and analysis of Analysis of purity of glycerol, bleaching powder and fuels.	Understand

CO – PO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	2	1	-	-	2	2	-	2	-	-	-	1	1
2	3	2	1	1	-	2	2	-	2	-	-	-	1	1
3	3	2	1	1	-	2	2	-	2	-	-	-	1	1

1-low, 2-medium, 3-high, '-' - no correlation

PUCH4PL04	HEAT TRANSFER LABORATORY	L T P C
		3 1 0 2

COURSE OBJECTIVE

- Provide Students with solid practical understanding of various heat transfer equipment kinds.

LISTOF EXPERIMENTS

1. Measurement of Thermal Conductivity of metal rod
2. Performance studies on Cooling Tower
3. Batch drying kinetics using Tray Dryer
4. Heat transfer in single effect Evaporator
5. Boiling Heat Transfer
6. Heat Transfer through Packed Bed
7. Heat Transfer in a Double Pipe Heat Exchanger
8. Heat Transfer in a Shell and tube Heat Exchanger
9. Heat Transfer in a Vertical /Horizontal Condenser
10. Heat Transfer in Helical Coils
11. Heat Transfer in Agitated Vessels
12. Heat transfer studies in Stefan-Boltzmann apparatus

***Minimum 10 experiments shall be offered**

TOTAL: 60 PERIODS

COURSE OUTCOMES	Upon completion of this course, the student will be able to	Cognitive Level
CO1	Apply the concepts of heat transfer and fluid dynamics to the operation of heat transfer equipments	Understand
CO2	Estimate the heat transfer rate and heat transfer co-efficient	Application
CO3	To perform heat transfer operation and to compare observed with predicted performance.	Understand

CO – PO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	2	1	-	-	2	2	-	2	-	-	-	1	1
2	3	2	1	1	-	2	2	-	2	-	-	-	1	1
3	3	2	1	1	-	2	2	-	2	-	-	-	1	1

1-low, 2-medium, 3-high, '-' - no correlation

PMC23UMC2001	MANDATORY COURSES – II	L T P C
	PRACTICES FOR WELL BEING	3 0 0 3

COURSE OBJECTIVE

1. To provide an effective educational program that will equip students to gain an in-depth understanding of the various ways to improve Physical & Mental Health and Wellbeing.
2. To produce interdisciplinary/intersectional student research that addresses Health and hygiene, Diseases and disorders, Diet and nuitrician and traditional and modern practices of wellbeing.
3. To Engage students in a process of healthy behavior change or health promotion.

UNIT I: HEALTH AND ITS IMPORTANCE 9

Health: WHO definition – Ten types of health one has to maintain-Physical health-Mental health-Social health-Financial health-Emotional health-Spiritual health-Intellectual health-Relationship health-Environmental health-Occupational/Professional heath – Prevention is better than Cure.

UNIT II: DISEASES AND DISORDERS 9

Life expectancy rate - mortality rate

Types of diseases and disorders - dreadful diseases -Non-communicable diseases (NCDs) - heart disease – cancer –chronic pulmonary diseases - Lifestyle disorders – Obesity – Diabetes – Cardiovascular diseases– Strokes– hypertension – PCOD –infertility – ADHD – sleeplessness-Mental health issues. **Causes& Risk** factors – tobacco – alcohol - unhealthy diet - lack of physical activities.

UNIT III: DIET AND NUITRICIAN 9

Role of diet in maintaining health-energy one needs to keep active throughout the day-nutrients one needs for growth and repair.

Balanced Diet and its 7 Components - Carbohydrates – Proteins – Fats – Vitamins – Minerals –Fibre and Water.

Food additives and their merits & demerits - Effects of food additives - Types of food additives –Food additives and processed foods-Food additives and the irreactions

Simple life style modifications to maintain health-Healthy Eating habits (Balanced diet according) Physical Activities (Stretching exercise, aerobics, resisting exercise)-Maintaining BMI-Importance and actions to be taken.

UNIT IV: AYURVEDA & SIDDHA SYSTEMS 9

AYUSH systems and their role in maintaining health Traditional Diet and Nutrition - Regimen of Personal andSocialHygiene-Dailyroutine(Dinacharya)-Seasonalregimens(Ritucharya)- basic sanitation and healthy living environment -Sadvritta(good conduct) -for conducive social life. **Principles of Siddha & Ayurveda systems -** Macrocosm and Microcosm theory -Pancheekarana Theory / (Five Element Theory) 96 fundamental Principles – Uyir Thathukkal (Tri-DoshaTheory)-Udal Thathukkal

UNIT V: PHYSICAL & EMOTIONAL WELLNESS 9

Definition and importance of yoga-Types of yoga- The Eight Limbs of Yoga - Simple Yogasanas for cure and prevention of health disorders-What yoga can bring to our life. **Emotional health -** 3 key elements: the subjective experience – the physiological response - the behavioral response - Role of emotions in daily life - Short term and long term effects of emotional disturbances - Practices for emotional health - Recognize how thoughts influence emotions - Cultivate positive thoughts - Practice self-compassion - Expressing a full range of emotions. **Stress management -** Stress definition - How stress affects one's life -causes of stress - Symptoms of stress - Managing stress (habits, tools, training, professional help)-Complications of stress mismanagement. **Sleep-**Sleep and its importance for mental wellness-Sleep and digestion.

Immunity-Types and importance-Ways to develop immunity

TOTAL: 45 PERIODS

COURSE OUTCOMES:

(Each unit – one outcome, total 5 outcomes)

At the end of the course, the students will be able:

COs	KL	Course Outcome (CO)	Cognitive Level
CO-1	K2	Able to describe Health and its importance at multi-dimensional levels.	Understand
CO-2	K2	To be summarize on various diseases and disorders and their symptoms.	Understand
CO-3	K3	Able to illustrate habits of food intake and nutritious diet.	Apply
CO-4	K2	To explain on traditional methods of Medical Treatments: Ayurvedha and Siddha.	Understand
CO-5	K3	Able to Implement best practices to manage physical and emotional Quotient.	Apply

CO – PO Mapping

Course Outcomes	Programme Outcomes (Pos)											
	PO-1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	1	1	-	2	1	-	3
CO2	-	-	-	-	-	1	1	-	2	1	-	3
CO3	-	-	-	-	-	1	2	-	2	1	-	3
CO4	-	-	-	-	-	1	1	-	2	1	-	3
CO5	-	-	-	-	-	1	1	-	3	1	-	3

*For Entire Course, PO /PSO Mapping; 1 (Low); 2(Medium); 3(High) Contribution to PO/PSO

TEXT BOOK:

1. Ashley Martin: Nutrition and Dietetics, Published by White Word Publications, New York, NY 10001.
2. Cory Martin: Yoga for Beginners_35 Simple Yoga Poses to Calm Your Mind and Strengthen Your Body, Althea Press, Berkeley, California, 2015

REFERENCES:

1. Moshe Zeidner, Gerald Matthews, and Richard D.Roberts, : WHAT WE KNOW ABOUT EMOTIONAL INTELLIGENCE How It Affects Learning, Work, Relationships, and Our Mental Health, The MIT Press, Cambridge, Massachusetts, London, England
2. Kristin Neff, Ph.D Christopher Germer, Ph.D,: The Mindful Self-Compassion Work book The Guil ford Press A Division of Guil for d Publications, 2011

WEBSITE REFERENCE:

1. https://www.who.int/
2. https://standard.wellcertified.com/mind/health-and-wellness-awareness
3. https://www.niehs.nih.gov/health/topics/conditions
4. https://www.ayurwakeup.com/how-are-ayurveda-and-yoga-related/#:~:text=Yoga%20can%20help%20release%20physical,their%20physical%20health%20as%20well.

5. https://ayurhealing.net/blog/comparing-homeopathy-allopathy-and-ayurveda/
6. https://www.medicalnewstoday.com/articles/286745
7. https://yoga.ayush.gov.in/blog?q=58
8. https://www.yogabasics.com/practice/

NPTEL/ SWAYAM/ MOOC REFERENCE:

1. https://www.tnpesu.org/syllabus/414%20-%20Certificate%20Course%20in%20Yoga%20and%20Naturopathy
2. https://onlinecourses.swayam2.ac.in/aic23_ge05/preview
3. https://onlinecourses.nptel.ac.in/noc21_hs29/preview

PMC TECH

PMC23UMC2H02	MANDATORY COURSES – II	L T P C
	HISTORY OF SCIENCE AND TECHNOLOGY IN INDIA	3 0 0 3

COURSE OBJECTIVE

1. To provide an understanding of the socio-cultural and philosophical context in which the various scientific and technological ideas got developed in India
2. Stimulate students interest in knowing various evolutions and thereby help in repositioning India's contributions in science and technology.

UNIT I: CONCEPTS AND PERSPECTIVES 9

Science and Technology-Meaning, Scope and Importance, Interaction of science, technology &society, Sources of history on science and technology in India. Introduction to the works of D.D.Kosambi,Dharmpal,DebiprasadChattopadhyay,Rehman,S.IrfanHabib, Deepak Kumar, Dhruv Raina, and others

UNIT II: SCIENCE ANDTECHNOLOGY IN ANCIENT INDIA 9

Technology in pre-historic period - Beginning of agriculture and its impact on technology - Science and Technology during Vedic and Later Vedic timesScience and technologyfrom1st centuryAD toC-1200.

UNIT III: SCIENCE AND TECHNOLOGY IN MEDIEVAL INDIA 9

Legacy of technology in Medieval India, Interactions with Arabs-Development in medical knowledge, interaction between Unani and Ayurveda and alchemy –Astronomy and Mathematics: interaction with Arabic Sciences-Science and Technology on the eve of British conquest

UNIT IV: SCIENCE AND TECHNOLOGY IN COLONIAL INDIA 9

Science and the Empire - Indian response to Western Science Growth of techno-scientific institutions

UNIT V: SCIENCE AND TECHNOLOGY IN A POST-INDEPENDENT INDIA 9

Science, Technology and Development discourse - Shaping of the Science and Technology – Policy Developments in the field of Science and Technology - Science and technology in globalizing India-Social implications of new technologies like the Information Technology and Biotechnology.

TOTAL: 45PERIODS

COURSEOUTCOMES:

(Each unit – one outcome, total 5 outcomes)

At the end of the course, the students will be able:

COs	KL	Course Outcome (CO)	Cognitive Level
CO-1	K2	Able to explain the origin and development of Science & Technology in India.	Understand
CO-2	K2	Able to Summarize the evolution of Science and Technology in Ancient India.	Understand
CO-3	K2	Comprehend the evolution of Science and Technology in Medieval India.	Understand
CO-4	K2	Comprehend the evolution of Science and Technology during Colonialism.	Understand
CO-5	K2	Comprehend the evolution of Science and Technology during Modern period in India.	Understand

CO – PO Mapping

Course Outcomes	Programme Outcomes (Pos)											
	PO-1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1						3	-	-	1	1	-	3
CO2						3	-	-	1	1	-	3
CO3						3	-	-	1	1	-	3
CO4						3	-	-	1	1	-	3

CO5						3	-	-	1	1	-	3	

*For Entire Course, PO /PSO Mapping; 1 (Low); 2(Medium); 3(High) Contribution to PO/PSO

TEXT BOOK:

1. Kuppuram. G.: History of Science and Technology in India, South Asia Books, 1990, ISBN-13: 978-8185067315.
2. Dr. P Lathwal,: A Brief History of Science & Technology In India, Indu Book Services Pvt Ltd, 2022, ISBN: 9789391377205

REFERENCES:

1. Suvobrata Sarkar, :History of Science, Technology, Environment, and Medicine in India, Taylor & Francis, 2021, ISBN: 1000485005
2. Rattan Lal Hangloo,:HISTORY OF SCIENCE AND TECHNOLOGY: Exploring New Themes, Rawat Publications, 2011, ISBN 9788131604267
3. Dilip K. Chakrabarti,:History of Ancient India: Volume IX: Science and Technology, Medicine, Aryan Books International, 2023, ISBN: 9788173054884
4. The Great Indian Scientists,:Cengage India Private Limited, 2017, ISBN-13 : 8131533321-978
5. D M Bose, S N Sen, B V Subbarayappa,:A Concise History of Science in India, Orient Blackswan, 2009, ISBN: 9788173716195

WEBSITE REFERENCE:

1. https://en.wikipedia.org/wiki/History_of_science_and_technology_on_the_Indian_subcontinent
2. https://en.wikipedia.org/wiki/Science_and_technology_in_India
3. https://link.springer.com/journal/43539
4. https://www.youtube.com/watch?v=zxDp7OkjlLM
5. https://en.wikipedia.org/wiki/List_of_Indian_scientists
6. https://www.indiascience.in/
7. http://www.indianscience.org/index.html
8. https://www.ias.ac.in/About_IASc/History/

NPTEL/ SWAYAM/ MOOC REFERENCE:

1. https://onlinecourses.swayam2.ac.in/arp20_ap35/preview
2. https://onlinecourses.nptel.ac.in/noc20_ae10/preview
3. https://www.classcentral.com/subject/indian-history
4. https://iisc.ac.in/courses/

PMC23UMC2H03	MANDATORY COURSES – II	L T P C
	POLITICAL AND ECONOMIC THOUGHT FOR A HUMAN SOCIETY	3 0 0 3

COURSE OBJECTIVE

1. To understand the political history of a diversity of development paradigms.
2. To develop a comparative research paper that seeks to understand why development politics and outcomes have varied across time and/or across geographic space.
3. To read theoretical and policy literature and be able to identify key concepts, arguments, assumptions, and adequacy of logic as well as evidence.

UNIT I: SOCIETY & HUMANE 9

Society – Human – Six Senses - Responsibilities – holistic thought – Desires – harmony in self, Relationship, society, nature, societal systems.

UNIT II: EVOLUTION OF POLITICAL THOUGHTS 9

Capitalism–Free markets, demand-supply, perfect competition, laissez- faire, monopolies, imperialism, Liberal democracy - Fascism and totalitarianism. World war I and II. Cold war - Communism–Mode of production, theory of labour, surplus value, class struggle, dialectical materialism, historical materialism, Russian and Chinese models.

UNIT III: GANDHIAN THOUGHTS 9

Gandhian thought. Swaraj, Decentralized economy & polity, Community. Control over one's lives. Relationship with nature – Welfare state. Relation with human desires. Empowered human beings, satisfaction.

UNIT IV: CIVILIZATIONS 9

History of Civilization – Indian Civilization – Essential elements of Indian civilization – Technology as driver of society, Role of education in shaping of society. Future directions.

UNIT V: MODERN ECONOMY 9

Concept of modernity - Tradition Vs Modernity – Globalization – Industrial Revolutions – Modernism and Post – Modernism.

TOTAL: 45 PERIODS

COURSE OUTCOMES: (Each unit – one outcome, total 5 outcomes)
At the end of the course, the students will be able:

COs	KL	Course Outcome (CO)	Cognitive Level
CO-1	K2	Able to describe human, society and their interrelationships	Understand
CO-2	K2	Able to summarize various political theories and their evolutions.	Understand
CO-3	K2	To summarize the theory of Gandhi and his uniqueness.	Understand
CO-4	K3	To be illustrate the formation, role and future of civilization in making of human	Apply
CO-5	K3	To be illustrate the trends of Modern Economic Policies.	Apply

CO – PO Mapping												
Course Outcomes	Programme Outcomes (Pos)											
	PO-1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1						3	-	1	2	1	-	3
CO2						3	-	1	2	1	-	3
CO3						3	-	1	2	1	-	3
CO4						3	-	1	2	1	-	3
CO5						3	-	1	2	1	-	3

*For Entire Course, PO /PSO Mapping; 1 (Low); 2(Medium); 3(High) Contribution to PO/PSO

TEXT BOOK:

1. Jogdand P G, Globalization and social movements : Struggle for a humane society, Jaipur Rawat Publications, 2003, ISBN: 9788170338154
2. Adam Smith, The Wealth of Nations, Fingerprint Publishing, 2018, ISBN-13: 9387779464-978

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1. Maharajan. M, Economic Thoughts of Mahatma Gandhi, Discovery Publishing Pvt.Ltd; First Edition, 2008, ISBN-13 : 8171414154-978
2. James Mill, The Elements of Political Economy, Cosimo Classics, 2007, ISBN-13 : 1602069800-978
3. Lokanathan. V., A History Of Economic Thought, S Chand & Co Ltd, 2018, ISBN-13 : -978 9352533374

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1. https://www.acton.org/node/6298
2. https://thegreatthinkers.org/
3. https://oll.libertyfund.org/pages/major-political-thinkers
4. https://www.youtube.com/watch?v=3_lmd4XH-a4
5. https://en.wikipedia.org/wiki/Political_philosophy

NPTEL/ SWAYAM/ MOOC REFERENCE:

1. https://onlinecourses.swayam2.ac.in/nou21_hs34/preview

PMC23UMC2H04	MANDATORY COURSES – II	L T P C
	SOCIOLOGY, SOCIETY AND CULTURE	3 0 0 3

COURSE OBJECTIVE

- To understand the reciprocal relationship between the individual and society.
- To develop an understanding of societal and cultural dimensions of the nature of society and the environment in which they will live and work as scientists, engineers and entrepreneurs.
- To analyse problems and frame research questions relating to humans and their experience.

UNIT I: SOCIOLOGY AS A SCIENCE 9

Sociology and common Sense – Sociology and current affairs – Sociology as a science – Logic in sociological inquiry – Sociology of action – The field and relevance of sociology – Positivism

UNIT II: SOCIETY AND CULTURE 9

Culture and society – The structure of culture – Cultural Traits and complexes – Sub cultures and counter cultures – Cultural integration – Cultural relativism – Real and Ideal culture – Ethnocentrism - Xenocentrism – Cultural lag.

UNIT III: SOCIAL INSTITUTIONS 9

The concept of varna – The Caste system: Origin and characteristics (of caste) as a system – Hierarchy based on birth – Religious sanctions on social participation - Caste and sub caste – Caste conflicts – Caste councils – An appraisal of caste system – Prospects of caste in modern India. The Class system: What is social class? – Development of class - Self-identification and class consciousness – Class in It self and class for it self – Class having blue collar status and white collar status – Industrial class – Significance of social class. The future of social classes: From Proletariat to status seekers.

UNIT IV: ENVIRONMENT AND ECOLOGY 9

Conceptualising environment - Forest, ecology and society – Common Property Resources and its management – Significance of forest and environment in modern life – environmental movement with reference to forest and water management

UNIT V: ISSUES OF MODERNITY 9

Concept of modernity – Tradition Vs Modernity – Globalization: Is globalization new and real? – Has globalization weakened the state? – Has globalization led to cultural homogenisation? – Does globalization lead to a clash of cultures?

TOTAL: 45 PERIODS

COURSE OUTCOMES: (Each unit – one outcome, total 5 outcomes)
At the end of the course, the students will be able:

COs	Course Outcome (CO)	Cognitive Level
CO-1	Able to Describe Society in terms of science and find logic behind establishment of society.	Understand
CO-2	Able to Illustrate Society with Culture to develop the best cultural environment.	Apply
CO-3	To summarize two major revolutionary concepts of Varna: The Caste and The Class.	Understand
CO-4	Able to describe the relationship between environment and modern society.	Understand
CO-5	Able to illustrate various levels of modern issues in the evolution of society.	Apply

CO – PO Mapping

Course Outcomes	Programme Outcomes (Pos)											
	PO-1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1						3	-	1	3	1	-	3
CO2						3	-	1	3	1	-	3
CO3						3	-	1	3	1	-	3
CO4						3	3	1	3	1	-	3
CO5						3	-	2	3	1	-	3

*For Entire Course, PO /PSO Mapping; 1 (Low); 2(Medium); 3(High) Contribution to PO/PSO

TEXT BOOK:

1. Rosamund Billington, Sheelagh Strawbridge, Culture and Society: A Sociology of Culture, Palgrave Macmillan, 1991, ISBN-13 : 0333460399-978
2. Subas Mohapatra, Society and Culture in India: A Reader, Orient Blackswan, 2017, ISBN: 9789383166145.

REFERENCES:

1. Satish Chandra, State, Society, and Culture in Indian History, Oxford University Press, 2012, ISBN: 9780198077398
2. Byran S. Turner, Chris Rojek, Society & Culture, Sage Knowledge, 2001, ISBN: 9780761970491

WEBSITE REFERENCE:

1. https://en.wikipedia.org/wiki/Society
2. https://en.wikipedia.org/wiki/Culture
3. https://www.sparknotes.com/sociology/society-and-culture/context/
4. https://en.wikipedia.org/wiki/Sociology_of_culture
5. https://ncert.nic.in/textbook/pdf/kesy104.pdf

NPTEL/ SWAYAM/ MOOC REFERENCE:

1. https://nptel.ac.in/courses/109106180
2. https://archive.nptel.ac.in/courses/109/103/109103023/
3. https://onlinecourses.swayam2.ac.in/cec21_hs40/preview
4. https://www.my-mooc.com/en/categorie/sociology
5. https://egyankosh.ac.in/handle/123456789/66016
6. https://onlinecourses.swayam2.ac.in/cec24_hs15/preview