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

(Version 1)

B.E. Mechanical Engineering

Applicable from 2023 -24 onwards

REGULATIONS 2023 - AUTONOMOUS
CHOICE BASED CREDIT SYSTEM
B. E. MECHANICAL 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	PUME2PC01	Engineering Mechanics	PC	3	-	-	3	3
5	PUCC2BE02	Basic Electrical & Electronics Engineering	BE	3	-	-	3	3
6	PUCC2BE03	Problem Solving using Python Programming	BE	2	-	-	2	2
7	PUCC2HM05	Tamils and Technology தமிழரும் தொழில்நுட்பமும்	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	PUME3PC02	Engineering Thermodynamics	PC	3	1	-	4	4
3	PUME3PC03	Fluid Mechanics and Machinery	PC	3	1	-	4	4
4	PUME3PC04	Manufacturing Technology -I	PC	3	-	-	3	3
5	PUCE3PC05	Strength of Materials	PC	3	1	-	4	4
6	PUCC3MCXX	Mandatory Course – I (Non-Credit)	MC	2	-	-	2	0
PRACTICALS								
7	PUME3PL01	Fluid Mechanics & Machinery and Material Testing Laboratory	PC	-	-	4	4	2
8	PUME3PL02	Manufacturing Technology Laboratory - I	PC	-	-	4	4	1.5
9	PUCC3HM07	Extension Activities	HM	-	-	1	1	0
Total				20	4	9	30	22.5

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	PUME4PC06	Metrology and Measurements	PC	3	-	-	3	3
3	PUME4PC07	Thermal Engineering	PC	3	1	-	4	4
4	PUME4PC08	Manufacturing Technology-II	PC	3	-	-	3	3
5	PUME4PC09	Kinematics of Machinery	PC	3	-	-	3	3
6	PUCC4MCXX	Mandatory Course – II (Non-Credit)	MC	2	-	-	2	0
PRACTICALS								
7	PUME4PL03	Metrology and Measurements Laboratory	PC	-	-	4	4	2
8	PUME4PL04	Manufacturing Technology Laboratory – II	PC	-	-	4	4	1.5
9	PUME4PL05	Thermal Engineering Laboratory	PC	-	-	4	4	2
10	PUCC4HM08	Extension Activities	HM	-	-	1	1	0
11	PUME4IP01	In-plant Training / Internship	SD	-	-	-	-	-
Total				17	1	13	31	21.5

- 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

22.

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	PUME5PC10	Design of Machine Elements	PC	3	-	-	3	3
3	PUME5PC11	Dynamics of Machines	PC	3	1	-	3	3
4	PUME5PC12	Computer Aided Design	PC	3	-	-	3	3
5	PUME5PEXX	Professional Elective -I	PE	3	-	-	3	3
6	PUME5IL01	Industry Lecture	SD	1	-	-	1	0
PRACTICALS								
7	PUME5PL06	CAD Laboratory	PC	-	-	4	4	2
8	PUME5PL07	Kinematics and Dynamics Laboratory	PC	-	-	4	4	2
9	PUCC5PD01	Professional Development- I	SD	-	-	2	2	1
10	PUME5IP02	In-plant Training / Internship	SD	-	-	-	-	-
Total				16	1	10	27	20

- 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 -VI

S.No	Course Code	Course Name	Category	Periods Per Week			Total Contact Periods	Credits
				L	T	P		
THEORY								
1	PUME5PC13	Heat and Mass Transfer	PC	3	1	-	4	4
2	PUME6PC14	Design of transmission System	PC	3	-	-	3	3
3	PUME6PC15	Finite Element Analysis	PC	3	1	-	4	4
4	PUME6PEXX	Professional Elective – II	PE	3	-	-	3	3
5	PUME6PEXX	Professional Elective – III	PE	3	-	-	3	3
6		Open Elective – I (Management)	OE	3	-	-	3	3
7	PUME6IL02	Industry Lecture	SD	1	-	-	1	0
PRACTICALS								
8	PUME6PL08	Heat Transfer Laboratory	PC	-	-	4	4	1.5
9	PUCC6PD02	Professional Development II	SD	-	-	2	2	1
10	PUCC6VA01	Technical Skill Development I	SD	-	-	2	2	1
11	PUME6IP03	In-plant Training / Internship	SD	-	-	-	-	-
Total				19	2	8	29	23.5

- 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
- 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	PUME7PC16	Mechatronics	PC	3	-	-	3	3
2	PUME7PEXX	Professional Elective – IV	PE	3	-	-	3	3
3	PUME7PEXX	Professional Elective – V	PE	3	-	-	3	3
4		Open Elective – II	OE	3	-	-	3	3
5		Open Elective – III	OE	3	-	-	3	3
PRACTICALS								
6	PUME7PL09	Mechatronics Laboratory	PC	-	-	4	4	1.5
7	PUME7PL10	Simulation and Analysis Laboratory	PC	-	-	4	4	2
8	PUCC7VA02	Technical Skill Development -II	SD	-	-	2	2	1
9	PUME7PR01	Project Phase – I	PROJECT	-	-	2	2	1
Total				15	-	12	27	20.5

SEMESTER - VIII

S.No	Course Code	Course Name	Category	Periods Per Week			Total Contact Periods	Credits
				L	T	P		
Project								
1	PUME8PR02	Project Phase – II / Internship	PROJECT	-	-	24	24	12
Total				-	-	24	24	12

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

SUMMARY

B.E. MECHANICALENGINEERING										
S.NO	Subject Area	I	II	III	IV	V	VI	VII	VIII	Total Credits
		Credits Per Semester								
1	HM	5	5			3				13
2	BS	12	7	4	3					26
3	BE	4	9							13
4	PC		3	18.5	18.5	13	12.5	6.5		72
5	PE					3	6	6		15
6	OE						3	6		9
7	PR							1	12	13
8	SD					1	2	2		5
Total		21	24	22.5	21.5	20	23.5	20.5	12	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 OBJECTIVES:

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

UNIT – I	INTRODUCTION TO COMMUNICATION	6

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

ME09

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

TEXT BOOKS:	
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.

REFERENCE BOOKS:	
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 / 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)
3	http://www.indiabix.com/group-discussion/topics-with-answers/
4	http://www.dailywriting tips .com/

CO-PO MAPPING

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	-	-	-	-	-	3	-	2	3	3	1
CO2	2	-	-	-	-	-	2	-	1	3	3	-
CO3	3	-	-	-	-	-	2	-	2	3	3	-
CO4	4	-	-	-	-	-	2	-	1	3	3	1
CO5	5	-	-	-	-	-	1	-	1	2	2	-

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

COURSE OBJECTIVES:

1	To develop the use of matrix algebra techniques that are needed by engineers for practical applications
2	To familiarize the students with differential calculus.
3	To familiarize the student with functions of several variables. This is needed in many branches of engineering.
4	To make the students understand various techniques of integration
5	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: 60 PERIODS

COURSE OUTCOMES		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

TEXT BOOKS:	
1	Kreyszig.E, "Advanced Engineering Mathematics", John Wiley and Sons, 10th Edition, New Delhi, 2016.
REFERENCE BOOKS:	
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 / 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.
4	https://3lihandam69.files.wordpress.com/2018/10/calculus-10th-edition-anton.pdf - Calculus 10th Edition anton.pdf
5	https://www.hzu.edu.in/engineering/Higher%20Engineering%20Mathematics.pdf - Higher Engineering Mathematics, Sixth Edition.
6	https://dl.konkur.in/post/Book/Paye/Thomas-Calculus-14th-Edition-%5Bkonkur.in%5D.pdf
7	https://archive.org/details/advanced-engneering-maths - High advanced Engineering Mathematics

CO-PO MAPPING

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

PUCC1BS02	ENGINEERING PHYSICS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

1	To make the students effectively to achieve an understanding of mechanics.
2	To enable the students to gain knowledge of electromagnetic waves and its applications
3	To introduce the basics of oscillations, optics and lasers
4	Equipping the students to be successfully understand the importance of quantum physics.
5	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, CO_2 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

COURSE OUTCOMES Upon completion of this course, the student will be able to		Cognitive level
CO1	Comprehend the basics and importance of mechanics	Understand

ME13

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

TEXT BOOKS:

1	D. Kleppner and R. Kolenkow. An Introduction to Mechanics. McGraw Hill Education (Indian Edition), 2017.
2	Arthur Beiser, Shobhit Mahajan, S. Rai Choudhury, Concepts of Modern Physics, McGraw-Hill (Indian Edition), 2017.

REFERENCE BOOKS:

1	R.Wolfson. Essential University Physics. Volume 1 & 2. Pearson Education (Indian Edition), 2009.
2	K.Thyagarajan and A.Ghatak. Lasers: Fundamentals and Applications, Laxmi Publications, (Indian Edition), 2019.
3	D.Halliday, R.Resnick and J.Walker. Principles of Physics, Wiley (Indian Edition), 2015.
4	N.Garcia, A.Damask and S.Schwarz. Physics for Computer Science Students. Springer- Verlag, 2012.

WEBSITE REFERENCE / NPTEL/ SWAYAM/ MOOC 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

CO-PO MAPPING

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

PUCC1BS03	ENGINEERING CHEMISTRY	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

1	To inculcate sound understanding of water quality parameters and water treatment techniques.
2	To impart knowledge on the basic principles and properties of polymers and composites
3	To introduce the basic concepts of corrosion, alloys and corrosion preventive methods
4	To facilitate the understanding of different type of fuels, their preparation, properties and combustion characteristics.
5	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 CaCO3. 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. CO2 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 **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

TEXT BOOKS:	
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

REFERENCE BOOKS:	
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 / NPTEL/ SWAYAM/ MOOC REFERENCE:	
1	NPTEL: Basic courses-Sem 1 and 2 - Engineering Chemistry-I
2	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
3	https://www.chemistryviews.org/debating-the-everyday-impact-of-polymer-materials - Debating the Everyday Impact of Polymer Materials – Chemistry Views
4	https://batteryuniversity.com – Learn about batteries
5	https://wiseinternational.org/nuclear-energy -Nuclear Energy Wise international

CO-PO MAPPING												
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	2	1	1	1	1	1	1	-	1	-	2
CO2	3	2	1	1	1	1	1	1	-	1	-	2
CO3	3	2	1	1	1	1	1	1	-	1	-	2
CO4	3	2	2	1	1	1	2	1	-	1	-	2
CO5	3	2	2	1	1	1	2	1	-	1	-	2

PUCC1BE01	ENGINEERING GRAPHICS	L	T	P	C
		2	4	0	4

COURSE OBJECTIVES:

1	Drawing engineering curves
2	Drawing freehand sketch of simple objects
3	Drawing orthographic projection of solids and section of solids.
4	Drawing development of solids
5	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 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

TEXT BOOKS:	
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.

REFERENCE BOOKS:	
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

WEBSITE REFERENCE / NPTEL/ SWAYAM/ MOOC REFERENCE:	
1	https://nptel.ac.in/courses/112102304 - Engineering Graphics and Design, IIT Delhi
2	https://nptel.ac.in/courses/112103019 - Engineering Drawing, IIT Guwahati
3	https://archive.nptel.ac.in/courses/112/102/112102304/ - Engineering Graphics and Design
4	https://users.encs.concordia.ca/~nrskumar/Index_files/Mech211/Full%20Lecture/Lecture%201.pdf - Mechanical Engineering Drawing

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.

CO-PO MAPPING

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

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—Massive Terracottasculptures, Villagedeities, Thiruvalluvar Statueat Kanyakumari, 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 OBJECTIVES:

1	To improve the communicative competence of learners
2	To develop various listening strategies to comprehend various types of audio materials like lectures, discussions, videos etc.
3	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	

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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 **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

TEXT BOOKS:

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 BOOKS:

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

CO-PO MAPPING

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

PUCC1PL02	PHYSICS AND CHEMISTRY LABORATORY	L	T	P	C
		0	0	4	2

PHYSICS LABORATORY: (Any seven experiments to be conducted)

COURSE OBJECTIVES:

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

LIST OF EXPERIMENTS — **30**

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: 30 PERIODS

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

CHEMISTRY LABORATORY: (Any seven experiments to be conducted)		
COURSE OBJECTIVES:		
1	To inculcate experimental skills to test basic understanding of water quality parameters, such as, acidity, alkalinity, hardness, DO, chloride and copper	
2	To induce the students to familiarize with electroanalytical techniques such as, pH metry, potentiometry and conductometry in the determination of impurities in aqueous solutions	
3	To demonstrate the analysis of metals and alloys.	
4	To demonstrate the synthesis of nanoparticles	
LIST OF EXPERIMENTS		**30**

1. Preparation of Na2CO3 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 (TiO2/ZnO/CuO) by Sol-Gel method.
14. Estimation of Nickel in steel
15. Proximate analysis of Coal

TOTAL: 30 PERIODS

COURSE OUTCOMES		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

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

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

COURSE OBJECTIVES:

1	To engage learners in meaningful language activities to improve their reading and writing skills
2	To help learners understand the purpose, audience, contexts of different types of writing
3	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		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

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TEXT BOOKS:	
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
REFERENCE BOOKS:	
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 / NPTEL/ SWAYAM/ MOOC REFERENCE:	
1	IELTS: https://ieltstrainingonline.com/british-council-practice-ielts-reading-actual-tests/
2	http://www.englishdaily626.com/c-errors.php?010 (common errors)
3	https://nptel.ac.in/courses/109105144 (employment communication)
4	https://onlinecourses.nptel.ac.in/noc22_hs05/preview (effective Writing)
5	https://www.slideshare.net/Punitayadav19/cv-writing-nptelpdf (resume Preparation)

CO-PO MAPPING

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

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

COURSE OBJECTIVES:

1	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.
2	To acquaint the knowledge of testing of hypothesis for small and large samples which plays an important role in real life problems.
3	To introduce the basic concepts of solving algebraic and transcendental equations.
4	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.
5	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		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

TEXT BOOKS:

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.

REFERENCE BOOKS:

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 / NPTEL/ SWAYAM/ MOOC 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
3	NPTEL: Introduction to testing Hypothesis, Prof. Arun, K Tangirala, IIT Madras.
4	NPTEL: Numerical Methods, Prof. Ameeya kumar Nayak, Sanjeev Kumar - IIT Roorkee.

CO-PO MAPPING

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

PUCC2BS05	ENGINEERING MATERIALS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

1	To make the students to understand the basics of crystallography and its importance in studying materials properties.
2	To understand the electrical properties of materials including free electron theory, applications of quantum.
3	To insist knowledge on physics of semiconductors, determination of charge carriers and device applications.
4	To establish a sound of knowledge on different optical properties of materials, optical displays and applications.
5	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		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

TEXT BOOKS:

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.

REFERENCE BOOKS:

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.

WEBSITE REFERENCE / NPTEL/ SWAYAM/ MOOC REFERENCE:

1	https://onlinecourses.nptel.ac.in/noc19_cy35/preview - Chemical Crystallography 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. Arghya Taraphder, IIT Kharagpur
4	https://nptel.ac.in/courses/112107086 - Engineering Materials and Processing Techniques by Prof. Inderdeep Singh, IIT Roorke.

CO-PO MAPPING

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

PUME2PC01	ENGINEERING MECHANICS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

1	To Learn the use scalar and vector analytical techniques for analysing forces in statically determinate structures
2	To introduce the equilibrium of rigid bodies, vector methods and free body diagram
3	To study and understand the distributed forces, surface, loading on beam and intensity.
4	To learn the principles of friction, forces and to determine the apply the concepts of frictional forces at the contact surfaces of various engineering systems.
5	To learn the principles of friction, forces and to determine the apply the concepts of frictional forces at the contact surfaces of various engineering systems.

UNIT – I	STATICS OF PARTICLES	9

Fundamental Concepts and Principles, Systems of Units, Method of Problem Solutions, Statics of Particles - Forces in a Plane, Resultant of Forces, Resolution of a Force into Components, Rectangular Components of a Force, Unit Vectors. Equilibrium of a Particle- Newton's First Law of Motion, Space and Free-Body Diagrams, Forces in Space, Equilibrium of a Particle in Space.

UNIT – II	EQUILIBRIUM OF RIGID BODIES	9

Principle of Transmissibility, Equivalent Forces, Vector Product of Two Vectors, Moment of a Force about a Point, Varignon's Theorem, Rectangular Components of the Moment of a Force, Scalar Product of Two Vectors, Mixed Triple Product of Three Vectors, Moment of a Force about an Axis, Couple - Moment of a Couple, Equivalent Couples, Addition of Couples, Resolution of a Given Force into a Force -Couple system, Further Reduction of a System of Forces, Equilibrium in Two and Three Dimensions - Reactions at Supports and Connections

UNIT – III	DISTRIBUTED FORCES	9

Centroids of lines and areas – symmetrical and unsymmetrical shapes, Determination of Centroids by Integration, Theorems of Pappus-Guldinus, Distributed Loads on Beams, Centre of Gravity of a ThreeDimensional Body, Centroid of a Volume, Composite Bodies, Determination of Centroids of Volumes by Integration. Moments of Inertia of Areas and Mass - Determination of the Moment of Inertia of an Area by Integration, Polar Moment of Inertia, Radius of Gyration of an Area, Parallel-Axis Theorem, Moments of Inertia of Composite Areas, Moments of Inertia of a Mass - Moments of Inertia of Thin Plates, Determination of the Moment of Inertia of a Three-Dimensional Body by Integration

UNIT – IV	FRICTION	9

The Laws of Dry Friction, Coefficients of Friction, Angles of Friction, Wedge friction, Wheel Friction, Rolling Resistance, Ladder friction.

UNIT – V	DYNAMICS OF PARTICLES	9

Kinematics - Rectilinear Motion and Curvilinear Motion of Particles. Kinetics- Newton's Second Law of Motion -Equations of Motions, Dynamic Equilibrium, Energy and Momentum Methods - Work of a Force, Kinetic Energy of a Particle, Principle of Work and Energy, Principle of Impulse and Momentum, Impact of bodies.

TOTAL: 45 PERIODS

COURSE OUTCOMES		Cognitive level
CO1	Illustrate the vector and scalar representation of forces and moments	Understand
CO2	Analyse the rigid body in equilibrium	Analyze
CO3	Evaluate the properties of distributed forces	Evaluate
CO4	Determine the friction and the effects by the laws of friction	Evaluate
CO5	Calculate dynamic forces exerted in rigid body	Evaluate

TEXT BOOKS:	
1	Beer Ferdinand P, Russel Johnston Jr., David F Mazurek, Philip J Cornwell, Sanjeev Sanghi, Vector Mechanics for Engineers: Statics and Dynamics, McGraw Higher Education., 12thEdition, 2019
2	Vela Murali, "Engineering Mechanics-Statics and Dynamics", Oxford University Press, 2018.

REFERENCE BOOKS:	
1	Boresi P and Schmidt J, Engineering Mechanics: Statics and Dynamics, 1/e, Cengage learning, 2012
2	Hibbeller, R.C., Engineering Mechanics: Statics, and Engineering Mechanics: Dynamics, 13th edition, Prentice Hall, 2013
3	Irving H. Shames, Krishna Mohana Rao G, Engineering Mechanics – Statics and Dynamics, 4thEdition, Pearson Education Asia Pvt. Ltd., 2010.
4	Meriam J L and Kraige L G, Engineering Mechanics: Statics and Engineering Mechanics: Dynamics, 7th edition, Wiley student edition, 2013
5	Timoshenko S, Young D H, Rao J V and SukumarPati, Engineering Mechanics, 5thEdition, McGraw Hill Higher Education, 2013

WEBSITE REFERENCE / NPTEL/ SWAYAM/ MOOC REFERENCE:	
1	https://archive.nptel.ac.in/courses/112/106/112106180/ - Engineering Mechanics Statics and Dynamics
2	https://nptel.ac.in/courses/112106286 - Engineering Mechanics, IIT Madras.
3	http://ecoursesonline.iasri.res.in/mod/page/view.php?id=125337 - Friction and Frictional Forces
4	https://archive.nptel.ac.in/courses/122/104/122104015/ - Engineering Mechanics

CO-PO MAPPING

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

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

COURSE OBJECTIVES:

1	To introduce the basics of electric circuits and analysis.
2	To impart knowledge in the basics of working principles and application of electrical machines.
3	To introduce analog devices and their characteristics.
4	To educate on the fundamental concepts of digital electronics.
5	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)

UNIT – II	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

UNIT – III	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

UNIT – IV	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: 45 PERIODS

COURSE OUTCOMES		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

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.
REFERENCE BOOKS:	
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 / NPTEL/ SWAYAM/ MOOC REFERENCE:	
1	https://www.electricaleasy.com/
2	https://easyengineering.net/be3251-basic-electrical-and-electronics-engineering-notes
3	https://nptel.ac.in/courses/117106108 - Basic Electrical Circuits

CO-PO MAPPING

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

PUCC2BE03	PROBLEM SOLVING AND PYTHON PROGRAMMING	L	T	P	C
		2	0	0	2

COURSE OBJECTIVES:

1	The objective of this course is to familiarize the students with to know the design of algorithm and efficiency.
2	To understand variables, expressions and statements.
3	To explore flow of data and its executions.
4	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: 45 PERIODS

COURSE OUTCOMES		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

TEXT BOOKS:	
1	Allen B. Downey, "Think Python: How to Think like a Computer Scientist", 2nd Edition, O'Reilly Publishers, 2016.
REFERENCE BOOKS:	
1	Paul Deitel and Harvey Deitel, "Python for Programmers", Pearson Education, 1st Edition, 2021.
2	G Venkatesh and Madhavan Mukund, "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 / NPTEL/ SWAYAM/ MOOC 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
3	The Joy of Computing using Python, IIT Ropar, Prof. Sudarshan Iyengar NPTEL Courses. https://onlinecourses.nptel.ac.in/nc21_cs32/preview

CO-PO MAPPING

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

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

UNIT – I	WEAVING AND CERAMIC TECHNOLOGY	3

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

UNIT – II	DESIGN AND CONSTRUCTION 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	AGRICULTURE AND 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	SCIENTIFIC TAMIL & 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: 15 PERIODS

TEXT-CUM-REFERENCE BOOK

1. கணினித் தமிழ் –மக்களும் பண்பாடும் – கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும்
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.

ME 40

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

COURSE OBJECTIVES:

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

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 compares 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: 60 PERIODS

COURSE OUTCOMES		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

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

REFERENCE BOOKS:	
1	Raman. Meenakshi, Sharma. Sangeeta, Professional English, Oxford university press, New Delhi. 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.

CO-PO MAPPING

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

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

COURSE OBJECTIVES:

1	The objective of this course is to familiarize the students with to know the design of algorithm and efficiency.
2	To understand variables, expressions and statements.
3	To explore flow of data and its executions.
4	To study the compound data types.
5	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 data types and files

TOTAL: 60 PERIODS

COURSE OUTCOMES		**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

TEXT BOOKS:

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

REFERENCE BOOKS:

1	Paul Deitel and Harvey Deitel, "Python for Programmers", Pearson Education, 1st Edition, 2021.
2	G Venkatesh and Madhavan Mukund, "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 / NPTEL/ SWAYAM/ MOOC 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
3	The Joy of Computing using Python, IIT Ropar, Prof. Sudarshan Iyengar NPTEL Courses. https://onlinecourses.nptel.ac.in/nc21_cs32/preview

CO-PO MAPPING												
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	2	3	3	1	3	-	-	-	3	-	-	-
CO2	2	3	3	1	3	-	-	-	3	-	-	-
CO3	2	3	3	1	3	-	-	-	3	-	-	-
CO4	2	3	3	1	3	-	-	-	3	-	-	-
CO5	2	3	3	1	3	-	-	-	3	-	-	-

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

COURSE OBJECTIVES:

1	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.
2	Welding various joints in steel plates using arc welding work; Machining various simple processes like turning, drilling, tapping in parts
3	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.

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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 –

(c) Exercise – Production of hexagonal headed bolt.

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

TOTAL: 30 PERIODS

COURSE OUTCOMES		**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

TEXT 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

CO-PO MAPPING

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

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

COURSE OBJECTIVES:

1	To enable the students to understand the behaviour of semiconductor device based on experimentation.
2	Be exposed to active and passive circuit elements.
3	Familiarize the operation and characteristics of transistor like BJT and FET.
4	Explore the characteristics of amplifier gain and frequency response.
5	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		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

TEXT BOOKS:

CO-PO MAPPING

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	1	1	1	1	1	1	1	1	1	1
CO2	3	3	3	3	3	3	3	3	3	3	3	3

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	12

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	12

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	12

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	12

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

UNIT – V	Z – TRANSFORMS	12

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.	Apply

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.

REFERENCE BOOKS:

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/- Partial Differential Equations
2	https://archive.nptel.ac.in/courses/111/107/111107111/ - Ordinary and Partial Differential Equation and Applications
E	https://archive.nptel.ac.in/courses/111/105/111105123/ - Transform and calculus and its application if differential equations
4	https://freevideolectures.com/course/3244/advanced-engineeringmathematics - Advanced Engineering Mathematics IIT Kharagpur, Prof. P. Panigrahi

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

ME 50

PUME3PCO2	ENGINEERING THERMODYNAMICS	L	T	P	C
		3	1	0	4

COURSE OBJECTIVES:

1	Impart knowledge on the basics and application of zeroth and first law of thermodynamics
2	Impart knowledge on the second law of thermodynamics in analysing the performance of thermal devices
3	Teach the various properties of steam through steam tables and Mollier chart.
4	Impart knowledge on the ideal and real gases, thermodynamic relations
5	Impart knowledge on the macroscopic properties of ideal and real gases.

Unit-I	BASICS, ZEROTH AND FIRST LAW	12

Review of Basics – Thermodynamic systems, Properties and processes Thermodynamic Equilibrium - Displacement work - P-V diagram. Thermal equilibrium - Zeroth law – Concept of temperature and Temperature Scales. First law – application to closed and open systems – steady and unsteady flow processes

Unit-II	SECOND LAW AND AVAILABILITY ANALYSIS	12

Heat Engine – Refrigerator - Heat pump. Statements of second law and their equivalence & corollaries. Carnot cycle - Reversed Carnot cycle - Performance - Clausius inequality. Concept of entropy - T-s diagram - Tds Equations - Entropy change for a pure substance.

Ideal gases undergoing different processes - principle of increase in entropy. Applications of II Law. High and low-grade energy. Availability and Irreversibility for open and closed system processes - I and II law Efficiency.

Unit-III	PROPERTIES OF PURE SUBSTANCES	12

Steam - formation and its thermodynamic properties - p-v, p-T, T-v, T-s, h-s diagrams. PVT surface. Determination of dryness fraction. Calculation of work done and heat transfer in non-flow and flow processes using Steam Table and Mollier Chart.

UNIT-IV	IDEAL AND REAL GASES, THERMODYNAMIC RELATIONS	12

Properties of Ideal gas- Ideal and real gas comparison- Equations of state for ideal and real gases- Reduced properties. Compressibility factor-. Principle of Corresponding states. –Generalised Compressibility Chart and its use-. Maxwell relations, Tds Equations, Difference and ratio of heat capacities, Energy equation, Joule-Thomson Coefficient, Clausius Clapeyron equation, Phase Change Processes. Simple Calculations.

UNIT-V	GAS MIXTURES AND PSYCHROMETRY	12

Mole and Mass fraction, Dalton's and Amagat's Law. Properties of gas mixture – Molar mass, gas constant, density, change in internal energy, enthalpy, entropy and Gibbs function. Psychrometric properties, Psychrometric charts. Property calculations of air vapour mixtures by using chart and expressions. Psychrometric process – adiabatic saturation, sensible heating and cooling, humidification, dehumidification, evaporative cooling and adiabatic mixing. Simple Applications

TOTAL: 60 PERIODS

COURSE OUTCOMES		Cognitive Level
CO1	Understand the zeroth and first law of thermodynamics by formulating temperature scales and calculating the property changes in closed and open engineering systems.	Understand

CO2	Explain the second law of thermodynamics and analysing the performance of thermal devices through energy and entropy calculations.	Understand
CO3	Apply the properties of pure substance in computing the macroscopic properties of ideal and real gases using gas laws and appropriate thermodynamic relations.	Apply
CO4	Apply the various thermodynamic relations to calculate property changes.	Apply
CO5	Apply the properties of gas mixtures in calculating the properties of gas mixtures	Apply

TEXT BOOKS:

1	Nag.P.K., "Engineering Thermodynamics", 6th Edition, Tata McGraw Hill (2017), New Delhi.
2	Natarajan, E., "Engineering Thermodynamics: Fundamentals and Applications", 2nd Edition (2014), Anuragam Publications, Chennai

REFERENCE BOOKS:

1	Claus Borgnakke and Richard E. Sonntag, "Fundamentals of Thermodynamics", 10th Edition, Wiley Eastern, 2019.
2	Chattopadhyay, P, "Engineering Thermodynamics", 2nd Edition Oxford University Press, 2016.
3	Cengel, Y and M. Boles, Thermodynamics - An Engineering Approach, Tata McGraw Hill,9th Edition, 2019

WEBSITE REFERENCE / NPTEL/ SWAYAM/ MOOC REFERENCE:

1	https://archive.nptel.ac.in/courses/112/106/112106310/- Engineering Thermodynamics
2	https://onlinecourses.nptel.ac.in/noc23_me141/preview - Engineering Thermodynamics By Prof. V. Raghavan | IIT Madras
3	https://www.engineersrail.com/?s=engineering+thermodynamics - Definitions, Laws, Types, Importance and Applications
4	https://web.iitd.ac.in/~pmvs/course_mcl140.php - MCL140: Engineering Thermodynamics

CO-PO MAPPING

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

PUME3PCO3	FLUID MECHANICS AND MACHINERY	L	T	P	C
		3	1	0	4

COURSE OBJECTIVES:

1	To introduce the students about properties of the fluids, behaviour of fluids under static conditions.
2	To impart basic knowledge of the dynamics of fluids and boundary layer concept and losses in pipes.
3	To impart knowledge of the Dimensional analysis of irregular bodies.
4	To expose the students to basic principles of working of hydraulic machineries and to design Pelton wheel, Francis and Kaplan turbine.
5	To expose the students to basic principles of working of hydraulic machineries and to design centrifugal and reciprocating pumps.

UNIT – I	FLUID PROPERTIES AND FLOW CHARACTERISTICS	12

Properties of fluids – Fluid statics - Pressure Measurements - Flow characteristics - Eulerian approach - Concept of control volume and system - Reynold's transportation theorem - Continuity equation, energy equation and momentum equation - Applications.

UNIT – II	FLOW THROUGH PIPES AND BOUNDARY LAYER	12

Reynold's Experiment - Laminar flow through circular conduits - friction factor - Major and minor losses - Hydraulic and energy gradient lines - Pipes in series and parallel - Boundary layer concepts - Types of boundary layer thickness

UNIT – III	DIMENSIONAL ANALYSIS AND MODEL STUDIES	12

Fundamental dimensions - Dimensional homogeneity - Rayleigh's method and Buckingham Pi theorem - Dimensionless parameters - Similitude and model studies - Distorted and undistorted models

UNIT – IV	TURBINES	12

Impact of jets - Velocity triangles - Theory of rotodynamic machines - Classification of turbines - Working principles - Pelton wheel - Modern Francis turbine - Kaplan turbine - Work done - Efficiencies - Draft tube - Specific speed - Performance curves for turbines - Governing of turbines

UNIT – V	PUMPS	12

Classification of pumps - Centrifugal pumps - Working principle - Heads and efficiencies– Velocity triangles - Work done by the impeller - Performance curves - Reciprocating pump working principle - Indicator diagram and its variations - Work saved by fitting air vessels - Rotary pumps.

TOTAL: 60 PERIODS

COURSE OUTCOMES		Cognitive Level
CO1	Apply mathematical knowledge to predict the properties and characteristics of a fluid.	Apply
CO2	Analyse and calculate major and minor losses associated with pipe flow in piping networks	Analyse
CO3	Critically predict the nature of physical quantities, mathematically.	Apply

CO4	Explain the working principles of various turbines and design the various types of turbines	Apply
CO5	Explain the working principles of centrifugal, reciprocating and rotary pumps and design the centrifugal and reciprocating pumps	Apply

TEXT BOOKS:	
1	Modi P.N. and Seth, S.M. Hydraulics and Fluid Mechanics, Standard Book House, New Delhi, 22nd edition (2019)
2	Jain A. K. Fluid Mechanics including Hydraulic Machines, Khanna Publishers, New Delhi, 2014.
REFERENCE BOOKS:	
1	Kumar K. L., Engineering Fluid Mechanics, Eurasia Publishing House(p) Ltd. New Delhi, 2016
2	Pani B S, Fluid Mechanics: A Concise Introduction, Prentice Hall of India Private Ltd, 2016
3	Cengel Y A and Cimbala J M, Fluid Mechanics, McGraw Hill Education Pvt. Ltd., 2014
WEBSITE REFERENCE / NPTEL/ SWAYAM/ MOOC REFERENCE:	
1	https://archive.nptel.ac.in/courses/112/104/112104118/ - Fluid Mechanics
2	https://onlinecourses.nptel.ac.in/noc23_ce65/preview - Fluid Mechanics by Prof. Subashisa Dutta | IIT Guwahati
3	https://onlinecourses.nptel.ac.in/noc23_me114/preview - Fluid Mechanics and Its Applications by Prof. Vijay Gupta | IIT Delhi
4	https://onlinecourses.nptel.ac.in/noc21_me79/preview - Principle of Hydraulic Machines and System Design
5	https://3dcadengineer.com/an-overview-of-15-Different-Pump-Types-And-Their-Applications

CO-PO MAPPING

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

PUME3PC04	MANUFACTURING TECHNOLOGY-I	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

1	To illustrate the working principles of various metal casting processes.
2	To learn and apply the working principles of various metal joining processes.
3	To study the working principles of bulk deformation of metals.
4	To learn the working principles of the sheet metal forming process.
5	To study and practice the working principles of plastic molding.

Unit-I	METAL CASTING PROCESSES	9

Sand Casting – Sand Mould – Type of patterns - Pattern Materials – Pattern allowances – Molding sand Properties and testing – Cores –Types and applications – Molding machines – Types and applications– Melting furnaces – Principle of special casting processes- Shell, investment – Ceramic mould – Pressure die casting – low pressure, gravity- Tilt pouring, high pressure die casting- Centrifugal Casting – CO2 casting — Defects in Sand casting process-remedies - Safety measures during melting and casting processes: Personal Protective Equipment (PPE), Ventilation, Fire Prevention, Material Handling, Hot Work Safety, Emergency Preparedness, Hygiene and Contamination Control, Environmental Protection

Unit-II	METAL JOINING PROCESSES	9

Fusion welding processes – Oxy fuel welding – Filler and Flux materials—Arc welding, Electrodes, Coating and specifications – Gas Tungsten arc welding –Gas metal arc welding - Submerged arc welding – Electro slag welding– Plasma arc welding — Resistance welding Processes -Electron beam welding –Laser beam Welding Friction welding – Friction stir welding – Diffusion welding – Thermit Welding, Weld defects – inspection & remedies – Brazing - soldering – Adhesive bonding, Safety measures during welding process: Personal Protective Equipment (PPE), Ventilation, Fire Prevention, Electrical Safety, Eye Protection, Noise Protection, Emergency, preparedness, Personal Hygiene

Unit-III	BULK DEFORMATION PROCESSES	9

Hot working and cold working of metals – Forging processes – Open, impression and closed die forging – cold forging- Characteristics of the processes – Typical forging operations – Overview of machinery and equipments: Presses: Types, components, and operation principles, Dies and tooling: Design considerations and materials, rolling of metals – Types of Rolling – Flat strip rolling – shape rolling operations – Defects in rolled parts – Principle of rod and wire drawing – Tube drawing – Principles of Extrusion – Types – Hot and Cold extrusion. Introduction to shaping operations. Worker Health and Safety to reduce the risk of musculoskeletal injuries.

UNIT-IV	SHEET METAL PROCESSES	9

Sheet metal characteristics – Typical shearing, bending, and drawing operations – Stretch forming operations – Formability of sheet metal – Test methods – Sheet Metal Forming Equipment: Types of Presses, components, and operation principles - Types of dies (blanking dies, piercing dies) and their functions. Material selection for dies and tooling considerations - special forming processes - Working principle and applications – Hydro forming – Rubber pad forming – Metal spinning – Introduction of Explosive forming, magnetic pulse forming, peen forming, Superplastic forming – Micro forming – Incremental forming.

UNIT-V	MANUFACTURE OF PLASTIC COMPONENTS	9

Types and characteristics of plastics – Molding of thermoplastics & Thermosetting polymers– working principles and typical applications – injection molding – Plunger and screw machines – Compression molding, Transfer Molding – Typical industrial applications – introduction to blow molding – Rotational molding – Film blowing – Extrusion – Thermoforming – Bonding of Thermoplastics- duff molding.

TOTAL: 45 PERIODS

COURSE OUTCOMES		**Cognitive Level**
CO1	Prepare sand molds, understand the different casting processes, furnaces, and safety measures	Understand
CO2	Demonstrate proficiency in various metal joining processes used in industries and safety measures.	Understand
CO3	Demonstrate an understanding of various bulk deformation processes to manufacture different engineering products	Understand
CO4	Understand the principles and applications of various conventional and advanced metal forming processes and safety measures.	Understand
CO5	Differentiate between different types of plastics and understand the principles and processes to manufacture various plastic components.	Understand

TEXT BOOKS:

1	P.N.Rao Manufacturing Technology Volume 1 Mc Grawhill Education 5th edition, 2018.
2	RK Jain, Production Technology: Manufacturing processes, Technology and Automation, Khanna Publishers, 2020

REFERENCE BOOKS:

1	Kalpakjian. S, "Manufacturing Engineering and Technology", Pearson Education India,4th Edition, 2018
2	Helmi A. Youssef, Manufacturing technology: Material processes and equipment, CRC Press, 2017

WEBSITE REFERENCE / NPTEL/ SWAYAM/ MOOC REFERENCE:

1	https://nptel.ac.in/courses/112/107/112107219/Fundamentals of Manufacturing processes.
2	https://nptel.ac.in/courses/112/105/112105127/Manufacturing Processes.

CO-PO MAPPING

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

PUCE3PC05	STRENGTH OF MATERIALS	L	T	P	C
		3	1	0	4

COURSE OBJECTIVES:

1	To understand the concepts of stress, strain, principal stresses and principal planes.
2	To familiarize the concept of shearing force and bending moment due to external loads in determinate beams and their effect on stresses.
3	To determine stresses and deformation in circular shafts, helical spring & laminated springs due to torsion.
4	To compute slopes and deflections in determinate beams by various methods.
5	To study the stresses and deformations induced in thin, thick shells & compound cylinders.

Unit-I	STRESS, STRAIN AND DEFORMATION OF SOLIDS	12

Rigid bodies and deformable solids – Tension, Compression and Shear Stresses - Deformation of simple and compound bars – Thermal stresses – Elastic constants - Volumetric strains – Stresses on inclined Planes – Principal stresses and principal planes – Mohr's circle of stress.

Unit-II	TRANSVERSE LOADING ON BEAMS AND STRESSES IN BEAM	12

Beams – Types - Transverse loading on beams – Shear force and Bending moment in beams – Cantilever, Simply supported and over hanging beams. Theory of simple bending – Bending stress distribution – Load carrying capacity – Proportioning of sections – Flitched beams.

Unit-III	TORSION	12

Theory of Torsion – Stresses and Deformations in Solid and Hollow Circular Shafts – Combined bending moment and torsion of shafts - Power transmitted to shaft – Shaft in series and parallel – Closed and Open Coiled helical springs – springs in series and parallel. Laminated Springs.

Unit-IV	DEFLECTION OF BEAMS	12

Elastic curve – Governing differential equation - Double integration method - Macaulay's method - Area moment method - Conjugate beam method for computation of slope and deflection of determinant beams.

Unit-V	THIN CYLINDERS, SPHERES AND THICK CYLINDERS	12

Stresses in thin cylindrical shell due to internal pressure - circumferential and longitudinal stresses - Deformation in thin cylinders – Spherical shells subjected to internal pressure – Deformation in spherical shells – Thick cylinders - Lame's theory, Compound Cylinders.

TOTAL: 60 PERIODS

COURSE OUTCOMES		Cognitive Level
CO1	Apply the concepts of stress and strain in simple and compound bars, the importance of principal stresses and principal planes.	Apply
CO2	Apply the load transferring mechanism in beams and stress distribution due to shearing force and bending moment.	Apply
CO3	Apply basic equation of torsion in designing of shafts, helical springs & laminated springs.	Apply

CO4	Calculate slope and deflection in beams using different methods.	Evaluate
CO5	Analyse thin and thick shells for applied pressures & compound cylinders.	Analyse

TEXT BOOKS:

1	Rajput R.K. "Strength of Materials (Mechanics of Solids)", S.Chand & company Ltd., New Delhi, 7th edition, 2018.
2	Rattan S.S., "Strength of Materials", Tata McGraw Hill Education Pvt .Ltd. New Delhi, 2017.

REFERENCE BOOKS:

1	Singh. D.K., "Strength of Materials", Ane Books Pvt Ltd., New Delhi, 2021.
2	Beer. F.P. & Johnston. E.R. "Mechanics of Materials", Tata McGraw Hill, 8th Edition, New Delhi 2019.
3	Egor P Popov, "Engineering Mechanics of Solids", 2nd edition, PHI Learning Pvt. Ltd., New Delhi, 2015.
4	Bansal R.K. "A Textbook of Strength of Materials" Laxmi Publications, 6th Edition, New Delhi, 2022.

WEBSITE REFERENCE / NPTEL/ SWAYAM/ MOOC REFERENCE:

1	https://archive.nptel.ac.in/courses/112/107/112107146/ - strength of materials
2	https://onlinecourses.nptel.ac.in/noc21_ce38/preview - Strength Of Materials By Prof. Sriman Kumar Bhattacharyya | IIT Kharagpur
3	https://www.engineersrail.com/strength-of-materials-basics/ - Extreme Basics of Strength of Materials
4	https://www.nuclear-power.com/nuclear-engineering/materials-science/material-properties/strength/

CO-PO MAPPING

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

PUME3PL01	Fluid Mechanics & Machinery and Material Testing Laboratory	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES:

1	To study the mechanical properties of metals, wood and spring by testing in laboratory
2	To verify the principles studied in fluid mechanics and machinery theory by performing experiments in laboratory.

PART-I	STRENGTH OF MATERIALS	30

LIST OF EXPERIMENTS

1. Tension test on mild steel rod
2. Torsion test on mild steel rod
3. Hardness test on metal (Rockwell and Brinell Hardness)
4. Compression test on helical spring
5. Impact test on metal specimen (Izod, Charpy)

PART-II	FLUID MECHANICS AND MACHINES LABORATORY	30

1. Determination of coefficient of discharge of a venturi meter
2. Determination of friction factor for flow through pipes
3. Characteristics of Gear pumps
4. Characteristics of centrifugal pumps
5. Characteristics of reciprocating pump
6. Characteristics of Pelton wheel turbine.

TOTAL: 60 PERIODS

COURSE OUTCOMES		Cognitive Level
CO1	Determine the tensile, torsion hardness and impact properties of metals by testing.	Apply
CO2	Determine the stiffness properties of helical spring	Apply
CO3	Apply the conservation laws to determine the coefficient of discharge of a venturimeter and finding the friction factor of given pipe	Apply
CO4	Determine the performance characteristics of rotodynamic pump and positive displacement pump.	Apply
CO5	Determine the performance characteristics of turbine.	Apply

REFERENCE BOOKS:

1	Fluid Mechanics and Machinery by C.S.P. Ojha , P.N. Chandramouli & R. Berndtsson, oxford university press
2	Pani B S, Fluid Mechanics: A Concise Introduction, Prentice Hall of India Private Ltd, 2016
3	Beer. F.P. & Johnston. E.R. "Mechanics of Materials", Tata McGraw Hill, 8th Edition, New Delhi 2019.
4	Bansal R.K. "A Textbook of Strength of Materials" Laxmi Publications, 6th Edition, New Delhi, 2022.
5	https://simplicable.com/materials/material-strength

WEBSITE REFERENCE / NPTEL/ SWAYAM/ MOOC REFERENCE:	
1	https://www.rgukt.ac.in/assets/images/civil/SOM%20Lab%20Manual%20(1).pdf
2	https://www.rgukt.ac.in/assets/images/civil/SOM%20Lab%20Manual%20(1).pdf
3	https://www.studocu.com/in/document/vellore-institute-of-technology/strength-of-materials/som-lab-manual modified/6118914
4	https://mlritm.ac.in/assets/civil/civil_manuals/R20_civil_labmanuals/R20%20FM%20&%20HM%20 Final%20Lab%20Manual%20(1)%20(1).pdf

CO-PO MAPPING

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

PUME3PL02	MANUFACTURING TECHNOLOGY LABORATORY - I	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES:

1	To Selecting appropriate tools, equipment's and machines to complete a given job
2	To Performing various welding process using GMAW and fabricating gears using gear making machines.
3	To Performing various machining process such as rolling, drawing, turning, shaping, drilling, milling and analysing the defects in the cast and machined components.

LIST OF EXPERIMENTS

1. Taper Turning
2. External Thread cutting
3. Internal Thread Cutting
4. Eccentric Turning
5. Knurling
6. Square Head Shaping
7. Hexagonal Head Shaping
8. Fabrication of simple structural shapes using Gas Metal Arc Welding
9. Joining of plates and pipes using Gas Metal Arc Welding/ Arc Welding /Submerged arc welding
10. Preparation of green sand moulds
11 Manufacturing of simple sheet metal components using shearing and bending operations.
12. Manufacturing of sheet metal components using metal spinning on a lathe

TOTAL: 60 PERIODS

COURSE OUTCOMES		Cognitive Level
CO1	Provide with the basic concepts of engineering fundamentals on various molding and casting processes, apply appropriate techniques by to obtain defect free casting.	Apply
CO2	Acquire the basic knowledge, engineering fundamentals of metal joining processes and identify the suitable welding techniques and apply them to the specific needs with safe environmental conditions in welding industries.	Apply
CO3	Explain the basic engineering fundamentals of various metal forming processes, equipment's, design of forming dies and select the suitable forming techniques.	Apply
CO4	Identify the basic characteristics of sheet metals and its forming processes, apply appropriate techniques and resources to fabricate sheet metal components.	Apply
CO5	Illustrate the basics of plastics and apply suitable methods, resources, modern engineering tools in manufacture of plastic components	Apply

REFERENCE BOOKS:

1	Hajra Chouldhary S.K and Hajra Choudhury. AK., "Elements of workshop Technology", volume I and II, Media promoters and Publishers Private Limited, Mumbai, 2016
2	Kalpakjian. S, "Manufacturing Engineering and Technology", Pearson Education India Edition, 2018
3	Gowri P. Hariharan, A.Suresh Babu, "Manufacturing Technology I", Pearson Education, 2016

4	Rao, P.N. "Manufacturing Technology Foundry, Forming and Welding", 4 th Edition, TMH-2018
5	Sharma, P.C., "A Text book of production Technology", S.Chand and Co. Ltd., 2018.

WEBSITE REFERENCE / NPTEL/ SWAYAM/ MOOC REFERENCE:

1	https://vdocument.in/manufacturing-technology-i-lab-manual.html
2	https://shanmugha.edu.in/pdf/course/mech/labmanual_2/MT-I%20Lab%20Manual.pdf
3	https://www.avit.ac.in/lab/manufacturing_technology_lab_I/download/lab_manual.pdf
4	https://stannescet.ac.in/cms/staff/qbank/MECH/Lab_Manual/ME3382-MANUFACTURING%20TECHNOLOGY%20LABORATORY-1400774932-MT-Lab%20Manual.pdf

CO-PO MAPPING

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

PUCC3MC01	WOMEN AND GENDER STUDIES	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

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.

UNIT – I	CONCEPTS	9

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

UNIT – II	FEMINIST THEORY	9

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

UNIT – III	WOMEN'S MOVEMENTS: GLOBAL, NATIONAL AND LOCAL	9

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

UNIT – IV	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: 45 PERIODS

COURSE OUTCOMES		Cognitive level
CO1	Define and Evaluate gender as a social construct.	Understand
CO2	Identify the ways gender, power, privilege, and oppression play out across a range of cultures and human experiences.	Understand
CO3	Demonstrate an understanding of gender as it intersects with sexuality, race, ethnicity, religion, class and other critical variables.	Understand
CO4	Analyze human interactions and social/political systems using a "gender lens".	Apply
CO5	Conduct scholarly research on key gender issues and/or debates in the present modern era.	Apply

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TEXT BOOKS:	
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
REFERENCE BOOKS:	
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 / NPTEL/ SWAYAM/ MOOC REFERENCE:	
1	https://en.wikipedia.org/wiki/Gender_studies
2	https://www.wellesley.edu/departments-programs/department/womens-and-gender-studies
3	https://nptel.ac.in/courses/109103122
4	https://www.youtube.com/watch?v=lI8pyUSg4ns&list=PL2QYOrBMOd7-Jw6OA78pfp4B0oIDhsqwF
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

PUCC3MC02	ELEMENTS OF LITERATURE	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

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

UNIT – II	PROSE	9

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

UNIT – III	DRAMA	9

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

UNIT – IV	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: 45 PERIODS

COURSE OUTCOMES: At the end of the course, the students will be able:		**Cognitive level**
CO1	Analyze the various elements of poetry and develop their critical thinking skills.	Apply
CO2	Comprehend Complex academic texts for narrating experience and events.	Understand
CO3	To understand the nature of the dramatic genres including comedy, romance, tragedy, and history.	Understand
CO4	To analyze the texts and understand the modernist techniques in the narratives & to develop critical thinking and close reading of texts.	Apply
CO5	Critically view literary artifacts & apply high seriousness as guiding principles in appreciating literature.	Apply

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TEXT BOOKS:	
1	Nozar Niazi & Rama Gautam, How to Study Literature: Stylistic and Pragmatic Approaches, Prentice Hall of India; 1st edition, 2010, ISBN – 10: 8120340612
2	Mahdi Javid shad, Amirhossein Nemati, An Outline of The Norton Anthology of English Literature, Arb Publications, 2024, ISBN-10: 9382527559
REFERENCE BOOKS:	
1	David Green, The Winged World, Macmillan Education, 2016, ISBN-10: 9352521005
2	Patricia Waugh, Literary Theory and Criticism, Oxford University Press, 2006.
3	George. K. M., Modern Indian Literature – An Anthology, Sahitya Akademi, 1994, ISBN: 8172017839
4	X. J. Kennedy, Dana Gioia, Literature: An Introduction to Fiction, Poetry, Drama, and Writing, Pearson; 13th edition, 2015, ISBN – 10: 0321971663
5	About Edgar V. Roberts, Literature: An Introduction to Reading and Writing, Pearson; 6th edition, 2014, ISBN – 10: 032194478X
WEBSITE REFERENCE / NPTEL/ SWAYAM/ MOOC 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
5	https://onlinecourses.nptel.ac.in/noc22_hs01/preview
6	https://archive.nptel.ac.in/courses/109/106/109106124/
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

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PUCC3MC03	FILM APPRECIATION	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

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.

UNIT – I	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

UNIT – II	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

UNIT – III	FILM THEORIES AND CRITICISM/APPRECIATION	9

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

UNIT – IV	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: 45 PERIODS

COURSE OUTCOMES: At the end of the course, the students will be able		**Cognitive level**
CO1	Analyze the various Components of Films and develop their critical thinking skills.	Apply
CO2	To understand the evolutionary levels of Films and analyze its linguistic nature.	Understand
CO3	To understand the nature of the Film genres including comedy, romance, tragedy, and history and appreciate it as criticism.	Understand
CO4	To analyse the history of films at universal level.	Apply
CO5	To Understand the native film techniques and appreciate it.	Understand

TEXT BOOKS:

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

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REFERENCE BOOKS:	
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	Penda Kur, 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 / NPTEL/ SWAYAM/ MOOC REFERENCE:	
1	https://onlinecourses.nptel.ac.in/noc21_hs17/preview - Introduction to film studies
2	https://onlinecourses.nptel.ac.in/noc24_ge56/preview - Thin Film Technology
3	https://testbook.com/objective-questions/mcq-on-cinema--626bb8c22de86486d8920d08 - Cinema MCQ
4	https://www.videomaker.com/how-to/directing/film-history/an-introduction-to-film-studies/ - An introduction to film studies
5	https://www.youtube.com/watch?v=g3qFVVjzQFA – What is film studies
6	https://www.filmconnection.com/reference-library/how-the-internet-has-changed-movies-and-the-movie-business/ - Film Connection
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

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PUCC3MC04	THE CONSTITUTION OF INDIA	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

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 -Role and Position – CM and Council of ministers, State Secretariat: Organisation, Structure and Functions – Relation between the Union and the States.

UNIT – IV	LOCAL ADMINISTRATION	9

District's Administration Head - Role and Importance, Municipalities - Mayor and role 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

COURSE OUTCOMES At the end of the course, the students will be able		**Cognitive level**
CO1	Describe historical background of the constitution making and its importance for building a democratic India.	Apply
CO2	Explain the functioning of three wings of the Union government i.e., executive, legislative and judiciary.	Understand
CO3	Explain the functions of State Government and the Union Territories and compare with the Union.	Understand
CO4	Analyse the decentralization of power between central, state and local self-government.	Apply

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CO5	Apply the knowledge in strengthening of the constitutional institutions like CAG, NITI Election Commission and USPC for sustaining democracy.	Apply

TEXT BOOKS:	
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
REFERENCE BOOKS:	
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 / NPTEL/ SWAYAM/ MOOC REFERENCE:	
1	https://onlinecourses.nptel.ac.in/noc24_lw05/preview - Constitution Law and Public Administration in India
2	https://archive.nptel.ac.in/courses/129/106/129106003/ - Constitution Studies
3	https://cdnbbsr.s3waas.gov.in/s380537a945c7aaa788ccfcdf1b99b5d8f/uploads/2023/05/2023050195.pdf - National Informatics Centre
4	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
5	https://en.bharatpedia.org/wiki/Constitution_of_India
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

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PUCC4BS07	ENVIRONMENTAL SCIENCES & 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

ME 71

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

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

PUME4PC06	METROLOGY AND MEASUREMENTS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

1	To learn basic concepts of the metrology and importance of measurements.
2	To teach measurement of linear and angular dimensions assembly and transmission elements.
3	To study the tolerance analysis in manufacturing.
4	To develop the fundamentals of GD & T and surface metrology.
5	To provide the knowledge of the advanced measurements for quality control in manufacturing industries.

Unit-I	BASICS OF METROLOGY	9

Measurement – Need, Process, Role in quality control; Factors affecting measurement - SWIPE; Errors in Measurements – Types – Control-Standards and its Types – Measurement uncertainty – Types, Estimation, Problems on Estimation of Uncertainty, Calibration of measuring instruments, ISO standards.

Unit-II	LINEAR AND ANGULAR MEASUREMENTS	9

Linear Measuring Instruments – Vernier caliper, Micrometer, Vernier height gauge, Depth Micrometer, bore gauge, Telescoping gauge; Gauge blocks – Use and precautions, Comparators – Working and advantages; Opto-mechanical measurements using measuring microscope and Profile projector - Angular measuring instruments – Bevel protractor, Clinometer, Angle gauges, Precision level, Sine bar, Autocollimator, Angle dekkor, Alignment telescope

Unit-III	TOLERANCE ANALYSIS	9

Fundamentals of GD & T- Conventional vs Geometric tolerance, Datums – Interchangeability, Selective assembly, Tolerance representation, Terminology, Limits and Fits, Problems (using tables IS919); Design of Limit gauges, Problems. Tolerance analysis in manufacturing, Process capability, tolerance stack-up, tolerance charting.

UNIT-IV	FORM MEASUREMENTS	9

Measurement of Screw threads - Single element measurements – Pitch Diameter, Lead, Pitch. Measurement of Gears – purpose – Analytical measurement – Runout, Pitch variation, Tooth profile, Tooth thickness, Lead – Functional checking – Rolling gear test. Principles and Methods of straightness – Flatness measurement -surface finish measurement-Roundness measurement – Applications.

UNIT-V	ADVANCES IN METROLOGY	9

Lasers in metrology - Advantages of lasers – Laser scan micrometers; Laser interferometers – Applications – Straightness, Alignment; Ball bar tests, Computer Aided Metrology - Basic concept of CMM — Types of CMM-Constructional features – Probes – Accessories– Software – Applications – Multi-sensor CMMs-Machine Vision - Basic concepts of Machine Vision System – Elements – Applications - On-line and in-process monitoring in production - Computed tomography – White light Scanners.

TOTAL: 45 PERIODS

COURSE OUTCOMES		Cognitive Level
CO1	Discuss the concepts of measurements to apply in various metrological instruments.	Understand

CO2	Apply the principle and applications of linear and angular measuring instruments, assembly and transmission elements.	Apply
CO3	Apply the tolerance symbols and tolerance analysis for industrial applications.	Apply
CO4	Apply the principles and methods of form and surface metrology.	Apply
CO5	Apply the advances in measurements for quality control in manufacturing Industries	Apply

TEXT BOOKS:

1	Venkateshan, S. P., "Mechanical Measurements", Second edition, John Wiley &Sons, 2015.
2	Dotson Connie, "Dimensional Metrology", Cengage Learning, First edition, 2012

REFERENCE BOOKS

1	Mark Curtis, Francis T. Farago, "Handbook of Dimensional Measurement", Industrial Press, Fifth edition, 2013
2	Raghavendra N.V. and Krishnamurthy. L., Engineering Metrology and Measurements, Oxford University Press, 2013.
3	Ammar Grous, J "Applied Metrology for Manufacturing Engineering", Wiley-ISTE, 2011

WEBSITE REFERENCE / NPTEL/ SWAYAM/ MOOC REFERENCE:

1	https://nptel.ac.in/courses/112/104/112104250/ - Metrology and Measurements.
2	https://onlinecourses.nptel.ac.in/noc20_me94/preview- Engineering Metrology.
3	https://archive.nptel.ac.in/courses/112/106/112106179/ - Metrology
4	https://archive.nptel.ac.in/courses/112/106/112106138/ - Mechanical Measurements and metrology

CO-PO MAPPING

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

PUME4PC07	THERMAL ENGINEERING	L	T	P	C
		3	1	0	4

COURSE OBJECTIVES:

1	To learn the concepts and laws of thermodynamics to predict the operation of thermodynamic cycles.
2	To understand the classification and working of the reciprocating air compressor.
3	To analysing the performance of steam nozzle, calculate critical pressure ratio
4	To Evaluating the performance of steam turbines through velocity triangles, understand the need for governing and compounding of turbines
5	To analysing the working of IC engines and various auxiliary systems present in IC engines

Unit-I	THERMODYNAMIC CYCLES	12

Air Standard Cycles – Carnot, Otto, Diesel, Dual, Brayton – Cycle Analysis, Performance and Comparison, Basic Rankine Cycle, modified, reheat and regenerative cycles.

Unit-II	RECIPROCATING AIR COMPRESSOR	12

Classification and comparison, working principle, work of compression - with and without clearance, volumetric efficiency, Isothermal efficiency and isentropic efficiency. Multistage air compressor with Intercooling. Working principle and comparison of Rotary compressors with reciprocating air compressors

Unit-III	STEAM NOZZLES AND BOILERS	12

Types and Shapes of nozzles, Flow of steam through nozzles, Critical pressure ratio, Variation of mass flow rate with pressure ratio. Effect of friction. Metastable flow. Types and comparison. Mountings and Accessories. Fuels - Solid, Liquid and Gas. Performance calculations, Boiler trial.

UNIT-IV	STEAM AND GAS TURBINES	12

Types, Impulse and reaction principles, Velocity diagrams, Work done and efficiency – optimal operating conditions. Multi-staging, compounding and governing. Gas turbine cycle analysis – open and closed cycle. Performance and its improvement - Regenerative, Intercooled, Reheated cycles and their combination.

UNIT-V	INTERNAL COMBUSTION ENGINES	12

IC engine – Classification, working, components and their functions. Ideal and actual : Valve and port timing diagrams, p-v diagrams- two stroke & four stroke, and SI & CI engines – comparison. Geometric, operating, and performance comparison of SI and CI engines. Desirable properties and qualities of fuels. Air-fuel ratio calculation – lean and rich mixtures. Combustion in SI & CI Engines – Knocking – phenomena and control

TOTAL: 60 PERIODS

COURSE OUTCOMES		Cognitive Level
CO1	Apply thermodynamic concepts to different air standard cycles and solve problems.	Apply
CO2	Solve problems in single stage and multistage air compressors	Understand

CO3	Explain the steam nozzle, boiler and its characteristics	Understand
CO4	Explain the flow in steam turbines, draw velocity diagrams, flow in Gas turbines and solve problems.	Understand
CO5	Explain the IC engine types, functions and combustion phenomena.	Understand

TEXT BOOKS:

1	Mahesh. M. Rathore, "Thermal Engineering", 1st Edition, Tata McGraw Hill, 2010.
2	Ganesan, " Internal Combustion Engines" 4th Edition, Tata McGraw Hill, 2012.

REFERENCE BOOKS:

1	Ballaney. P, "Thermal Engineering", 25th Edition, Khanna Publishers, 2017
2	Domkundwar, Kothandaraman, &Domkundwar, "A Course in Thermal Engineering", 6th Edition, Dhanpat Rai& Sons, 2011
3	Gupta H.N, "Fundamentals of Internal Combustion Engines", 2nd Edition Prentice Hall of India, 2013.
4	Mathur M.L and Mehta F.S., "Thermal Science and Engineering", 3rd Edition, Jain Brothers Pvt. Ltd, 2017
5	Soman. K, "Thermal Engineering", 2nd Edition, Prentice Hall of India, 2011

WEBSITE REFERENCE / NPTEL/ SWAYAM/ MOOC REFERENCE:

1	https://learnmech.com/what-is-steam-nozzle-types-of-steam-nozzle-shapes/#google_vignette - Steam Nozzle – Definitions, Types, Efficiency, Application
2	https://archive.nptel.ac.in/courses/112/103/112103262/ - Engine and Gas Turbines
3	https://archive.nptel.ac.in/courses/112/103/112103316/ - Thermal Engineering
4	https://www.thermal-engineering.org/ - Thermal Engineering
5	https://books.google.co.in/books?id=ia_TpdIDBUQC&pg=PA1&source=gbs_toc_r&cad=2#v=twopage&q&f=true – A Text Book of Thermal Engineering

CO-PO MAPPING

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

PUME4PC08	MANUFACTURING TECHNOLOGY-II	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

1	To study the basics of cutting tools and mechanics of metal cutting.
2	To learn working of basic and advanced turning machines
3	To teach the basics of machine tools with reciprocating and rotating motions and abrasive finishing processes.
4	To teach the basics of machine tools with rotating motions and to provide comprehensive knowledge of abrasive finishing processes and additive manufacturing processes
5	To learn the basics of CNC programming concepts to develop the part programme for Machine centre and turning centre

Unit-I	CUTTING TOOL AND METAL CUTTING THEORY	9

Cutting tool materials- nomenclature -single point cutting tool, forces in machining, Mechanics of chip formation -Types of chips, orthogonal metal cutting, thermal aspects, tool wear, tool life, cutting fluids and Machinability.

Unit-II	TURNING MACHINES AND SINGLE POINT DIAMOND TURNING	9

Centre lathe, constructional features, operations – taper turning methods, special attachments, Capstan and turret lathes- tool layout. Introduction to SPDT: process technology-tool parameters-tool setting and process parameters.

Unit-III	MILLING AND GEAR CUTTING MACHINES	7

Milling operations-types of milling cutter. Gear cutting – forming and generation principle and construction of gear milling, hobbing and gear shaping processes –finishing of gears.

Unit-IV	ABRASIVE PROCESS AND ADDITIVE MANUFACTURING	10

Abrasive processes: grinding wheel – specifications and selection, types of grinding process– cylindrical grinding, surface grinding, centreless grinding and internal grinding- Typical applications – concepts of surface integrity, Introduction to layered manufacturing-classification of additive manufacturing process-Fused Deposition modelling (FDM), Selective Laser Sintering (SLS), Stereo Lithography (SLA),3D printing: Capabilities, materials, advantage and limitations of the systems.

Unit - V	CNC MACHINING AND PROGRAMMING	10

Numerical Control (NC) machine tools – CNC types, constructional details, special features, machining centre, Coolant systems, Safety features-Part programming fundamentals, CNC – manual part programming – micromachining – High level computer programming language: Automatically Programmed Tool (APT) .

TOTAL: 45`` PERIODS

COURSE OUTCOMES		Cognitive Level
CO1	Apply the mechanism of metal removal process and to identify the factors involved in improving machinability.	Understand
CO2	Describe the constructional and operational features of centre lathe and SPDT	Understand

CO3	Describe the constructional and operational features of milling and gear cutting machine tools.	Understand
CO4	Apply the constructional features and working principles of abrasive and additive manufacturing process.	Understand
CO5	Demonstrate the Program CNC machine tools through planning, writing codes and setting up CNC machine tools to manufacture a given component.	Understand

TEXT BOOKS:

1	P.N.Rao Manufacturing Technology Volume 1 Mc Grawhill Education 5th edition,2018
2	Sharma, P.C., A Text book of production Technology, S.Chand and Co. Ltd., 2004

REFERENCE BOOKS:

1	Kalpakjian. S, "Manufacturing Engineering and Technology", Pearson Education India,7th Edition, 2018.
2	Michael Fitzpatrick, Machining and CNC Technology, McGraw-Hill Education; 4thedition, 2018.
3	A. B. Chattopadhyay, Machining and Machine Tools, Wiley, 2nd edition, 2017.
4	Roy. A. Lindberg, Processes and materials of manufacture, PHI / Pearson education, 2006.
5	Peter Smid, CNC Programming Handbook, Industrial Press Inc.;Third edition, 2007

WEBSITE REFERENCE / NPTEL/ SWAYAM/ MOOC REFERENCE:

1	https://archive.nptel.ac.in/courses/112/105/112105233/ - Metal cutting and Machine tools
2	https://archive.nptel.ac.in/courses/112/105/112105306/ - Elements of metal cutting, machine tools, gear cutting and CNC machining
3	https://archive.nptel.ac.in/courses/112/103/112103306/ - Fundamentals of Additive manufacturing technologies
4	https://archive.nptel.ac.in/courses/112/105/112105211/ - Computer numerical control (CNC) of Machine tools and process

CO-PO MAPPING

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

PUME4PC09	KINEMATICS OF MACHINERY	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

1	To understand the basic components and layout of linkages in the assembly of a system machine.
2	To understand the principles in analysing the assembly with respect to the displacement, velocity, and acceleration at any point in a link of a mechanism
3	To understand the motion resulting from a specified set of linkages, design few linkage mechanisms and cam mechanisms for specified output motions.
4	To understand the basic concepts of toothed gearing and kinematics of gear trains and the effects of friction in motion transmission and in machine components.

Unit-I	BASICS OF MECHANISMS	9

Definitions – Link, Kinematic pair, Kinematic chain, Mechanism and Machine – Degree of Freedom – Mobility – Kutzbach criterion (Gruebler's equation) – Grashoff's law – Kinematic Inversions of four-bar chain and slider crank chain – Mechanical Advantage – Transmission angle. Description of common Mechanisms – Offset slider mechanism as quick return mechanisms, Pantograph, Straight line generators (Peaucellier and Watt mechanisms), Steering gear for automobile, Hooke's joint, Toggle mechanism, Ratchets and escapements – Indexing Mechanisms, Steering gear mechanisms such as Davis and Ackermann Steering gear.

Unit-II	KINEMATICS OF LINKAGE MECHANISMS	9

Displacement, velocity and acceleration analysis of simple mechanisms – Graphical method– Velocity and acceleration polygons – Velocity analysis using instantaneous centres – kinematic analysis of simple mechanisms – Coincident points – Coriolis component of Acceleration – Introduction to linkage synthesis problem.

Unit-III	KINEMATICS OF CAM MECHANISMS	9

Classification of cams and followers – Terminology and definitions – Displacement diagrams – Uniform velocity, parabolic, simple harmonic and cycloidal motions – Derivatives of follower motions – Layout of plate cam profiles – Specified contour cams – Circular arc and tangent cams – Pressure angle and undercutting – sizing of cams.

UNIT-IV	GEARS AND GEAR TRAINS	9

Law of toothed gearing – Involutes and cycloidal tooth profiles –Spur Gear terminology and definitions –Gear tooth action – contact ratio – Interference and undercutting. Helical, Bevel, Worm, Rack and Pinion gears [Basics only]. Gear trains – Speed ratio, train value – Parallel axis gear trains – Epicyclic Gear Trains.

UNIT-V	FRICTION IN MACHINE ELEMENTS	9

Surface contacts – Sliding and Rolling friction – Friction drives – Friction in screw threads – Bearings and lubrication – Friction clutches – Belt and rope drives – Friction in brakes- Band and Block brakes.

TOTAL: 45 PERIODS

COURSE OUTCOMES		Cognitive Level
CO1	Discuss the basics of mechanism	Understand
CO2	Calculate velocity and acceleration in simple mechanisms	Understand

CO3	Develop CAM profiles	Apply
CO4	Solve problems on gears and gear trains.	Apply
CO5	Examine friction in machine elements	Analyse

TEXT BOOKS:

1	Sadhu Sigh: Theory of Machines, "Kinematics of Machine", Third Edition, Pearson Education, 2012.
2	Rattan, S.S, "Theory of Machines", 3rd Edition, Tata McGraw-Hill, 2009

REFERENCE BOOKS:

1	Uicker, J.J., Pennock G.R and Shigley, J.E., "Theory of Machines and Mechanisms", 3rdEdition, Oxford University Press, 2009
2	Thomas Bevan, "Theory of Machines", 3rd Edition, CBS Publishers and Distributors, 2005
3	Khurmi, R.S.," Theory of Machines",14th Edition, S Chand Publications, 2005

WEBSITE REFERENCE / NPTEL/ SWAYAM/ MOOC REFERENCE:

1	https://nitsri.ac.in/Department/Mechanical%20Engineering/MEC_403_Part_3_KINEMATICS_OF_MACHINERY.pdf - Kinematics of Machinery
2	https://archive.nptel.ac.in/courses/112/104/112104121/ - Kinematics of Machines
3	https://archive.org/details/NPTEL-MechEngr-Kinematics_of_Machines/AKM-M_1-L_2.MP4 - Kinematics of Machines
4	https://archive.nptel.ac.in/courses/112/106/112106270/ - Theory of Machines

CO-PO MAPPING

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

PUME4PL03	METROLOGY AND MEASUREMENTS LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES:

1	To study the different measurement equipment and use of this industry for quality inspection.
2	To supplements the principles learnt in dynamics of machinery.
3	To understand how certain measuring devices are used for dynamic testing.

LIST OF EXPERIMENTS

1. Calibration and use of linear measuring instruments – Vernier caliper, micro meter, Vernier height gauge, depth micro meter, bore gauge, Comparators.
2. Measurement of angles using bevel protractor, sine bar, autocollimator.
3. Measurement of assembly and transmission elements - screw thread parameters – Screw thread Micro meters, three wire method, Toolmaker's microscope.
4. Measurement of gear parameters – Micro meters, Vernier caliper.
5. Non-contact (Optical) measurement using Measuring microscope / Profile projector and Video measurement system.
6. surface metrology - Measurement of form parameters – Straightness, Flatness, Roundness, Cylindricity, Perpendicular, Runout, Concentricity – in the given component using Roundness tester.
7. Measurement of Surface finish in components manufactured using various processes (turning, milling, grinding, etc.,) using stylus-based instruments
8. Measurements of force & Temperature

TOTAL: 30 PERIODS

COURSE OUTCOMES		Cognitive Level
CO1	Apply the knowledge of mathematics, science and engineering fundamentals to obtain the measurement from measuring instruments like sine bar, vernier height gauge and gear tooth vernier.	Apply
CO2	Select and interpretation of data, and synthesis of the information to provide by the measuring instrument to be compare with the standard information and give the valid conclusions like electrical comparators and mechanical comparator etc..	Apply
CO3	The design system components or process of the measuring instrument to measure the specific needs in engineering products like straightness, flatness by using auto collimator.	Apply
CO4	Design and apply appropriate techniques, resources, to measure the Bore diameter of the product by the application of modern engineering with IT tools.	Apply
CO5	Identify the design system components or process of the measuring instrument to measure the power, flow and Temperature.	Apply

WEBSITE REFERENCE / NPTEL/ SWAYAM/ MOOC REFERENCE:

1	https://www.jru.edu.in/studentcorner/lab-manual/btech/ME/4th sem/Mechanical%20Measurement%20and%20Metrology%20lab.pdf - Mechanical Measurement and Metrology Lab
2	https://sjce.ac.in/wp-content/uploads/2018/04/Metrology-and-Measurement-Laboratory-Manual.pdf

3	https://cmti.res.in/precision-metrology/

CO-PO MAPPING

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

PUME4PL04	MANUFACTURING TECHNOLOGY LABORATORY – II	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES:

1	To Study and acquire knowledge on various basic machining operations in special purpose machines and its applications in real life manufacture of components in the industry
2	To study and acquire knowledge about CNC Programming

LIST OF EXPERIMENTS

1. Contour milling using vertical milling machine
2. Spur gear cutting in milling machine
3. Plain Surface grinding
4. Surface Grinding
5. Cylindrical grinding
6. Pedestal grinding
7. Measurement of cutting forces in Milling / Turning Process
8. CNC Part Programming – Turning
9. Slotting Machine
10. Capstan lathe with semi-automatic type

TOTAL: 60 PERIODS

COURSE OUTCOMES		Cognitive Level
CO1	Examine different type of machine tools to use in manufacturing Industry	Apply
CO2	Ability to use different machine tools to manufacturing gears.	Apply
CO3	Ability to use different machine tools for finishing operations gears	Apply
CO4	Ability to manufacture tools using cutter grinder	Apply
CO5	Develop CNC part programming	Apply

WEBSITE REFERENCE / NPTEL/ SWAYAM/ MOOC REFERENCE:

1	https://www.studocu.com/in/document/anna-university/mechanical-engineering/mt-ii-lab-manual/38046038
2	https://ggnindia.dronacharya.info/ME/Downloads/Labmanuals/Even/Sem_VI/Manufacturing-Technology-II-28072023.pdf
3	https://home.iitk.ac.in/~vkjain/manual.pdf

CO-PO MAPPING

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

CO3	2	2	2	-	-	-	-	2	-	-	-	1	1	-
CO4	2	-	1	-	-	-	-	2	-	-	-	2	2	1
CO5	2	1	3	-	-	-	-	2	-	-	-	1	1	1

PUME4PL05	THERMAL ENGINEERING LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES:

1	To study the value timing-V diagram and performance of IC Engine
2	To Study the characteristics of fuels/Lubricates used in IC Engines
3	To study the Performance of refrigeration cycle / components
4	To study the Performance of Cooling Tower

LIST OF EXPERIMENTS **30**

1. Valve Timing and Port Timing diagrams.
2. Performance Test on four – stroke Diesel Engine.
3. Heat Balance Test on 4 – stroke Diesel Engine.
4. Morse Test on Multi-Cylinder Petrol Engine.
5. Retardation Test on a Diesel Engine.
6. Determination of p-θ diagram and heat release characteristics of an IC engine.
7. Determination of Flash Point and Fire Point of various fuels / lubricants
8. Performance test on a two stage Reciprocating Air compressor
9. Determination of COP of a Refrigeration system
10. Performance test in a Cooling Tower

TOTAL: 30 PERIODS

COURSE OUTCOMES		Cognitive Level
CO1	Conduct tests to evaluate performance characteristics of IC engines	Apply
CO2	Conduct tests to evaluate the performance of refrigeration cycle	Apply
CO3	Conduct tests to evaluate performance characteristics of Cooling Tower	Apply
CO4	Conduct tests to Determination of COP of a Refrigeration system	Apply
CO5	Conduct tests to Determination of Flash Point and Fire Point	Apply

WEBSITE REFERENCE / NPTEL/ SWAYAM/ MOOC REFERENCE:

1	http://www.tagoreiet.ac.in/uploads/corner/qbmech/ME8512.pdf - Thermal Engineering Laboratory
2	https://www.academia.edu/33582214/Lab_Manual_of_I_C_Engine_pdf
3	https://ies.ipsacademy.org/wp-content/uploads/2016/12/I.C.-Engine-Manual.pdf
4	https://web.iitd.ac.in/~pmvs/course_mel713.php

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

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

COURSE OBJECTIVES:

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 behaviour 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 - nutrientsone 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 their reactions

Simple lifestyle modifications to maintain health - Healthy Eating habits (Balanced diet according to age) Physical Activities (Stretching exercise, aerobics, resisting exercise) - MaintainingBMI-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 and Social Hygiene - Daily routine (Dinacharya) - Seasonal regimens (Ritucharya) - basic sanitation andhealthy 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-Dosha Theory) - 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

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COURSE OUTCOMES: At the end of the course, the students will be able:		Cognitive level
CO1	Able to describe Health and its importance at multi-dimensional levels.	Apply
CO2	To be summarize on various diseases and disorders and their symptoms.	Understand
CO3	Able to illustrate habits of food intake and nutritious diet.	Understand
CO4	To explain on traditional methods of Medical Treatments: Ayurveda and Siddha.	Apply
CO5	Able to Implement best practices to manage physical and emotional Quotient	Apply

TEXT BOOKS:	
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

REFERENCE BOOKS:	
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 Workbook The Guilford Press A Division of Guilford Publications, 2011

WEBSITE REFERENCE / NPTEL/ SWAYAM/ MOOC REFERENCE:	
1	https://www.who.int/ - World Health Organization (WHO)
2	https://standard.wellcertified.com/mind/health-and-wellness-awareness - Health and wellness awareness
3	https://www.niehs.nih.gov/health/topics/conditions - Conditions & Diseases
4	https://www.ayurwakeup.com/how-are-ayurveda-and-yoga-related/#:~:text=Yoga%20can%20help%20release%20physical,their%20physical%20health%20as%20well. - Yoga & Ayurveda Integration: A Holistic System
5	https://ayurhealing.net/blog/comparing-homeopathy-allopathy-and-ayurveda/ - Comparing Homeopathy, Allopathy, & Ayurveda
6	https://www.medicalnewstoday.com/articles/286745 - Yoga: Methods, types, philosophy, and risks
7	https://yoga.ayush.gov.in/blog?q=58 - Do's and Don'ts of Yoga Practice - Yoga Ayush Portal
8	https://www.yogabasics.com/practice/ - The Practice of Yoga
9	https://www.tnpesu.org/syllabus/414%20-%20Certificate%20Course%20in%20Yoga%20and%20Naturopathy - Certificate Course in Yoga and Naturopathy
10	https://onlinecourses.swayam2.ac.in/aic23_ge05/preview - Yoga for Concentration - Online Courses Swayam 2
11	https://onlinecourses.nptel.ac.in/noc21_hs29/preview - Psychology of Stress, Health and Well-being - Course

CO-PO MAPPING

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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

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, Debiprasad Chattopadhyay, Rehman, S. IrfanHabib, Deepak Kumar, Dhruv Raina, and others.

UNIT II	SCIENCE AND TECHNOLOGY 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 technology from 1st century AD to C-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 alchemyAstronomy 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: 45 PERIODS

COURSE OUTCOMES: At the end of the course, the students will be able:		**Cognitive level**
CO1	Able to explain the origin and development of Science & Technology in India.	Understand
CO2	Able to Summarize the evolution of Science and Technology in Ancient India.	Understand
CO3	Comprehend the evolution of Science and Technology in Medieval India.	Understand
CO4	Comprehend the evolution of Science and Technology during Colonialism.	Understand
CO5	Comprehend the evolution of Science and Technology during Modern period in India.	Understand

TEXT BOOKS:

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

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REFERENCE BOOKS:	
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 : 978-8131533321
5	D M Bose, S N Sen, B V Subbarayappa,: A Concise History of Science in India, Orient Blackswan, 2009, ISBN: 9788173716195
WEBSITE REFERENCE / NPTEL/ SWAYAM/ MOOC REFERENCE:	
1	https://en.wikipedia.org/wiki/History_of_science_and_technology_on_the_Indian_subcontinent - History of science and technology on the Indian subcontinent
2	https://en.wikipedia.org/wiki/Science_and_technology_in_India - Science and technology in India
3	https://link.springer.com/journal/43539 - Indian Journal of History of Science - SpringerLink
4	https://www.youtube.com/watch?v=zxDp7OkjlLM - Talk by Prof. Partha P Chakrabarti on "History of Science
5	https://en.wikipedia.org/wiki/List_of_Indian_scientists - List of Indian scientists
6	https://www.indiascience.in/ - India Science | Explore Science Channel in India
7	http://www.indianscience.org/index.html - History of Indian Science And Technology
8	https://www.ias.ac.in/About_IASc/History/ - History | About IASc
9	https://onlinecourses.swayam2.ac.in/arp20_ap35/preview - History of Indian Science and Technology - Course
10	https://onlinecourses.nptel.ac.in/noc20_ae10/preview -Introduction to Ancient Indian Technology - Course
11	https://www.classcentral.com/subject/indian-history - Indian History Courses and Certifications
12	https://iisc.ac.in/courses/ - Courses - Bengaluru
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

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PMC23UMC2H03	MANDATORY COURSES – II	L	T	P	C
	POLITICAL AND ECONOMIC THOUGHT FOR A HUMANE 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: At the end of the course, the students will be able:		**Cognitive level**
CO1	Able to describe human, society and their interrelationships	Understand
CO2	Able to summarize various political theories and their evolutions.	Understand
CO3	To summarize the theory of Gandhi and his uniqueness	Understand
CO4	To be illustrate the formation, role and future of civilization in making of human	Apply

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CO5	To be illustrate the trends of Modern Economic Policies	Apply

TEXT BOOKS:	
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: 978-9387779464
REFERENCE BOOKS:	
1	Maharajan. M, Economic Thoughts of Mahatma Gandhi, Discovery Publishing Pvt.Ltd; First Edition, 2008, ISBN-13 : 978-8171414154
2	James Mill, The Elements of Political Economy, Cosimo Classics, 2007, ISBN-13 : 978-1602069800
3	Lokanathan. V., A History Of Economic Thought, S Chand & Co Ltd, 2018, ISBN-13 : 978-9352533374
WEBSITE REFERENCE / NPTEL/ SWAYAM/ MOOC REFERENCE:	
1	https://www.acton.org/node/6298 - The Humane Economy
2	https://thegreatthinkers.org/ - Great Thinkers: A Guide to the History of Political Philosophy
3	https://oll.libertyfund.org/pages/major-political-thinkers - Major Political Thinkers: Plato to Mill | Online Library of Liberty
4	https://www.youtube.com/watch?v=3_lmd4XH-a4 -The History of Economic Thought (Economic Ideas and ...
5	https://en.wikipedia.org/wiki/Political_philosophy - Political philosophy
6	https://onlinecourses.swayam2.ac.in/nou21_hs34/preview - MGPE-009: Gandhi in the 21st Century - Course
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

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

COURSE OBJECTIVE

1	To Understand the reciprocal relationship between the individual and society
2	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
3	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 - Subcultures 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 subcaste - 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 itself and class for itself - 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

Conceptualizing 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: At the end of the course, the students will be able:		**Cognitive level**
CO1	Able to Describe Society in terms of science and find logic behind establishment of society	Understand
CO2	Able to Illustrate Society with Culture to develop the best cultural environment	Apply
CO3	To summarize two major revolutionary concepts of Varna: The Caste and The Class	Understand
CO4	Able to describe the relationship between environment and modern society	Understand

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CO5	Able to illustrate various levels of modern issues in the evolution of society	Apply

TEXT BOOKS:	
1	ROSAMUND BILLINGTON, SHEELAGH STRAWBRIDGE, Culture and Society: A Sociology of Culture, Palgrave Macmillan, 1991, ISBN-13 : 978-0333460399
2	Subas Mohapatra, Society and Culture in India: A Reader, Orient Blackswan, 2017, ISBN: 9789383166145
REFERENCE BOOKS:	
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 / NPTEL/ SWAYAM/ MOOC REFERENCE:	
1	https://en.wikipedia.org/wiki/Society - Society
2	https://en.wikipedia.org/wiki/Culture - Culture
3	https://www.sparknotes.com/sociology/society-and-culture/context/ - Society and Culture: Introduction
4	https://en.wikipedia.org/wiki/Sociology_of_culture - Sociology of culture
5	https://ncert.nic.in/textbook/pdf/kesy104.pdf - Culture and Socialisation
6	https://nptel.ac.in/courses/109106180 - Course Details
7	https://archive.nptel.ac.in/courses/109/103/109103023/ - Humanities and Social Sciences - Introduction to Sociology
8	https://onlinecourses.swayam2.ac.in/cec21_hs40/preview - Introduction to Sociology I - Online Courses Swayam 2
9	https://www.my-mooc.com/en/categorie/sociology - Learn with MOOCs about Sociology | Free Online Courses
10	https://egyankosh.ac.in/handle/123456789/66016 - Unit-8 Culture and Society
11	https://onlinecourses.swayam2.ac.in/cec24_hs15/preview - Sociology of India - 1 - Online Courses Swayam 2
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

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