w.e.f. 2023-24

VR23

VELAGAPUDI RAMAKRISHNA
SIDDHARTHA ENGINEERING COLLEGE
First & Second Year
B.Tech. Syllabus

VR23
SCHEME OF INSTRUCTION
B.Tech. PROGRAMME in Mechanical Engineering
Applicable for the batch of students admitted
from the Academic Year 2023-24

VELAGAPUDI RAMAKRISHNA
SIDDHARTHA ENGINEERING COLLEGE
(An Autonomous, ISO 9001:2015 Certified Institution)
(Approved by AICTE, Accredited by NAAC, Affiliated to JNTUK, Kakinada)
(Sponsored by Siddhartha Academy of General & Technical Education)
Kanuru, Vijayawada
Andhra Pradesh - 520007, INDIA.
www.vrsiddhartha.ac.in

V.R. SIDDHARTHA ENGINEERING COLLEGE

SCHEME OF INSTRUCTION FOR FIRST YEAR UG

MECHANICAL ENGINEERING PROGRAMME [VR23]

SEMESTER I   **CONTACT HOURS: 26**

S.No	Course Code	Course Category	Course Name	L	T	P	Credits
1.	23BS1101	Basic Science	Linear Algebra & Calculus	3	0	0	3
2.	23BS1102A	Basic Science	Engineering Chemistry	3	0	0	3
3.	23ES1103B	Engineering Science	Basic Electrical and Electronics Engineering	3	0	0	3
4.	23ES1104	Engineering Science	Introduction to Programming	3	0	0	3
5.	23ES1105	Engineering Science	Engineering Graphics	1	0	4	3
6.	23BS1151A	Basic Science	Engineering Chemistry Lab	0	0	2	1
7.	23ES1152	Engineering Science	Computer Programming Lab	0	0	3	1.5
8.	23ES1153	Engineering Science	Basic Electrical and Electronics Workshop	0	0	3	1.5
9.	23BS1154B	Basic Science	Health and wellness, Yoga and Sports	-	-	1	0.5
			Total :	**13**	**0**	**13**	**19.5**
10.	23MC1106	Mandatory Course	Induction Program				

SEMESTER II   **CONTACT HOURS: 29**

S.No	Course Code	Course Category	Course Name	L	T	P	Credits
1.	23BS2101	Basic Science	Differential Equations & Vector Calculus	3	0	0	3
2.	23BS2102	Basic Science	Engineering Physics	3	0	0	3
3.	23ES2103A	Engineering Science	Basic Civil and Mechanical Engineering	3	0	0	3
4.	23PC2104B	Professional Core	Engineering Mechanics	3	0	0	3
5.	23HS2105	Basic Science	Communicative English	2	0	0	2
6.	23BS2151	Basic Science	Engineering Physics Lab	0	0	2	1
7.	23PC2152E	Professional Core	Engineering Mechanics Lab (ME)	0	0	3	1.5
8.	23HS2153	Basic Science	Communicative English Lab	0	0	2	1
9.	23ES2154	Engineering Science	Engineering Workshop	0	0	3	1.5
10.	23ES2155	Engineering Science	IT Work shop	0	0	2	1
11.	23BS2156	Basic Science	NSS/NCC/Community Service	-	-	1	0.5
			Total :	**14**	**0**	**13**	**20.5**

SEMESTER III

S.No.	Course Code	Course Category	Course Name	L	T	P	Credits
1	23BS 3101E	Basic Sciences & Humanities	Mathematics for Mechanical Engineers	3	0	0	3
2	23HS 3102	Basic Sciences & Humanities	Universal Human Values 2 – Understanding Harmony	2	1	0	3
3	23ES 3103G	Engineering Science	Basic Thermodynamics	3	0	0	**3**
4	23ME3304	Professional Core	Mechanics of Materials	3	0	0	3
5	23ME 3305	Professional Core	Kinematics of Machines	3	0	0	3
6	23TP 3106	Soft Skills- I	Logic and Reasoning	0	0	2	1
7	23MC3107	Audit Course	Environmental Science	2	0	0	-
8	23ME3651	Skill oriented Course	Programmable logic controllers Lab	0	0	2	1
9	23ME3352	Professional Core	Solid Modeling Laboratory	0	0	3	1.5
10	23ME3353	Professional Core	Computational Methods Lab	0	0	3	1.5
Total				**15**	**1**	**10**	**20**

SEMESTER IV

S.No.	Code	Category	Title	L	T	P	Credits
1	23 HS 4101	Management Course	Engineering Economics and management	2	0	0	2
2	23ES 4102D	Engineering Science	Engineering Metallurgy	3	0	0	3
3	23ME4303	Professional Core	Manufacturing Processes	3	0	0	3
4	23ME4304	Professional Core	Fluid Mechanics and Hydraulic Machines	3	0	0	3
5	23ME4305	Professional Core	Machine Dynamics	3	0	0	3
6	23TP4106	Soft skills -2	English for Professionals	0	0	2	1
7	23ES4651	Skill oriented course	Python Programming Lab	0	0	2	1
8	23ES4152	Engineering Science	Design Thinking & Innovation	1	0	2	2
9	23ME4353	Professional Core	SM &FM Laboratory	0	0	3	1.5
10	23ME4354	Professional Core	Manufacturing Process Lab	0	0	3	1.5
Total				**15**	**0**	**12**	**21**

23BS1101
LINEAR ALGEBRA & CALCULUS

Course Category:	Basic Science	Credits:	3
Course Type:	Theory	Lecture -Tutorial-Practice:	3 - 0- 0
Prerequisites:	10+2 level Mathematics	Continuous Evaluation: Semester end Evaluation: Total Marks:	30 70 100

COURSE OUTCOMES

Upon successful completion of the course, the student will be able to:

CO1	Solve the system of homogeneous and non-homogeneous linear equations
CO2	Examine the nature of a quadratic form by transforming into a canonical form
CO3	Determine maxima and minima of multivariable functions
CO4	Evaluate areas and volumes using double, triple integrals

Contribution of Course Outcomes towards achievement of Program Outcomes
(L – Low, M - Medium, H – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	H	M			L							
CO2	H	M			L							
CO3	H	M			L							
CO4	H	M			L							

COURSE CONTENT

UNIT I   Matrices

Rank of a matrix by Echelon form, Normal form, Cauchy–Binet formulae (without proof), Inverse of Non-singular matrices by Gauss-Jordan method, System of linear equations: Solving system of Homogeneous and Non-Homogeneous equations by Gauss elimination method, Jacobi and Gauss-Seidel Iteration Methods.

UNIT II   Eigenvalues, Eigenvectors and Orthogonal Transformation

Eigenvalues, Eigenvectors and their properties, Diagonalization of a matrix, Cayley-Hamilton Theorem (without proof), Finding inverse and power of a matrix by Cayley-Hamilton Theorem, Quadratic forms and Nature of the Quadratic forms, Reduction of Quadratic form to Canonical forms by Orthogonal Transformation.

UNIT III   Differential Calculus

Mean Value Theorems: Rolle's theorem, Lagrange's mean value theorem with their geometrical interpretation, Cauchy's mean value theorem, Taylor's and Maclaurin's theorems with remainders (without proof), Problems and applications on the above theorems.

Functions of Several Variables: Continuity and Differentiability, Partial derivatives, Total derivatives, Chain rule, Directional derivative, Taylor's and Maclaurin's series expansion of functions of two variables, Jacobians, Functional dependence, Maxima and Minima of functions of two variables, Method of Lagrange multipliers.

UNIT IV   Multiple Integrals (Multivariable Calculus)

Double integrals,Triple integrals, Change of order of integration, Change of variables to polar, cylindrical and spherical coordinates, Finding areas (by double integrals) and volumes (by double integrals and triple integrals).

TEXT BOOKS

[1]. Higher Engineering Mathematics, B. S. Grewal, Khanna Publishers, 2017, 44th Edition

REFERENCE BOOKS

[1]. Advanced Engineering Mathematics, Erwin Kreyszig, John Wiley & Sons, 2018, 10thEdition
[2]. Thomas Calculus, George B. Thomas, Maurice D. Weir and Joel Hass, Pearson Publishers, 2018, 14th Edition
[3]. Advanced Engineering Mathematics, R. K. Jain and S. R. K. Iyengar, Alpha Science International Ltd., 2021 5th Edition(9th reprint)
[4]. Advanced Modern Engineering Mathematics, Glyn James, Pearson publishers, 2018, 5thEdition
[5]. Advanced Engineering Mathematics, Micheael Greenberg, , Pearson publishers, 9thEdition
[6]. Higher Engineering Mathematics, H. K Das, Er. Rajnish Verma, S. Chand Publications,2014, 3rd Edition (Reprint 2021)

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1]. Prof.S. K. Gupta & Prof. Sanjeev Kumar ,IIT Roorkee, Matrix Analysis with Applications[English], Available:https://onlinecourses.nptel.ac.in/noc19_ma28/preview
[2]. Prof. Jitendra Kumar , IIT Kharagpur, Engineering Mathematics – I[English], Available:https://onlinecourses.nptel.ac.in/noc20_ma37/preview
[3]. Prof. Jitendra Kumar & Prof. Somesh Kumar, IIT Kharagpur, Advanced Calculus For Engineers[English], Available:https://onlinecourses.nptel.ac.in/noc22_ma75/preview
[4]. Prof. Denis Auroux, Massachusetts Institute of Technology: MIT Open Courseware,Multivariable Calculus,Available:https://ocw.mit.edu.

23BS1102A
ENGINEERING CHEMISTRY

Course Category:	Basic Science		Credits:	3
Course Type:	Theory		Lecture -Tutorial-Practice:	3 - 0 - 0
Prerequisites:	10 + 2 level Chemistry		Continuous Evaluation: Semester end Evaluation: Total Marks:	30 70 100

COURSE OUTCOMES

Upon successful completion of the course, the student will be able to:

CO1	Analyse various water treatment methods and boiler troubles.
CO2	Apply the knowledge of basic electrochemistry principles for electrochemical energy systems and corrosion.
CO3	Compare mechanistic aspects of polymerisation, and different polymers and conventional fuels for their effective utilisation.
CO4	Evaluate various modern engineering materials for their applications in engineering and other fields.

Contribution of Course Outcomes towards achievement of Program Outcomes
(L – Low, M - Medium, H – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	M	M					L					
CO2	M	M										
CO3	M		M				L					
CO4	M		M									

COURSE CONTENT

UNIT – I :
Water Technology-I (Domestic water): Specifications for drinking water - World Health Organization (WHO) standards, domestic water treatment – sedimentation, coagulation, disinfection by chlorination – breakpoint chlorination, desalination of brackish water – electrodialysis and reverse osmosis (RO).

Water Technology-II (Industrial water): Hardness of water, Estimation of hardness of water by EDTA Method, Estimation of dissolved oxygen – Boiler troubles – scales, caustic embrittlement – reasons, disadvantages and control methods – conditioning, Industrial water treatment – Ion-exchange method, concept of adsorption and its applications**.**

UNIT – II :
Electrochemistry: Electrodes, electrochemical cell, Nernst equation, cell potential calculations, Primary cells – zinc-air battery, Secondary cells –lithium ion batteries- working principle of the batteries including cell reactions; Fuel cells – working principle of a fuel cell and working of hydrogen-oxygen fuel cell.

Corrosion: Introduction, electrochemical corrosion – hydrogen evolution and oxygen absorption corrosion, differential aeration corrosion, galvanic corrosion, factors affecting the corrosion, cathodic protection, copper electroplating and copper electroless plating.

UNIT – III :
Polymer Chemistry: Introduction, functionality of monomers, mechanism of chain growth, step growth polymerization, thermoplastics and thermosetting plastics: Preparation, properties and applications of PVC, polystyrene, Nylon 6,6 and Bakelite. Elastomers – Preparation, properties and applications of Buna S and Buna N.

Fuel Chemistry: Fuels- classification, calorific value of fuels, numerical problems based on calorific value;Analysis of coal (proximate and ultimate analysis), Liquid fuels -refining of petroleum, concept of knocking, octane and cetane number, alternative fuels –biomass, biogas, biodiesel.

UNIT – IV :
Modern Engineering Materials-I: *Composites*: classification – particle, fibre and layered reinforced composites, properties and engineering applications.*Lubricants*: classification, mechanisms, properties of lubricating oils-viscosity, viscosity Index, flash point, fire point, and applications.

Modern Engineering Materials-II: *Building materials*: Portland cement, constituents, setting and hardening of cement, refractories – classification and properties –refractoriness, RUL test, porosity, and applications.*Nanomaterials*: classification, properties and applications.

TEXT BOOKS

[1].Engineering Chemistry, Jain and Jain, 17th Edition, DhanpatRai, 2018.
[2]. Engineering Chemistry, PrasanthaRath& S. ArunaKumari, Cengage Publishers, 2023.

REFERENCE BOOKS

[1].Peter Atkins, Julio de Paula and James Keeler, Atkins' Physical Chemistry, 10/e, Oxford University Press, 2010.
[2].H.F.W. Taylor, Cement Chemistry, 2/e, Thomas Telford Publications, 1997.
[3]. Textbook of polymer Science,Fred W.BillmayerJr, 3rd Edition.

E-RESOURCES AND OTHER DIGITAL MATERIAL

1. https://onlinecourses.swayam2.ac.in/cec24_cy02/preview
2. https://www.youtube.com/watch?v=LMSTMBX_2F4
3. https://www.corrosion-doctors.org/
4. https://www.watertechonline.com/videos

23BS1103B
BASIC ELECTRICAL & ELECTRONICS ENGINEERING

Course Category:	Engineering Science	Credits:	3
Course Type:	Theory	Lecture -Tutorial-Practice:	3 - 0 - 0
Prerequisites:	Basic Electrical and Electronics Engineering	Continuous Evaluation: Semester end Evaluation: Total Marks:	30 70 100

COURSE OUTCOMES

Upon successful completion of the course, the student will be able to:

CO1	**Apply** different techniques to solve DC circuits.
CO2	**Understand** the magnetic circuit concepts.
CO3	**Analyze the** steady-state response, series, parallel AC circuits, mesh & nodal analysis, and resonance.
CO4	**Apply** network theorems for AC & DC circuits.
CO5	Demonstrate the working principles of basic Electronic devices, circuits and instrumentation System .
CO6	Implementation of simple Combinational and Sequential circuits using Logic gates.

Contribution of Course Outcomes towards achievement of Program Outcomes
(L – Low, M - Medium, H – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	H											
CO2	H											
CO3	M											
CO4	M											
CO5	M		M									
CO6	M		M									

COURSE CONTENT

UNIT I   DC & AC Circuits

DC Circuits: Electrical circuit elements (R, L and C), Ohm's Law and its limitations, KCL & KVL,

series, parallel, series-parallel circuits, Super Position theorem, Simple numerical problems.

AC Circuits: A.C. Fundamentals: Equation of AC Voltage and current, waveform, time period, frequency, amplitude, phase, phase difference, average value, RMS value, form factor, peak factor, Voltage and current relationship with phasor diagrams in R, L, and C circuits, Concept of Impedance, Active power, reactive power and apparent power, Concept of power factor (Simple Numerical problems).

Equipment Safety Measures: Working principle of Fuse and Miniature circuit breaker (MCB), merits and demerits. Personal safety measures: Electric Shock, Earthing phenomenon, Safety Precautions to avoid shock.

UNIT II   Machines and Measuring Instruments

Machines: Construction, principle and operation of (i) DC Motor, (ii) DC Generator, (iii) Single Phase Transformer, (iv) Three Phase Induction Motor and (v) Alternator, Applications of electrical machines.

Measuring Instruments: Construction and working principle of Voltage, Current, temperature sensors, basic block diagram of multimeter.

Electricity bill: Power rating of household appliances including air conditioners, PCs, Laptops, Printers, etc. Definition of "unit" used for consumption of electrical energy, calculation of electricity bill for domestic consumers.

UNIT – III : SEMICONDUCTOR DEVICES

Introduction - Evolution of electronics – Vacuum tubes to nano electronics – Characteristics of PN Junction Diode — Zener Effect — Zener Diode and its Characteristics. Bipolar Junction Transistor — CB, CE, CC Configurations and Characteristics — Elementary Treatment of Small Signal CE Amplifier.

Rectifiers and power supplies: Block diagram description of a dc power supply, working of a full wave bridge rectifier, capacitor filter (no analysis), working of simple zener voltage regulator.

Amplifiers: Block diagram of Public Address system, Circuit diagram.

Electronic Instrumentation: Block diagram of an electronic instrumentation system.

UNIT – IV : DIGITAL ELECTRONICS

Overview of Number Systems, Logic gates including Universal Gates, BCD codes, Excess-3 code, Gray code, Hamming code. Boolean Algebra, Basic Theorems and properties of Boolean Algebra, Truth Tables and Functionality of Logic Gates – NOT, OR, AND, NOR,NAND, XOR and XNOR. Simple combinational circuits–Half and Full Adders. Introduction to Flip flops, Registers and counters (Elementary Treatment only)

TEXT BOOKS (for UNITS I & II)

1. Basic Electrical Engineering, D. P. Kothari and I. J. Nagrath, Mc Graw Hill, 2019, Fourth Edition
2. Principles of Power Systems, V.K. Mehtha, S.Chand Technical Publishers, 2020
3. Basic Electrical Engineering, T. K. Nagsarkar and M. S. Sukhija, Oxford University Press, 2017
4. Basic Electrical and Electronics Engineering, S. K. Bhatacharya, Person Publications, 2018, Second Edition.

REFERENCE BOOKS (for UNITS I & II)

1. Basic Electrical Engineering, D. P. Kothari and I. J. Nagrath, Mc Graw Hill, 2019, Fourth Edition
2. Principles of Power Systems, V.K. Mehtha, S.Chand Technical Publishers, 2020
3. Basic Electrical Engineering, T. K. Nagsarkar and M. S. Sukhija, Oxford University Press, 2017
4. Basic Electrical and Electronics Engineering, S. K. Bhatacharya, Person Publications, 2018, Second Edition.

E-RESOURCES AND OTHER DIGITAL MATERIAL (for UNITS I & II)

1. https://nptel.ac.in/courses/108105053

2. https://nptel.ac.in/courses/10810807

TEXT BOOKS   (for UNITS III & IV)

[1].R. L. Boylestad & Louis Nashlesky, Electronic Devices & Circuit Theory, Pearson Education, 2021.
[2]. P. Jain, Modern Digital Electronics, 4th Edition, Tata Mc Graw Hill, 2009. Resnick, Halliday and Krane, "Physics", 5th edition, Wiley India Pvt. Ltd, New Delhi, 2016.

REFERENCE BOOKS (for UNITS III & IV)

[1]. R. S. Sedha, A Textbook of Electronic Devices and Circuits, S. Chand & Co, 2010.

[2]. Santiram Kal, Basic Electronics- Devices, Circuits and IT Fundamentals, Prentice Hall, India, 2002.

[3]. R. T. Paynter, Introductory Electronic Devices & Circuits – Conventional Flow Version,

[4]. Pearson Education, 2009.

E-RESOURCES AND OTHER DIGITAL MATERIAL (for UNITS III & IV)

[1] https://embeddedengineers.files.wordpress.com/2015/09/electronic-devices-and-circuits-by-salivahanan.pdf
[2]. http://www.nptelvideos.in/2012/12/basic-electronics-drchitralekha-mahanta.html
[3] https://en.wikipedia.org/wiki/Digital_electronics

23ES1104
INTRODUCTION TO PROGRAMMING

Course Category:	Engineering Science	Credits:	3
Course Type:	Theory	Lecture -Tutorial-Practice:	3 - 0 - 0
Prerequisites:	--	Continuous Evaluation:	30
		Semester end Evaluation:	70
		Total Marks:	100

COURSE OUTCOMES

Upon successful completion of the course, the student will be able to:

CO1	To introduce students to the fundamentals of computer programming.
CO2	To provide hands-on experience with coding and debugging on control structures and arrays.
CO3	To foster logical thinking and problem-solving skills on strings and ponters.
CO4	To familiarize students with programming concepts such as functions, structures and files.

**Contribution of Course Outcomes towards achievement of Program Outcomes
(L – Low, M - Medium, H – High)**

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	H				M							
CO2			H		M							
CO3			H		M							
CO4			H		M							

COURSE CONTENT

UNIT – I : Introduction to Programming and Problem Solving

History of Computers, Basic organization of a computer: ALU, input-output units, memory, program counter, Introduction to Programming Languages, Basics of a Computer Program-Algorithms, flowcharts (Using Dia Tool), pseudo code. Introduction to Compilation and Execution, Primitive Data Types, Variables, and Constants, Basic Input and Output, Operations, Type Conversion, and Casting.

Problem solving techniques: Algorithmic approach, characteristics of algorithm, Problem solving strategies: Top-down approach, Bottom-up approach, Time and space complexities of algorithms.

UNIT – II : Control Structures and Arrays
Simple sequential programs Conditional Statements (if, if-else, switch), Loops (for, while, do-while) Break and Continue, Arrays indexing, memory model, programs with array of integers,two dimensional arrays

UNIT – III : Strings and pointers
Introduction to Strings. Pointers, dereferencing and address operators, pointer and address arithmetic, array manipulation using pointers.

UNIT – IV : Functions, User Defined Data types and File Handling
Introduction to Functions, Function Declaration and Definition, Function call Return Types and Arguments, modifying parameters inside functions using pointers, arrays as parameters. Scope and Lifetime of Variables, User-defined data types-Structures and Unions, Basics of File Handling

TEXT BOOKS

[1]. "The C Programming Language", Brian W. Kernighan and Dennis M. Ritchie, Prentice- Hall, 1988.
[2]. Schaum's Outline of Programming with C, Byron S Gottfried, McGraw-Hill Education, 1996

REFERENCE BOOKS

[1]. Computing fundamentals and C Programming, Balagurusamy, E., McGraw-Hill Education, 2008.W. H. Hayt and J. A. Buck, "Engineering Electromagnetics", 7th edition, Tata McGraw Hill, New Delhi, 2006
[2]. Programming in C, Rema Theraja, Oxford, 2016, 2nd edition
[3]. C Programming,A Problem Solving Approach,Forouzan,Gilberg,Prasad, CENGAGE, 3rd edition.

E-RESOURCES AND OTHER DIGITAL MATERIAL

1. http://nptel.iitm.ac.in/video.php?subjectId=10810607
2. http://nptel.iitm.ac.in/courses/Webcourse-contents/IIT-%20Guwahati/em/index.htm
3. http://www.mike-willis.com/Tutorial/PF2.htm

23ES1105
ENGINEERING GRAPHICS

Course Category:	Engineering Science	Credits:	3
Course Type:	Theory & Practice	Lecture -Tutorial-Practice:	1 - 0 - 4
Prerequisites:	NIL	Continuous Evaluation: Semester end Evaluation: Total Marks:	30 70 100

COURSE OUTCOMES

Upon successful completion of the course, the student will be able to:

CO1	Understand the principles of engineering drawing, including engineering curves and scales.
CO2	Draw and interpret orthographic projections of points, lines and planes in front,top and side views.
CO3	Understand and draw projection of solids in various positions in first quadrant and Explain principles behind development of surfaces.
CO4	Explain principles behind the Sections of solids, Prepare isometric views and conversion of simple solids.

Contribution of Course Outcomes towards achievement of Program Outcomes
(L – Low, M - Medium, H – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	H		H							H		
CO2	H		H							H		
CO3	M		M							M		
CO4	L		L							L		

COURSE CONTENT

UNIT I
Introduction: Lines, Lettering and Dimensioning, Geometrical Constructions of regular polygons by general methods.

Curves: Construction of ellipse, parabola and hyperbola by general method and Involutes. Draw normal and tangent to Curves.

Scales: Plain scales and diagonal scales.

UNIT II

Orthographic Projections: Reference plane, importance of reference lines or Plane, **Projections of a point** situated in **first quadrant** only.

Projections of Straight Lines: Projections of straight lines parallel to both reference planes, perpendicular to one reference plane and parallel to other reference plane, inclined to one reference plane and parallel to the other reference plane. Projections of Straight Line Inclined to both the reference planes.

Projections of Planes: Regular planes Perpendicular to both reference planes, parallel to one reference plane and inclined to the other reference plane; plane inclined to both the reference planes.

UNIT III

Projections of Solids: Projections of solids(Prisms and Pyramids only) in simple positions: Axis perpendicular to horizontal plane, Axis perpendicular to vertical plane and Projection of Solids with axis inclined to one reference plane and parallel to another plane.

Development of Surfaces: Methods of Development: Parallel line development and radial line development. Development of a cube, prism, cylinder, pyramid and cone.

Computer graphics: Creating 2D & 3D drawings of objects including PCB and Transformations using Auto CAD (*Not for end examination*).

UNIT IV

Sections of Solids: Section planes perpendicular to VP and inclined to HP only, Sectional views (Front View and Top View only) and Sections of solids in simple position only.

Isometric Views: Draw an Isometric views of Simple solids

Conversion of Views: Conversion of isometric views to orthographic views of Simple solids.

TEXT BOOKS

1. N. D. Bhatt, Engineering Drawing, Charotar Publishing House, 2016.

REFERENCE BOOKS

1. Engineering Drawing, Basant Agrawal and C M Agrawal,Tata McGraw Hill, 2009.
2. Engineering Drawing, K.L. Narayana and P. Kannaiah, Tata McGraw Hill, 2013.
3. Engineering Drawing, M.B.Shah and B.C. Rana, Pearson Education Inc,2009.
4. Engineering Drawing with an Introduction to Auto CAD, Dhananjay Jolhe , Tata McGraw Hill, 2017.

23BS1151A
ENGINEERING CHEMISTRY LAB

Course Category:	Basic Science	Credits:	1
Course Type:	Laboratory	Lecture -Tutorial-Practice:	0 - 0 - 2
Prerequisites:	Knowledge of chemistry practicals at Intermediate level	Continuous Evaluation: Semester end Evaluation: Total Marks:	30 70 100

COURSE OUTCOMES

Upon successful completion of the course, the student will be able to:

CO1	Analyzewater samples and various commercial samples of acids, cement, coal, lubricants, etc. for their purity and quality.
CO2	Analyzesamples of water and cement through various instrumental methods like colorimetry, and pH metry.
CO3	Apply standard procedures for preparation of nanomaterials, polymers and blueprinting, as well as study the adsorption process.

Contribution of Course Outcomes towards achievement of Program Outcomes
(L – Low, M - Medium, H – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1				M								
CO2				M								
CO3				M								

COURSE CONTENT

List of Experiments

1. Determination of hardness of a groundwater sample

2. Determination of strength of an acid in Lead-acid battery

3. Determination of calcium in Portland cement

4. Determination of strength of a base using pH metric titration

5. Determination of percentage of iron in cement sample by colorimetry

6. Chemistry of blueprinting

7. Preparation of a polymer – Urea-formaldehyde resin

8. Preparation of nanomaterials by precipitation method

9. Adsorption of acetic acid by charcoal

10. Determination of percentage moisture content in a coal sample

11. Determination of viscosity of lubricating oil by Redwood viscometer

12. Determination of calorific value of gases by Junker's gas calorimeter

REFERENCE BOOKS

[1]. "Vogel's quantitative chemical analysis", 6th Edition, by J. Mendham, R.C. Denney, J.D. Barnes and B. Sivasankar, Pearson Publications.

23ES1152
COMPUTER PROGRAMMING LAB

Course Category:	Engineering Science	Credits:	1.5
Course Type:	Lab	Lecture -Tutorial-Practice:	0 - 0 - 3
Prerequisites:		Continuous Evaluation:	30
		Semester end Evaluation:	70
		Total Marks:	100

COURSE OUTCOMES

Upon successful completion of the course, the student will be able to:

CO1	Read, understand, and trace the execution of programs written in C language.
CO2	Select the right control structure for solving the problem.
CO3	Develop C programs which utilize memory efficiently using programming constructs like pointers.
CO4	Develop, Debug and Execute programs to demonstrate the applications of arrays, functions, basic concepts of pointers in C.

Contribution of Course Outcomes towards achievement of Program Outcomes
(L – Low, M - Medium, H – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	H	L			M							
CO2		M	H		M							
CO3	M	M	H		M							
CO4		M	H		M							

COURSE CONTENT

WEEK 1
Objective: Getting familiar with the programming environment on the computer and writing the first program.
Suggested Experiments/Activities:
Tutorial 1: Problem-solving using Computers.
Lab1: Familiarization with programming environment
i) Basic Linux environment and its editors like Vi, Vim & Emacs etc.
ii) Exposure to Turbo C, gcc
iii) Writing simple programs using printf(), scanf()

WEEK 2
Objective: Getting familiar with how to formally describe a solution to a problem in a series of finite steps both using textual notation and graphic notation.
Suggested Experiments /Activities:
Tutorial 2: Problem-solving using Algorithms and Flow charts.
Lab 1: Converting algorithms/flow charts into C Source code.
Developing the algorithms/flowcharts for the following sample programs
i) Sum and average of 3 numbers
ii) Conversion of Fahrenheit to Celsius and vice versa
iii) Simple interest calculation

WEEK 3
Objective: Learn how to define variables with the desired data-type, initialize them with appropriate values and how arithmetic operators can be used with variables and constants.
Suggested Experiments/Activities:
Tutorial 3: Variable types and type conversions:
Lab 3: Simple computational problems using arithmetic expressions.
i) Finding the square root of a given number
ii) Finding compound interest
iii) Area of a triangle using heron's formulae
iv) Distance travelled by an object

UNIT II WEEK 4
Objective: Explore the full scope of expressions, type-compatibility of variables & constants and operators used in the expression and how operator precedence works.
Suggested Experiments/Activities:
Tutorial4: Operators and the precedence and as associativity:
Lab4: Simple computational problems using the operator' precedence and associativity
i) Evaluate the following expressions.
a. A+B*C+(D*E) + F*G
b. A/B*C-B+A*D/3
c. A+++B---A
d. J= (i++) + (++i)
ii) Find the maximum of three numbers using conditional operator
iii) Take marks of 5 subjects in integers, and find the total, average in float

WEEK 5
Objective: Explore the full scope of different variants of "if construct" namely if-else, null- else, if-else if*-else, switch and nested-if including in what scenario each one of them can be used and how to use them. Explore all relational and logical operators while writing conditionals for "if construct".
Suggested Experiments/Activities:
Tutorial 5: Branching and logical expressions:
Lab 5: Problems involving if-then-else structures.
i) Write a C program to find the max and min of four numbers using if-else.
ii) Write a C program to generate electricity bill.
iii) Find the roots of the quadratic equation.
iv) Write a C program to simulate a calculator using switch case.
v) Write a C program to find the given year is a leap year or not.

WEEK 6
Objective: Explore the full scope of iterative constructs namely while loop, do-while loop and
loop in addition to structured jump constructs like break and continue including when each of these statements is
more appropriate to use.
Suggested Experiments/Activities:
Tutorial 6: Loops, while and for loops
Lab 6: Iterative problems e.g., the sum of series
i) Find the factorial of given number using any loop.
ii) Find the given number is a prime or not.
iii) Compute sine and cos series
iv) Checking a number palindrome
v) Construct a pyramid of numbers.

UNIT III WEEK 7:
Objective: Explore the full scope of Arrays construct namely defining and initializing 1-D and 2-D and more
generically n-D arrays and referencing individual array elements from the defined array. Using integer 1-D
arrays, explore search solution linear search.
Suggested Experiments/Activities:
Tutorial 7: 1 D Arrays: searching.
Lab 7:1D Array manipulation, linear search
i) Find the min and max of a 1-D integer array.
ii) Perform linear search on1D array.
iii) The reverse of a 1D integer array
iv) Find 2's complement of the given binary number.
v) Eliminate duplicate elements in an array.

WEEK 8:
Objective: Explore the difference between other arrays and character arrays that can be used as Strings by using
null character and get comfortable with string by doing experiments that will reverse a string and concatenate two
strings. Explore sorting solution bubble sort using integer arrays.
Suggested Experiments/Activities:
Tutorial 8: 2 D arrays, sorting and Strings.
Lab 8: Matrix problems, String operations, Bubble sort
i) Addition of two matrices
ii) Multiplication two matrices
iii) Sort array elements using bubble sort
iv) Concatenate two strings without built-in functions
v) Reverse a string using built-in and without built-in string functions

UNIT IV WEEK 9:
Objective: Explore pointers to manage a dynamic array of integers, including memory allocation & value
initialization, resizing changing and reordering the contents of an array
memory de-allocation using malloc (), calloc (), realloc () and free () functions. Gain experience processing
command-line arguments received by C
Suggested Experiments/Activities:
Tutorial 9: Pointers, structures and dynamic memory allocation
Lab 9: Pointers and structures, memory dereference.
i) Write a C program to find the sum of a 1D array using malloc()
ii) Write a C program to find the total, average of n students using structures
iii) Enter n students data using calloc() and display failed students list
iv) Read student name and marks from the command line and display the student details along with the total.
v) Write a C program to implement realloc()

WEEK 10:
Objective: Experiment with C Structures, Unions, bit fields and self-referential structures (Singly linked lists) and nested structures
Suggested Experiments/Activities:
Tutorial 10: Bitfields, Self-Referential Structures, Linked lists
Lab10 : Bitfields, linked lists
Read and print a date using dd/mm/yyyy format using bit-fields and differentiate the same without using bit-fields
i) Create and display a singly linked list using self-referential structure.
ii) Demonstrate the differences between structures and unions using a C program.
iii) Write a C program to shift/rotate using bitfields.
iv) Write a C program to copy one structure variable to another structure of the same type.

UNIT V WEEK 11:
Objective: Explore the Functions, sub-routines, scope and extent of variables, doing some experiments by parameter passing using call by value. Basic methods of numerical integration
Suggested Experiments/Activities:
Tutorial 11: Functions, call by value, scope and extent,
Lab 11: Simple functions using call by value, solving differential equations using Eulers theorem.
i) Write a C function to calculate NCR value.
ii) Write a C function to find the length of a string.
iii) Write a C function to transpose of a matrix.
iv) Write a C function to demonstrate numerical integration of differential equations using Euler's method

WEEK 12:
Objective: Explore how recursive solutions can be programmed by writing recursive functions that can be invoked from the main by programming at-least five distinct problems that have naturally recursive solutions.
Suggested Experiments/Activities:
Tutorial 12: Recursion, the structure of recursive calls
Lab 12: Recursive functions
i) Write a recursive function to generate Fibonacci series.
ii) Write a recursive function to find the lcm of two numbers.
iii) Write a recursive function to find the factorial of a number.
iv) Write a C Program to implement Ackermann function using recursion.
v) Write a recursive function to find the sum of series.

WEEK 13:
Objective: Explore the basic difference between normal and pointer variables, Arithmetic operations using pointers and passing variables to functions using pointers
Suggested Experiments/Activities:
Tutorial 13: Call by reference, dangling pointers
Lab 13: Simple functions using Call by reference, Dangling pointers.
i) Write a C program to swap two numbers using call by reference.
ii) Demonstrate Dangling pointer problem using a C program.
iii) Write a C program to copy one string into another using pointer.
iv) Write a C program to find no of lowercase, uppercase, digits and other characters using pointers.

WEEK14:
Objective: To understand data files and file handling with various file I/O functions. Explore the differences between text and binary files.
Suggested Experiments/Activities:
Tutorial 14: File handling
Lab 14: File operations

i) Write a C program to write and read text into a file.
ii) Write a C program to write and read text into a binary file using fread() and fwrite()
iii) Copy the contents of one file to another file.
iv) Write a C program to merge two files into the third file using command-line arguments.
v) Find no. of lines, words and characters in a file
vi) Write a C program to print last n characters of a given file.

TEXT BOOKS

[1] Ajay Mittal, Programming in C: A practical approach, Pearson.
[2] Byron Gottfried, Schaum' s Outline of Programming with C, McGraw Hill

E-RESOURCES

1] Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice- Hall of India

[2] C Programming, A Problem-Solving Approach, Forouzan, Gilberg, Prasad, CENGAGE

23ES1153
BASIC ELECTRICAL & ELECTRONICS WORKSHOP

Course Category:	Engineering Science	Credits:	1.5
Course Type:	Practice	Lecture-Tutorial-Practice:	0-0-3
Prerequisites:	Engineering Physics	Continuous Evaluation:	30M
		Semester End Evaluation:	70M
		Total Marks:	100M

Course outcomes

Upon successful completion of the course, the student will be able to:

Part A: Electrical Lab

CO1	Measure voltage, current and power in an electrical circuit
CO2	Measure of Resistance using Wheat stone bridge.
CO3	Discover critical field resistance and critical speed of DC shunt generators
CO4	Investigate the effect of reactive power and power factor in electrical loads

Contribution of Course Outcomes towards achievement of Program Outcomes (L - Low, M - Medium, H - High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1			M	H										
CO2			M	H										
CO3			H	M										
CO4			H	M										

PART A: ELECTRICAL ENGINEERING LAB:

List of experiments:

1. Verification of KCL and KVL

2. Verification of Superposition theorem

3. Measurement of Resistance using Wheat stone bridge

4. Magnetization Characteristics of DC shunt Generator

5. Measurement of Power and Power factor using Single-phase wattmeter

6. Measurement of Earth Resistance using Megger.

7. Calculation of Electrical Energy for Domestic Premises.

PART B: ELECTRONICS ENGINEERING LAB

CO1	Identify & testing of various electronic components.
CO2	Understand the usage of electronic measuring instruments.

		Plot and discuss the characteristics of various electron devices.												
CO3		Plot and discuss the characteristics of various electron devices.												
CO4		Explain the operation of a digital circuit.												

Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M – Medium, H – High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1			M	H										
CO2			M	H										
CO3			H	M										
CO4			H	M										

Course Content

PART B: ELECTRONICS ENGINEERING LAB:

List of Experiments:

1. Plot V-I characteristics of PN Junction diode A) Forward bias B) Reverse bias.

2. Plot V – I characteristics of Zener Diode and its application as voltage Regulator.

3. Implementation of half wave and full wave rectifiers

4. Plot Input & Output characteristics of BJT in CE and CB configurations

5. Frequency response of CE amplifier.

6. Simulation of RC coupled amplifier with the design supplied

7. Verification of Truth Table of AND, OR, NOT, NAND, NOR, Ex-OR, Ex-NOR gates

using ICs.

8. Verification of Truth Tables of S-R, J-K& D flip flops using respective ICs.

Reference Books:
1. Basic Electrical Engineering, D. C. Kulshreshtha, Tata McGraw Hill, 2019, 1st edition
2. Power System Engineering, P.V. Gupta, M.L. Soni, U.S. Bhatnagar and A. Chakrabarti, Dhanpat Rai & Co, 2013
3. Fundamentals of Electrical Engineering, Rajendra Prasad, PHI publishers, 2014, 3rd edition.
4. R. L. Boylestad & Louis Nashlesky, Electronic Devices & Circuit Theory, Pearson Education, 2021.
5. R. P. Jain, Modern Digital Electronics, 4th Edition, Tata Mc Graw Hill, 2009

6. R. T. Paynter, Introductory Electronic Devices & Circuits – Conventional Flow Version, Pearson Education,2009.

1. A minimum of 6 experiments from each Part- A and Part-B are to be completed.
2. Students are encouraged to do experiments with virtual labs.

23BS1154B
HEALTH AND WELLNESS, YOGA AND SPORTS

Course Category:	Basic Science	Credits:	0.5
Course Type:	Lab (Activity Based Course)	Lecture -Tutorial- Practice:	0 - 0 - 1
Prerequisites:	-	Continuous Evaluation: Max.Activities:6 Viva: Total Marks:	Activity based course 6 x 15 = 90 10 100

COURSE OBJECTIVES

The main objective of introducing this course is to make the students maintain their mental and physical wellness by balancing emotions in their life. It mainly enhances the essential traits required for the development of the personality.

COURSE OUTCOMES

Upon successful completion of the course, the student will be able to:

CO1	Understand the importance of yoga and sports for Physical fitness and sound health
CO2	Demonstrate an understanding of health-related fitness components
CO3	Compare and contrast various activities that help enhance their health.
CO4	Assess current personal fitness levels.
CO5	Develop Positive Personality

COURSE CONTENT

UNIT – I :
Concept of health and fitness, Nutrition and Balanced diet, basic concept of immunity Relationship between diet and fitness, Globalization and its impact on health, Body Mass Index(BMI) of all age groups.

Activities:
  i)   Organizing health awareness programmes in community
  ii) Preparation of health profile
  iii) Preparation of chart for balance diet for all age groups

UNIT II
Concept of yoga, need for and importance of yoga, origin and history of yoga in Indian context, classification of yoga, Physiological effects of Asanas- Pranayama and meditation, stress management and yoga, Mental health and yoga practice.

Activities:

Yoga practices – Asana, Kriya, Mudra, Bandha, Dhyana, Surya Namaskar

UNIT III

Concept of Sports and fitness, importance, fitness components, history of sports, Ancient and Modern Olympics, Asian games and Commonwealth games.

Activities:

i) Participation in one major game and one individual sport viz., Athletics, Volleyball, Basketball, Handball, Football, Badminton, Kabaddi, Kho-kho, Table tennis, Cricket etc.
    Practicing general and specific warm up, aerobics

ii) Practicing cardiorespiratory fitness, treadmill, run test, 9 min walk, skipping andrunning.

REFERENCE BOOKS

[1]. Gordon Edlin, Eric Golanty. Health and Wellness, 14th Edn. Jones & Bartlett Learning,2022
[2]. T.K.V.Desikachar. The Heart of Yoga: Developing a Personal Practice
[3]. Archie J.Bahm. Yoga Sutras of Patanjali, Jain Publishing Company, 1993
[4]. Wiseman, John Lofty, SAS Survival Handbook: The Ultimate Guide to SurvivingAny where Third Edition, William Morrow Paperbacks, 2014
[5]. The Sports Rules Book/ Human Kinetics with Thomas Hanlon. -- 3rd ed. HumanKinetics, Inc.2014

23BS2101
DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS

Course Category:	Basic Science	Credits:	3
Course Type:	Theory	Lecture -Tutorial-Practice:	3 - 0- 0
Prerequisites:	23BS1101 LinearAlgebra & Calculus	Continuous Evaluation: Semester end Evaluation: Total Marks:	30 70 100

COURSE OUTCOMES

Upon successful completion of the course, the student will be able to:

CO1	Solve first order linear differential equations
CO2	Solve higher order linear differential equations with constant coefficients
CO3	Solve Partial differential equations
CO4	Evaluate the work done against field, circulation and flux using vector calculus

Contribution of Course Outcomes towards achievement of Program Outcomes
(L – Low, M - Medium, H – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	H	M			L							
CO2	H	M			L							
CO3	H	M			L							
CO4	H	M			L							

COURSE CONTENT

UNIT I   Differential equations of first order and first degree

Linear differential equations – Bernoulli's equations- Exact equations and equations reducible to exact form, Applications: Newton's Law of cooling – Law of natural growth and decay- Electrical circuits.

UNIT II   Linear differential equations of higher order (Constant Coefficients)

Definitions,homogenous and non-homogenous, complimentary function, general solution, particular integral, Wronskian, Method of variation of parameters, Simultaneous linear equations, Applications to L-C-R Circuit problems and Simple Harmonic motion**.**

UNIT III   Partial Differential Equations

Introduction and formation of Partial Differential Equations by elimination of arbitrary constants and arbitrary functions, solutions of first order linear equations using Lagrange's method, Homogeneous Linear Partial differential equations with constant coefficients**.**

UNIT IV   Vector Calculus

Scalar and vector point functions, vector operator Del, Del applies to scalar point functions- Gradient, Directional derivative, del applied to vector point functions-Divergence and Curl, vector identities.

Line integral-circulation-work done, surface integral-flux, Green's theorem in the plane (without proof), Stoke's theorem (without proof), volume integral, Divergence theorem (without proof) and related problems.

TEXT BOOKS

[1]. Higher Engineering Mathematics, B. S. Grewal, Khanna Publishers, 2017, 44th Edition

REFERENCE BOOKS

[1]. Advanced Engineering Mathematics, Erwin Kreyszig, John Wiley & Sons, 2018, 10th Edition.

[2]. Thomas Calculus, George B. Thomas, Maurice D. Weir and Joel Hass, Pearson Publishers, 2018, 14th Edition.

[3]. Advanced Engineering Mathematics, R. K. Jain and S. R. K. Iyengar, Alpha Science International Ltd., 2021 5th Edition(9th reprint).

[4]. Advanced Modern Engineering Mathematics, Glyn James, Pearson publishers, 2018, 5th Edition.

[5]. Advanced Engineering Mathematics, Micheael Greenberg, Pearson publishers, 9th Edition.

[6]. Higher Engineering Mathematics, H. K Das, Er. Rajnish Verma, S. Chand Publications,2014, 3rd Edition (Reprint 2021).

E-RESOURCES AND OTHER DIGITAL MATERIAL

1].   Prof. Srinivas Rao Manam, IIT Madras,Differential equations for engineers[English], Available: https://onlinecourses.nptel.ac.in/noc22_ma72/preview
[2]. Prof. Jitendra Kumar , IIT Kharagpur, Engineering Mathematics – I[English], Available:https://onlinecourses.nptel.ac.in/noc20_ma37/preview
[3]. Prof. Jitendra Kumar , IIT Kharagpur, Engineering Mathematics – II[English], Available: https://onlinecourses.nptel.ac.in/noc22_ma08/preview
[4]. Prof. Jitendra Kumar & Prof. Somesh Kumar, IIT Kharagpur, Advanced Calculus For Engineers[English], Available:https://onlinecourses.nptel.ac.in/noc22_ma75/preview
[5]. Prof. Denis Auroux, Massachusetts Institute of Technology: MIT Open Courseware,Multivariable Calculus,Available:https://ocw.mit.edu.

23BS2102
ENGINEERING PHYSICS

Course Category:	Basic Science		Credits:	3
Course Type:	Theory		Lecture -Tutorial-Practice:	3 - 0 - 0
Prerequisites:			Continuous Evaluation: Semester end Evaluation: Total Marks:	30 70 100

Course Objectives:

To bridge the gap between the Physics in school at 10+2 level and UG level engineering courses by identifying the importance of the modern optical devices such as Lasers and optical fibers, enlightening the periodic arrangement of atoms in crystalline solids and concepts of quantum mechanics, introduce novel concepts of dielectric and magnetic materials, physics of semiconductors.

COURSE OUTCOMES

Upon successful completion of the course, the student will be able to:

CO1	Elaborate different types of lasers, optical fibers and their applications.
CO2	Familiarize with the basics of crystals and their structures.
CO3	Summarize various types of polarization of dielectrics and classify the magnetic materials.
CO4	Explain the basic concepts of Quantum Mechanics and types of semiconductors using Hall Effect.

Contribution of Course Outcomes towards achievement of Program Outcomes
(1 – Low, 2 - Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	H	L										
CO2	H	M										
CO3	H	L										
CO4	H	L										

COURSE CONTENT

UNIT I Lasers and Fiber Optics   (10 periods)

Lasers: Introduction, Characteristics of laser, Basic Principles of lasers (absorption, spontaneous emission and stimulated emission), Requirements of lasers (pumping, population inversion and cavity resonance), Einstein's coefficients, different types of lasers: solid-state lasers (Ruby), gas lasers, (He-Ne), Semiconductor laser, applications of lasers in science, engineering and medicine.

Fibre Optics: Introduction, Fundamentals of optic fibre, Propagation of light through optical fiber, Types of optical fibers, Numerical aperture, Fractional Refractive Index change, Fiber optics in communication and its advantages.

UNIT II Crystallography and X-ray diffraction   (10 periods)

Crystallography: Space lattice, Basis, Unit Cell and lattice parameters – Bravais Lattices – crystal systems (3D) – coordination number - packing fraction of SC, BCC & FCC - Miller indices – separation between successive (hkl) planes.

X-ray diffraction: Bragg's law - X-ray Diffractometer – crystal structure determination by Laue's and powder methods.

UNIT III Dielectric and Magnetic Materials   (12 periods)

Dielectric Materials: Introduction - Dielectric polarization - Dielectric polarizability, Susceptibility, Dielectric constant and Displacement Vector – Relation between the electric vectors - Types of polarizations- Electronic (Quantitative), Ionic (Quantitative) and Orientation polarizations (Qualitative) - Lorentz internal field - Clausius- Mossotti equation - Frequency dependence of polarization – complex dielectric constant (Qualitative) – dielectric loss (Qualitative).

Magnetic Materials: Introduction - Magnetic dipole moment - Magnetization-Magnetic susceptibility and permeability – Atomic origin of magnetism - Classification of magnetic materials: Dia, Para and Ferro magnetic materials - Domain concept for Ferromagnetism & Domain walls (Qualitative) - Hysteresis - soft and hard magnetic materials.

UNIT IV Quantum Mechanics and Semiconductors   (12 periods)

Quantum Mechanics: Dual nature of light, Matter waves,Properties and Debroglie's hypothesis, G.P.Thomson experiment,Heisenberg's Uncertainty Principle and its applications (Non existence of electron in nucleus) and properties of wave function – Schrodinger's time independent and dependent wave equations– Particle in a one-dimensional infinite potential well.

Semiconductors: Formation of energy bands – classification of crystalline solids - Intrinsic semiconductors- Fermi level-Extrinsic semiconductors-Fermi level - Drift and diffusion currents – Einstein's equation – Hall effect and its applications, Photodiode,Light Emitting Diode,Solar cell and its applications.

Textbooks:
1. A Text book of Engineering Physics, M. N. Avadhanulu, P.G.Kshirsagar & TVS Arun Murthy, S. Chand Publications, 11th Edition 2019.
2. Engineering Physics - D.K.Bhattacharya and Poonam Tandon, Oxford press (2015)

Reference Books:
1. Engineering Physics - B.K. Pandey and S. Chaturvedi, Cengage Learning 2021.
2. Engineering Physics - Shatendra Sharma, Jyotsna Sharma, Pearson Education, 2018.
3. Engineering Physics - Sanjay D. Jain, D. Sahasrabudhe and Girish, University Press. 2010
4. Engineering Physics - M.R. Srinivasan, New Age international publishers (2009).
Web Resources: https://www.loc.gov/rr/scitech/selected-internet/physics.html

23ES2103A
BASIC CIVIL & MECHANICAL ENGINEERING

Course Category:	Engineering Science	Credits:	3
Course Type:	Theory	Lecture -Tutorial-Practice:	3- 0 - 0
Prerequisites:	10 + 2	Continuous Evaluation: Semester end Evaluation: Total Marks:	30 70 100

COURSE OUTCOMES

Upon successful completion of the course, the student will be able to:

CO1	Understand various Civil Engineering sub-divisions thereby appreciate their role in ensuring a better society and understand the basic building components along with attaining knowledge of Civil Engineering Materials and prefabricated technology.
CO2	Know the basic concepts, uses and classification of surveying and realize the importance of Transportation in the nation's economy and the engineering measures related to Transportation and understand the importance of Water Storage and Conveyance Structures so that the social responsibilities of water conservation will be appreciated
CO3	Understand the scope of Mechanical Engineering in different sectors and industries and know about different manufacturing processes.
CO4	Explain the basics of thermal engineering, Power plants , power transmission and robotics.

Contribution of Course Outcomes towards achievement of Program Outcomes
(L – Low, M - Medium, H – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	M					H	M					
CO2	L					M	H					
CO3	M					M	H					
CO4	M					M	H					

COURSE CONTENT

UNIT I

Basics of Civil Engineering: Role of Civil Engineers in Society- Various Disciplines of Civil Engineering- Structural Engineering- Geo-technical Engineering- Transportation Engineering - Hydraulics and Water Resources Engineering - Environmental Engineering-Scope of each discipline - Building Construction and Planning- Construction Materials-Cement - Aggregate - Bricks- Cement concrete- Steel-Introduction to Prefabricated Construction Techniques

UNIT II

Surveying and Transportation Engineering: Objectives of Surveying- Principles of Surveying-Classification based on function and instruments, Importance of Transportation in Nation's Economic Development- Basics components of Road-Classification of Highways.

Water Resources and Environmental Engineering: Introduction, Sources of water- Quality of water-Specifications- Simple introduction to Dams and Reservoirs.

UNIT III

Introduction to Mechanical Engineering: Role of Mechanical Engineering in Industries and Society-Technologies in different sectors such as Energy, Manufacturing, Automotive, Aerospace, and Marine sectors. Engineering Materials - Metals-Ferrous and Non-ferrous, Ceramics, Composites, Smart materials. Manufacturing Processes: Principles of Casting, joining processes,

Machining, Introduction to CNC machines, 3D printing, and Smart manufacturing.

UNIT IV

Thermal Engineering: –IC engines, 2-Stroke and 4-Stroke engines, SI/CI Engines, Otto cycle,Diesel cycle,Components of Electric and Hybrid Vehicles., Refrigeration and air conditioning Working principle of Boilers: classification of Boilers Power plants – Working principle of Steam, Nuclear power plants. Mechanical Power Transmission - Belt and Gear Drives, Introduction to Robotics

TEXT BOOKS   (for UNITS I & II)

[1]. Basic Civil Engineering, M.S.Palanisamy, , Tata Mcgraw Hill publications (India) Pvt. Ltd. Fourth Edition.

[2]. Introduction to Civil Engineering, S.S. Bhavikatti, New Age International Publishers. 2022. First Edition.

[3]. Basic Civil Engineering, Satheesh Gopi, Pearson Publications, 2009, First Edition.

REFERENCE BOOKS (for UNITS I & II)

[1]. Surveying, Vol- I and Vol-II, S.K. Duggal, Tata McGraw Hill Publishers 2019. Fifth Edition.

[2]. Hydrology and Water Resources Engineering, Santosh Kumar Garg, Khanna Publishers, Delhi. 2016

[3]. Irrigation Engineering and Hydraulic Structures - Santosh Kumar Garg, Khanna Publishers, Delhi 2023. 38th Edition.

[4]. Highway Engineering, S.K.Khanna, C.E.G. Justo and Veeraraghavan, Nemchand and Brothers Publications 2019. 10th Edition.

[5]. Indian Standard DRINKING WATER — SPECIFICATION IS 10500-2012

[6]. Advances in Civil Engineering (Volume - 5), S. Sathish, AkiNik Publications,2021

[7]. Advances in Civil Engineering (Volume - 5), S. Sathish, AkiNik Publications,2021.

E-RESOURCES AND OTHER DIGITAL MATERIAL (for UNITS I & II)

1. http://nptel.iitm.ac.in/video.php?subjectId=10810607
2. http://nptel.iitm.ac.in/courses/Webcourse-contents/IIT-%20Guwahati/em/index.htm
3. http://www.mike-willis.com/Tutorial/PF2.htm

TEXT BOOKS   (for UNITS III & IV)

[1]. Internal Combustion Engines by V.Ganesan, By Tata McGraw Hill publications (India) Pvt. Ltd.

[2]. A text book of Theory of Machines by S.S. Rattan, Tata McGraw Hill Publications, (India) Pvt. Ltd.

[3]. An introduction to Mechanical Engg by Jonathan Wicker and Kemper Lewis, Cengage learning India Pvt. Ltd.

REFERENCE BOOKS (for UNITS III & IV)

[1]. G. Shanmugam and M.S.Palanisamy, Basic Civil and the Mechanical Engineering, Tata McGraw Hill publications (India) Pvt. Ltd.

[2]. Thermal Engineering by Mahesh M Rathore Tata McGraw Hill publications (India) Pvt. Ltd.

[3]. 3D printing & Additive Manufacturing Technology- L. Jyothish Kumar, Pulak M Pandey, Springer publications

[4]. Appuu Kuttan KK, Robotics, I.K. International Publishing House Pvt. Ltd. Volume-I

E-RESOURCES AND OTHER DIGITAL MATERIAL (for UNITS III & IV)

1. https://www.scribd.com/document/680441639/Basic-Civil-and-Mechanical-Engineering

2. https://www.imeche.org/careers-education/careers-information/what-is-mechanical-engineering/where-do-mechanical-engineers-work

23PC2104B
ENGINEERING MECHANICS

Course Category:	Professional Core		Credits:	3
Course Type:	Theory		Lecture -Tutorial-Practice:	3 - 0 - 0
Prerequisites:	Basic Mathematics, Physics at (10 + 2) level		Continuous Evaluation: Semester end Evaluation: Total Marks:	30 70 100

COURSE OUTCOMES

Upon successful completion of the course, the student will be able to:

CO1	Analyze coplanar concurrent , parallel forces and evaluate centroid for plane figures
CO2	Analyze coplanar general case forces and evaluate moment of inertia for plane figures
CO3	Analyze rectilinear and curvilinear motion of particles
CO4	Evaluate the moment of inertia of material bodies and analyze the fixed axis rotation of rigid bodies.

Contribution of Course Outcomes towards achievement of Program Outcomes
(L – Low, M - Medium, H – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	H	M	M									
CO2	H	M	M									
CO3	H	M	M									
CO4	H	M	M									

COURSE CONTENT

UNIT – I
Equilibrium of Systems of Concurrent Forces: Composition and resolution of forces – Constraint, Action and Reaction, Types of supports and support reactions, Free body diagram, Equilibrium of concurrent forces in a plane – Method of Projections, Method of moments.
Equilibrium of Systems of Parallel Forces: Introduction, Types of parallel forces, Resultant, Couple, Resolution of Force into force and a couple, General case of parallel forces in a plane.
Centroid: Centroids of standard figures, Centroids of Composite Figures.

UNIT – II
Friction: Introduction, limiting friction and impending motion, Coulomb's laws of dry friction, coefficient of friction, Cone of static friction, Numerical problems.

Coplanar General case of force system: Equilibrium of forces in plane-Analysis of plane trusses: Method of joints.

Area Moments of Inertia: Definition– Polar Moment of Inertia, Transfer Theorem, Moments of Inertia of Composite Figures

UNIT – III
Kinematics of Rectilinear motion: Displacement, Velocity and acceleration, Motion of Uniform and Variable acceleration.

Kinetics of Rectilinear motion: D'Alembert's Principle **(Other principles not included)**

Kinematics of Curvilinear motion: Rectangular components of velocity and acceleration, Normal and tangential acceleration, Motion of projectiles.

Kinetics of Curvilinear motion: D'Alembert's Principle.**(Theory only)**

UNIT – IV
Mass Moment of Inertia: Moment of Inertia of Masses, Transfer Formula for Mass Moments of Inertia, Mass moment of inertia of slender rod, Circular disc. Mass Moment of Inertia of 3D bodies– Cone, Solid cylinder & Sphere **(Derivations only).**
Rigid body Motion: Kinematics of rotation: Linear & angular velocity, Linear & angular acceleration in uniformly accelerated motion.
Kinetics of a rigid body in rotation of about a fixed axis: Equation of motion for a rigid body rotating about a fixed axis- Rotation under the action of constant moment.
Kinematics of Rigid body: Plane motion: Method of Instantaneous center of rotation **(Theory only)**

TEXT BOOKS

[1]. Engineering Mechanics by S. Timoshenko & D. H. Young, 4th Edition, 2007, McGraw Hill International Edition. (For Concepts and symbolic Problems).
[2].   Engineering Mechanics Statics and dynamics by A. K. Tayal, 13th Edition, 2006, Umesh Publication, Delhi, (For numerical Problems using S.I.System of Units).
[3]. A Textbook of Engineering Mechanics, S.S Bhavikatti. New age international publications 2018

REFERENCE BOOKS

[1] Engineering Mechanics, P.C.Dumir- S.Sengupta and Srinivas V Veeravalli , University press. 2020. First Edition.
[2] Engineering Mechanics, Statics and Dynamics, I.H. Shames., PHI, 2002. 4th Edition.
[3] Engineering Mechanics, Volume-I: Statics, Volume-II: Dynamics, J. L. Meriam and L. G. Kraige., John Wiley, 2008. 6th Edition

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] http://emweb.unl.edu/
[2] https://nptel.ac.in/courses/122/104/122104015/
[3] Prof. U.S. Dixit, , IIT Guwahati, Engineering Mechanics [English], Web available: https://nptel.ac.in/courses/112103109
[4] Prop. K.Ramesh, IIT Madras, Engineering Mechanics, , [English], Web available: https://nptel.ac.in/courses/112106286

23HS2105
COMMUNICATIVE ENGLISH

Course Category:	Basic Science	Credits:	3
Course Type:	Theory	Lecture -Tutorial-Practice:	3 - 0- 0
Prerequisites:	Basic understanding of the language skills viz Listening, Speaking, Reading and Writing, including Sentence construction abilities	Continuous Evaluation: Semester end Evaluation: Total Marks:	30 70 100

COURSE OUTCOMES

Upon successful completion of the course, the student will be able to:

CO1	Understand the context, topic, and pieces of specific information from social orTransactional dialogues
CO2	Apply grammatical structures to formulate sentences and correct word forms.
CO3	Analyze discourse markers to speak clearly on a specific topic in informal discussions.
CO4	Evaluate reading texts / listening to write summaries based on globalcomprehension and create a coherent paragraph, essay and résumé

Contribution of Course Outcomes towards achievement of Program Outcomes
(L – Low, M - Medium, H – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1										H		M
CO2										H		M
CO3										H		M
CO4										H		M

COURSE CONTENT

UNIT I

Lesson: HUMAN VALUES: Gift of Magi **(Short Story)**

Listening: Identifying the topic, the context and specific pieces of information by listeningto short audio texts and answering a series of questions.

Speaking: Asking and answering general questions on familiar topics such as home,family, work, studies and interests; introducing oneself and others.

Reading: Skimming to get the main idea of a text; scanning to look for specific pieces of information.

Writing: Mechanics of Writing-Capitalization, Spellings, Punctuation-Parts of Sentences.

Grammar: Parts of Speech, Basic Sentence Structures-forming questions

Vocabulary: Synonyms, Antonyms, Affixes (Prefixes/Suffixes), Root words.

UNIT II
Lesson: NATURE: The Brook by Alfred Tennyson (Poem)
Listening: Answering a series of questions about main ideas and supporting ideas afterlistening to audio texts.

Speaking: Discussion in pairs/small groups on specific topics followed by short structuretalks.

Reading: Identifying sequence of ideas; recognizing verbal techniques that help to linkthe ideas in a paragraph together.

Writing: Structure of a paragraph - Paragraph writing (specific topics) **Grammar:** Cohesive devices - linkers, use of articles and zero article; prepositions.**Vocabulary:** Homonyms, Homophones, Homographs.

UNIT III
Lesson: BIOGRAPHY: Elon Musk
Listening: Listening for global comprehension and summarizing what is listened to.

Speaking: Discussing specific topics in pairs or small groups and reporting what isdiscussed

Reading: Reading a text in detail by making basic inferences -recognizing and interpretingspecific context clues; strategies to use text clues for comprehension.

Writing: Summarizing, Note-making, paraphrasing, Essay Writing, (The Power of Intrapersonal Communication) **Grammar:**   Verbs - tenses; subject-verb agreement; Compound words, Collocations
Vocabulary: Compound words, Collocations

UNIT IV
Lesson: INSPIRATION: The Toys of Peace by Saki
Listening: Making predictions while listening to conversations/ transactional dialogues without video; listening with video.

Speaking: Role plays for practice of conversational English in academic contexts (formal and informal) - asking for and giving information/directions.

Reading: Studying the use of graphic elements in texts to convey information, reveal trends/patterns/relationships, communicate processes or display complicated data.

Writing: Letter Writing: Official Letters, Resumes & Report Writing
Grammar: Reporting verbs, Direct & Indirect speech, Active & Passive Voice

Vocabulary: Words often confused, Jargons & Technical Jargons

TEXT BOOKS

1. Pathfinder: Communicative English for Undergraduate Students, 1st Edition, OrientBlack Swan, 2023 (Units 1,2 & 3)
2. Empowering with Language by Cengage Publications, 2023 (Units 4 & 5)

3. English: Language, Context and Culture, 1st Edition, OrientBlack Swan, 2023 (Units5)

REFERENCE BOOKS

1. Dubey, Sham Ji & Co. English for Engineers, Vikas Publishers, 2020
2. Bailey, Stephen. Academic writing: A Handbook for International Students. Routledge,2014.
3. Murphy, Raymond. English Grammar in Use, Fourth Edition, Cambridge UniversityPress, 2019.
4. Lewis, Norman. Word Power Made Easy- The Complete Handbook for Building aSuperior Vocabulary. Anchor, 2014.

E-RESOURCES AND OTHER DIGITAL MATERIAL

Web Resources:
GRAMMAR:

1. www.bbc.co.uk/learningenglish
2. https://dictionary.cambridge.org/grammar/british-grammar/
3. www.eslpod.com/index.html
4. https://www.learngrammar.net/
5. https://english4today.com/english-grammar-online-with-quizzes/
6. https://www.talkenglish.com/grammar/grammar.aspx

VOCABULARY

1. https://www.youtube.com/c/DailyVideoVocabulary/videos
2. https://www.youtube.com/channel/UC4cmBAit8i_NJZE8qK8sfpA

23BS2151
ENGINEERING PHYSICS LAB

Course Category:	Basic Science		Credits:	1
Course Type:	Lab		Lecture -Tutorial-Practice:	0 - 0 - 2
Prerequisites:			Continuous Evaluation:	30
			Semester end Evaluation:	70
			Total Marks:	100

COURSE OUTCOMES

Upon successful completion of the course, the student will be able to:

CO1	Test optical components using principles of interference and diffraction of light
CO2	Use spectrometer, travelling microscope and function generator in various experiments
CO3	Determine the V-I characteristics of photo cells and appreciate the accuracy in measurements

Contribution of Course Outcomes towards achievement of Program Outcomes
(L – Low, M - Medium, H – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1				H								
CO2				H	M							
CO3	M			H								

COURSE CONTENT

1. Determination of radius of curvature of a given Plano-convex lens by Newton's rings.

2. Study the variation of B versus H by magnetizing the magnetic material (B-H curve).

3. Determination of wavelength of Laser light using diffraction grating.

4. Estimation of stopping potential and work function of a photo material using photoelectric effect.

5. Magnetic field along the axis of a current carrying circular coil by Stewart Gee's Method.

6. Determination of Hall voltage and Hall coefficient of a given semiconductor using Hall Effect.

7. Determination of Acceleration due to Gravity and radius of Gyration by using a compound pendulum.

8. Sonometer: Verification of laws of stretched string.

9. Determination of Dielectric constant of different solid materials.

10. Determination of Numerical Aperture of a given optical fiber.

11. Determination of Frequency of electrically maintained tuning fork by Melde's experiment.

12. Determination of Rigidity Modulus of the material of the given wire using Torsional pendulum.

13. Determination of wavelengths of different spectral lines in mercury spectrum using diffraction grating in normal incidence configuration.

14. Determination of Energy Gap of a semiconductor using p-n junction diode.

15. Determination of thickness of a thin foil by Wedge Method.

16. Estimation of Fill Factor of a given Solar Cell.

17. Study the frequency response and determination of resonating frequency of LCR Circuit.

18. Determination of Figure of merit of a Galvanometer.

Note: Any TEN of the listed experiments are to be conducted. Out of which any TWO

experiments may be conducted in virtual mode.

TEXT BOOKS

[1] Madhusudhan Rao, "Engineering Physics Lab Manual", Ist ed., Scitech Publications, 2015
[2] Ramarao Sri, Choudary Nityanand and Prasad Daruka, "Lab Manual of Engineering Physics"., Vth ed., Excell Books, 2010

E-RESOURCES

[1] http://plato.stanford.edu/entries/physics-experiment
[2] http://www.physicsclassroom.com/The-Laboratory
[3] http://facstaff.cbu.edu/~jvarrian/physlabs.html

VIRTUAL LAB REFERENCES

[1] http://vlab.amrita.edu/?sub=1&brch=201&sim=366&cnt=1
[2] http://vlab.amrita.edu/?sub=1&brch=195&sim=840&cnt=1
[3] http://vlab.amrita.edu/?sub=1&brch=282&sim=879&cnt=1

23PC2152E
ENGINEERING MECHANICS LAB

Course Category:	Professional Core	Credits:	1.5
Course Type:	Theory	Lecture -Tutorial-Practice:	0 - 0 - 3
Prerequisites:	10 + 2 level Physics	Continuous Evaluation: Semester end Evaluation: Total Marks:	30 70 100

COURSE OUTCOMES

Upon successful completion of the course, the student will be able to:

CO1	Evaluate the coefficient of friction between two different surfaces and between the inclined plane and the roller.
CO2	Verify Law of Polygon of forces and Law of Moment using force polygon and bell crank lever.
CO3	Determine the Centre of gravity and Moment of Inertia of different configurations. CO4: Verify the equilibrium conditions of a rigid body under the action of different force systems.

**Contribution of Course Outcomes towards achievement of Program Outcomes
(L – Low, M - Medium, H – High)**

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	H	M										
CO2	H	M										
CO3	H											

COURSE CONTENT:

1. Verification of Law of Parallelogram of Forces.

2. Verification of Law of Triangle of Forces.

3. Verification of the Law of polygon for coplanar-concurrent forces acting on a particle in equilibrium and to find the value of unknown forces considering particle to be in equilibrium using universal force table.

4. Determination of coefficient of Static and Rolling Frictions

5. Determination of Centre of Gravity of different shaped Plane Lamina.

6. Verification of the conditions of equilibrium of a rigid body under the action of coplanar non-concurrent, parallel force system with the help of a simply supported beam.

7. Study of the systems of pulleys and draw the free body diagram of the system.

8. Determine the acceleration due to gravity using a compound pendulum.

9. Determine the Moment of Inertia of the compound pendulum about an axis perpendicular to the plane of oscillation and passing through its centre of mass.

10. Determine the Moment of Inertia of a Flywheel.

11. Verification of Law of Moment using Rotation Disc Apparatus and Bell Crank Lever.

REFERENCE BOOKS

[1]. S. Timoshenko, D. H. Young, J.V. Rao, S. Pati., Engineering Mechanics, 5th Edition, McGraw Hill Education.

[2]. Hibbeler R.C., Engineering Mechanics: Statics and Dynamics, 14th Edition, Pearson Education, Inc., New Delhi, 2022

23HS2153
COMMUNICATIVE ENGLISH LAB

Course Category:	Basic Science	Credits:	1
Course Type:	Practical	Lecture -Tutorial-Practice:	0 - 0 - 2
Prerequisites:	Basic understanding of the language skills viz Listening, Speaking, Reading and Writing, including Sentence construction abilities	Continuous Evaluation: Semester end Evaluation: Total Marks:	30 70 100

COURSE OUTCOMES

Upon successful completion of the course, the student will be able to:

CO1	Understand the different aspects of the English language proficiency with emphasis on LSRW skills.
CO2	Apply communication skills through various language learning activities.
CO3	Analyze the English speech sounds, stress, rhythm, intonation and syllable division for better listening and speaking comprehension.
CO4	Evaluate and exhibit professionalism in participating in debates and group discussions.

Contribution of Course Outcomes towards achievement of Program Outcomes
(L – Low, M - Medium, H – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1		M								H		M
CO2										H		M
CO3										H		M
CO4										H		M

COURSE CONTENT

List of Topics

1. Vowels and Consonants
2. Neutralizaton/Accent Rules
3. Communication Skills & JAM
4. Role Play or Conversational Practice
5. E-mail Writing

6.   Resume Writing, Cover Letter, SOP

7.   Group Discussions-methods & practice

8.   Debates – Methods & Practice

9.   PPT Presentations/Poster Presentations

10. Interview Skills

SUGGESTED SOFTWARE

1.   WALDEN

2.   SOFTX

3.   VISIONET

23ES2154
ENGINEERING WORKSHOP

Course Category:	Engineering Science	Credits:	1.5
Course Type:	Laboratory	Lecture -Tutorial-Practice:	0 - 0 - 3
Prerequisites:		Continuous Evaluation:	30
		Semester end Evaluation:	70
		Total Marks:	100

COURSE OUTCOMES

Upon successful completion of the course, the student will be able to:

CO1	Understand the basic joints using wood and familiarize with various fundamental aspects of house wiring, fitting and foundry.
CO2	Prepare basic models using sheet metal and practice joining of metals using various types of welding.
CO3	Familiarize with various advanced manufacturing processes such as injection moulding and 3D printing.
CO4	Understand the preparation of PCB and simple IOT applications using Arduino

Contribution of Course Outcomes towards achievement of Program Outcomes
(L – Low, M - Medium, H – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1			M		H							
CO2			M		H							
CO3			M		H							
CO4			M		L							

COURSE CONTENT

PART-A

1. **Demonstration:** Safety practices and precautions to be observed in workshop.

2. **Wood Working:** Familiarity with different types of woods and tools used in wood working and make following joints.

a) Half – Lap joint b) Bridle joint c) Demonstration of power tools. **(2 classes)**

3. **Sheet Metal Working:** Familiarity with different types of tools used in sheet metal working,

developmentsof following sheet metal job from GI sheets.

a) Tapered tray b) Conical funnel **(2 classes)**

4. **Fitting:** Familiarity with different types of tools used in fitting and do the following fitting
        exercises.
   a) V-fit b) Semi-circular fit c) Bicycle tire puncture and change of two-wheeler tyre **(2 classes)**

5. **Electrical Wiring:** Familiarity with different types of basic electrical circuits and make the following connections.
   a) Parallel and series b) Two-way switch c) Godown lighting d) Tube light **(1 class)**

6. **Foundry Trade:** Demonstration and practice on Moulding tools and processes, Preparation of

Green Sandmoulds for given Patterns. **(1 class)**

7. **Welding Shop:** Demonstration and practice on Arc Welding and Gas welding. Preparation of

Lap joint and Butt joint. **(1 class)**

8. **Advanced manufacturing processes:** Demonstration of injection moulding and 3 D printing

processes.**(1 class)**

9. **Electronic Circuits:** Demonstration of preparation of simple electronic circuit (PCB) and testing

its operation. **(1 class)**

10. **Basic IOT:** Demonstration of different components & pin configuration of Arduino board

a) Measure Temperature & Humidity b) Measure Distance **(1 class)**

PART-B

GROUP ACTIVITY (2 classes)

- Students must prepare a Working model / Assembly using the knowledge gained from the above trades.

TEXT BOOKS

[1] Basic Workshop Technology: Manufacturing Process, Felix W.; Independently Published,2019.
Workshop Processes, Practices and Materials; Bruce J. Black, Routledge publishers, 5th Edn. 2015.

[2] A Course in Workshop Technology Vol I. & II, B.S. Raghuwanshi, DhanpathRai& Co., 2015 & 2017.

REFERENCE BOOKS

[1] Elements of Workshop Technology, Vol. I by S. K. Hajra Choudhury & Others, Media Promoters and
Publishers, Mumbai. 2007, 14th edition.

[2] Workshop Practice by H. S. Bawa, Tata-McGraw Hill, 2004.

[3] Wiring Estimating, Costing and Contracting; Soni P.M. &Upadhyay P.A.; AtulPrakashan, 2021-22.

E-RESOURCES AND OTHER DIGITAL MATERIAL

1. https://dsceme.files.wordpress.com/2016/08/workshop-practice-manual-2016-17- 1.pdf

2. https://www.protosystech.com/rapid-prototyping.htm

3. https://www.arduino.cc/en/Tutorial/Foundations 4. https://www.tutorialspoint.com/arduino/

23ES2155
IT WORKSHOP

Course Category:	Engineering Science	**Credits:**	1
Course Type:	Lab	**Lecture -Tutorial-Practice:**	0 - 0 - 2
Prerequisites:		**Continuous Evaluation:**	30
		Semester end Evaluation:	70
		Total Marks:	100

COURSE OBJECTIVES

- To introduce the internal parts of a computer, peripherals, I/O ports, connecting cables
- To demonstrate configuring the system as Dual boot both Windows and other Operating   Systems Viz. Linux, BOSS
- To teach basic command line interface commands on Linux.
- To teach the usage of Internet for productivity and self-paced life-long learning
- To introduce Compression, Multimedia and Antivirus tools and Office Tools such as Word processors, Spread sheets and Presentation tools.

COURSE OUTCOMES

Upon successful completion of the course, the student will be able to:

CO1	Perform Hardware troubleshooting.
CO2	Understand Hardware components and inter dependencies.
CO3	Safeguard computer systems from viruses/worms
CO4	Document/ Presentation preparation.
CO5	Perform calculations using spreadsheets.

Contribution of Course Outcomes towards achievement of Program Outcomes
(L – Low, M - Medium, H – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	L	L										
CO2	M	L										
CO3	L	L										
CO4	L	L										

COURSE CONTENT

PC Hardware & Software Installation
Task 1: Identify the peripherals of a computer, components in a CPU and its functions. Draw the block diagram of the CPU along with the configuration of each peripheral and submit to your instructor.

Task 2: Every student should disassemble and assemble the PC back to working condition. Lab instructors

should verify the work and follow it up with a Viva. Also students need to go through the video which shows the process of assembling a PC. A video would be given as part of the course content.

Task 3: Every student should individually install MS windows on the personal computer. Lab instructor should verify the installation and follow it up with a Viva.

Task 4: Every student should install Linux on the computer. This computer should have windows installed. The system should be configured as dual boot (VMWare) with both Windows and Linux. Lab instructors should verify the installation and follow it up with a Viva

Task 5: Every student should install BOSS on the computer. The system should be configured as dual boot (VMWare) with both Windows and BOSS. Lab instructors should verify the installation and follow it up with a Viva

Internet & World Wide Web
Task1: Orientation & Connectivity Boot Camp: Students should get connected to their Local Area Network and access the Internet. In the process they configure the TCP/IP setting. Finally students should demonstrate, to the instructor, how to access the websites and email.
If there is no internet connectivity preparations need to be made by the instructors to simulate the WWW on the LAN.

Task 2: Web Browsers, Surfing the Web: Students customize their web browsers with the LAN proxy settings, bookmarks, search toolbars and pop up blockers. Also, plug-ins like Macromedia Flash and JRE for applets should be configured.

Task 3: Search Engines & Netiquette: Students should know what search engines are and how to use the search engines. A few topics would be given to the students for which they need to search on Google. This should be demonstrated to the instructors by the student.

Task 4: Cyber Hygiene: Students would be exposed to the various threats on the internet and would be asked to configure their computer to be safe on the internet. They need to customize their browsers to block pop ups, block active x downloads to avoid viruses and/or worms.

LaTeX and WORD
Task 1 – Word Orientation: The mentor needs to give an overview of La TeX and Microsoft (MS) office or equivalent (FOSS) tool word: Importance of La TeX and MS office or equivalent (FOSS) tool Word as word

Processors, Details of the four tasks and features that would be covered in each, Using La TeXand word – Accessing, overview of toolbars, saving files, Using help and resources, rulers, format painter in word.

Task 2: Using La TeX and Word to create a project certificate. Features to be covered:-
Formatting Fonts in word, Drop Cap in word, Applying Text effects, Using Character Spacing, Borders and Colors, Inserting Header and Footer, Using Date and Time option in both La TeX and Word.

Task 3: Creating project abstract Features to be covered:-Formatting Styles, Inserting table, Bullets and Numbering, Changing Text Direction, Cell alignment, Footnote, Hyperlink, Symbols, Spell Check, Track Changes.

Task 4: Creating a Newsletter: Features to be covered:- Table of Content, Newspaper columns, Images from files and clipart, Drawing toolbar and Word Art, Formatting Images, Textboxes, Paragraphs and Mail Merge in word.

EXCEL
Excel Orientation: The mentor needs to tell the importance of MS office or equivalent (FOSS) tool Excel as a Spreadsheet tool, give the details of the four tasks and features that would be covered in each. Using Excel – Accessing, overview of toolbars, saving excel files, Using help and resources.

Task 1: Creating a Scheduler - Features to be covered: Gridlines, Format Cells, Summation, auto fill, Formatting Text

Task 2: Calculating GPA -. Features to be covered:- Cell Referencing, Formulae in excel – average, std. deviation, Charts, Renaming and Inserting worksheets, Hyper linking, Count function.

LOOKUP/VLOOKUP
Task 3: Split cells, freeze panes, group and outline, Sorting, Boolean and logical operators, Conditional formatting

POWER POINT
Task 1: Students will be working on basic power point utilities and tools which help them create basic power point presentations. PPT Orientation, Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows in PowerPoint.

Task 2: Interactive presentations - Hyperlinks, Inserting –Images, Clip Art, Audio, Video, Objects, Tables and Charts.

Task 3: Master Layouts (slide, template, and notes), Types of views (basic, presentation, slide slotter, notes etc), and Inserting – Background, textures, Design Templates, Hidden slides.

AI TOOLS – ChatGPT
Task 1: Prompt Engineering: Experiment with different types of prompts to see how the model responds. Try asking questions, starting conversations, or even providing incomplete sentences to see how the model completes them.
   • Ex: Prompt: "You are a knowledgeable AI. Please answer the following question:What is the capital of France?"

Task 2: Creative Writing: Use the model as a writing assistant. Provide the beginning of a story or a description of a scene, and let the model generate the rest of the content. This can be a fun way to brainstorm creative ideas
   • Ex: Prompt: "In a world where gravity suddenly stopped working, people started floating upwards. Write a story about how society adapted to this new reality."

Task 3: Language Translation: Experiment with translation tasks by providing a sentence in one language and asking the model to translate it into another language. Compare the output to see how accurate and fluent the translations are.
   • Ex:Prompt: "Translate the following English sentence to French: 'Hello, how are you doing today?'"

REFERENCE BOOKS

[1]. Comdex Information Technology course tool kit, Vikas Gupta, WILEY Dream tech, 2003

[2]. The Complete Computer upgrade and repair book, Cheryl A Schmidt, WILEY Dream tech,2013, 3rd edition

[3]. Introduction to Information Technology, ITL Education Solutions limited, Pearson Education, 2012, 2nd edition

[4]. PC Hardware - A Handbook, Kate J. Chase, PHI (Microsoft)

[5]. LaTeX Companion, Leslie Lamport, PHI/Pearson.

[6]. IT Essentials PC Hardware and Software Companion Guide, David Anfins on and Ken Quamme. − CISCO Press, Pearson Education, 3rd edition

[7]. IT Essentials PC Hardware and Software Labs and Study Guide, Patrick Regan− CISCO Press, Pearson Education, 3rd edition

23BS2156
NSS/NCC/ COMMUNITY SERVICE

Course Category:	Basic Science		**Credits:**	0.5
Course Type:	Lab (Activity Based Course)		**Lecture -Tutorial-Practice:**	0 - 0 - 1
Prerequisites:	-		**Continuous Evaluation:**	Activity based course
			Max.Activities:6	6 x 15 = 90
			Viva:	10
			Total Marks:	100

COURSE OBJECTIVES

The objective of introducing this course is to impart discipline, character, fraternity, teamwork,social consciousness among the students and engaging them in selfless service.

COURSE OUTCOMES

Upon successful completion of the course, the student will be able to:

CO1	Understand the importance of discipline, character and service motto.
CO2	Solve some societal issues by applying acquired knowledge, facts, and techniques.
CO3	Explore human relationships by analyzing social problems.
CO4	Determine to extend their help for the fellow beings and downtrodden people.
CO5	Develop leadership skills and civic responsibilities.

Contribution of Course Outcomes towards achievement of Program Outcomes
(L – Low, M - Medium, H – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1								M	L			
CO2								M	L			
CO3								M	L			
CO4								M	L			
CO5								M	L			

COURSE CONTENT

UNIT I   Orientation

General Orientation on NSS/NCC/ Scouts & Guides/Community Service activities, careerguidance.

Activities:
  i)   Conducting – ice breaking sessions - expectations from the course-knowing personaltalents and skills
  ii) Conducting orientations programs for the students –future plans-activities-releasingroad map etc.
  iii) Displaying success stories-motivational biopics- award winning movies on societalissues etc.
  iv) Conducting talent show in singing patriotic songs-paintings- any other contribution.

UNIT II   Nature & CareActivities:
  i)   Best out of waste competition.
  ii)   Poster and signs making competition to spread environmental awareness.
  iii) Recycling and environmental pollution article writing competition.
  iv)   Organising Zero-waste day.
  v)   Digital Environmental awareness activity via various social media platforms.
  vi)   Virtual demonstration of different eco-friendly approaches for sustainable living.
  vii) Write a summary on any book related to environmental issues.

UNIT III   Community ServiceActivities:
  i)   Conducting One Day Special Camp in a village contacting village-area leaders- Survey in the village, identification of problems- helping them to solve via media- authorities-experts-etc.
  ii)   Conducting awareness programs on Health-related issues such as General Health,Mental health, Spiritual Health, HIV/AIDS,
  iii) Conducting consumer Awareness. Explaining various legal provisions etc.
  iv)   Women Empowerment Programmes- Sexual Abuse, Adolescent Health and PopulationEducation.
  v)   Any other programmes in collaboration with local charities, NGOs etc.

REFERENCE BOOKS

  1. Nirmalya Kumar Sinha & Surajit Majumder, *A Text Book of National Service Scheme* Vol;.I, Vidya Kutir Publication, 2021 (ISBN 978-81-952368-8-6)
  2. *Red Book - National Cadet Corps* – Standing Instructions Vol I & II, DirectorateGeneral of NCC, Ministry of Defence, New Delhi
  3. Davis M. L. and Cornwell D. A., "Introduction to Environmental Engineering",McGraw Hill, New York 4/e 2008
  4. Masters G. M., Joseph K. and Nagendran R. "Introduction to EnvironmentalEngineering and Science", Pearson Education, New Delhi. 2/e 2007
  5. Ram Ahuja. *Social Problems in India*, Rawat Publications, New Delhi.

SECOND YEAR

23BS3101E
MATHEMATICS FOR MECHANICAL ENGINEERS

Course Category:	Basic Sciences & Humanities	Credits:	3
Course Type:	Theory	Lecture -Tutorial-Practice:	3 - 0 - 0
Prerequisites:	23BS1101-Linear Algebra and Calculus 23BS2101- Differential equations & Vector Calculus	Continuous Evaluation: Semester end Evaluation: Total Marks:	30 70 100

COURSE OUTCOMES

Upon successful completion of the course, the student will be able to:

CO1	Determine analytic, non-analytic functions and evaluate complex integrals
CO2	Analyze Taylor, Laurent series and apply residue theorem for computing real definite integrals.
CO3	Solve Algebraic and transcendental,system of equations and interpret the concept of polynomial interpolation
CO4	Find the probabilities using distributions and to estimate correlation, regression coefficients

Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low,M-Medium,H- High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	H	M		L									L	L
CO2	H	M		L									L	M
CO3	H	M		L	L								M	M
CO4	H	M		M	L								M	M

COURSE CONTENT

UNIT I

COMPLEX ANALYSIS:

Introduction, Continuity, Cauchy-Riemann equations, Analytic functions, Harmonic functions, Orthogonal systems, Applications to flow problems, Complex integration, Cauchy's integral theorem, Cauchy's integral formula

UNIT II

Taylor's series, Laurent's series, Zeros and Singularities of an analytic function, Residue theorem, Calculation of Residues, Evaluation of real definite integrals: (i) Integration around the unit circle (ii) Integration around a small semi-circle, Bilinear transformation.

UNIT III

NUMERICAL METHODS:
Solution of Algebraic and Transcendental equations with Newton - Raphson method, Solution of Simultaneous linear equations with Gauss - Seidel iterative method

INTERPOLATION: Introduction, Finite Differences-Forward, Backward and Central differences, Symbolic Relations, Newton's interpolation formulae-forward and backward differences, Central difference interpolation formulae-Gauss's formulae, Interpolation with unequal intervals - Lagrange's and Newton's divided difference formulae.

UNIT IV
PROBABILITY DENSITIES: Continuous random variables – Normal distribution.
SAMPLING DISTRIBUTIONS: Populations and Samples – Sampling distribution of the mean (SD known) – Sampling distribution of the mean (SD unknown) – Sampling distribution of the variance.
STATISTICS: Method of Least Squares – Correlation – Regression.

TEXT BOOKS

[1] B. S. Grewal, "Higher Engineering Mathematics", 44th Edition, Khanna Publishers, 2019.
[2] Richard A. Johnson, "Probability and Statistics for Engineers", 8th Edition, Prentice Hall of India, 2011.

REFERENCE BOOKS

[1] Erwin Kreyzig, "Advanced Engineering Mathematics", 10th Edition, John Wiley & Sons, 2015.

[2] R. K. Jain, S. R. K. Iyengar, "Advanced Engineering Mathematics", 5th   Edition, Narosa Publishers, 2016.

[3] N. P. Bali, Manish Goyal, "A Text book of Engineering Mathematics", 9th Edition,   Lakshmi Publications   (P) Limited, 2016.

[4] H. K. Das, Er. Rajnish Verma, "Higher Engineering Mathematics", 3rd Revised Edition, S. Chand & Co., 2014.

[5] Rukmangadachari E, "Probability and Statistics", Pearson, 2012

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] Prof. Pranav Haridas, Kerala School of Mathematics, Complex Analysis, [English],
     Web Available: https://onlinecourses.nptel.ac.in/noc21_ma39/preview

[2] Prof. Ameeya Kumar Nayak, Prof. Sanjeev Kumar, IIT Roorkee, Numerical methods, [English],
     Web Available: https://onlinecourses.nptel.ac.in/noc21_ma45/preview

[3] Jeremy Orloff, Massachusetts Institute of Technology: MIT OpenCourseWare, Complex Variables with
     Applications, [English],Web Available: https://ocw.mit.edu.

[4] Henrik Schmidt, Massachusetts Institute of Technology: MIT OpenCourseWare, Introduction to
     Numerical Analysis for Engineering, [English], Web Available: https://ocw.mit.edu.

[5] Prof. A. Kannan, IIT Madras, Statistics for Experimentalists, [English],
     Web Available:https://freevideolectures.com/course/3467/statistics-for-experimentalists/2

23HS3102
UNIVERSAL HUMAN VALUES 2-
UNDERSTANDING HARMONY

Course Category: Basic Sciences & Humanities   **Credits**: 3
Course Type   : Mandatory course   **Lecture/Tutorial/Practice**: 2/1/0
Prerequisites   :   -   **Continuous Evaluation**:   30
       Semester end Evaluation: 70

COURSE OUTCOMES	
Upon successful completion of the course, the student will be able to:	
CO1	Understand and aware of themselves and their surroundings (family, society and nature).
CO2	Handle problems with sustainable solutions, while keeping human relationships and human nature in mind.
CO3	Exhibit critical ability and become sensitive to their commitment towards their understanding of human values, human relationship and human society.
CO4	Apply what they have learnt to their own self in different day-to-day settings in real life.

Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low,M-Medium,H- High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1						L								
CO2						L								
CO3						L								
CO4						L								

Course Content: UNIT – I:

Course introduction, need, basic guidelines, content and process for value education:

Part-1: Purpose and motivation for the course, recapitulation from UHV-I, Self-exploration: what is it?, its content and process, 'Natural acceptance' and experiential validation- as the process for self-exploration. Continuous Happiness and Prosperity – A look at basic Human Aspirations.

Part-2: Right understanding, Relationship and Physical Facility – the basic requirements for fulfillment of aspirations of every human being with their correct priority, Understanding Happiness and Prosperity correctly – A critical appraisal of the current scenario, Method to fulfill the above human aspirations: understanding and living in harmony at various levels. (Practice sessions are to be included to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence)

rather than as arbitrariness in choice based on liking-disliking).

UNIT – II: Understanding Harmony in the Human Being – Harmony in Myself:

Part-1: Understanding human being as a co-existence of the sentient 'I' and the material 'Body'. Understanding the needs of Self ('I') and 'Body' – happiness and physical facility, Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer).

Part-2: Understanding the characteristics and activities of 'I' and harmony in 'I'. Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail, Programs to ensure Sanyam and Health.

(Practice sessions are to be included to discuss the role others have played in making material goods available to me. Identifying from one's own life. Differentiate between prosperity and accumulation. Discuss program for ensuring health vs. dealing with disease).

UNIT – III: Understanding Harmony in the Family and Society – Harmony in Human- Human Relationship:

Part-1: Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfillment to ensure mutual happiness; Trust and Respect as the foundational values of relationship, Understanding the meaning of Trust; Difference between intention and competence, Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship.

Part-2: Understanding the harmony in the society (society being an extension of family); Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals, Visualizing a universal harmonious order in society–Undivided Society, Universal Order–from
family to world family.

(Practice sessions are to be included to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education, etc. Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from
students' lives).

UNIT – IV:

Part-1:Understanding Harmony in Nature & Existence – Whole existence as Coexistence: Understanding the harmony in the Nature, Interconnectedness and mutual fulfillment among the four orders of Nature – recyclability and self-regulation in nature, Understanding Existence as Co-existence of mutually interacting units in all-pervasive space, Holistic perception of harmony at all levels of existence.

Part-2: Implications of the above Holistic Understanding of Harmony on Professional Ethics: Natural acceptance of human values, Definitiveness of ethical human conduct, Basis for humanistic education, humanistic constitution and humanistic universal order, Competence in professional ethics: a) ability to utilize the professional competence for augmenting universal human order, b) ability to identify the scope and characteristics of people-friendly and eco- friendly production systems, c) ability to identify and develop appropriate technologies and management patterns for above production systems, Case studies of typical holistic technologies, management models and production systems, Strategy for transition from the present state to Universal Human Order: a) at the level of individual: as

socially and ecologically responsible engineers, technologists and managers, b) at the level of society: as mutually enriching institutions and organizations.

(Part-1: Practice sessions are to be included to discuss human being as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology, etc. Part-2: Practice exercises and case studies are to be taken up in practice (tutorial) sessions eg. to discuss the conduct as an engineer or scientist, etc.)

Text Book:

1. Human values and professional ethics, R. R. Gaur, R. Sangal and G. P. Bagaria, Excel Books Private Limited, New Delhi (2010).

Reference books:

1. Jeevan Vidya: Ek Parichaya, A. Nagaraj, Jeevan Vidya Prakashan, Amarkantak (1999).
2. Human Values, A. N. Tripathi, New Age International Publishers, New Delhi (2004).
3. The Story of Stuff: The impact of overconsumption on the planet, our communities, and our health and how we can make it better, Annie Leonard, Free Press, New York (2010).
4. The story of my experiments with truth: Mahatma Gandhi Autobiography, Mohandas Karamchand Gandhi, B. N. Publishing (2008).
5. Small is beautiful: A study of economics as if people mattered, E. F. Schumacher, Vintage Books, London (1993).
6. Slow is beautiful: New Visions of Community, Cecile Andrews, New Society Publishers, Canada (2006).
7. Economy of Permanence, J. C. Kumarappa, Sarva-Seva-Sangh Prakashan, Varanasi (2017).
8. Bharat Mein Angreji Raj, Pandit Sunderlal, Prabhath Prakashan, Delhi (2018).
9. Rediscovering India, Dharampal, Society for Integrated Development of Himilayas (2003).
10. Hind Swaraj or Indian Home Rule, M. K. Gandhi, Navajivan Publishing House, Ahmedabad (1909).
11. India Wins Freedom: The Complete Version, Maulana Abul Kalam Azad, Orient Blackswan (1988).
12. The Life of Vivekananda and the Universal gospel, Romain Rolland, Advaitha Ashrama, India (2010).
13. Mahatma Gandhi: The Man who become one with the Universal Being, Romain Rolland, Srishti Publishers & Distributors, New Delhi (2002).

E-RESOURCES:

- AICTE – SIP Youtube Channel:
   https://www.youtube.com/channel/UCo8MpJB_aaVwB4LWLAx6AhQ
- AICTE – UHV Teaching Learning Material:
   https://fdp-si.aicte-india.org/download.php#1

23ES3103 G
BASIC THERMODYNAMICS

Course Category:	Engineering Science	Credits:	3
Course Type:	Theory	Lecture -Tutorial-Practice:	3 - 0 - 0
Prerequisites:	23BS2102 Engineering Physics	Continuous Evaluation: Semester end Evaluation: Total Marks:	30 70 100

COURSE OUTCOMES

Upon successful completion of the course, the student will be able to:

CO1	Illustrate the basic concepts of thermodynamics and can distinguish work and heat forms of energy
CO2	Apply first of law of thermodynamics to flow and non-flow processes and thermodynamic systems
CO3	Apply the second law of thermodynamics to systems and understand the concept of entropy, exergy and irreversibility
CO4	Evaluate the properties of steam, gas mixtures and analyse steam and air cycles

	Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)													
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	H	M	L										M	
CO2	M	H	H										M	
CO3	M	H	H										M	
CO4	M	H	M										M	

COURSE CONTENT

UNIT I

FUNDAMENTAL CONCEPTS AND DEFINITIONS: Thermodynamic system, type of systems Macroscopic and microscopic points of view, properties and state of a substance, Thermodynamic equilibrium and Quasistatic Process, thermodynamic path, cycle, Zerothlaw of thermodynamics, Temperatures scales

WORK AND HEAT: Ideal gas equation, equation of state, Work transfer, pdV-work and heat transfer in various Quasistatic processes, flow work, path function and point function, heat transfer-A path function, comparison of heat and work.

UNIT II
FIRST LAW FOR NON-FLOW SYSTEMS: Joule Experiment in establishing First law of thermodynamics, First law of thermodynamics for a system undergoing a cycle and for a change in state of system, Energy –a property of a system, internal energy and enthalpy, constant volume and constant pressure specific heats and their relation to internal energy and enthalpy of ideal gases.

FIRST LAW FOR FLOW SYSTEMS: Control mass and control volume, first law of thermodynamics for a control volume, steady flow energy equation and application to engineering equipment.

UNIT III
SECOND LAW OF THERMODYNAMICS: Cyclic heat engines and Refrigerators, Kevin Planks and Clausius statements, Equivalence of Kevin Planks and Clausius statements, Carnot cycle, Carnot theorem and its corollary, absolute thermodynamic temperature scale, efficiency of reversible heat engine and COP of reversed heat engine, Causes of irreversibility, Concept of Exergy and irreversibility (Theory).

ENTROPY: Clausius Theorem, property of entropy, Inequality of Clausius, Entropy change in irreversible process, Entropy principle, Problems on Entropy change and entropy generation in system during change of state, T-ds relations.

UNIT IV
PROPERTIES OF GAS MIXTURES: Properties of mixture of gases-Dalton`s law of Partial Pressures, Internal Energy, enthalpy and specific heats of gas mixtures and Entropy of gas mixtures

PURE SUBSTANCES: P-v, P-T, T-s and h-s diagrams for a pure substance, Triple point, Critical point, Dryness fraction, Steam tables, problems using steam tables and Mollier chart.

VAPOUR AND AIR POWER CYCLES: Ideal Rankine cycle, Otto cycle, Diesel cycle, Dual cycle

TEXT BOOKS
[1] P. K. Nag, "Engineering Thermodynamics" 6thedition, Tata Mc Graw Hill Education Private Limited, 2017.
[2] Mahesh M. Rathore, Thermal Engineering, Tata McGraw-Hill Education, 2010
[3] G.J.Van Wylen & Sonntag, "Fundamentals of Classical Thermodynamics", 4th Edition, Wiley publication 2005

REFERENCE BOOKS
[1] Yunus A. Cengel M. and Michael A. Boles, "Thermodynamics – An Engineering Approach", 8th edition, McGrawHill Education (India) Private Limited, 2014.
[2] R.K. Rajput, Thermal Engineering, Lakshmi Publications Limited, 2020

E-RESOURCES AND OTHER DIGITAL MATERIAL
[1] www.learnthermo.com/tutorials.php
[2] www.khanacademy.org/science/physics/ thermodynamics
[3] www.courseera.org/learn/ thermodynamics -intro
[4] www.edx.org/course/thermodynamics -iitbombayx-me209-1x-1
[5] http://nptel.ac.in/courses/112106141
[6] http://nptel.ac.in/courses/112108148
Note: *Steam tables are permitted in internal and external examinations*

23ME3304
MECHANICS OF MATERIALS

Course Category:	Professional Core		Credits:	3
Course Type:	Theory		Lecture -Tutorial-Practice:	3 - 0 - 0
Prerequisites:	23PC2104B Engineering Mechanics		Continuous Evaluation: Semester end Evaluation: Total Marks:	30 70 100

COURSE OUTCOMES

Upon successful completion of the course, the student will be able to:

CO1	Estimate the stresses and strains in structural members subjected to axial loading and analyse the members subjected to torsion.
CO2	Construct Shear force and Bending moment diagrams for determinate beams and analyse the members subjected to bending.
CO3	Evaluate the deflections of determinate beams and safe load on columns.
CO4	Solve plane stress problems and calculate the stresses in thin cylindrical and spherical vessels.

Contribution of Course Outcomes towards achievement of Program Outcomes

PO	1	2	3	4	5	6	7	8	9	10	11	12	PSO I	PSO II
CO1	H	M	L											M
CO2	M	H	L											M
CO3	M	H	L											M
CO4	M	H	L											M

(L-Low, M-Medium, H-High)

UNIT - I
TENSION, COMPRESSION AND SHEAR : Introduction, Concepts of Normal Stress and Strain, Stress-Strain Diagrams, Elasticity and Plasticity, Linear Elasticity and Hooke's Law, Poisson's Ratio, Shear Stress and Strain, Allowable Stresses and Allowable Loads. Numerical problems on Change in length of axially loaded members, Change in length for a tapered bar under axial loading.

TORSION: Introduction, Torsional deformations of Circular Bar, Circular bars of linearly elastic materials, Transmission of power by circular shafts.

UNIT - II
STATICALLY DETERMINATE BEAMS: Introduction, Types of Beams, Loads and Reactions, Shear Force and Bending Moments, Relationships between Load, Shear Force and Bending Moment, Shear Force and Bending Moment Diagrams.

BENDING STRESSES IN STATICALLY DETERMINATE BEAMS: Introduction, Pure bending, Bending stress Equation, Design of beams for bending stresses

UNIT – III
DEFLECTIONS OF STATICALLY DETERMINATE BEAMS: Introduction, Differential Equations of the Deflection Curve, Deflections by Integration of the Bending Moment Equation, Macaulay's Method.

COLUMNS: Introduction,Buckling and Stability, Columns with Pinned ends, Columns with other support conditions, Limitations of Euler's Formula, Rankine's Formula.

UNIT – IV
ANALYSIS OF PLANE STRESS: Introduction, Plane Stress, Principal Stresses and Maximum Shear Stress.Mohr's Circle for Plane Stress.

THIN CYLINDRICAL AND SPHERICAL PRESSURE VESSELS:
Introduction,Stressesinthincylindrical and spherical pressure vessels subjected to internal pressure. Effect of internal pressure on the dimensions of the thin cylindrical and spherical pressure vessels.

Text Books:
[1] James M. Gere and Barry J.Goodno, "Mechanics of Materials", Eighth edition, CENGAGE Learning, 2013
[2] R.K.Bansal, "Strength of Materials"Sixth edition,Laxmi Publishers, 2017

Reference books:
[1] Dr. Sadhu Singh,"Strength of Materials", Ninth edition, Khanna Publishers, 2007.
[2] R.K. Rajput,"Strength of Materials",First Edition,S.Chand& Company, 2006.
[3] S.S.Rattan, "Strength of Materials", Third Edition,Tata McGraw Hill Education Private Limited, 2017.

E-resources and other digital material:
[1] Prof. M.S. Sivakumar, IIT Madras, Strength of material, [English], Web
    Available: http://nptel.ac.in/courses/112106141/
[2] Dr. Satish C Sharma, IIT Roorkee, Strength of material, [English], Web
    Available: http://nptel.ac.in/courses/112107146/
[3] Dr. S. P. Harsha, IIT Roorkee, Strength of material, [English], Video
    Available: http://nptel.ac.in/courses/112107147/

23ME3305
KINEMATICS OF MACHINES

Course Category:	Professional Core		Credits:	3
Course Type:	Theory		Lecture -Tutorial-Practice:	3 - 0 - 0
Prerequisites:	23PC2104B Engineering Mechanics 23ES1105 Engg. Graphics		Continuous Evaluation: Semester end Evaluation: Total Marks:	30 70 100

COURSE OUTCOMES

Upon successful completion of the course, the student will be able to:

CO1	Distinguish different Mechanisms and determine velocity of links using Instantaneous Centre Method.
CO2	Evaluate velocity and acceleration of various links in a Mechanism
CO3	Apply the analytical techniques for Synthesis of Mechanisms & Develop cam profiles
CO4	Illustrate the concepts of toothed gearing and gear trains

Contribution of Course Outcomes towards achievement of Program Outcomes

PO	1	2	3	4	5	6	7	8	9	10	11	12	PSO I	PSO II
CO 1	M	M	M											L
CO 2	M	H	M											L
CO 3	M	M	H											M
CO 4	M	H	H											M

(L-Low, M-Medium, H-High)

UNIT-I : INTRODUCTION : Mechanisms and machines, Rigid and resistant bodies, Link, Kinematic pair, Types of joints, Constrained motions, Degrees of Freedom, Mobility - Kutzbach criterion -Gruebler's equation - Grashoff's law, Classifications of Kinematic pairs, kinematic-chain, Linkage, mechanism and structure, Classification of mechanisms, Inversions of Mechanism- Four - bar chain, Single Slider - Crank Chain, Double – Slider Crank Chain.

INSTANTANEOUS CENTRE: Notation, Number of Instantaneous centres, Kennedy's theorem, Locating Instantaneous centres, Angular velocity by Instantaneous centre Method for simple mechanisms (Four bar and Slider - Crank Mechanism).

UNIT-II : VELOCITY AND ACCELERATION ANALYSIS: Introduction, Absolute and Relative Motion, Vectors, Addition and subtraction of Vectors, Motion of a Link, Velocity and Acceleration, Angular velocity and Angular acceleration of Links: Four bar Mechanism, Velocity and Acceleration of Intermediate and offset points. Velocity and acceleration of Slider - Crank Mechanism, Coriolis acceleration of Crank and Slotted Lever Mechanism.

UNIT-III : KINEMATIC SYNTHESIS : Stages of synthesis-Concepts of type, Number and dimensional synthesis - Tasks of dimensional synthesis, Concepts of function generation, Rigid body guidance and path generation, Freudenstein equation for function generation using three precision points for four bar mechanism. (3 precision points only).
CAMS: Introduction, Classification of cams and followers, Terminology and definitions, Displacement diagrams – Uniform velocity, simple harmonic and uniform acceleration motions, Graphical synthesis of cam profile limited to reciprocating, radial & offset follower. (Knife Edge and Roller Followers).

UNIT-IV: GEARS: Introduction, Classification of gears, Gear terminology, Law of Gearing, Velocity of Sliding, Forms of Teeth- Cycloidal Profile Teeth, Involute Profile Teeth, Comparison of Cycloidal and Involute tooth forms. Path of contact, Arc of contact, Number of pairs of Teeth in contact, Concept of Interference in Involute Gears. Minimum number of Teeth in Involute Gears,
GEAR TRAINS: Introduction, simple Gear Train, Compound Gear Train, Reverted Gear train, Planetary or Epicyclic Gear Train, Analysis of Epicyclic Gear Train using Tabular method only.

Text Books:
[1] S.S.Rattan, Theory of Machines, 4th Edition, 2014, TMH.
[2] Amitabha Ghosh and Asok Kumar Mallik, Theory of Mechanisms and Machines, 3rd Edition,2006 East West   Press
Reference Books:
[1] C S Sharma and Kamlesh Purohit, Theory of Mechanisms and Machines, Prentice Hall of India.
[2] Dr. R. K. Bansal & Dr. J. S. Brar, Theory of Machines 4th Edition, 2009, Lakshmi publications

[3] Robert L.Norton, Design of Machinery, 6rd Edition, 2019, McGraw-Hill Education.

Additional Resources:
[1] http://nptel.iitg.ernet.in/Mech_Engg/IIT%20Delhi/Kinematics%20of%20Machines.htm
[2] http://freevideolectures.com/Course/2359/Kinematics-of-Machines
[3]http://www.rapidmaniac.com/search/relevant/All/solution-manual-kinematics-and-dynamics-ofmachines

23TP3106
LOGIC & REASONING

Course Category:	Soft skills -I	Credits:	1
Course Type:	Learning by Doing	Lecture -Tutorial-Practice:	0- 0 - 2
Prerequisites:		Continuous Evaluation:	100
		Semester end Evaluation:	0
		Total Marks:	100

COURSE OUTCOMES

Upon successful completion of the course, the student will be able to:

CO1	Think reason logically in any critical situation
CO2	Analyze given information to find correct solution
CO3	To reduce the mistakes in day to day activities in practical life
CO4	Develop time management skills by approaching different shortcut methods
CO5	Use mathematical based reasoning to make decisions
CO6	Apply logical thinking to solve problems and puzzles in qualifying exams for companies and in other competitive exams

Contribution of Course Outcomes towards achievement of Program Outcomes
(1 – Low, 2 - Medium, 3 – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1						M								
CO2		M												
CO3								M						
CO4									M					
CO5	M													
CO6	L													

COURSE CONTENT

UNIT I :
1. Series Completion,
2. Coding-Decoding,
3. Blood Relation,
4. Puzzles test

UNIT II:
1. Direction sense test,
2. Logical Venn diagrams,
3. Number test, ranking test,
4. Mathematical operations

UNIT III:
1. Arithmetical Reasoning,
2. Inserting missing character,
3. Syllogism.
4. Binary logic.
5. Data sufficiency

UNIT IV: Non – Verbal:
1. Water images,
2. Mirror images,
3. Paper folding,
4. Paper cutting,
5. Embedded Figures,
6. Dot situation,
7. Cubes & Dice

TEXT BOOKS

1. R. S. Aggarwal, " Verbal and non-verbal reasoning", Revised Edition, S Chand publication, 2017 ISBN:81-219-0551-6,

2. Reasoning Guru Verbal & Non-Verbal Reasoning by Vikramjeeth, Multilingual Edition-2023. ISBN :978-9358706000

23MC3107
ENVIRONMENTAL SCIENCE

Course Category:	Audit Course		Credits:	-
Course Type:	Theory		Lecture -Tutorial-Practice:	2 – 0 - 0
Prerequisites:	Consciousness of Environment		Continuous Evaluation: Semester end Evaluation: Total Marks:	46+46+3+5 --- 100

Course Outcomes	
Upon successful completion of the course, the student will be able to:	
CO1	Identify various factors causing degradation of natural resource and control measures [K3]
CO2	Identify various ecosystems and need for biodiversity[K3]
CO3	Interpret the problems related to environmental pollution and its Management [K2]
CO4	Apply the information and technology to analyze social issues [K3]

Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low, Medium-M, H- High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	L							L					L	
CO2		L	L							L			L	
CO3				L	L							L	L	
CO4						L	L	L					L	

Course Content

UNIT I

The Multidisciplinary Nature of Environmental StudiesDefinition, scope and importanceNeed for public awareness.

Natural Resources :

Renewable and Non-renewable Resources: Natural resources and associated problems.

(a)Forest resources: Use and over-exploitation, deforestation. Timber extraction, mining, dams and their effects on forests and tribal people.

(b)Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.

(c)Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources.

(d)Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity.

(e)Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources.

(f)Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification. Role of an individual in conservation of natural resources. Equitable use of resources for sustainable lifestyles.

UNIT II
Ecosystems
Concept of an ecosystem. Structure and function of an ecosystem. Producers, consumers and decomposers. Energy flow in the ecosystem. Ecological succession. Food chains, food webs and ecological pyramids. Introduction, types, characteristic features, structure and function of the following ecosystem: (a) Forest ecosystem (b)Grassland ecosystem (c)Desert ecosystem

(d)Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Biodiversity and Its Conservation

Introduction, definition: genetic, species and ecosystem diversity. Biogeographically classification of India. Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values. Biodiversity at global, National and local levels. 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 conservation of biodiversity.

UNIT III
Environmental Pollution
Definition ,Causes, effects and control measures of (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution   (f) Thermal pollution (g) Nuclear hazards

Solid waste management: Causes, effects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution.

Disaster management: Floods, earthquake, cyclone and landslides.

UNIT IV
Social Issues and the Environment:
From unsustainable to sustainable development. Urban problems related to energy.

Water conservation, rain water harvesting, watershed management. Resettlement and rehabilitation of people; its problems and concerns.

Environmental ethics Issues and possible solutions. Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Wasteland reclamation.Consumerism and waste products.

Environment Protection Act

Air (Prevention and Control of Pollution) Act. Water (Prevention and Control of Pollution) Act. Wildlife Protection Act. Forest Conservation Act. Issues involved in enforcement of environmental legislation.

Public awareness

Human Population and the Environment,Population growth, variation among nations, Population explosion—Family Welfare Programme.

Environment and human health

Human rights, Value education,HIV/AIDS,Women and Child Welfare,Role of Information Technology in environment and human health.

Field Work/ Case Studies

Visit to a local area to document environmental assets—river/forest/grassland/hill/ mountain. Visit to a local polluted site—Urban/Rural/Industrial/Agricultural.Study of common plants, insects, birds. Study of simple ecosystems—pond, river, hill slopes, etc.

Self-Study

Water resources, Threats to biodiversity, Solid waste management, Role of Information Technology in environment and human health.

Text books and Reference books

Text Book(s):

[1]. ErachBharucha. 2004, Environmental Studies for undergraduate courses, University Grants Commission, New Delhi, BharatiVidyapeeth Institute of Environment Education and Research.

REFERENCE BOOKS:

[1]. AnjaneyuluY. Introduction to Environmental sciences, B S Publications PVT Ltd, Hyderabad

[2]. Anjireddy.M Environmental science & Technology, BS Publications PVT Ltd, Hyderabad.

[3]. Benny Joseph, 2005, Environmental Studies, The Tata McGraw- Hill publishing company limited, New Delhi.

[4]. Principles of Environmental Science. &Engg. P.VenuGopalaRao, 2006, Prentice-Hall of India Pvt. Ltd., New Delhi.

[5]. Ecological and Environmental Studies – Santosh Kumar Garg, RajeswariGarg   (or) RajaniGarg, 2006, Khanna Publishers, New Delhi.

[6]. Essentials of Environmental Studies, Kurian Joseph & R Nagendran, Pearson   Education publishers, 2005.

[7]. A.K Dee – Environmental Chemistry, New Age India Publications.

[8]. BharuchaErach- Biodiversity of India, Mapin Publishing Pvt.Ltd..

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1]. ErachBharucha. 2004, Environmental Studies for undergraduate courses, University Grants Commission, New Delhi,   BharatiVidyapeeth Institute of Environment Education and Research.https://www.ugc.ac.in/oldpdf/modelcurriculum/env.pdf

[2]. NPTEL Courses - Environmental Studies By Dr.Tushar Banerjee | Devi AhilyaViswavidyalaya, Indore.

23ME3651
PROGRAMMABLE LOGIC CONTROLLERS LAB

Course Category:	Skill oriented course	Credits:	1
Course Type:	Lab	Lecture -Tutorial-Practice:	0 – 0 - 2
Prerequisites:	Nil	Continuous Evaluation: Semester end Evaluation: Total Marks:	30 70 100

COURSE OUTCOMES

Upon successful completion of the course, the student will be able to:

CO1	Demonstrate knowledge of basic ladder logic instructions like timers, counters etc. used to program PLCs.
CO2	Apply PLC ladder programming for simple industrial processes.
CO3	Analyze the performance of PLC based systems.
CO4	Make use of various vendors PLCs to perform experiments as individual or team

Contribution of Course Outcomes towards achievement of Program Outcomes
(L – Low, M - Medium, H – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	H		M		M									M
CO2	H		M		M									M
CO3	H		M		M									M
CO4	H		M		M									M

COURSE CONTENT

List of experiments:

1.Implementation of logic gates using PLC ladder diagram (LD)

2. Implementation of timers using PLC

3. Implementation of counters using PLC

4. Positive and negative edge detection in PLC

5. Level control using PLC

6. Pressure control using PLC

7. Temperature control using PLC

8. Motor speed control using PLC

9. Automation of material handling system using PLC

10. Automatic pneumatic stamping machine using PLC

11. Automatic drilling system using PLC

12. Elevator control using PLC

23ME3352
SOLID MODELLING LABORATORY

Course Category:	Professional Core	Credits:	1.5
Course Type:	Laboratory	Lecture -Tutorial-Practice:	0 - 0- 3
Prerequisites:	23ES1105 Engineering Graphics	Continuous Evaluation: Semester end Evaluation: Total Marks:	30 70 100

COURSE OUTCOMES

Upon successful completion of the course, the student will be able to:

CO1	Construct 2D sketches in a modelling software
CO2	Develop part models of machine components
CO3	Combine part models of machine components for assembly
CO4	Translate geometric models to other file formats.

Contribution of Course Outcomes towards achievement of Program Outcomes
(L – Low, M - Medium, H – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1			M		H									H
CO2			M		H									H
CO3			M		H									H
CO4			M		H									H

COURSE CONTENT

Lab Exercises:

1. Construction of 2D sketches.
2. Modelling of simple machine components.
3. Assembly of Machine components.
4. Orthographic views of the assembled components.
5. Solid modelling of real components
6. Exporting the files to other file formats
7. Group assignment topic
i. Part drawing & Assembly of Screw jack
ii. Part drawing & Assembly of Stuffing Box

iii.   Part drawing of Marine engine connecting rod end
iv.   Part drawing & Assembly of Single tool post
v.   Part drawing & Assembly of Socket and spigot joint
vi.   Part drawing & Assembly of Foot-step bearing
vii.   Develop various types of GI pipe fittings
viii.   Develop double strap diamond butt joint

TEXT BOOKS

[1] Pro/Engineer Wildfire 5.0 by Roger Toogood, Jack Zecher, SDC Publications.
[2] Machine Drawing by K.L Narayana, P.Kannaiah, K.Venkata Reddy, Publisher: New Age International

REFERENCE BOOKS

[1] Parametric Modeling with Pro/ENGINEER Wildfire 5.0
[2] Parametric Modeling with Creo Parametric 1.0

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] http://www.proetutorials.com/
[2] http://learningexchange.ptc.com/tutorials/by_sub_product/p tc-creo-elements-pro-pro-engineer/sub_product_id:1
[3] http://www.eng-tips.com/viewthread.cfm?qid=48209
[4] https://catiatutor.com/
[5] www.v5train.com

NPTEL Video references:
[1] https://www.youtube.com/watch?v=c2VtgkfZ2BQ
[2] https://www.youtube.com/watch?v=hjgGxl4Yk_M
[3] https://www.youtube.com/watch?v=xsKtzWBZ5FY
[4] https://www.youtube.com/watch?v=rIFeKNzm4gE
[5] https://www.youtube.com/watch?v=uCdypjnnKto
[6] https://www.youtube.com/watch?v=YIzwA_Wlj_M

23ME3353
COMPUTATIONAL METHODS LABORATORY

Course Category:	Professional Core	Credits:	1.5
Course Type:	Laboratory	Lecture -Tutorial-Practice:	0 -0- 3
Prerequisites:	23BS2101Differential Equations & Vector Calculus 23PC2104B Engineering Mechanics	Continuous Evaluation: Semester end Evaluation: Total Marks:	30 70 100

COURSE OUTCOMES

Upon successful completion of the course, the student will be able to:

CO1	Illustrate basic commands in MATLAB and perform matrix Operations
CO2	Evaluate linear equations, Numerical integration and ODE using FDM
CO3	Intercept Engineering Mechanics and Strength of Materials Problems
CO4	Solve Thermal Engineering Problems

Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	H												H	
CO2	H	M											H	
CO3	L	H			H								H	
CO4	L	H		M	H								H	

COURSE CONTENT

List of Experiments:

1. Basic MATLB Commands, functions and plot commands

2. Scalars, vectors and Matrix Operations

3. Solution of System of Linear Equations

4. Numerical Integration and Differentiation

5. Solution of ODE problem using FDM Method

6. Solution to simple Engineering Mechanics Problem

7. Solution to simple Vibration Problem

8. Solution to simple Strength of Materials Problem

9. Solution to simple Thermodynamics Problem

10. Solution to simple Fluid Dynamics Problem

11. Solution to simple Heat Transfer Problem

TEXT BOOKS & REFERENCE BOOKS

[1] Solving Mechanical Engineering Problems with MATLAB, 2nd Edition, Simin Nasseri,Linus Learning (2022)

[2] MATLAB programming by Y.Kirani Singh &B.B.Chaudhuri. PHI Publications (2010).

[3] Getting started with MATLAB -a quick reference for scientists & engineers by RudraPratap. Oxford University Press (2009).

[4] An introduction to programming and numerical methods in MATLAB by S.R.Otto, J.P.Denier. Springer Publications (2007)

[5] Ordinary and Partial Differential Equation Routines in C, C++, FORTRAN, Java, Maple,and MATLAB by H.J. Lee, W.E. Schiesser.

[6] Graphics and GUIs with MATLAB, Third Edition (Graphics & GUIs with MATLAB)3rd Edition by O. Thomas Holland, Patrick Marchand.

 E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] http://www.math.ucsd.edu/~bdriver/21d-s99/matlab-primer.html

[2] http://www.mathworks.in/academia/student_center/tutorials/   launchpad.html

[3] http://www.cyclismo.org/tutorial/matlab/

[4] http://www.mathworks.com/matlabcentral/fileexchange?s_cid=wiki_matlab_17

[5] http://www.youtube.com/user/matlab?feature=results_mai

[6] http://www.youtube.com/watch?v=DPLBPdux6bs

23HS4101
ENGINEERING ECONOMICS AND MANAGEMENT

Course Category:	Management Course	Credits:	2
Course Type:	Theory	Lecture -Tutorial-Practice:	2 – 0 – 0
Prerequisites:		**Continuous Evaluation:** **Semester end Evaluation:** **Total Marks:**	30 70 100

COURSE OUTCOMES	
Upon successful completion of the course, the student will be able to:	
CO1	Understand the principles of management and various forms of organizations.
CO2	Understand the various aspects of business economics.
CO3	Perceive the knowledge on Human resources and Marketing functions.
CO4	Evaluate various alternatives economically and methods of calculating depreciation.

Contribution of Course Outcomes towards achievement of Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO I	PSO II
CO1	M											M		M
CO2	M				H							M		M
CO3	M											M		M
CO4	M				H							M		M

(L-Low, M-Medium, H-High)

UNIT – I
Management: Introduction to Management, Functions of Management, Principles of Scientific Management, Modern Principles of Management.
Forms of Business Organization: Salient Features of Sole Proprietorship, Partnership, Joint Stock Company, Co-operative Society and Public Sector.

UNIT - II
Introduction to Economics: Introduction to Basic Economic Concepts, Utility Analysis: Marginal Utility

and Total Utility, Law of Diminishing Marginal Utility, Law of Equi Marginal Utility.

Demand Analysis: Theory of Demand: Demand Function, Factors Influencing Demand, Demand Schedule and Demand Curve, Shift in Demand, Elasticity of Demand: Elastic and Inelastic Demand, Types of Elasticity.

Supply Analysis: Supply Schedule and Supply Curve, Factors Influencing Supply, Supply Function.

UNIT – III

Human Resource Management: Meaning and difference between Personnel Management and Human Resource Management, Functions of Human Resource Management.

Marketing Management: Concept of Selling And Marketing – Differences, Functions of Marketing, Product Life Cycle, Concept of Advertising, Sales Promotion, Types of Distribution Channels, Marketing Research, Break-Even Analysis.

UNIT – IV

Financial Management: Functions of Financial Management, Time value of money with cash flow diagrams, Concept of Simple and Compound Interest.

Economic Alternatives: Methods of Evaluating Alternatives under Present worth method, Future worth method, Annual Equivalent method - Problems.

Depreciation: Causes of depreciation, Factors influencing depreciation, common methods of Depreciation: Straight Line Method, Declining Balance Method, Sum of Year's Digits Method –Problems.

Text Books:

[1] M. Mahajan*Industrial Engineering and Production Management* Dhanpat Rai Publications2nd Edition.

[2] Martand Telsang" Industrial & Business Management" S.Chand publications

Reference books:

[1] R.Paneerselvam "Production and Operations Management" PHI

[2]Philip Kotler   & Gary Armstrong "Principles of Marketing" ,pearson prentice Hall,New Delhi,2012 Edition.

[3] IM Pandey, "*Financial Management*" Vikas Publications 11th Edition

[4] B.B Mahapatro, *"Human Resource Management".*,New Age International ,2011

E-resources and other digital material:

[1]https://www.toppr.com/guides/fundamentals-of-economics-and-management/supply/supply-function/

[2]https://keydifferences.com/difference-between-personnel-management-and-human-resource-management.html

[3]http://productlifecyclestages.com/

[4]https://speechfoodie.com/cash-flow-diagrams/

23ES4102D
ENGINEERING METALLURGY

Course Category: Engineering Science	**Credits**: 3
Course Type : Theory	**Lecture/Tutorial/ Practice**: 3 /0/ 0
Prerequisites:	**Continuous Evaluation**: 30
23BS2102 Engineering Physics	**Semester end Evaluation**:70
23BS1102A Engineering Chemistry	**Total Marks:**100

COURSE OUTCOMES

Upon successful completion of the course, the student will be able to:

CO1	Recognize the importance and concept of materials and solid solutions.
CO2	Exemplify the phase diagrams and TTT diagrams of steels.
CO3	Classify theheat treatment processes and strengthening mechanisms.
CO4	Outlinethe principles of powder metallurgy and manufacturing methods of different types of composites.

Contribution of Course Outcomes towards achievement of Program Outcomes

PO	1	2	3	4	5	6	7	8	9	10	11	12	PSO I	PSO II
CO1	H	M											L	L
CO2	H	M											L	L
CO3	H	M											L	L
CO4	H	M											L	L

(L-Low, M-Medium, H-High)

UNIT - I
INTRODUCTION TO MATERIAL SCIENCE: Material Science, Classification of materials, Requirement and selection of materials, Mechanical properties of materials.

INTRODUCTION TO CRYSTALLOGRAPHY: Space Lattice, Unit Cell, Bravais Lattices, Coordination number, Atomic Packing Factor for SCC, BCC and FCC,Crystal imperfections, Crystal deformation- Slip and Twinning.

SOLID SOLUTIONS: Introduction, Substitutional solid solutions, Ordered Substitutional solid solutions, Disordered Substitutional solid solutions, Hume Rothery's rule, Interstitial solid solution.

UNIT – II

PHASE DIAGRAMS: Binary phase diagrams – Phase rule – one component system, two component system, isomorphous, eutectic, eutectoid, peritectic and peritectoid systems,   Fe-Fe$_3$C   equilibrium diagram.

TTT Diagrams: TTT diagrams for eutectoid, hypo and hyper eutectoid steels.

UNIT – III

HEAT TREATMENT PROCESSES: Annealing, normalizing, hardening, tempering, austempering, martempering, flame Hardening, Induction Hardening & Chemical hardening techniques, hardenability concept and experimental determination.

STRENGTHENING MECHANISMS: Strain hardening, solid solution strengthening, grain refinement, dispersion strengthening.

UNIT – IV

POWDER METALLURGY: Powder metallurgy process, preparation of powders, Characteristics of metal powders, mixing and blending, compacting, sintering, Applications of Powder Metallurgy.

COMPOSITE MATERIALS: Introduction, Classification of composites, Characteristics of Composite Materials, Advantages and Dis-advantages of composite materials, applications of composite materials, various methods of component manufacture of composites – Hand Lay-up method, Resin transfer moulding, Filament winding process, and continuous pultrusion process.

Text Books:
[1]Kodgirie .V.D and Kodgirie.S.V, "Material Science and Metallurgy", Thirty-seventh Edition, Everest House Publication, 2015.
[2] Raghavan.V, " Material Science and Metallurgy" ,Fifth Edition, PHI Learning Pvt Limited,2013

Reference books:
[1] Avener , "Introduction to Physical Metallurgy", Second Edition, Tata McGraw hill Education (India) Pvt Limited,1997.
[2] Rajput R. K,"Material Science and Engineering", Fourth Edition, S.K.kataria& Sons,2009.
[3] C. Daniel Yesudian, D.G.Harris Samuel, "Material Science and Metallurgy", First Edition, SCITECH, 2006.

E-resources and other digital material:
[1] Prof.R.N.Ghosh, IIT Kharagpur, Solidification Binary Alloys, Iron-Carbon Phase
Diagram,[English]WebAvailable:https://www.youtube.com/results?searchquery=prof.r.n+ghosh+lecturers
[2] Prof.S.K.Gupta, IIT Delhi, Phase Diagrams, Crystal imperfections [English] Web Available: https://www.youtube.com/watch?v=x3n9ht-eRfg

23ME4303
MANUFACTURING PROCESSES

Course Category:	Professional Core		Credits:	3
Course Type:	Theory		Lecture -Tutorial-Practice:	3 - 0 - 0
Prerequisites:	23ES2103A Basic Mechanical Engineering.		Continuous Evaluation: Semester end Evaluation: Total Marks:	30 70 100

COURSE OUTCOMES

Upon successful completion of the course, the student will be able to:

CO1	Describe the Methodology of the casting processes.
CO2	Distinguish the special casting methods and their applications.
CO3	Familiarize with various Bulk Deformation and Sheet Metal operations.
CO4	Illustrate various Welding processes with applications.

Contribution of Course Outcomes towards achievement of Program Outcomes
(L – Low, M - Medium, H – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	H	M	L									
CO2	H		L									
CO3	H	M	L									
CO4	H		L									

COURSE CONTENT

UNIT – I Metal Casting Processes

Introduction to Manufacturing Processes, Sand casting - General method, pattern: types, materials and allowances, Molding Sand – Materials, preparation and properties, Types of Cores, Gating system and Risers: Types, Functions and Design (Numerical). Solidification process and time estimation (Numerical). Classification of Furnace: Constructional Features, Working Principle and Zones of Cupola Furnace, Electric Furnace – Arc. Advantages, Limitations and Applications.

UNIT – II Special Metal Casting Methods

Permanent Mold Casting, Die Casting: Hot chamber die casting- Cold chamber die casting, Centrifugal Casting: True Centrifugal Casting, Semi-centrifugal Casting and Centrifuging.
Investment casting - Shell Mold Casting - CO2 casting Process and Continuous Casting, Advantages, Limitations and Applications. Casting defects: Causes and Remedies.
UNIT – III Bulk Deformation and Sheet metal operations

Bulk Deformation Processes: Fundamentals, Hot and Cold working of metals - Rolling- Forging- Extrusion -Tube Making, and Wire Drawing. High Energy Rate Forming Processes: Explosive Forming, Electro Hydraulic Forming, Electro Magnetic Forming.

Sheet metal operations: Introduction, Sheet metal Blanking - Punching operations. Clearance and Shear as applied to Punching/Blanking operations (simple problems), Elastic recovery in bending operation.

UNIT – IV Metal Joining Welding Processes

Welding Processes: Fundamentals and classification of welding, Gas welding Processes: Working Principle of Oxy-acetylene Gas Welding, Arc Welding: TIG - MIG – Arc blow, Duty cycle. Resistance Welding: Principles of Resistance Welding - Types: Butt Welding, Spot Welding, Seam Welding. Advantages, Limitations and Applications.

Special welding Processes: Electron beam welding, Thermit Welding, Electro slag welding, Laser beam welding, Friction Welding, Friction stir Welding, Under Water Welding and Brazing & Soldering, Advantages, Limitations and Applications. Welding defects: Causes and Remedies.

TEXT BOOKS

[1]   Manufacturing Technology by P.N. Rao,Vol.1, Edition-3, 2009, TMH.
[2]   Production Technology (Manufacturing Processes) by P.C. Sharma, 2007, S. Chand Publishers.

REFERENCE BOOKS

[1] Welding and welding Technology by Richard.L.Little,1973, McGraw Hill.
[2] Principles of Metal Casting by Heine, Loper, Rosenthal.33rd Reprint, 2008, TMH.

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[1] https://themechanicalengineering.com/casting-process.
[2] Bulk Metal Forming - an overview | ScienceDirect Topics
[3] Different Sheet Metal Operations - Mech4study
[4] https://workshopinsider.com/underwater-welding.

23ME4304
FLUID MECHANICS AND HYDRAULIC MACHINES

Course Category:	Professional Core	Credits:	3
		Lecture-Tutorial -Practice:	3-0-0
Course Type:	Theory	Continuous Evaluation:	30
		Semester end Evaluation:	70
Prerequisites:		Total Marks:	100

COURSE OUTCOMES:

Upon successful completion of the course, the student will be able to:

CO1	Evaluate the fluid properties and analyze the fluid flow
CO2	Apply the knowledge of fluid dynamics for flow analysis and analyze the losses in pipes
CO3	Apply the momentum principle in impact of jets & analyze the flow in boundary layer
CO4	Analyze the performance of hydraulic turbines and pumps

Contribution of Course Outcomes towards achievement of Program Outcomes

(L – Low, M - Medium, H – High)

PO	1	2	3	4	5	6	7	8	9	10	11	12	PSO I	PSO II
CO 1	H	M	L										M	
CO 2	M	H	H										M	
CO 3	M	H	H										M	
CO 4	M	H	M										M	

COURSE CONTENT

UNIT – I

FLUID PROPERTIES AND FLUID STATICS: Density, Specific weight, Specific gravity, viscosity, Surface Tension, Capillarity, Types of Fluids, Vapour pressure, Compressibility, Pressure and its measurements (Treatment limited to Manometers).

FLUID KINEMATICS: Stream line, path line, streak line, stream tube, classification of flows, one and three dimensional continuity equation.

UNIT – II

FLUID DYNAMICS: Surface and Body forces - Euler's equation of motion and Bernoulli's equation from Euler's equation, applications of Bernoulli's equation.

INTERODUCTION TO PIPE FLOW: Reynolds's experiment, Darcy-Weisbach equation, Minor losses in pipes (Treatment limited to explanation), flow through pipes in series and parallel, Hydraulic gradient and total energy lines.

UNIT – III

BOUNDARY LAYER CONCEPTS: Definition, Displacement Thickness, Momentum thickness, Energy Thickness, Drag and lift (Treatment limited to concept only).

INTERODUCTION TO TURBO MACHINERY: Review of momentum equation, Impact of jet of water on various configurations and derivation of force applied by jet in all applications, Introduction to velocity triangles and applications.

UNIT – IV

HYDRAULIC TURBINES: Classification of turbines, Pelton wheel construction and working principle, Francis and Kaplan turbines detailed discussion, Heads, Efficiencies and Performance of turbines.

HYDRAULIC PUMPS: Classification of pumps with definition, Working Principles and work done by Centrifugal and Reciprocating pumps.

Text Books

[1] R.K.Bansal, "Fluid Mechanics & Hydraulic Machines" Tenth Edition, Laxmi Publications, 2023.

[2] Robert W. Fox , Alan T. McDonald and Philip J. "Fluid Mechanics" Eighth edition, Wiley Publishers.

Reference Books

[1] P.N.Modi & S.M. Seth.," Hydraulics and Fluid Mechanics", Second Edition, Standard Book House, 2005.
[2] R.K. Rajput," Fluid Mechanics & Hydraulic Machines", Ninth Edition, S.Chand & Company, 2015.
[3] D.S.Kumar, "Fluid Mechanics & Fluid Power Engineering", Second Edition, S.K.Kataria & Sons Publishers, 2014.

E-Resources and other digital material

[1] Prof. S.K. Som, IIT Kharagpur, Fluid Mechanics & Hydraulic Machines, [English],

Web Available: http://nptel.ac.in/courses/112105171/

[2] Prop.Gowtham Biswas, IIT Kharagpur, Fluid Mechanics & Hydraulic Machines, [English], WebAvailable: http://nptel.ac.in/courses/112104118/

[3] Fluid Mechanics & Hydraulic Machines, [English], Web Available: http://www.efluids.com/

23ME4305
MACHINE DYNAMICS

Course Category:	Professional Core	Credits:	3
		Lecture-Tutorial -Practice:	3-0-0
Course Type:	Theory	Continuous Evaluation:	30
		Semester end Evaluation:	70
Prerequisites:	23PC2104B Engineering Mechanics	Total Marks:	100

COURSE OUTCOMES

Upon successful completion of the course, the student will be able to:

CO1	Analyze balancing of rotating and reciprocating masses.
CO2	Examine the speed of governors and gyroscopic effects on vehicles.
CO3	Apply the concepts of energy fluctuations in fly wheels.
CO4	Calculate natural frequency for longitudinal, transverse and torsional vibrations.

Contribution of Course Outcomes towards achievement of Program Outcomes

PO	1	2	3	4	5	6	7	8	9	10	11	12	PSO I	PSO II
CO1	M	H	L											M
CO2	M	H	L											M
CO3	M	H	H											M
CO4	M	H	L											M

(L-Low, M-Medium, H-High)

UNIT – I
BALANCING OF ROTATING SYSTEMS: Introduction, Static balancing, Dynamic balancing, Transferring of a Force from one plane to another, Balancing of Several Masses in Different planes.
BALANCING OF RECIPROCATING SYSTEMS: Primary balancing only.

UNIT – II
GOVERNORS: Introduction, Watt Governor, Porter Governor, Hartnell Governor, Sensitiveness of a Governor, Hunting, Isochronism, Stability.
GYROSCOPES: Angular Velocity, Angular Acceleration, Gyroscopic Torque, Gyroscopic Effect on Air-planes and Naval Ships

UNIT – III

TURNING MOMENT DIAGRAMS: Introduction, Single - cylinder double – acting steam engine, Single - cylinder four stroke engine, Multi-cylinder engine, Fluctuation of energy, determination of maximum fluctuation of energy, coefficient of fluctuation of energy.

FLY WHEELS: Introduction, Coefficient of fluctuation of speed, energy stored in fly wheel.

UNIT – IV

UNDAMPED FREE VIBRATIONS:

LONGITUDINAL VIBRATION: Introduction, Definitions, Types of vibrations, Basic features of vibrating systems, Degree of freedom, free longitudinal vibrations.

TRANSVERSE VIBRATION: Single concreted load, shaft carrying several loads, whirling of shafts.

TORSIONAL VIBRATION: Single rotor systems and two rotor systems, Torsionally equivalent shafts.

Text Books:

[1] S.S.Rattan, "Theory of Machines", Fifth edition, McGraw Hill Education (India) Private Limited, 2014

[1]Dr.R.K.Bansal & Dr.J.S.Brar," Theory of Machines", Fourth edition, Laxmi Publications (P) Limited, 2009.

Reference books:

[1] R.S.Khurmi & J.K.Guptha," Theory of Machines", 14th Edition, S.Chand & Company, 2006.

[2] V.P.Singh,"Mechanical vibrations", Second Edition, Dhanpat Rai & Co (P) Limited, 2009

E-resources and Other digital material:

[1]Video in web: http://nptel.ac.in/courses/112104114/

[2]Video in web: https://youtu.be/OlZXxPVpmBs

[3]Notes in web:http://www.vssut.ac.in/lecture_notes/lecture1429901026.pdf

23TP4106
ENGLISH FOR PROFESSIONALS

Course Category:	**Soft Skills – 2**	Credits:	**1**
Course Type:	**Practical**	Lecture – Tutorial – Practice:	**0-0-2**
Prerequisites:	**Basic understanding of the language skills viz Listening, Speaking, Reading and Writing.**	Continuous Evaluation:	**100**
		Semester end Evaluation:	**0**
		Total Marks:	**100**

Course Outcomes

Upon successful completion of the course, the student will be able to:

CO1	Understand how to listen, reflect, and speak while communicating with others.
CO2	Recall the fundamentals of language in terms of grammar and vocabulary in communication.
CO3	Apply English language skills in various speaking contexts to present ideas with clarity and accuracy.
CO4	Analyze the different parts in Versant Test and answer them.

Contribution of Course Outcomes towards achievement of Program Outcomes
(L – Low, M – Medium, H – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	M									H		M
CO2	M									H		M
CO3	M								M	H		M
CO4	M									H		M

COURSE CONTENT

1. Conversation Starters :
Introduction – Seeking Permissions – Asking for Directions – Making Requests – Offering Help – Expressing Thanks – Conveying Apologies – Starting a Conversation with a Stranger – Practice.

2. Functional Conversations
Introducing Self – Introducing Others – Starting a Group Introduction – Icebreaker Introduction – Introducing a Formal Setting – Practice Exercises.

3. Grammar
Verbs – Tenses – Sentence Structures – Spotting the Errors.

4. Just A Minute
Introduction – Significance – Fluency – Coherence – Avoiding Errors – Communication Skills – Confidence – Practice.

5. Vocabulary
Idioms – Phrases – Significance – Meanings – Usage – Practice.

6. Elocution
Definition – Importance – Key Components – Voice Modulation – Articulation – Posture and Gestures – Practice.

7. Extempore
Introduction – Significance – Developing Quick Thinking – Communication Skills – Confidence – Practice.

8. Debate
Introduction – Understanding the Structure – Purpose of a Debate – Developing Basic Debating skills – Do's and Don'ts – Practice.

9. Versant Test
Overview of the Versant Test – Purpose and Importance – Format of the Test – Types of Questions – Practice.

10. Story Telling

Know Your Audience – Choose a Story – Set the Scene – Introduce the Characters – Build Suspense – Describe the Conflict – Show the Resolution – Share the moral/message – Use Vivid Language – Practice Delivery – Invite Reflection/Discussion – Follow Up.

Learning Resources

[1] English for Professionals Lab Manual

Reference Books

[1] Wren & Martin. *English Grammar and Composition.* S.Chand & Company, 2023.

[2] Dale Carnegie. *The Quick and Easy way to Effective Speaking.* Rupa Publications, 2016.

[3] Richard A. Spears. *McGraw-Hill's Dictionary of American Idioms and Phrasal Verbs*. McGraw Hill, 2005.

[4] Kamalesh Sadanand. *A Spoken English*. VOL 1&2, Orient BlackSwan, Second Edition, 2014.

E-Resources

[1] https://www.pearson.com/languages/hr-professionals/versant.htmlSoftx

[2] https://www.ted.com/talks

[3] https://shortstoryproject.com/

23ES4651
PYTHON PROGRAMMING LAB

Course Category:	Skill oriented course	Credits:	1
Course Type:	Lab	Lecture -Tutorial-Practice:	0 - 0 -2
Prerequisites:	23ES1104 -Introduction to programming	Continuous Evaluation: Semester end Evaluation: Total Marks:	30 70 100

Course Objective: To understand the PYTHON environment and make numerical computations and analysis.

Course Outcomes:

COs	Statements
CO1	Solve the different methods for linear, non-linear and differential equations
CO2	Learn the PYTHON Programming language
CO3	Familiar with the strings and matrices in PYTHON
CO4	Write the Program scripts and functions in PYTHON to solve the methods
CO5	Evaluate different methods of numerical solutions

Contribution of Course Outcomes towards achievement of Program Outcomes (L-Low,M-Medium,H- High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	H			L								M	M	M
CO2	L			L								M	M	M
CO3	M			H								M	M	M
CO4	M			H								M	M	M
CO5	M			L								M	M	M

Write Programs in PYTHON Programming for the following:

1. To find the roots of non-linear equation using Newton Raphson's method.

2. Curve fitting by least – square approximations

3. To solve the system of linear equations using Gauss - elimination method

4. To solve the system of linear equations using Gauss - Siedal method

5. To solve the system of linear equations using Gauss - Jordan method

6. To integrate numerically using Trapezoidal rule

7. To integrate numerically using Simpsons rule

8. To find the largest eigen value of a matrix by Power – method

9. To find numerical solution of ordinary differential equations by Euler's method

10. To find numerical solution of ordinary differential equations by Runge-Kutta method

11. To find numerical solution of ordinary differential equations by Milne's method

12. To find the numerical solution of Laplace equation

13. To find the numerical solution of Wave equation

14. To find the solution of a tri-diagonal matrix using Thomas algorithm

15. To fit a straight using least square technique

Online Learning Sources

- https://www.udemy.com/course/python-the-complete-python-developer-course/?matchtype=e&msclkid=0584dfb54dc715f39c0bb9aaf74033be&utm_campaign=BG-Python_v.PROF_la.EN_cc.INDIA_ti.7380&utm_content=deal4584&utm_medium=udemyads&utm_source=bing&utm_term=_._ag_1220458320107116_._ad__._kw_Python+language_._de_c_._dm__._pl__._ti_kwd-76278984197882%3Aloc-90_._li_116074_._pd__._&couponCode=IND21PM

- https://www.w3schools.com/python/python_intro.asp

- https://www.youtube.com/watch?v=eWRfhZUzrAc

- https://onlinecourses.nptel.ac.in/noc20_cs83/preview

- https://www.edx.org/learn/python

- Virtual Labs - https://python-iitk.vlabs.ac.in/

- Virtual Labs - https://virtual-labs.github.io/exp-arithmetic-operations-iitk/

- Virtual Labs - https://cse02-iiith.vlabs.ac.in/

- https://mlritm.ac.in/assets/cse/cse_lab_manuals/R20_cse_manuals/Python%20Lab%20Manual.pdf

23ES4152
DESIGN THINKING & INNOVATION

Course Category:	Engineering Sciences		Credits:	2
Course Type:	Activity Based Learning		Lecture -Tutorial-Practice:	1 - 0 -2
Prerequisites:	Social Needs, Customer needs & market needs		Continuous Evaluation: Semester end Evaluation: Total Marks:	100

COURSE OUTCOMES

Upon successful completion of the course, the student will be able to:

CO1	Able to define basic design components, Design thinking components and process
CO2	Apply the design thinking techniques for solving problems in various sectors.
CO3	Analyse to work in a multidisciplinary environment.
CO4	Evaluate the value of creativity.

	Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M - Medium, H – High)													
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO1			M											
CO2			M											
CO3			M						M					
CO4			M											

COURSE CONTENT

UNIT I

Introduction to Design Thinking & Design Thinking Process: Introduction to elements and principles of Design components, Introduction to design thinking, history of Design Thinking, New materials in Industry.

Design thinking process (empathize, analyze, idea & prototype), implementing the process in driving inventions, design thinking in social innovations. Tools of design thinking - person, costumer, journey map, brainstorming, product development

Activity: Every student presents their idea in three minutes, Every student can present design process in the form of flow diagram or flow chart etc. Every student should explain about product development.

UNIT II
Innovation

Art of innovation, Difference between innovation and creativity, role of creativity and innovation in organizations. Creativity to Innovation. Teams for innovation, Measuring the impact and value of creativity.

Activity: Debate on innovation and creativity, Flow and planning from idea to innovation, Debate on value-based innovation.

UNIT III
Product Design

Problem formation, introduction to product design, Product strategies, Product value, Product planning, product specifications. Innovation towards product design Case studies.

Activity: Importance of modeling, how to set specifications, Explaining their own product design.

UNIT IV
Design Thinking in Business Processes

Design Thinking applied in Business & Strategic Innovation, Design Thinking principles that redefine business – Business challenges: Growth, Predictability, Change, Maintaining Relevance, Extreme competition, Standardization. Design thinking to meet corporate needs. Design thinking for Startups. Defining and testing Business Models and Business Cases. Developing & testing prototypes.

Activity: How to market our own product, about maintenance, Reliability and plan for startup.

TEXT BOOKS

1.   Tim Brown, Change by design, 1/e, Harper Bollins, 2009.
2.   Idris Mootee, Design Thinking for Strategic Innovation, 1/e, Adams Media, 2014.

REFERENCE BOOKS

1.   David Lee, Design Thinking in the Classroom, Ulysses press, 2018.
2.   Shrrutin N Shetty, Design the Future, 1/e, Norton Press, 2018.
3.   William lidwell, Kritinaholden, & Jill butter, Universal principles of design, 2/e, Rockport Publishers, 2010.
4.   Chesbrough.H, The era of open innovation, 2003.

E-RESOURCES AND OTHER DIGITAL MATERIAL

•   https://nptel.ac.in/courses/110/106/110106124/
•   https://nptel.ac.in/courses/109/104/109104109/
•   https://swayam.gov.in/nd1_noc19_mg60/preview
•   https://onlinecourses.nptel.ac.in/noc22_de16/preview

23ME4353
STRENGTH OF MATERIALS & FLUID MECHANICS LABORATORY

Course Category:	Professional Core	Credits:	1.5
		Lecture-Tutorial -Practice:	0-0-3
Course Type:	Laboratory	Continuous Evaluation:	30
		Semester end Evaluation:	70
Prerequisites:	23 PC 2104 B Engineering Mechanics. 23 ME 3104 Mechanics of Materials. 23 ME 3204 Fluid Mechanics & Hydraulic Machines.	Total Marks:	100

COURSE OUTCOMES

Upon successful completion of the course, the student will be able to:

CO1	Determine Young's modulus using UTM [K5]
CO2	Evaluate hardness, Tensile, compressive, shear and impact strengths as per IS code of Practice [K5]
CO3	Measure the rigidity modulus by conducting torsion test on Mild Steel [K5]
CO4	Determine the coefficient of discharge for Venturimeter, orifice, orificemeter & Mouthpiece [K5]
CO5	Determine the Friction factor for a given pipe [K5]
CO6	Evaluate and analyse the characteristics of Centrifugal pumps, Reciprocating Pumps and Gear pumps [K5]

Contribution of Course Outcomes towards achievement of Program Outcomes

PO	1	2	3	4	5	6	7	8	9	10	11	12	13	PSO I	PSO II
CO 1	M	H		M	H										M
CO 2	M	H		M	H										M
CO 3	M	H		M	H										M
CO 4	M	H		M	H									H	
CO 5	M	H		M	H									H	
CO 6	M	H		M	H									H	

(L-Low, M-Medium, H-High)

Strength of Materials Lab:

1. Determination of Young's modulus for Mild Steel by conducting Tension test on UTM
2. Load vs Deflection - Determination of Young's modulus on cantilever beam and simply supported beam.
3. Compression test- Determination of compressive strength of Concrete block or Wood
4. (a) Rockwell Hardness test - Determination of Hardness Number for different metal specimens   such as Mild steel, cast iron, Brass, Aluminum (b) Brinnell's Hardness Test
5. Impact Test - (a) Charpy and (b) lzod: Determination of impact strength of Mild steel and cast iron specimens
6. Torsion test - Determination of Modulus of Rigidity of the material.
7. Double shear Test - Determination of shear strength of Mild steel specimens

Fluid Mechanics Lab:

1. Orifice / mouthpiece - Determination of coefficient of discharge
2. Venturimeter / Orifice meter - Determination of coefficient of discharge
3. Pipe friction - Determination of friction factor and size of roughness of a given pipe.
4. Single - stage centrifugal pump - To draw the operating characteristics of the pump and to determine the designed discharge and designed head from it.
5. Single - acting reciprocating pump - To draw the operating characteristic curves at constant speed and determination of efficiency.
6. Gear pump - To draw the operating characteristic curves and determination of overall efficiency

Text Books & References:

[1] James M. Gere and Barry J. Goodno, "Mechanics of Materials"
    Seventh edition, CENGAGE Learning, 2019

[2] R.K.Bansal, "Fluid Mechanics & Hydraulic Machines"

    Fifth edition, Laxmi Publishers, 2020

[3] Dr. Sadhu Singh,"Strength of Materials"

    Ninth edition, Khanna Publishers, 2017.

[4] P.N.Modi & S.M. Seth.,"Hydraulics and Fluid Mechanics",

    Second edition, Standard Book House, 2015.

23ME4354

MANUFACTURING PROCESS LABORATORY

Course Category:	Professional Core	Credits:	1.5
		Lecture-Tutorial -Practice:	0-0-3
Course Type:	Laboratory	**Continuous Evaluation:** **Semester end Evaluation:**	30 70
Prerequisites:	23ME3203 Manufacturing Processes	**Total Marks:**	100

COURSE OUTCOMES

Upon successful completion of the course, the student will be able to:

CO1	Develop various joints using fitting.
CO2	Create various welding joints.
CO3	Build various sand casting moulds.
CO4	Construct various models using 3D printing.

Contribution of Course Outcomes towards achievement of Program Outcomes
(L – Low, M - Medium, H – High)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1			H	H										L
CO2			H	H										L
CO3			M	H										L
CO4			H	H										M

COURSE CONTENT

I. FITTING:
To make the following joints
a. Half round Joint
b. Stepped Joint
c. Dovetail Joint

II .WELDING:
To make the following welding joints
a. To make Lap Joint using Oxy Acetylene Gas welding
b. To make 'T'– Joint using MIG welding
c. To make Spot joint (Door Handle) using Resistance welding

III. FOUNDRY:
To make the following sand moulds
a. Single piece pattern (Stepped Rectangular Block)
b. Two piece pattern (Step Cone Pulley)
c. Two piece pattern (Double end pipe flange)

IV. 3D PRINTING:
To make the following 3D print models
a. Bolt &Nut
b. Screw feeder
c. Gear wheel

V. PROJECT:

To prepare a metal Casting (Automobile component) – Group assignment

TEXT BOOKS

[1] S.K.HajraChowdary, A.K. HajraChowdary, NirjharRoy,"Elements of WorkshopTechnology, Vol.I".Media Promoters and Publishers Pvt.Ltd, Mumbai,Scitech Publications, Chennai, 2013

E-RESOURCES AND OTHER DIGITAL MATERIAL

[1] https://www.youtube.com/watch?v=OwzHpVE_S4I
[2] https://www.youtube.com/watch?v=1nXbYXj7Xos
[3] https://www.youtube.com/watch?v=0tOfaQ9pOGU
[4] https://www.youtube.com/watch?v=wQaytFTckGU
[5] https://3d-p.eu/wp-content/uploads/2018/08/IO3_3DP-courseware_EN.pdf