

COURSE STRUCTURE
&
SYLLABUS
For
MECHANICAL ENGINEERING
(Applicable for batches admitted from 2019-20)



USHARAMA COLLEGE OF ENGINEERING & TECHNOLOGY

NH-16, Telaprolu, Ungutur Mandalam,
Near Gannavaram, Krishna District, AP - 521109.

I Year I Semester

S No	Category	Course Code	Course Title	L	T	P	Contact Hrs/per Wk	Credits
1	HMC	UR19HM101	Communicative English	2	0	0	2	2
2	BSC	UR19BSC101	Linear Algebra & Calculus	3	1	0	4	4
3	BSC	UR19BSC102	<i>Numerical Methods & Complex Variables</i>	3	0	0	3	3
4	BSC	UR19BSC109	Engineering Chemistry	3	0	0	3	3
5	ESC	UR19ESC110	Problem Solving and Programming using C	3	0	0	3	3
6	HMC	UR19HML101	Communicative English Lab	0	0	2	2	1
7	BSC	UR19BSCL103	Engineering and applied Chemistry Lab	0	0	3	3	1.5
8	ESC	UR19ESCL102	Problem Solving and Programming using C Lab	0	0	3	3	1.5
Total				14	01	8	23	19

I Year II Semester

S No	Category	Course Code	Course Title	L	T	P	Contact Hrs/per Wk	Credits
1	HMC	UR19HM202	Professional English	2	0	0	2	2
2	BSC	UR19BSC205	Differential Equations & vector calculus	3	0	0	3	3
3	BSC	UR19BSC207	Engineering Physics	3	0	0	3	3
4	ESC	UR19ESC206	Basic Electrical & Electronics Engineering	3	0	0	3	3
5	ESC	UR19ESC207	Engineering Mechanics	3	0	0	3	3
6	ESC	UR19ESC208	Engineering Graphics & Drafting	1	0	3	4	2.5
7	HMC	UR19HML202	Professional English Lab	0	0	3	3	1.5
8	BSC	UR19BSCL201	Engineering Physics Lab	0	0	3	3	1.5
9	ESC	UR19ESCL201	Engineering Workshop & IT Workshop	0	0	3	3	1.5
Mandatory courses								
10	MC	UR19MC200	Engineering Exploration Project	0	0	0	1	0
11	MC	UR19MC201	Engineering Physics Lab-Virtual Lab	0	0	0	2	0
12	MC	UR19MC203	Constitution of India	0	0	0	2	0
Total credits				15	0	12	32	21

III Semester								
S No	Category	Course Code	Course Title	L	T	P	Contact Hrs/per Wk	Credits
1	PCC	UR19PCME301	Metallurgy & Material Science	3	0	0	3	3
2	PCC	UR19PCME302	Production Technology	3	0	0	3	3
3	PCC	UR19PCME303	Engineering Thermodynamics	3	0	0	3	3
4	PCC	UR19PCME304	Mechanics of Solids	3	0	0	3	3
5	ESC	UR19ESC302	Machine Drawing	1	0	3	4	2.5
6	PCC	UR19PCMEL301	Materials Testing Lab	0	0	3	3	1.5
7	PCC	UR19PCMEL302	Production Technology Lab	0	0	3	3	1.5
8	ESC	UR19ESCL301	Basic Electrical & Electronics Engineering Lab	0	0	3	3	1.5
Mandatory courses								
9	MC	UR19MC301	Environmental studies	0	0	0	2	0
	Total			13	0	12	27	19
Employability Skills- I*							2	0
Self Learning Course*							2	0
*Internal Evaluation								

IV Semester								
S No	Category	Course Code	Course Title	L	T	P	Contact Hrs/per Wk	Credits
1	PCC	UR19PCME401	Fluid Mechanics & Hydraulic Machinery	3	0	0	3	3
2	PCC	UR19PCME 402	Applied Thermodynamics	3	0	0	3	3
3	PCC	UR19PCME 403	Metal Cutting & Machine Tools	3	0	0	3	3
4	PCC	UR19PCME 404	Kinematics of Machinery	3	0	0	3	3
5	HMC	UR19HM401	Managerial Economics & Financial Analysis	3	0	0	3	3
6	PCC	UR19PCMEL401	Fluid Mechanics & Hydraulic Machinery Lab	0	0	3	3	1.5
7	PCC	UR19PCMEL402	Thermal Engineering Lab	0	0	3	3	1.5
8	PCC	UR19PCMEL403	Machine Tools lab	0	0	3	3	1.5
<i>Mandatory course</i>								
9	MC	UR19MC401	Professional ethics and human values	0	0	0	2	0
10	PROJ	UR19MPROJME 402	Socially relevant mini project	0	0	0	2	0
			Total	15	0	9	28	19.5

V Semester								
S No	Category	Course Code	Course Title	L	T	P	Contact Hrs/per Wk	Credits
1	PCC	UR19PCME501	Dynamics of Machinery	3	0	0	3	3
2	PCC	UR19PCME502	Mechatronics	3	0	0	3	3
3	PCC	UR19PCME503	Design of Machine Members-I	3	0	0	3	3
4	PCC	UR19PCME504	Operations Research	3	0	0	3	3
Professional Elective-I								
5	PEC	UR19PEME501	Nano Technology	3	0	0	3	3
		UR19PEME502	Refrigeration & Air Conditioning					
		UR19PEME503	Mechanical Vibrations & Condition Monitoring					
		UR19PEME504	Theory of Metal Forming					
		UR19PEME505	Welding Technology					
Professional Elective-II								
6	PEC	UR19PEME506	Power plant Engineering	3	0	0	3	3
		UR19PEME507	Automobile Engineering					
		UR19PEME508	Theory of Elasticity					
		UR19PEME509	Industrial Tribology					
		UR19PEME510	Foundry Technology					
7	PCC	UR19PCMEL501	Dynamics of Machinery Lab	0	0	3	3	1.5
8	PCC	UR19PCMEL502	Mechatronics lab	0	0	3	3	1.5
9	ESC	UR19ESCL503	Computer Aided Drafting lab	0	0	3	3	1.5
<i>Mandatory course</i>								
10	MC	UR19MC501	IPR & Patents	0	0	0	2	0
			Total	18	0	09	29	22.5

VI Semester								
S No	Category	Course Code	Course Title	L	T	P	Contact Hrs/per Wk	Credits
1	PCC	UR19PCME601	Metrology& Instrumentation	3	0	0	3	3
2	PCC	UR19PCME602	Heat Transfer	3	0	0	3	3
3	PCC	UR19PCME 603	Design of Machine Members-II	3	0	0	3	3
4	OEC		Open Elective-I	3	0	0	3	3
Professional Elective-III								
5	PEC	UR19PEME601	Turbo Machinery Systems	3	0	0	3	3
		UR19PEME602	Automation in Manufacturing					
		UR19PEME603	Advanced Materials					
		UR19PEME604	Computational Fluid Dynamics					
		UR19PEME605	Quality & Reliability Engineering					
6	PCC	UR19PCMEL601	Metrology & Instrumentation Lab	0	0	3	3	1.5
7	PCC	UR19PCMEL602	Heat Transfer lab	0	0	3	3	1.5
<i>Mandatory course</i>								
8	PROJ	UR19MPROJME 601	Socially relevant mini project	0	0	0	0	0
			Total credits	15	0	6	21	18
Employability Skills- I*							2	0
Self Learning Course*							2	0
*Internal Evaluation								

VII Semester								
S No	Category	Course Code	Course Title	L	T	P	Contact Hrs/per Wk	Credits
1	PCC	UR19PCME701	CAD/CAM	3	0	0	3	3
2	PCC	UR19PCME702	Finite Element Method	3	0	0	3	3
3	PCC	UR19PCME703	Unconventional machining processes	3	0	0	3	3
4	PCC	UR19PCME704	Industrial Engineering	3	0	0	3	3
5	OEC		Open Elective-II	3	0	0	3	3
Professional Elective-IV								
6	PEC	UR19PEME701	Non Destructive Evaluation	3	0	0	3	3
		UR19PEME702	Additive Manufacturing					
		UR19PEME703	Concurrent Engineering					
		UR19PEME704	Hydraulic and Pneumatic Systems					
		UR19PEME705	Tool Engineering Design					
7	PCC	UR19PCMEL701	CAD/CAM Lab	0	0	3	3	1.5
8	PROJ	UR19PROJME701	Project Stage -I	0	0	3	3	1.5
9	PROJ	UR19MPROJME702	Internship	0	0	0	0	2
<i>Mandatory course</i>								
10			Total credits	18	0	06	24	23
Self Learning Course*							2	0
*Internal Evaluation								

VIII Semester								
S No	Category	Course Code	Course Title	L	T	P	Contact Hrs/per Wk	Credits
1	PCC	UR19PCME801	Production planning & control	3	0	0	3	3
2	OEC		Open Elective-III	3	0	0	3	3
Professional Elective-V								
3	PEC	UR19PEME801	Experimental stress analysis	3	0	0	3	3
		UR19PEME802	Design for Manufacture					
		UR19PEME803	Cryogenic Engineering					
		UR19PEME804	Industrial Safety and Environment					
		UR19PEME805	Alternate fuels					
4	PROJ	UR19PROJME801	Project Stage - II	0	0	18	18	9
			Total credits	9	0	18	18	18

Total: 40 + 38.5 + 40.5 + 41 = 160

Note: L- Lecture T- Tutorial P- Practical

List of Open Electives

Open Electives offered by the Dept. of CE

S.No.	Course Code	Open Elective – I
1.	UR19OECE601	Introduction To GIS
2.	UR19OECE602	Environmental Pollution Control
3.	UR19OECE603	Conservation of Water Resources
	Course Code	Open Elective – II
4.	UR19OECE701	Metro Systems and Engineering
5.	UR19OECE702	Natural Disaster Mitigation and Management
6.	UR19OECE703	Total Quality Management
	Course Code	Open Elective – III
7.	UR19OECE801	Sanitary and Public Health Engineering
8.	UR19OECE802	Environmental and Industrial Hygiene
9.	UR19OECE803	Green Buildings

Open Electives offered by the Dept. of EEE

S.No.	Course Code	Open Elective – I
1.	UR19OEEEE601	Neural Networks and Fuzzy Logic
2.	UR19OEEEE602	Linear Control Systems
3.	UR19OEEEE603	Electrical Safety Management
	Course Code	Open Elective – II
4.	UR19OEEEE701	Programmable Logic Controllers
5.	UR19OEEEE702	Energy Audit and Conservation Management
6.	UR19OEEEE703	Electrical Technology
	Course Code	Open Elective – III
7.	UR19OEEEE801	Non Conventional Energy Sources
8.	UR19OEEEE802	Industrial Electrical Operation
9.	UR19OEEEE803	Hybrid Electric Vehicles

Open Electives offered by the Dept. of ME

S.No.	Course Code	Open Elective – I
1.	UR19OEME601	Nano Technology
2.	UR19OEME602	Robotics
3.	UR19OEME603	Power Plant Engineering
	Course Code	Open Elective – II
4.	UR19OEME701	Operations Research
5.	UR19OEME702	Industrial Engineering & Quality control
6.	UR19OEME703	Advanced materials
	Course Code	Open Elective – III
7.	UR19OEME801	Optimization Techniques
8.	UR19OEME802	Green Engineering systems
9.	UR19OEME803	Mechatronics

Open Electives offered by the Dept. of ECE

S.No.	Course Code	Open Elective – I
1.	UR19OEEEC601	Consumer Electronics
2.	UR19OEEEC602	Digital Electronics
3.	UR19OEEEC603	Analog and Digital I.C. Applications
	Course Code	Open Elective – II
4.	UR19OEEEC701	Embedded Systems
5.	UR19OEEEC702	Internet of Things (IoT)
6.	UR19OEEEC703	Principles of Computer Communications and Networks
	Course Code	Open Elective – III
7.	UR19OEEEC801	Microcontrollers
8.	UR19OEEEC802	Principles of Electronic Communications
9.	UR19OEEEC803	Electronic Measurements and Instrumentation

Open Electives offered by the Dept. of CSE

S.No.	Course Code	Open Elective – I
1.	UR19OECS601	Java Programming
2.	UR19OECS602	Data Base Management Systems
3.	UR19OECS603	C++ Programming
	Course Code	Open Elective – II
4.	UR19OECS701	Distributed Computing
5.	UR19OECS702	Deep Learning
6.	UR19OECS703	AI and ML for Robotics
	Course Code	Open Elective – III
7.	UR19OECS801	AI Tools & Techniques
8.	UR19OECS802	Information Security
9.	UR19OECS803	Big Data

Open Electives offered by the Dept. of IT

S.No.	Course Code	Open Elective-I
1.	UR19OEIT101	Data Structures
2.	UR19OEIT102	Computer Graphics
3.	UR19OEIT103	Data Science
	Course Code	Open Elective – II
4.	UR19OEIT201	Operating Systems
5.	UR19OEIT202	Python Programming
6.	UR19OEIT203	Web Technologies
	Course Code	Open Elective – III
7.	UR19OEIT301	Information Security
8.	UR19OEIT302	Mobile Application Development
9.	UR19OEIT303	Block Chain Technologies

I Year - I Semester

Course Code : UR19HM101

L	T	P	C
2	0	0	2

Internal: 30 Marks

External: 70 Marks

COMMUNICATIVE ENGLISH

(Common to all branches)

Course Objectives:

- Recall and improve the language proficiency of the students in English
- Paraphrase and interpret the ideas and thoughts in a dynamic way
- Prioritize the importance of practical learning of English
- Distinguish the various levels of Listening, Speaking, Reading and writingskills
- Construct statements in writing and speaking in professional manner

UNIT – I

Poem: “Life” by Sarojini Naidu

Grammar: Articles

Vocabulary: Prefixes and Suffixes

Writing: Paragraph Writing

Life-Skills: Attitude

UNIT – II

Essay: A Drawer full of Happiness

Grammar: Prepositions

Vocabulary: Homonyms, Homophones, Homographs

Writing: Letter of Request and Apology

Life-Skills: Self- Management

UNIT – III

Short Story: “Half a Rupee Worth” by R.K. Narayan

Grammar: Tenses

Vocabulary: Idiomatic Expressions; Phrasal Verbs

Writing: Letter of Complaint and Appreciation

Life-Skills: Body Language

UNIT – IV

Text: Stephen Hawking – Positivity ‘Benchmark’

Grammar: Question Tags, Conjunctions

Vocabulary: One - Word Substitutes, Collocations

Writing: Dialogue and Speech Writing

Life-Skills: Being Assertive

UNIT – V

Poem: Once Upon a Time by Gabriel Okara

Grammar: Degrees of Comparison

Vocabulary: Technical Abbreviations

Writing: E-mail Writing, Preparation of Resume and Letter of application

Life-Skills: Goal Setting, Working in a Team

TEXT BOOK:

‘InfoTech English’ – Maruti Publications

REFERENCE BOOKS:

1. Raymond Murphy, "Murphy's Essential English Grammar" with CD, Cambridge University Press
2. Practical English Usage, Michael Swan, OUP, 1995

NPTEL ONLINE COURSE:

'Enhancing Soft skills & Personality Development

Course Outcomes:

- CO1:** Apply critical-thinking to develop writing skills
- CO2:** Understand and evaluate different kinds of prose texts.
- CO3:** Describe distinct literary characteristics of poems.
- CO4:** Analyze the major and minor details of a biography.
- CO5:** Develop grammar and vocabulary skills
- CO6:** Evaluate the effectiveness in improving life-skills.

I Year - I Semester

Course Code : UR19BSC101

L	T	P	C
3	1	0	4

Internal: 30 Marks

External: 70 Marks

LINEAR ALGEBRA & CALCULUS

(Common to all branches)

Course Objectives:

- This course will illuminate the students in the concepts of calculus and linear algebra.
- To equip the students with standard concepts and tools at an intermediate to advanced level mathematics to develop the confidence and ability among the students to handle various real world problems and their applications.

UNIT – I

Matrices: Solving system of homogeneous and non-homogeneous linear equations by Gauss elimination method. Eigen values and Eigen vectors and their properties, Cayley-Hamilton theorem (without proof), finding inverse and power of a matrix by Cayley-Hamilton theorem.

UNIT – II

Sequences and Series: Convergence and divergence, Ratio test - Comparison test -Cauchy's root test-. Fourier series, Euler's formulae, conditions for Fourier expansion, Even and Odd functions.

UNIT – III

Mean Value Theorems: Rolle's Theorem, Lagrange's mean value theorem, Cauchy's mean value theorem, Taylor's and Maclaurin theorems with remainders (single variable & without proofs).

UNIT – IV

Multivariable calculus: Partial derivatives, total derivatives, chain rule, change of variables, Jacobians, maxima and minima of functions of two variables, method of Lagrange multipliers.

UNIT – V

Multiple Integrals: Double integrals, change of order of integration, double integration in polar coordinates. Evaluation of triple integrals, change of variables.

TEXT BOOK:

1. Higher Engineering Mathematics, B.S.Grewal, Khanna Publishers

Course Outcomes:

- CO1:** Develop the use of matrix algebra techniques that is needed by engineers for practical Applications
- CO2:** Find or compute the Fourier series of Fourier series periodic signals.
- CO3:** Utilize mean value theorems to real life problems.
- CO4:** Translate the given function as series of Taylor's and Maclaurin's with remainders.
- CO5:** Familiarize with functions of several variables which are useful in optimization.
- CO6:** Apply Double integration in evaluating areas bounded by regions.

I Year - I Semester

Course Code : UR19BSC102

L	T	P	C
3	0	0	3

Internal: 30 Marks

External: 70 Marks

NUMERICAL METHODS & COMPLEX VARIABLES

(ME)

Course Objectives:

- To elucidate the different numerical methods to solve nonlinear algebraic equations.
- To familiarize the students with numerical methods of solving the non-linear equations.
- To familiarize the complex variables.

UNIT – I

Solution to algebraic equations: Solution of polynomial and transcendental equations: Bisection method, Regula-Falsi method, Iteration method, Newton-Raphson method.

UNIT – II

Interpolation: Finite differences, interpolation using Newton's forward and backward difference formulae, Gauss forward and backward interpolation formulae, Interpolation with unequal intervals, Newton's divided difference and Lagrange's formulae.

UNIT – III

Numerical integration and Solution of ODE: Numerical integration- trapezoidal rule and Simpson's 1/3rd and 3/8 rules. Ordinary differential equations, Taylor's series, Euler and modified Euler's methods. Runge-Kutta method of fourth order for solving first order ODE.

UNIT – IV

Complex Differentiation: Derivative of complex function, analytic functions, Cauchy-Riemann equations (without proof), Applications to flow problems.

UNIT – V

Complex Integration: Complex integration, Cauchy's theorem (without proof), Cauchy's integral theorem (without proof), Cauchy's integral formula (without proof), Singularities, Laurent's series. Calculation of residues, Cauchy residue theorem (without proof).

TEXT BOOK:

1.Higher Engineering Mathematics, B.S. Grewal, Khanna Publishers

REFERENCE BOOKS:

1. Advanced Engineering Mathematics, Erwin kreyszig,
2. Complex Variables and Applications, J. W. Brown and R. V. Churchill.

Course Outcomes:

CO1: Evaluate approximating the roots of polynomial and transcendental equations by different algorithms

CO2: Apply Newton's forward & backward interpolation and Lagrange's formulae for equal and unequal Intervals

CO3: Apply definite integral of function by using different numerical methods.

CO4: Apply different algorithms for approximating the solutions of ordinary differential equations to Its analytical computations

CO5: Apply Cauchy – Riemann equations to complex functions in order to determine whether a given continuous function is analytic

CO6: Differentiation and integration of complex functions used in engineering problems.

I Year - I Semester

Course Code : UR19BSC109

L	T	P	C
3	0	0	3

Internal: 30 Marks

External: 70 Marks

ENGINEERING CHEMISTRY

(MECH)

Course Objectives:

- Importance of usage of Plastics in household appliances and composites (FRP) in aerospace automotive industries.
- Select the fuels as a source of energy are a basic need of any industry, particularly industries like thermal power stations, steel industry, fertilizer industry etc., and hence they are introduced.
- Construction of galvanic cells as well as some batteries used in instruments are introduced. Understand the mechanism of corrosion which itself is explained by electrochemical theory
- With the increase in demand, a wide variety of materials are coming up; some of them have excellent engineering properties and a few of these materials are introduced.
- List the differences between temporary and permanent hardness of water and explain the working principles of different Industrial water treatment processes.

UNIT – I

Polymerisation : Introduction- Mechanism of polymerization - Stereo regular polymers – methods of polymerization (emulsion and suspension) -Physical and mechanical properties – Plastics as engineering materials : advantages and limitations – Thermoplastics and Thermosetting plastics – Compounding and fabrication (4 techniques)- Preparation, properties and applications of Polyethene, PVC, Bakelite and Teflon Elastomers – Natural rubber-compounding and vulcanization – Synthetic rubbers : Buna S, Buna N, Thiokol and polyurethanes – Applications of elastomers. Composite materials & Fiber reinforced plastics – Biodegradable polymers – Conducting polymers.

UNIT – II

Fuels: Introduction – Classification – Calorific value - HCV and LCV – Dulong’s formula – Bomb calorimeter – Numerical problems – Coal — Proximate and ultimate analysis – Significance of the analyses – Liquid fuels – Petroleum- Refining – Cracking – Synthetic petrol –Petrol knocking – Diesel knocking - Octane and Cetane ratings – Anti-knock agents – Power alcohol – Gaseous fuels – Natural gas. LPG and CNG – Combustion – Calculation of air for the combustion of a fuel – Flue gas analysis – Orsat apparatus – Numerical problems on combustion.

UNIT – III

CORROSION PART-A: ELECTROCHEMISTRY

Introduction-Galvanic cells - Reversible and irreversible cells – Single electrode potential – Electro chemical series and uses of this series- Standard electrodes (Hydrogen and Calomel electrodes) - Concentration Cells – Batteries: Dry Cell - Ni-Cd cells-Li cells. Fuel cells: - Hydrogen Oxygen fuel cells – Methanol Oxygen fuel cells

PART-B: CORROSION

Corrosion:-Definition–Theories of Corrosion (electrochemical and chemical)-Galvanic corrosion, Differential aeration corrosion –Factors which influence the rate of corrosion - Protection from corrosion– Cathodic protection - Protective coatings: – Surface preparation – Metallic (cathodic and anodic) coatings - Methods of application on metals (Galvanizing, Tinning, Electroplating, Electroless plating)

UNIT – IV

Hard water:- Reasons for hardness – units of hardness - determination of hardness and alkalinity - Water for steam generation - Boiler troubles – Priming and Foaming, Scale formation, Boiler corrosion, Caustic embrittlement - Internal treatments - Softening of Hard water : Zeolite process and Ion Exchange process - Water for drinking purposes Purification – Sterilization and disinfection : Chlorination, Break point chlorination and other methods – Reverse Osmosis and ElectroDialysis.

UNIT – V

Nano materials:- Introduction – Sol-gel method & chemical reduction method of preparation - Carbon nano tubes-Preparation and applications **Liquid Crystals :-** Types and applications **Green Chemistry :-** Principles-3 methods of synthesis with examples and Applications **Solar Energy:-** Introduction, application of solar energy, photovoltaic cell: design, working and its importance **Refractories:-** Definition, characteristics, classification, properties, failure of refractories.**Cement:-** Constituents, manufacturing, hardening and setting, deterioration of cement .

TEXT BOOKS:

1. Engineering Chemistry by Jain and Jain; Dhanpat Rai Publishing Co.
2. Engineering Chemistry by Shikha Agarwal; Cambridge University Press, 2015 edition.

REFERENCE BOOKS:

1. Engineering Chemistry of Wiley India Pvt. Ltd., Vairam and others, 2014 edition(second).
2. Engineering Chemistry by Prasanth Rath, Cengage Learning, 2015 edition.
3. A text book of engineering Chemistry by S. S. Dara; S. Chand & Co Ltd., Latest Edition
4. Applied Chemistry by H.D. Gesser, Springer Publishers
5. Text book of Nano-science and nanotechnology by B.S. Murthy, P. Shankar and others, University Press, IIM

Course Outcomes:

- CO1:** Understand the advantages and limitations of plastic materials.
- CO2:** Relate the need of fuels as a source of energy.
- CO3:** Explain the theory of construction of batteries.
- CO4:** The Categorize the reasons for corrosion and study some methods of corrosion control.
- CO5:** Know the importance of advanced engineering materials like Nanomaterials, Liquid Crystals, Semiconductors and superconductors.
- CO6:** Identify the problems associated with impurities in water and how to avoid them.

I Year - I Semester

Course Code : UR19ESC110

L	T	P	C
3	0	0	3

Internal: 30 Marks

External: 70 Marks

Problem Solving and Programming Using C (MECH)

Course Objectives:

- The objectives of this course are to make the student familiar with 'problem solving using computers, development of algorithms, usage of basic flowchart symbols and designing flowcharts.
- The students can also understand programming language basic concepts, reading and displaying the data, earn the programming skills using selection, iterative control structures, functions, arrays, pointers and files. After completion of this course the student is expected to analyze the real life problem and write programs in C language to solve the problems.

UNIT – I INTRODUCTION

Problem Solving: Problem solving aspects, Problem solving techniques, Computer as a Problem solving tool, Algorithms-definition, features, criteria. Flowchart-definition, basic symbols, sample flowcharts. Top down design, Implementation of program verification, The efficiency of algorithms, Analysis of algorithms, computational complexity of algorithm, order(O) notation, Worst case & Average case Analysis.

UNIT – II

Basics of C programming language: Introduction to C, structure of a C program,.basic data types and sizes, constants, variables, unary, binary and ternary operators, expressions, type conversions, conditional expressions, precedence and order of evaluation, Input and Output statements, Sample Programs.

SELECTION-DECISION MAKING CONDITIONAL CONTROL STRUCTURES: simple-if, if- else, nested if-else, if- else ladder and switch-case.

ITERATIVE: while-loop, do-while loop and for loop control structures, goto, break and continue statements. Sample Programs.

UNIT – III

FUNCTIONS-basics, parameter passing, storage classes extern, auto, register, static, scope rules, block structure, user defined functions, standard library functions, recursive functions, Recursive solutions for Fibonacci series, towers of Hanoi, header files, C Preprocessor, example c programs :

ARRAYS-concepts, declaration, definition, accessing elements, storing 'elements, 1-D arrays, 2-D arrays and character arrays, Multidimensional arrays, array applications: Matrix operations, checking the symmetry of a Matrix, Passing 1-D arrays, 2-D arrays to functions, Strings and String Manipulations

UNIT – IV

POINTERS-pointers concepts, initialization of pointer variables, pointers and function arguments, passing by address-dangling memory, address arithmetic, character pointers and functions, pointers to pointers, pointers and -multi-dimensional arrays, dynamic memory management functions, command line arguments

UNIT – V

ENUMERATED, STRUCTURE AND UNION TYPES: Derived types- structures- declaration, definition and initialization of structures, accessing 'structures, nested structures, arrays of structures, structures and functions, pointers to structures, self referential structures, unions, typedef, bit-fields, program applications

FILEHANDLING: Concept of a file, text files and binary files, Formatted I/O, File I/O operations

TEXT BOOKS:

1. How to Solve it by Computer, R. G. Dromey, Pearson Education, 2019
2. Programming in C, Ashok N Kamthane, Amit Ashok Kamthane, 3rd Edition, Pearson Education, 2019

Reference Books:

1. The C programming Language by Dennis Richie and Brian Kernighan
2. Programming in C, Reema Thareja, OXFORD
3. C Programming, A Problem Solving Approach, Forouzan, Gilberg, Prasad, Cengage

Course Outcomes:

CO1: Student will be able to develop efficient algorithm for solving a problem.

CO2: Use various constructs of C programming language efficiently.

CO3: Student will be able to develop programs using modular approach such as functions.

CO4: To develop programs to perform matrix and mathematical applications.

CO5: Student will be able to understand dynamic memory management and problems using pointers and solving the problems.

CO6: Student will be able to develop programs for real life applications using structures and also learn about handling the files for storing the data permanently.

I Year - I Semester

Course Code : UR19HML101

L	T	P	C
0	0	2	1

Internal: 20 Marks

External: 30 Marks

COMMUNICATIVE ENGLISH LAB

(Common to all branches)

Course Objectives:

To enable the students to learn through practice the communication skills of listening, speaking, reading and writing.

List of Activities

- 1) Introducing yourself
- 2) Greeting
- 3) Thanking and Responding to thanks
- 4) Requesting and Responding to requests
- 5) Making and Responding to complaints
- 6) Apologising and accepting apologies
- 7) Consonants : Plosives, Affricates and Nasals
- 8) Consonants: Fricatives, Liquids and Glides
- 9) Vowels: Pure vowels
- 10) Vowels :Diphthongs
- 11) Consonant clusters
- 12) Word Accent
- 13) Word Stress
- 14) Intonation

Note: Minimum 12 experiments of duration 3 periods must be completed for the eligibility to appear for the semester end examinations. In case if the student fails to get eligibility for semester end exams in the current semester, he has to take the permission of HOD and complete the required number of experiments and appear for semester end exam as and when conducted.

Reference Manuals:

'INTERACT: English Lab Manual for Undergraduate Students' Published by Orient Blackswan Pvt Ltd 'Strengthen Your Communication Skills' published by Maruthi Publications

Course Outcomes:

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

CO1 Apply expressions in day to day life

CO2 Build language proficiency by using patterns

CO3 Develop communication skills through various language activities

CO4 Outline of Letters and Sounds

CO5 Identify consonants and vowel sounds in phonetic script

CO6 Understand pronunciation, stress and intonation

Internal: 20 Marks

External: 30 Marks

Engineering and Applied Chemistry Lab**Course objectives:**

- To gain practical knowledge by applying the experimental methods to correlate with the chemistry theory.
- To learn the usage of electrical systems for various measurements.
- Apply the analytical techniques and graphical analysis to the experimental data.

List of Experiments

1. Introduction to Chemistry laboratory-Molarity, Normality, Primary, Secondary standard solutions, Volumetric titrations, Qualitative analysis, Quantitative analysis etc.
2. Trial experiment-Estimation of HCl by using standard Na_2CO_3 solution.
3. Estimation of Total hardness of water by using standard EDTA solution.
4. Estimation of Zinc using standard EDTA solution.
5. Estimation of Copper using standard EDTA solution.
6. Estimation of P^{H} of the given sample solution using P^{H} meter.
7. Conductometric titration between Strong acid and Strong base.
8. Conductometric titration between Strong acid and Weak base.
9. Potentiometric titration between Strong acid and Strong base.
10. Potentiometric titration between Strong acid and Weak base.
11. Estimation of KMnO_4 using standard Oxalic acid.
12. Determination of Alkalinity of water.
13. Determination of Viscosity of given sample by Ostwald viscometer.
14. Estimation of Ferric iron using standard $\text{K}_2\text{Cr}_2\text{O}_7$ solution.
15. Estimation of Copper using standard $\text{K}_2\text{Cr}_2\text{O}_7$ solution.
16. Preparation of Bakelite (Demo).

Note: Minimum 12 experiments of duration 3 periods must be completed for the eligibility to appear for the semester end examinations. In case if the student fails to get eligibility for semester end exams in the current semester, he has to take the permission of HOD and complete the required number of experiments and appear for semester end exam as and when conducted.

Reference Books

1. A Textbook of Quantitative Analysis, Arthur J. Vogel.
2. Dr. Jyotsna Cherukuri (2012) Laboratory Manual of engineering chemistry-II, VGS Techno Series
3. Chemistry Practical Manual, Lorven Publications
4. K. Mukkanti (2009) Practical Engineering Chemistry, B.S. Publication.

Course Outcomes:

Upon Completion of the course, the student will be able to

CO1: Utilize different Analytical tools and execute experiments involving estimation of raw materials, finished products and environmental samples etc.

CO2: Utilize modern instruments like Conductometer, pH meter and Potentiometer for the analysis of samples.

CO3: Determine the total hardness present in water for its quality in drinking purpose.

CO4: Estimate the Viscosity of oil and assess its suitability as a lubricant.

CO5: Determine the alkalinity present in water for its quality in drinking purpose.

CO6: Identify the adulteration of lemon juice for Vitamin-C.

Problem Solving and Programming using C Lab**Course Objectives:**

- Understand the basic concept of C Programming, and its different modules that include conditional and looping expressions, Arrays, Strings, Functions, Pointers, Structures and File programming.
- Acquire knowledge about the basic concept of writing a program.
- Role of constants, variables, identifiers, operators, type conversion and other building blocks of C Language.
- Use of conditional expressions and looping statements to solve problems associated with conditions and repetitions.
- Role of Functions involving the idea of modularity.

Exercise 1

- Write a C Program to calculate the area of a triangle.
- Write a C program to find the largest of three numbers using ternary operator.
- Write a C Program to swap two numbers without using a temporary variable.

Exercise 2

- Write a C program to find the 2's complement of a binary number.
- Write a C program to find the roots of a quadratic equation.
- Write a C program, which takes two integer operands and one operator from the user, performs the operation and then prints the result. (Consider the operators +, -, *, /, % and use Switch Statement)

Exercise 3

- Write a C program to find the sum of individual digits of a positive integer and, also, find 'the reverse of the given number.
- Write a C program to generate the first n terms of the Fibonacci sequence.
- Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.

Exercise 4

- Write a C Program to print the multiplication table of a given number.
- Write a C Program to read a decimal number and find its equivalent binary number.
- Write a C Program to check whether the given number is Armstrong number or not.

Exercise 5

- Write a C program to interchange the largest and smallest numbers in the given array.
- Write a C program to implement a linear search on a given set of values.
- Write a C program to implement binary search on a given set of values.

Exercise 6

- Write a C program to implement sorting of an array of elements.
- Write a C program to input two m x n matrices, check the compatibility and perform 'addition and multiplication of them.

Exercise 7

Write a C program that uses functions to perform the following operations:

- i. To insert a sub-string into given main string at a given position.
- ii. To delete n characters from a given position in a given string.
- iii. To replace a character of string either from beginning or ending or at a specified location.

Exercise 8

Write a C program that uses functions to perform the following operations using Structure:

- i) Reading a complex number
- ii) Writing a complex number
- iii) Addition of two complex numbers
- iv) Multiplication of two complex numbers

Exercise 9

Write C Programs for the following string operations without using the built in functions

- to concatenate two strings to append a string to another string
- to compare two strings

Exercise 10

- a) Write C Program to find the number of characters in a given string including and excluding spaces.
- b) Write C Program to copy the contents of one string to another string without using string handling functions.
- c) Write C Program to find whether a given string is palindrome or not.
- d) Write a C program to find both the largest and smallest number of an array of integers using call by value and call by reference.

Exercise 11

Write a C program using recursion for the following:

- a) To display sum of digits of given number
- b) To find the factorial of a given integer
- c) To find the GCD (greatest common divisor) of two given integers.
- d) To find Fibonacci sequence

Exercise 12

- a) Write C Program to reverse a string using pointers
- b) Write a C Program to compare two 2D arrays using pointers
- c) Write a C program consisting of Pointer based function to exchange value of two integers using passing by address.

Exercise 13

Examples which explores the use of structures, union and other user defined variables.

Exercise 14

- a) Write a C program. which copies one file to another.
- b) Write a C program to count the number of characters and number of lines in a file.
- c) Write a C Program to merge two files into a third file. The names of the files must be entered using command line arguments.

Note: Minimum 12 experiments of duration 3 periods must be completed for the eligibility to appear for the semester end examinations. In case if the student fails to get eligibility for semester end exams in the current semester, he has to take the permission of HOD and complete the required number of experiments and appear for semester end exam as and when conducted.

Course Outcomes:

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

CO1: Apply and practice logical ability to solve the problems.

CO2: Identify C programming development environment, compiling, debugging, and linking and executing a program using the development environment.

CO3: Analyze the complexity of problems, modularize the problems into small modules and then convert them into programs.

CO4: Apply the in-built functions and customized functions for solving the problems.

CO5: Create C programs using pointers, memory allocation techniques.

CO6: Use files for dealing with variety of problems.

I Year - II Semester

Course Code : UR19HM202

L	T	P	C
2	0	0	2

Internal: 30 Marks

External: 70 Marks

PROFESSIONAL ENGLISH

(Common to all branches)

Course Objectives:

- Recall and improve the language proficiency of the students in English
- Paraphrase and interpret the ideas and thoughts in a dynamic way
- Prioritize the importance of practical learning of English
- Distinguish the various levels of Listening, Speaking, Reading and writing skills
- Construct statements in writing and speaking in professional manner

UNIT – I

Poem: "Enterprise" by

Nissim Ezekiel **Grammar:**

Types of Sentences

Vocabulary: Synonyms

Writing: Essay Writing

Life-Skills: Values and Ethics

UNIT – II

Text: Like a tree, unbowed:

Wangari Maathai **Grammar:** Active Voice

& Passive Voice **Vocabulary:** Antonyms

Writing: Technical Report Writing **Life-Skills:** Time Management

UNIT – III

Text: Stay Hungry – Stay Foolish

Grammar: Common Errors in Articles and Prepositions

Vocabulary: Words Often Confused

Writing: Describing People, Places, Objects, Events

Life-Skills: Motivation

UNIT – IV

Story: The Cop and the Anthem by O. Henry

Grammar: Common Errors in Subject – Verb agreement

Vocabulary: Technical Vocabulary

Writing: Note-Making **Life-Skills:** Rapid Reading

UNIT – V

Short Story: “A Village School Master” by Oliver Gold Smith

Grammar: Common Errors

Vocabulary: GRE Word List

Writing: Precise Writing / Information Article

Life-Skills: Career Planning

TEXT BOOK:

1. ‘InfoTech English’ – Maruti Publications

REFERENCE BOOKS:

1. Raymond Murphy, “Murphy’s Essential English Grammar” with CD, Cambridge University Press.
2. Practical English Usage, Michael Swan, OUP, 1995
3. Remedial English Grammar, F.T. Wood, Macmillan, 2007

Course Outcomes:

Upon completion of the course, the students will be able to

CO1: Apply critical thinking to develop writing skills

CO2: Evaluate common errors in grammar

CO3: Describe distinct literary characteristics of poems

CO4: Analyze the characteristics of one-act-plays

CO5: Develop correspondence skills and promotional writing skills

CO6: Evaluate the importance of values and ethics for career planning.

I Year - II Semester

Course Code : UR19BSC205

L	T	P	C
3	0	0	3

Internal: 30 Marks External: 70 Marks

DIFFERENTIAL EQUATIONS & VECTOR CALCULUS
(Common to all branches)

Course Objectives:

- To enlighten the learners in the concept of differential equations.
- To furnish the learners with basic concepts and techniques at plus two level to lead them into advanced level by handling various real world applications.

UNIT – I

Linear Differential Equations of Higher Order: Definitions, complete solution, operator D, rules for finding complimentary function, inverse operator, rules for finding particular integral with RHS of the forms e^{ax} , $\sin ax$, $\cos ax$, x^n , $e^{ax} \cdot V$ and xV . L-C-R Circuit problems.

UNIT – II

First order Partial Differential Equations: Formation of PDE, solutions of Lagrange's linear equation Method of grouping – Method of multipliers, Solution of non-linear PDEs of the forms $f(p,q)=0$, $f(z,p,q)=0$, $f(x,p)=g(y,q)$, $Z=px+qy+f(p,q)$.

UNIT – III

Applications of Partial Differential Equations: Method of Separation of variables-One dimensional Wave equation-Two dimensional Heat equation, Laplace equation.

UNIT – IV

Vector Differential Calculus: Scalar and vector point functions, Gradient, Directional derivative. Divergence, Curl, Physical interpretation of operators.

UNIT – V

Vector Integral Calculus: Line integral-work done, surface and volume integrals, Green's theorem in the plane (without proof), Stoke's theorem (without proof), Divergence theorem (without proof).

TEXT BOOK:

1. Higher Engineering Mathematics, B. S. Grewal.

REFERENCE BOOKS:

1. Advance Engineering in Mathematics, Erwin Kreyszig.
2. Vector calculus, Schaum's series.

Course Outcomes:

Upon completion of the course, the students will be able to

CO1: Solve the differential equations related to various engineering fields.

CO2: Identify solution methods for partial differential equations that model physical processes.

CO3: Apply a range of techniques to find solutions of standard PDEs .

CO4: Classify the nature of the partial differential equations.

CO5: Interpret the physical meaning of different operators such as gradient, curl and divergence.

CO6: Estimate the work done against a field and circulation using vector calculus.

I Year - II Semester

Course Code : UR19BSC207

L	T	P	C
3	0	0	3

Internal: 30 Marks

External: 70 Marks

ENGINEERING PHYSICS

(ME)

Course Objectives:

- Impart Knowledge of Physical Optics phenomena like Interference and Diffraction involving required designing instruments with higher resolution.
- Teach Concepts of coherent sources, its realization and utility optical instrumentation.
- Study the Structure-property relationship exhibited by solid crystal materials for their utility.
- Tap the Simple harmonic motion and its adaptability for improved acoustic quality of concert halls.
- To explore the Nuclear Power as a reliable source required to run industries
- To impart the knowledge of materials with characteristic utility in appliances.
- Understand the physics of Semiconductors and their working mechanism for their utility in sensors.

UNIT – I

INTERFERENCE: Principle of Superposition – Coherent Sources – Interference in thin films (reflection geometry) – Newton's rings.

DIFFRACTION: Diffraction - Fraunhofer Diffraction - Diffraction due to Single slit (quantitative), Double slit, N-slits and circular aperture (qualitative) – Intensity distribution curves - Diffraction Grating – Grating spectrum – missing order – resolving power – Rayleigh's criterion – Resolving powers of Microscope, Telescope and grating (qualitative).

UNIT – II

LASERS: Characteristics–Spontaneous and Stimulated emission of radiation – population inversion - Einstein's coefficients & Relation between them and their significance - Pumping Mechanisms - Ruby laser – Helium Neon laser – Applications.

SENSORS (qualitative description only): Different types of sensors and applications; Strain and Pressure sensors- Piezoelectric, magnetostrictive sensors, Temperature sensor - bimetallic strip, pyroelectric detectors.

UNIT – III

ELASTICITY: stress, strain, Hooke's law, stress-strain curve, generalized Hooke's law with and without thermal strains for isotropic materials, different types of moduli and their relations, bending of beams – Bending moment of a beam – Depression of cantilever.

UNIT – IV

ACOUSTICS & ULTRASONICS: Introduction – Reverberation - Reverberation time - Sabine's formula (Derivation using growth and decay method)–absorption coefficient and its determination- factors affecting acoustics of buildings and their remedies.

Production of ultrasonics by Magnetostriction and piezoelectric methods – Detection of ultrasonics - acoustic grating - Non-Destructive Testing- pulse echo system through transmission and reflection modes -Applications

UNIT – V

MAGNETISM & DIELECTRICS: Introduction – Magnetic dipole moment – Magnetization- Magnetic susceptibility and permeability – Origin of permanent magnetic moment – Bohr Magneton - Classification of magnetic materials (Dia, Para and Ferro) – Domain concept of Ferromagnetism - Hysteresis – soft and hard magnetic materials – Applications of

Ferromagnetic materials.

Introduction - Dielectric polarization – Dielectric polarizability, Susceptibility and Dielectric constant- types of polarizations: Electronic and Ionic (Quantitative), Orientational polarizations (qualitative)- Lorentz internal field – Clausius-Mossoti equation- Frequency dependence of polarization - Applications of dielectrics

TEXT BOOKS:

1. "Engineering Mechanics" by Manoj K Harbola, Cengage Publications 2nd Eds.
2. "A text book of Engineering Physics" by P G K Shirsagar & M N Avadhanulu, S Chand & Company Ltd.
3. "Engineering Physics" by R K Gaur and S L Gupta, Dhanpat Rai Publications.
4. "Sensor and Transducers" by Ian R Sinclair, Elsevier (Newnes) 3rd Eds.

REFERENCE BOOKS:

1. "Engineering Physics" by M R Srinivasan, New Age International Publishers.
2. "Lectures on Physics" by Richard P Feynman, Pearson Publishers, New Millennium Eds.
3. "Lasers and Non-linear Optics" by B. B. Laud, New Age International Publishers (3rd Eds.).

Course Outcomes:

Upon completion of the course, the students will be able to

- CO1:** Study the need of coherent sources and the conditions for sustained interference and resolving power of various optical instruments.
- CO2:** Express the basic concepts of LASER light Sources and identify different types of sensors and their working principles.
- CO3:** demonstrate the elasticity & plasticity concepts and study different types of moduli.
- CO4:** Analyze how sound is propagated in buildings and acoustic properties of typically used materials in buildings.
- CO5:** Understanding of the physics of ultrasound and a perspective of areas of applicability to apply in different industries.
- CO6:** Explain the concept of dielectric constant & polarization in dielectric materials and explain the applications of dielectric and magnetic materials.

I Year - II Semester

Course Code : UR19ESC206

L	T	P	C
3	0	0	3

Internal: 30 Marks External: 70 Marks

BASIC ELECTRICAL ELECTRONICS ENGINEERING
(ME)

Course Objectives:

- To learn the basic principles of electrical circuit laws and analysis of networks.
- To understand the principle of operation and construction details of DC machines & transformers.
- To understand the principle of operation and construction details of alternator and 3-phase induction motor.
- To study the operation of PN junction diode, half wave, full wave rectifiers and OP-AMPS.
- To learn the operation of PNP and NPN transistors and various amplifiers

UNIT – I

Electrical Circuits: Basic definitions - Types of network elements - Ohm's Law - Kirchhoff's Laws - Inductive networks - Capacitive networks – Series - Parallel circuits - Star-delta and delta-star transformations.

UNIT – II

Dc Machines: Principle of operation of DC generator – EMF equation - Types of DC machine – Torque equation – Applications– Three point starter - Speed control methods of DC motor – Swinburne's test.

UNIT – III

Transformers: Principle of operation and construction of single phase transformers – EMF equation – Losses – OC & SC tests - Efficiency and regulation.

AC Rotating Machines: Principle of operation and construction of alternators– Types of alternators – Principle of operation of synchronous motor - Principle of operation of 3-Phase induction motor – Slip-torque characteristics - Applications.

UNIT – IV

Rectifiers & Linear ICs: PN junction diodes - Diode applications (Half wave and bridge rectifiers). Characteristics of operation amplifiers (OP-AMP) - application of OP-AMPS (inverting, non-inverting, integrator and differentiator).

UNIT – V

Transistors: PNP and NPN junction transistor, transistor as an amplifier- Transistor amplifier - Frequency response of CE amplifier - Concepts of feedback amplifier.

TEXT BOOKS:

1. Electrical Technology by Surinder Pal Bali, Pearson Publications.
2. Electronic Devices and Circuits, R.L. Boylestad and Louis Nashelsky, 9th edition, PEI/PHI 2006.

REFERENCE BOOKS:

1. Electrical Circuit Theory and Technology by John Bird, Routledge Taylor & Francis Group
2. Basic Electrical Engineering by M.S.Naidu and S.Kamakshiah, TMH Publications
3. Fundamentals of Electrical Engineering by Rajendra Prasad, PHI Publications, 2nd edition
4. Basic Electrical Engineering by Nagsarkar, Sukhija, Oxford Publications, 2nd edition

5. Industrial Electronics by G.K. Mittal, PHI

Course Outcomes:

Upon completion of the course, the students will be able to

CO1: Analyze the various electrical networks.

CO2: Identify the operation of DC generators, 3-point starter and DC machine testing by Swinburne's Test.

CO3: Analyze the performance of single-phase transformer.

CO4: Explain the operation of 3-phase alternator and 3-phase induction motors.

CO5: Classify the operation of half wave, full wave bridge rectifiers and OP-AMPS.

CO6: Explain the single stage CE amplifier and concept of feedback amplifier.

I Year - II Semester

Course Code : UR19ESC207

L	T	P	C
3	0	0	3

Internal: 30 Marks

External: 70 Marks

**ENGINEERING MECHANICS
(ME)**

Course Objectives:

- Explain the effect of force and moment in the different engineering applications.
- Teach centre of gravity and moment of inertia of solids and surfaces.
- Familiarize frictional forces in mechanical applications.
- Analysis of rigid bodies under dynamic conditions.

UNIT – I

Resultant of Force systems: Basic Concepts, Introduction to Engineering Mechanics – Composition and Resolution of Forces , Moment of a Force, Couple, Principle of Transmissibility, Systems of forces., Varignon's theorem. Resultant of Force Systems: Concurrent and non concurrent coplanar force systems.

Equilibrium of Force systems: Free Body Diagram, Conditions for equilibrium of two force system and three force system. Lami's Theorem - Equilibrium equations Equilibrium of Force systems: Concurrent and non concurrent coplanar force systems.

Friction: Introduction, limiting friction and impending motion - Coefficient of friction, Laws of static friction, cone of static friction, applications of friction.

UNIT – II

Properties of Surfaces and Volumes: Centroid and center of gravity, derivation of centroids from first moment of area, centroids of composite sections, center of gravity of common volumes

- cylinder, cone, sphere, theorem of Pappus.

Moment of Inertia: Area moment of inertia of plane and composite shapes, parallel axis theorem, perpendicular axis theorem, polar moment of inertia, mass moment of inertia of common volumes - thin plates, thin rod, cylinder, cone, sphere, rectangular prism, radius of gyration.

UNIT – III

Rectilinear Translation: Kinematics of rectilinear motion, principle of dynamics, rectilinear motion displacement, velocity and acceleration, graphical representation, motion with uniform & variable accelerations.

Kinetics: Differential equation of rectilinear motion, differential equation of dynamics equilibrium: D'Alembert's principle, principle of work energy, potential energy, conservation of energy, impulse and moment, conservation of moment and angular momentum, impact.

UNIT – IV

Curvilinear Translation: Kinematics of Curvilinear motion, position vector, velocity and acceleration, components of motion rectangular, radial and transverse, normal and tangential.

Kinetics: Differential equation rectangle, tangential and normal components, differential equation of dynamics equilibrium: D'Alembert's principle, working concepts: motion of vehicles.

UNIT – V

Motion of Projectiles: trajectory, motion of projectile thrown horizontal, vertical and inclined plane. **Rigid Bodies:** Rotation, linear and angular velocity, acceleration, absolute and relative velocity, instantaneous centre of rotation in plane motion, location.

Force and Acceleration: D'Alembert's principle in plane motion.

Work and energy: kinetic energy, work of the force, principle of work and energy, principle of conservation of energy

TEXT BOOKS:

1. Engineering Mechanics, Timoshenko, Young and J.V. Rao, Tata McGraw –Hill education (India) Pvt. Ltd.
2. Engineering Mechanics, R.K.Bansal, Laxmi publications Pvt.Ltd.

REFERENCE BOOKS:

1. Engineering Mechanics statics and dynamics – R.C.Hibbeler, 11th Edn – PearsonPubl.
2. Engineering Mechanics, statics – J.L.Meriam, 6th Edn – Wiley India PvtLtd.
3. Engineering Mechanics, statics and dynamics – I.H.Shames, – PearsonPubl.
4. Singer's Engineering Mechanics: Statics and Dynamics, K. Vijay Kumar Reddy, J. Suresh Kumar, Bs Publications.
5. Engineering Mechanics, Fedinand. L. Singer, Harper –Collins.

Course Outcomes:

Upon completion of the course, the students will be able to

CO1: Explain the basic concepts of force systems, free body diagram and equilibrium conditions

CO2: Solve the geometric properties like Centroid, moment of inertia of

Various Sectional areas and masses.

CO3: Analyze the concepts of friction and lifting machines and virtual work its applications.

CO4: Develop the knowledge on basic principles of kinematics and kinetics with simple Applications.

CO5: Show the applications on using motion of projectiles and work-energy principle.

CO6: Point out the concepts of Kinematics of Curvilinear motion

I Year - II Semester

Course Code : UR19ESC208

L	T	P	C
1	0	3	2.5

Internal: 30 Marks External: 70 Marks

**ENGINEERING GRAPHICS & DRAFTING
(ME/CSE/IT)**

PRE-REQUISITES: Mathematics, Physics

Course Objective:

- Engineering drawing being the principle method of communication for engineers, the objective is to introduce the students, the techniques of constructing the various types of polygons, curves and scales. The objective is also to visualize and represent the 3D objects in 2D planes with proper dimensioning, scaling etc.

UNIT – I

INTRODUCTION TO ENGINEERING DRAWING:

Introduction: Principles of Engineering Graphics and their significance - Drawing Instruments - Geometrical Constructions.

Polygons: Constructing regular polygons by general methods, inscribing and describing polygons on circles.

Curves: Ellipse, Parabola and Hyperbola by general methods,

Scales: Diagonal scales and Vernier scales

UNIT – II

ORTHOGRAPHIC PROJECTIONS: Principle of orthographic projection-Method of Projections – First and third angle projection methods Projections of Points – Projections of straight lines of different orientations - True lengths and traces.

UNIT – III

PROJECTIONS OF PLANES & SOLIDS: Regular planes perpendicular/parallel to one plane and inclined to the other reference plane; inclined to both the reference planes. Prisms, Pyramids, Cones and Cylinders with the axis inclined to one of the planes.

UNIT – IV

ISOMETRIC VIEWS: Conversion of isometric views to orthographic views; Conversion of orthographic views to isometric views.

UNIT – V

COMPUTER AIDED DRAFTING: Introduction – Computer Aided drafting system –Advantages, Applications of AUTOCAD, Drafting software-AUTOCAD-Advantages, Initial setup commands, utility commands, Drawing Aids, Entity Draw commands, Display commands, Edit commands, Lettering & Dimensioning

TEXT BOOKS:

1. N. D. Bhatt, Engineering Drawing, Revised and Enlarged Edition, Charotar publishers,
2. Engineering Drawing by Agarwal&Agarwal, Tata McGraw Hill Publishers
3. Engineering Drawing + AutoCad – K Venugopal, V. Prabhu Raja, NewAge

REFERENCE BOOKS:

1. Engineering Drawing by K.L.Narayana& P. Kannaiah, Scitech Publishers
2. Engineering Graphics for Degree by K.C. John, PHI Publishers
3. Engineering Graphics by P. Varghese, McGraw Hill Publishers

Course Outcomes:

Upon completion of the course, the students will be able to

CO1: Use the geometrical objects considering BIS standards.

CO2: Identify the basics of orthographic projections and deduce orthographic projections of a point and a line at different orientations.

CO3: Plan the visualization of geometrical planes of different positions in real life environment.

CO4: Sketch the projection of various of types of solids.

CO5:prepare the orthographic views of various solid objects at different orientations.

CO6:Judge the significance of isometric drawing to relate 2D environment with 3D environment. Learn basics of CAD.

I Year - II Semester

Course Code : UR19HML202

L	T	P	C
0	0	3	1.5

Internal: 20 Marks

External: 30 Marks

PROFESSIONAL ENGLISH LAB

(Common to all branches)

Course Objectives:

To enable the students to learn through practice the communication skills of listening, speaking, reading and writing.

List of activities:

- 1) Body Language: facial expressions, body posture, gestures
- 2) Body Language: eye movement, touch and the use of space
- 3) JAM
- 4) Extempore
- 5) Debate: Lincoln-Douglas debate and dos and don'ts
- 6) Debate: Formal and Informal debate
- 7) Interview Skills: Formal and Informal Interview
- 8) Interview Skills: Telephonic interview
- 9) Group Discussion: Dos and don'ts, general topics
- 10) Group Discussion: Science and technical topics
- 11) Presentation: Elimination of stage fear and preparation
- 12) Presentation on general topics
- 13) Presentation: using ppt or visual aids.

Note: Minimum 12 experiments of duration 3 periods must be completed for the eligibility to appear for the semester end examinations. In case if the student fails to get eligibility for semester end exams in the current semester, he has to take the permission of HOD and complete the required number of experiments and appear for semester end exam as and when conducted.

Reference Manuals:

'INTERACT: English Lab Manual for Undergraduate Students' Published by Orient Blackswan Pvt Ltd 'Strengthen Your Communication Skills' published by Maruthi Publications

Course Outcomes:

Upon Completion of the course, the student will be able to:

- CO1 Understand different types of body language
- CO2 Develop communication skills through various language activities
- CO3 Apply critical thinking to get main ideas for debate
- CO4 Develop audacity to face an interview
- CO5 Build knowledge for discussing topics effectively
- CO6 Analyze a topic by making a presentation

I Year - II Semester

Course Code : UR19BSCL201

L	T	P	C
0	0	3	1.5

Internal: 20 Marks

External: 30 Marks

ENGINEERING PHYSICS LAB

Course objectives:

- To gain practical knowledge by applying the experimental methods to correlate with the Physics theory.
- To learn the usage of electrical and optical systems for various measurements.
- Apply the analytical techniques and graphical analysis to the experimental data.
- To develop intellectual communication skills and discuss the basic principles of scientific concepts in a group.

List of Experiments

1. Determination of wavelength of a source-Diffraction Grating-Normal incidence
2. Newton's rings –Radius of Curvature of Plano Convex Lens.
3. Determination of thickness of a thin object using parallel interference fringes.
4. Determination of Rigidity modulus of a material- Torsional Pendulum.
5. Determination of Young's modulus by method of single cantilever oscillations.
6. Determination of Acceleration due to Gravity and Radius of Gyration- Compound Pendulum.
7. Melde's experiment – Transverse and Longitudinal modes.
8. Verification of laws of stretched string –Sonometer.
9. Magnetic field along the axis of a current carrying coil – Stewart and Gee's apparatus.
10. Determination of Velocity of sound –Volume Resonator.
11. Study the variation of B versus H by magnetizing the magnetic material (B-H curve).
12. Determination of wavelength of Laser by diffraction grating.
13. Determination of particle size using Laser.
14. Determination of spring constant of springs using coupled oscillators.
15. Determination of Pressure variation using strain Gauge sensor.

Note: Minimum 12 experiments of duration 3 periods must be completed for the eligibility to appear for the semester end examinations. In case if the student fails to get eligibility for semester end exams in the current semester, he has to take the permission of HOD and complete the required number of experiments and appear for semester end exam as and when conducted.

Text book:

A Text book of Practical Physics, Balasubramanian S, Srinivasan M.N, S Chand Publishers,2017

Course outcomes:

Upon the completion of course, student will be able to

CO1: operate optical instruments like microscope and spectrometer.

CO2: interpret the thickness of a hair/paper with the concept of interference.

CO3: determine the wavelength and resolving power of different colors using diffraction grating.

CO4: make use of elastic response of loaded beams; estimate the frequency of a vibrating system using standing wave pattern.

CO5: estimate the strength of the magnetic field due to a current carrying coil.

CO6: evaluate the mechanical properties of materials.

ENGINEERING WORK SHOP AND IT WORK SHOP**ENGINEERING WORK SHOP:****Course Objectives:**

- To familiarize with the basics of tools and equipments used in fitting, carpentry, Sheet metal and smithy.
- To familiarize with the production of simple modes in the above trades.

NOTE: At least one exercise to be done from each trade.

Trade: Carpentry:

1. Cross –Lap joint
2. Mortise and Tenon joint
3. T-Lap joint

FITTING:

1. V-fit
2. Square fit
3. Dovetail fit

Black Smithy:

1. S-Hook
2. Round rod to square
3. Round rod to Hexagonal headed bolt
4. Making simple parts like chisel.

House Wiring:

1. Parallel/Series connection of three bulbs
2. Stair Case wiring
3. Florescent lamp fitting
4. Measurement of earth resistance

Tin Smithy:

1. Making rectangular tray
2. Making scoop
3. Making hopper
4. Making funnel

IT WORK SHOP:**Course Objectives:**

- IT Workshop is to impart basic computer usage and maintenance skills and to introduce you to a suite of productivity tools that will aid in your day to day activities.
- IT workshop works in a learning-by-doing mode. It concentrates more on hands-on experience for the participants rather theoretical classes.
- It enables the participant to make the best use of Microsoft Office Suite in their day-to-day requirements and make use of it to improve the standards in the educational environment.
- The IT Workshop prepares the participant to have a hands-on experience in maintaining and troubleshooting a PC by themselves.

Task1: 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

Task2: Every student should individually install MS windows on the personal computer.

- Task3: Hardware Troubleshooting: Students have to be given a PC which does not boot due to improper assembly or defective peripherals.
- Task 4: Word Orientation: an overview of Microsoft (MS) office 2007/ 10: Importance of MS office 2007/10, overview of toolbars, saving files, Using help and resources, rulers, format painter.
- Task 5: Excel Orientation: The importance of MS office 2007/10 tool Excel as a Spreadsheet tool, Accessing, overview of toolbars, saving excel files, Using help and resources. Creating a Scheduler - Features to be covered:- Gridlines, Format Cells, Summation, auto fill, Formatting Text.
- Task 6: Basic power point utilities and tools which helpful to create basic power point presentation. Topic covered during this includes PPT Orientation, Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows in both Latex and Power point.
- Task 7: Introduction to HTML &Basic syntax of html Attributes, elements, lists, and basic programs, Homepage using HTML Consisting of photo, name, address and education details as a table.

Note: Minimum 12 experiments of duration 3 periods must be completed for the eligibility to appear for the semester end examinations. In case if the student fails to get eligibility for semester end exams in the current semester, he has to take the permission of HOD and complete the required number of experiments and appear for semester end exam as and when conducted.

Course Outcomes:

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

CO1: Identify the peripherals, components of CPU along with the functions of CPU.

CO2: Implement the installation of Windows OS and explain about Hardware Troubleshooting.

CO3: Create HTML Homepage and use MS Office like Word, Excel and Power Point Presentation.

CO4: Apply basic Electrical Engineering knowledge for House-wiring Practice.

CO5: Make different components using Fitting and Carpentry.

CO6: Prepare simple jobs as per specifications using Tinsmithy tools and Blacksmithy Tools.

ENGINEERING EXPLORATION PROJECT

COURSE OBJECTIVES:

- Build mindsets & foundations essential for designers
- Learn about the Human-Centered Design methodology and understand their real-world applications
- Use Design Thinking for problem solving methodology for investigating illdefined problems.
- Undergo several design challenges and work towards the final design challenge.

Apply Design thinking on the following Streams to

- Project Stream 1: Electronics, Robotics, IOT and Sensors
- Project Stream 2: Computer Science and IT Applications
- Project Stream 3: Mechanical and Electrical tools
- Project Stream4: Eco-friendly solutions for waste management, infrastructure, safety, alternative energy sources, Agriculture, Environmental science and other fields of engineering.

HOW TO PURSUE THE PROJECT WORK?

- The first part will be learning-based-masking students to embrace the methodology by exploring all the phases of design thinking through the wallet/ bag challenge and podcasts.
- The second part will be more discussion-based and will focus on building some necessary skills as designers and learning about complementary material for human-centered design.
- The class will then divide into teams and they will be working with one another for about 2 – 3 weeks. These teams and design challenges will be the basis for the final project and final presentation to be presented.
- The teams start with **Design Challenge** and go through all the phases more in depth from coming up with the right question to empathizing to ideating to prototyping and to testing.
- Outside of class, students will also be gathering the requirements, identifying the challenges, usability, importance etc
- At the end, Students are required to submit the final reports, and will be evaluated by the faculty.

TASKS TO BE DONE:

Task 1: Everyone is a Designer

- Understand class objectives & harness the designer mindset

Task 2: The Wallet/Bag Challenge and Podcast

- Gain a quick introduction to the design thinking methodology
- Go through all stages of the methodology through a simple design challenge
- Podcast: Observe, Listen and Engage with the surrounding environment and identify a design challenge.

Task 3: Teams & Problems

- Start Design Challenge and learn about teams & problems through this
- Foster team collaboration, find inspiration from the environment and learn how to identify problems.

Task 4: Empathizing

- Continue Design Challenge and learn empathy
- Learn techniques on how to empathize with users
- Go to the field and interview people in their environments
- Submit Activity Card

Task 5: Ideating

- Continue Design Challenge and learn how to brainstorm effectively
- Encourage exploration and foster spaces for brainstorming
- Submit Activity Card

Task 6: Prototyping

- Continue Design Challenge and learn how to create effective prototypes
- Build tangible models and use them as communication tools
- Start giving constructive feedback to classmates and teammates
- Submit Activity Card

Task 7: Testing

- Finish Design Challenge and iterate prototypes and ideas through user feedback
- Evolve ideas and prototypes through user feedback and constructive criticism
- Get peer feedback on individual and group performance
- Submit Activity Card

Task 8:

- Final Report Submission and Presentation

Note: The colleges may arrange for Guest Speakers from Various Design Fields: Graphic Design, Industrial Design, Architecture, Product Design, Organizational Design, etc to enrich the students with Design Thinking Concept.

REFERENCES:

1. Tom Kelly, *The Art of Innovation: Lessons in Creativity From IDEO, America's Leading Design Firm* (Profile Books, 2002)
2. Tim Brown, *Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation* (HarperBusiness, 2009)
3. Jeanne Liedtka, Randy Salzman, and Daisy Azer, *Design Thinking for the Greater Good: Innovation in the Social Sector* (Columbia Business School Publishing, 2017)

OTHER USEFUL DESIGN THINKING FRAMEWORKS AND METHODOLOGIES:

- Human-Centered Design Toolkit (IDEO); <https://www.ideo.com/post/design-kit>
- Design Thinking Boot Camp Bootleg (Stanford D-School); <https://dschool.stanford.edu/resources/the-bootcamp-bootleg>
- Collective Action Toolkit (frogdesign); https://www.frogdesign.com/wpcontent/uploads/2016/03/CAT_2.0_English.pdf
- Design Thinking for Educators (IDEO); <https://designthinkingforeducators.com/>

I Year - II Semester

Course Code : UR19MC201

L	T	P	C
0	0	0	0

Internal: 20 Marks

External: 0 Marks

Semester-end: 30 Marks

ENGINEERING PHYSICS - VIRTUAL LAB

(Any 3 of the following listed 12 experiments)

Course objectives:

- To gain practical knowledge by applying the experimental methods to correlate with the Physics theory.
- To learn the usage of electrical and optical systems for various measurements.

LIST OF EXPERIMENTS

1. Hall Effect
2. Crystal Structure
3. Brewster's angle
4. Numerical Aperture of Optical fiber
5. Photoelectric Effect
6. LASER – Beam Divergence and Spot size
7. Michelson's interferometer
8. Black body radiation
9. Flywheel –moment of inertia
10. AC Sonometer
11. Resistivity by four probe method
12. Newton's rings –Refractive index of liquid

URL: www.vlab.co.in

Course outcomes:

CO1: Handle optical instruments like microscope and spectrometer

CO2: Determine thickness of a hair/paper with the concept of interference

I Year - II Semester

Course Code : UR19MC203

L	T	P	C
0	0	0	0

Internal: 100 Marks

External: 0 Marks

CONSTITUTION OF INDIA

(CE,EEE, ME & ECE)

Course Objectives:

- To Enable the student to understand the importance of constitution
- To understand the structure of executive, legislature and judiciary
- To understand philosophy of fundamental rights and duties
- To understand the autonomous nature of constitutional bodies like Supreme Court and high court controller and auditor general of india and election commission of india.
- To understand the central and state relation financial and administrative.

UNIT – I

Introduction to Indian Constitution: Constitution' meaning of the term, Indian Constitution - Sources and constitutional history, Features - Citizenship, Preamble, Fundamental Rights and Duties, Directive Principles of State Policy.

UNIT – II

Union Government and its Administration Structure of the Indian Union: Federalism, Centre- State relationship, President: Role, power and position, PM and Council of ministers, Cabinet and Central Secretariat, Lok Sabha, Rajya Sabha, The Supreme Court and High Court: Powers and Functions;

UNIT – III

State Government and its Administration Governor - Role and Position - CM and Council of ministers, State Secretariat: Organisation, Structure and Functions

UNIT – IV

A. Local Administration - District's Administration Head - Role and Importance, Municipalities - Mayor and role of Elected Representative - CEO of Municipal Corporation Panchayati Raj: Functions PRI: Zila Panchayat, Elected officials and their roles, CEO Zila Panchayat: Block level Organizational Hierarchy - (Different departments), Village level - Role of Elected and Appointed officials - Importance of grass root democracy.

UNIT – V

Election Commission: Election Commission- Role of Chief Election Commissioner and Election Commissioner State Election Commission:, Functions of Commissions for the welfare of SC/ST/OBC and women.

TEXT BOOKS:

1. Subash Kashyap, Indian Constitution, National Book Trust
2. J.A. Siwach, Dynamics of Indian Government & Politics

REFERENCE BOOKS:

1. Durga Das Basu, Introduction to the Constitution of India, Prentice – Hall of India Pvt. Ltd., New Delhi
2. D.C. Gupta, Indian Government and Politics
3. H.M. Sreevai, Constitutional Law of India, 4th edition in 3 volumes (Universal Law Publication)
4. J.C. Johari, Indian Government and Politics Hans
5. J. Raj Indian Government and Politics

6.M.V. Pylee, Indian Constitution Durga Das Basu, Human Rights in Constitutional Law, Prentice – Hall of India Pvt. Ltd.. New Delhi

7.Noorani, A.G., (South Asia Human Rights Documentation Centre), Challenges to Civil Right), Challenges to Civil Rights Guarantees in India, Oxford University Press2012.

Course Outcomes:

Upon completion of the course, the students will be able to

CO1: Explain the concept of Indian constitution and Evaluate Preamble Fundamental Rights and Duties

CO2: Judge the structure of Indian government, Differentiate between the state and central government.

CO3: Explain the role of President and Prime Minister and Know the Structure of Supreme Court and High court.

CO4: Analyze the role Governor and Chief Minister and explain the role of state Secretariat

CO5: Explain theroleofMyerandelectedrepresentativesofMunicipalities,EvaluateZillapanchayat block levelorganization

CO6: Identify the roles of Election Commission apply knowledge and Evaluate various commissions of viz SC/ST/OBC andwomen.

METALLURGY & MATERIAL SCIENCE**Internal Marks: 30****External Marks: 70****Course Objective:**

To understand the basic fundamentals of Material science and Physical metallurgy. The basic concepts to be taught will help for the improvement, proper selection and effective utilization of materials which is essential to satisfy the ever increasing demands of the society.

UNIT - I

Structure of Metals and Constitution of alloys: Bonds in Solids – Metallic bond - crystallization of metals, grain and grain boundaries, effect of grain boundaries on the properties of metal / alloys – determination of grain size. Necessity of alloying, types of solid solutions, Hume Rotherys rules, intermediate alloy phases, and electron compounds.

UNIT –II

Equilibrium Diagrams: Experimental methods of construction of equilibrium diagrams, Isomorphous alloy systems, equilibrium cooling and heating of alloys, Lever rule, coring miscibility gaps, eutectic systems, congruent melting intermediate phases, peritectic reaction. Transformations in the solid state – allotropy, eutectoid, peritectoid reactions, phase rule, relationship between equilibrium diagrams and properties of alloys. Study of important binary phase diagrams of Cu-Ni-, Al-Cu, Bi-Cd and Fe-Fe₃C.

UNIT –III

Cast Iron and Steels: Structure and properties of White Cast iron, Malleable Cast iron, grey cast iron, Spheroidal graphite cast iron, Alloy cast irons. Classification of steels, structure and properties of plain carbon steels, Low alloy steels, Hadfield manganese steels, tool and die steels.

Heat treatment of Alloys: Effect of alloying elements on Fe-Fe₃C system, Annealing, normalizing, hardening, TTT diagrams, tempering, hardenability, surface - hardening methods, Age hardening treatment, Cryogenic treatment of alloys.

UNIT – IV

Non-ferrous Metals and Alloys: Structure and properties of Copper and its alloys, Aluminium and its alloys, Titanium and its alloys.

UNIT – V

Ceramic and composite materials: Crystalline ceramics, glasses, cermet's, abrasive materials, nanomaterials – definition, properties and applications of the above.

Powder metallurgy-Definition, properties, applications and steps in manufacturing.

Classification of composites, various methods of component manufacture of composites, particle – reinforced materials, fiber reinforced materials, metal ceramic mixtures, metal – matrix composites and C – C composites.

Text Books:

1. Introduction to Physical Metallurgy - Sidney H. Avener - McGrawHill
2. Essential of Materials science and engineering - Donald R.Askeland - Cengage.

References Books:

1. Material Science and Metallurgy – Dr. V.D.Kodgire.
2. Materials Science and Engineering -Callister&Baalasubrahmanyam
3. Material Science for Engineering students – Fischer – Elsevier Publishers
4. Material science and Engineering - V. Rahghavan
5. Introduction to Material Science and Engineering – Yip-Wah Chung CRC Press
6. Material Science and Metallurgy – A V K Suryanarayana – B S Publications
7. Material Science and Metallurgy – U. C. Jindal – Pearson Publications

Course outcomes:

Upon successful completion of the course, the students will be able to

1. Learn about bonds in metals & alloys and formation of solid solutions and other compounds
2. Understands the regions of stability of the phases in order to solve the problems in practical metallurgy
3. Know about cast irons and steels, their properties and practical applications.
4. Understand the affect of various alloying elements on iron-iron carbide system.
5. Learn the properties and applications of non-ferrous metals and alloys.
6. Learn about ceramics, composite and other advanced materials so as to use the suitable material for practical applications.

PRODUCTION TECHNOLOGY**Internal Marks: 30****External Marks: 70****Course Objective:**

To impart basic knowledge and understanding about the primary manufacturing processes such as casting, joining, bulk forming, sheet metal forming and powder metallurgy and their relevance in current manufacturing industry; To introduce processing methods of plastics.

UNIT – I

Casting: Steps involved in making a casting – Advantage of casting and its applications. – Patterns and Pattern making – Types of patterns – Materials used for patterns, pattern allowances and their construction, Principles of Gating, Gating ratio and design of Gating systems. Risers – Types, function and design, casting design considerations, Basic principles and applications of Centrifugal casting, Die casting and Investment casting.

UNIT – II

Welding: Classification of welding processes, types of welded joints and their characteristics, Gas welding, Different types of flames and uses, Oxy – Acetylene Gas cutting. Basic principles of Arc welding, Manual metal arc welding, submerged arc welding, and Inert Gas welding- TIG & MIG welding. Weld ability of metals, welding defects.

UNIT – III

Resistance welding, Solid state welding processes- Friction welding, Friction stir welding, Forge welding, Explosive welding; Thermit welding, Soldering & Brazing.

UNIT – IV

Plastic deformation in metals and alloys, hot working and cold working, Strain hardening and Annealing. Bulk forming processes: Forging, Smith forging, Drop Forging, Roll forging, Forging hammers, Rotary forging, forging defects; Rolling – fundamentals, types of rolling mills and products, Forces in rolling and power requirements. Extrusion and its characteristics. Types of extrusion, Impact extrusion, Hydrostatic extrusion; Wire drawing and Tube drawing.

UNIT – V

Sheet metal forming - Blanking and piercing, Forces and power requirement in these operations, Deep drawing, Stretch forming, Bending, Spring back and its remedies, Coining, Spinning, Types of presses and

press tools. High energy rate forming processes: Principles of explosive forming, electromagnetic forming, Electro hydraulic forming, rubber pad forming, advantages and limitations. Processing of Plastics: Types of Plastics, Properties, Applications and their processing methods, Blow and Injection moulding.

Text Books:

1. Manufacturing Processes for Engineering Materials - Kalpakjain S and Steven R Schmid- Pearson Publ, 5th Edn.
2. Manufacturing Technology -Vol I- P.N. Rao- TMH

References Books:

1. Manufacturing Science – A.Ghosh & A.K.Malik – East West Press Pvt. Ltd
2. Process and materials of manufacture- Lindberg- PHI
3. Production Technology- R.K. Jain- Khanna
4. Production Technology-P C Sharma-S. Chand
5. Manufacturing Processes- H.S. Shaun- Pearson
6. Manufacturing Processes- J.P. Kaushish- PHI
7. Workshop Technology /WAJ Chapman/CBS Publishers & Distributors Pvt.Ltd.

Course Outcomes:

Upon successful completion of the course, the students will be able to

1. Design patterns, gating, runner and riser systems
2. Learn various casting process based on the component
3. Learn various arc and solid state welding processes and select a suitable process based on the application and requirements
4. Understand the Extrusion and its characteristics.
5. Understand various bulk deformation processes
6. Understand various sheet metal forming and processing of plastics

ENGINEERING THERMODYNAMICS**Internal Marks: 30****External Marks: 70****Course Objectives:**

- To introduce and familiarize with basic concepts of system, properties and cycles.
- To introduce and familiarize the laws of thermodynamics and their applications to various thermodynamic processes and cycles.

UNIT – I

Introduction: Basic Concepts : System, boundary, Surrounding, control volume, Universe, Types of Systems, Macroscopic and Microscopic viewpoints, Concept of Continuum, Thermodynamic Equilibrium, State, Property, Process, Cycle – Reversibility – Quasi – static Process, Irreversible Process, Causes of Irreversibility – Energy in State and in Transition, Work and Heat, Point and Path function. Zeroth Law of Thermodynamics – Concept of Temperature — Scales of Temperature, Ideal Gas Scale

UNIT –II

First law of Thermodynamics – Corollaries – First law applied to a Process –to a flow system – Steady Flow Energy Equation. PMM-I, throttling and free expansion processes – deviations from perfect gas model – Vander waals equation of state – compressibility charts – variable specific heats – gas tables. Limitations of the First Law – Thermal Reservoir, Heat Engine, Heat pump, Parameters of performance.

UNIT -III

Second Law of Thermodynamics, Kelvin-Planck and Clausius Statements and their Equivalence / Corollaries, PMM of Second kind, Carnot's principle, Carnot cycle and its specialties, Thermodynamic scale of Temperature, Clausius Inequality, Entropy, Principle of Entropy Increase – Energy Equation, Availability and Irreversibility – Thermodynamic Potentials, Gibbs and Helmholtz Functions, Maxwell Relations – introduction Third Law of Thermodynamics.

UNIT- IV

Pure Substances, P-V-T, T-S and h-s diagrams, Mollier Charts, Phase Transformations – Triple point– Clausius – Clapeyron Equation steam Property tables. Mollier charts – Various Thermodynamic processes and energy Transfer – Steam Calorimetry.

UNIT – V

Power Cycles : Otto, Diesel, Dual Combustion cycles, Sterling Cycle, Atkinson Cycle, Ericsson Cycle, Lenoir Cycle – Description and representation on P–V and T-S diagram, Thermal Efficiency, Mean Effective Pressures on Air standard basis – comparison of Cycles.

Text Books:

1. Engineering Thermodynamics, PK Nag 4th Edn , TMH.
2. Thermodynamics – An Engineering Approach with student resources DVD – Y.A.Cengel & M.A.Boles , 7th Edn – McGraw-Hill

References Books:

1. Engineering Thermodynamics – Jones & Dugan PHI
2. Thermodynamics – J.P.Holman, McGraw-Hill
3. Basic Engineering Thermodynamics – A.Venkatesh – Universities press.
4. An Introduction to Thermodynamics - Y.V.C.Rao – Universities press.
5. Thermodynamics – W.Z.Black & J.G.Hartley, 3rd Edn Pearson Publ.
6. Engineering Thermodynamics – D.P.Misra, Cengage Publ.
7. Engineering Thermodynamics – P.Chattopadhyay – Oxford Higher Edn Publ...

Course Outcomes:

Upon successful completion of the course, the students will be able to

1. Understand the thermodynamic laws and principle like thermodynamic system, its boundary and related fundamental definitions.
2. Understand the distinguish between point function and path function shall be made with respect to energy, work and Heat.
3. Understand the first law of thermodynamics, which is also the energy conservation principle, and should be able to apply to different thermodynamic systems.
4. Understand the second law statements and the associated terms and should be able to apply the principles to heat engines. Should be able to analyze the concepts of Carnot cycle, entropy, availability and irreversibility. Should be able to understand the use of Maxwell's relations and thermodynamic functions.
5. Understand the process of steam formation and its representation on property diagrams with various phase changes and should be able to calculate the quality of steam after its expansion in a steam turbine, with the help of standard steam tables and charts.
6. Understand the concept of air standard cycles and should be able to calculate the efficiency and performance parameters of the systems that use these cycles.

MECHANICS OF SOLIDS**Internal Marks: 30****External Marks: 70****Course Objective:**

The students completing this course are expected to understand the basic terms like stress, strain, Poisson's ratio... and different stresses induced in beams, thin cylinders, thick cylinders, columns. Further, the student shall be able to understand the shear stresses in circular shafts.

UNIT – I

Simple Stresses & Strains: Elasticity and plasticity – Types of stresses & strains–Hooke's law – stress – strain diagram for mild steel – Working stress – Factor of safety – Lateral strain, Poisson's ratio & volumetric strain – Bars of varying section – composite bars – Temperature stresses- Complex Stresses - Stresses on an inclined plane under different uniaxial and biaxial stress conditions - Principal planes and principal stresses - Mohr's circle - Relation between elastic constants, Strain energy – Resilience – Gradual, sudden, impact and shock loadings.

UNIT – II

Shear Force And Bending Moment : Definition of beam – Types of beams – Concept of shear force and bending moment – S.F and B.M diagrams for cantilever, simply supported and overhanging beams subjected to point loads, u.d.l, uniformly varying loads and combination of these loads – Point of contra flexure – Relation between S.F., B.M and rate of loading at a section of a beam.

UNIT – III

Flexural Stresses: Theory of simple bending – Assumptions – Derivation of bending equation: $M/I = f/y = E/R$ Neutral axis – Determination bending stresses – section modulus of rectangular and circular sections (Solid and Hollow), I,T, Angle and Channel sections – Design of simple beam sections.

Shear Stresses: Derivation of formula – Shear stress distribution across various beams sections like rectangular, circular, triangular, I, T angle sections.

UNIT – IV

Deflection of Beams: Bending into a circular arc – slope, deflection and radius of curvature – Differential equation for the elastic line of a beam – Double integration and Macaulay's methods – Determination of slope and deflection for cantilever and simply supported beams subjected to point loads, - U.D.L uniformly varying load. Mohr's theorems – Moment area method – application to simple cases including overhanging beams, Statically Indeterminate Beams and solution methods.

UNIT – V

Thin Cylinders: Thin seamless cylindrical shells – Derivation of formula for longitudinal and circumferential stresses – hoop, longitudinal and volumetric strains – changes in dia, and volume of thin cylinders – Riveted boiler shells – Thin spherical shells.

Thick Cylinders: –Lame’s equation – cylinders subjected to inside & outside pressures –compound cylinders.

Text Books:

1. Strength of materials by Bhavikatti, Lakshmi publications.
2. Solid Mechanics, by Popov.
3. Mechanics of Materials by - Ferdinand P Beer, E Russell Johnston, and John T Dewolf.

References Books:

1. Strength of Materials -By Jindal, Umesh Publications.
2. Analysis of structures by Vazirani and Ratwani.
3. Mechanics of Structures Vol-III, by S.B.Junnarkar.
4. Strength of Materials by S.Timshenko.
5. Strength of Materials by Andrew Pytel and Ferdinand L. Singer Longman.

Course outcomes:

Upon successful completion of the course, the students will be able to

1. Calculate the simple and complex stresses, strains and other mechanical properties of materials
2. Analyze the shear forces and bending moments at various sections in various members
3. Understand concepts of flexural stresses.
4. Estimate and Analyze shear stresses in beams.
5. Analyze the deflections in beams under various loadings.
6. Estimate and analyze the stresses in thin cylinders and thick cylinders.

MACHINE DRAWING**Internal Marks: 30****External Marks: 70****Course Objective:**

The student will acquire knowledge of fastening arrangements such as welding, riveting the different styles of attachment for shaft. The student also is enabled to prepare the assembly of various machine or engine components and miscellaneous machine components.

Machine Drawing Conventions:

Need for drawing conventions – introduction to IS conventions

- a) Conventional representation of materials, common machine elements and parts such as screws, nuts, bolts, keys, gears, webs, ribs.
- b) Types of sections – selection of section planes and drawing of sections and auxiliary sectional views. Parts not usually sectioned.
- c) Methods of dimensioning, general rules for sizes and placement of dimensions for holes, centers, curved and tapered features.
- d) Title boxes, their size, location and details - common abbreviations & their liberal usage
- e) Types of Drawings – working drawings for machine parts.

PART-A**Drawing Standards**

Drawing of Machine Elements and simple parts Objective: To provide basic understanding and drawing practice of various joint, simple mechanical parts Selection of Views, additional views for the following machine elements and parts with every drawing proportions.

- a) Conventional representation of common machine elements such as Screw threads, bolts, nuts, stud bolts, taps bolts, set screws.
- b) Keys, gears, bearings, couplings, webs, ribs etc.

Fastening Drawing

Riveted joints for plates: Rivets, Rivet heads, chain riveting, zig-zag riveting, Diagonal pitch riveting, structural joints and boiler joint.

Bolt and Nut joints: Hexagonal headed bolts- Nuts –Square headed bolts

PART-B

Manufacturing Drawing

Preparation of manufacturing drawing for the following machine components:

Cotter joints – Cotter joint with Sleeve – Socket and Spigot Cotter joint – Cotter joint with Gib and Cotter – Knuckle joint. Shaft coupling, spigot and socket pipe joint. Journal, pivot and collar and foot step bearings.

Assembly Drawing

Objective: The student will be able to draw the assembly from the individual part drawing. Drawings of assembled views for the part drawings of the following using conventions and easy drawing proportions.

- a) Engine parts –Gear pump, Fuel pump Petrol Engine connecting rod, piston assembly.
- b) Other machine parts - Screws jacks, Machine Vices Plummer block, Tailstock.
- c) Valves: spring loaded safety valve, feed check valve and air cock, Control valves.

NOTE:

First angle projection to be adopted. The student should be able to provide working drawings of actual parts. End semester examination for 70 Marks, Part A- 20 Marks (Answer two questions out of three), Part B- 50 Marks (Assembly Drawing).

Text Books:

1. Machine Drawing – N.Siddeswar, K.Kannaiah&V.V.S.Sastry – TMH
- 2.Machine Drawing –K.L.Narayana, P.Kannaiah& K. Venkata Reddy / New Age/ Publishers

References Books:

1. Machine Drawing – P.S.Gill
2. Machine Drawing – Luzzader
3. Machine Drawing – Rajput
4. Machine Drawing – N.D. Junnarkar, Pearson
5. Machine Drawing – Ajeeth Singh, McGraw Hill
6. Machine Drawing – KC John, PHI
7. Machine Drawing – B Battacharya, Oxford
8. Machine Drawing – Gowtham and Gowtham, Pearson

Course Outcomes:

Upon successful completion of the course, the students will be able to

1. Learn drafting their technical ideas
2. Recognize machining and surface finish symbols.
3. Learn knowledge about the various practices with regard to the dimensioning, sectioning and development of views.

4. Understand the importance of the linking functional and visualization aspects in the preparation of the part drawings
5. Understand Preparation of the part or assembly drawings as per the conventions.
6. Understand Interpretation of machine drawings that in turn help the students in the preparation of the production drawings

MATERIALS TESTING LAB

Internal Marks: 20

External Marks: 30

NOTE: Any 6 experiments from each section A and B.

(A) Mechanics of Solids Lab

Course Objectives:

- To impart hands on training to examine the mechanical properties of materials.

List of Experiments

1. Direct tension test
2. Bending test on
 - a) Simple supported
 - b) Cantilever beam
3. Torsion test
4. Hardness test
 - a) Brinells hardness test
 - b) Rockwell hardness test
5. Test on springs
6. Compression test on cube
7. Impact test
8. Punch shear test

(B) Metallurgy Lab

Course Objectives

- To impart hands on training in preparation of metal specimen so as to observe the microstructure.

List of Experiments

1. Preparation and study of the Micro Structure of pure metals like Iron, Cu and Al.

2. Preparation and study of the Microstructure of Mild steels, low carbon steels, high – C steels.
3. Study of the Micro Structures of Cast Irons.
4. Study of the Micro Structures of Non-Ferrous alloys.
5. Study of the Micro structures of Heat treated steels.
6. Hardenability of steels by Jominy End Quench Test.
7. To find out the hardness of various treated and untreated steels.

Course Outcomes:

Upon successful completion of the course, the students will be able to

1. Determine the young's modulus, rigidity modulus of materials and stresses induced in bars and beams of uniform cross section.
2. Determine the hardness number and stiffness of spring.
3. Determine the impact strength of materials.
4. Prepare the Specimen using rough grinding, finish grinding and polishing.
5. Use different types of etchants to expose the microstructure of metal and alloys.
6. Perform Jominy End Quench test.

Note: Minimum 12 experiments of duration 3 periods each must be completed for the eligibility to appear for the semester end examinations.

In case if the student fails to get eligibility for semester end exams in the current semester, he has to take the permission of HOD and complete the required number of experiments and appear for semester end exam as and when conducted.

PRODUCTION TECHNOLOGY LAB

Internal Marks: 20

External Marks: 30

Course Objective:

- To impart hands-on practical exposure on manufacturing processes and equipment.
- The students are required to understand the parts of various machine tools and operate them. They are required to understand the different shapes of products that can be produced on these machine tools.

I. Metal Casting

1. Pattern design and making
2. Mould preparation
3. Melting and Casting

II. Welding:

4. Gas welding
5. Manual metal arc welding
6. Lap Joints
7. Butt Joints

III. Metal Forming and Powder Metallurgy:

8. Blanking & Piercing operations
9. Study of simple, compound and progressive dies.
10. Basic powder compaction and sintering

IV. Processing of Plastics:

11. Injection Moulding
12. Blow Moulding

Course outcomes:

Upon successful completion of the course, the students will be able to

1. Learn to produce different parts from various manufacturing processes.

2. Learn operate different machine tools with understanding of work holders and operating principles to produce different part features to the desired quality

Note: Minimum 12 experiments of duration 3 periods each must be completed for the eligibility to appear for the semester end examinations.

In case if the student fails to get eligibility for semester end exams in the current semester, he has to take the permission of HOD and complete the required number of experiments and appear for semester end exam as and when conducted.

BASIC ELECTRICAL & ELECTRONICS ENGINEERING LAB**Internal Marks: 20****External Marks: 30****SECTION A: ELECTRICAL ENGINEERING**

The following experiments are required to be conducted as compulsory experiments:

1. Swinburne's test on D.C. Shunt machine
(Predetermination of efficiency of a given D.C. Shunt machine working as motor and generator).
2. OC and SC tests on single phase transformer (Predetermination of efficiency and regulation at given power factors).
3. 3. Brake test on 3-phase Induction motor (Determination of performance characteristics).
4. Regulation of alternator by Synchronous impedance method.
5. Speed control of D.C. Shunt motor by a) Armature Voltage control b) Field flux control method
6. 6. Brake test on D.C. Shunt Motor.

SECTION B: ELECTRONICS ENGINEERING

1. PN junction Diode characteristics A. Forward bias, B. Reverse bias. (Cut in voltage & Resistance calculations)
2. Transistor CE Characteristics (Input and Output).
3. Full wave Rectifier with and without filters.
4. CE Amplifiers.
5. 5. RC Phase Shift Oscillator.
6. Class A Power Amplifier.

Course Outcomes:

Upon successful completion of the course, the students will be able to

1. Observe testing a machine at different loads.
2. Understand losses calculating in transformers.
3. Gain knowledge on induction motor by observing their characteristics.
4. Understand various stages in alternator.
5. Understand basic operation of PN junction
6. Understand concept of transistor and amplifiers.

Note: 12 experiments of duration 3 periods each must be completed for the eligibility to appear for the semester end examinations.

In case if the student fails to get eligibility for semester end exams in the current semester, he has to take the permission of HOD and complete the required number of experiments and appear for semester end exam as and when conducted.

ENVIRONMENTAL STUDIES**Internal Marks: 100****External Marks: 0****Course Objectives:**

- Overall understanding of the natural resources
- Basic understanding of the ecosystem and its diversity
- Acquaintance on various environmental challenges induced due to unplanned anthropogenic activities
- An understanding of the environmental impact of developmental activities
- Awareness on the social issues, environmental legislation and global treaties

UNIT – I

Multidisciplinary nature of Environmental Studies: Definition, Scope and Importance –

Sustainability: Stockholm and Rio Summit–Global Environmental Challenges: Global warming and climate change, Carbon Credits, acid rains, ozone layer depletion, population growth and explosion, effects. Role of information Technology in Environment and human health.

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 Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems.

UNIT – II

Natural Resources: Natural resources and associated problems

Forest resources – Use and over – exploitation, deforestation – Timber extraction – Mining, dams and other effects on forest and tribal people

Water resources – Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems

Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, Sustainable mining of Granite, Lignite, Coal, Sea and River sands.

Food resources: World food problems, changes caused by non-agriculture activities-effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity

Energy resources: Growing energy needs, renewable and non-renewable energy sources use of alternate energy sources Vs Oil and Natural Gas Extraction.

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

UNIT – III

Biodiversity and its conservation: Definition: genetic, species and ecosystem diversity classification - Value of biodiversity: consumptive use, productive use, social-Biodiversity at national and local levels. India as a mega-diversity nation - Hot-spots of biodiversity - Threats to biodiversity: habitat loss, man wildlife conflicts - Endangered and endemic species of India – Conservation of biodiversity: conservation of biodiversity.

UNIT – IV

Environmental Pollution: Definition, Cause, effects and control measures of Air pollution, Water pollution, Soil pollution, Noise pollution, Nuclear hazards. Role of an individual in prevention of pollution. - Pollution case studies, Sustainable Life Studies. Impact of Fire Crackers on Men and his well being.

Solid Waste Management: Sources, Classification, effects and control measures of urban and industrial solid wastes. Consumerism and waste products, Biomedical, Hazardous and e – waste management.

UNIT – V

Social Issues and the Environment: Urban problems related to energy -Water conservation, rain water harvesting-Resettlement and rehabilitation of people; its problems and concerns. Environmental ethics: Issues and possible solutions. Environmental 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.

Text Books:

1. Environmental Studies, K. V. S. G. Murali Krishna, VGS Publishers, Vijayawada
2. Environmental Studies, R. Rajagopalan, 2nd Edition, 2011, Oxford University Press.
3. Environmental Studies, P. N. Palanisamy, P. Manikandan, A. Geetha, and K. Manjula Rani; Pearson Education, Chennai

References Books:

1. Text Book of Environmental Studies, Deeshita Dave & P. Udaya Bhaskar, Cengage Learning.

2. A Textbook of Environmental Studies, Shaashi Chawla, TMH, New Delhi
3. Environmental Studies, Benny Joseph, Tata McGraw Hill Co, New Delhi
4. Perspectives in Environment Studies, Anubha Kaushik, C P Kaushik, New Age International Publishers, 2014

Course Outcomes:

Upon successful completion of the course, the students will be able to

1. Understand natural resources and their importance for the sustenance of the life and recognize the need to conserve the natural resources
2. Analyze concepts of the ecosystem and its function in the environment. The need for protecting the producers and consumers in various ecosystems and their role in the food web
3. Study biodiversity of India and the threats to biodiversity, and conservation practices to protect the biodiversity
4. Apply various attributes of the pollution and their impacts and measures to reduce or control the pollution along with waste management practices
5. Understand social issues both rural and urban environment and the possible means to combat the challenges
6. Analyze environmental legislations of India and the first global initiatives towards sustainable development.

FLUID MECHANICS & HYDRAULIC MACHINERY**Internal Marks: 30****External Marks: 70****Course Objective:**

The students completing this course are expected to understand the properties of fluids, its kinematic and dynamic behavior through various laws of fluids like continuity, Euler's, Bernoulli's equations, energy and momentum equations. Further, the student shall be able to understand the theory of boundary layer, working and performance characteristics of various hydraulic machines like pumps and turbines.

UNIT I

Fluid statics: Dimensions and units: physical properties of fluids- specific gravity, viscosity and its significance, surface tension, capillarity, vapor pressure. Atmospheric gauge and vacuum pressure – measurement of pressure. Manometers- Piezometer, U-tube, inverted and differential manometers. Pascal's law, hydrostatic law.

Buoyancy and floatation: Meta center, stability of floating body. Submerged bodies. Calculation of metacenter height. Stability analysis and applications.

UNIT II

Fluid kinematics: Introduction, flow types. Equation of continuity for one dimensional flow, circulation and vorticity, Stream line, path line and streak lines and stream tube. Stream function and velocity potential function, differences and relation between them. Condition for irrotational flow, flow net, source and sink, doublet and vortex flow.

Fluid dynamics: surface and body forces –Euler's and Bernoulli's equations for flow along a stream line, momentum equation and its applications, force on pipe bend.

Closed conduit flow: Reynold's experiment- Darcy Weisbach equation- Minor losses in pipes- pipes in series and pipes in parallel- total energy line-hydraulic gradient line.

UNIT III

Basics of turbo machinery: hydrodynamic force of jets on stationary and moving flat, inclined, and curved vanes, jet striking centrally and at tip, velocity diagrams, work done and efficiency, flow over radial vanes.

UNIT IV

Centrifugal pumps: classification, working, work done – manometric head- losses and efficiencies-specific speed- pumps in series and parallel-performance characteristic curves, cavitation & NPSH.

Reciprocating pumps: Working, Discharge, slip, indicator diagrams.

UNIT V

Hydraulic Turbines: classification of turbines, impulse and reaction turbines, Pelton wheel, Francis turbine and Kaplan turbine-working proportions, work done, efficiencies, hydraulic design –draft tube- theory functions and efficiency.

Performance of hydraulic turbines: Geometric similarity, Unit and specific quantities, characteristic curves, governing of turbines, selection of type of turbine, cavitation, surge tank, water hammer. Hydraulic systems hydraulic ram, hydraulic lift, hydraulic coupling. Fluidics – amplifiers, sensors and oscillators. Advantages, limitations and applications.

Text Books:

1. Hydraulics, fluid mechanics and Hydraulic machinery MODI and SETH.
2. Fluid Mechanics and Hydraulic Machines by Rajput.
3. Fluid Mechanics and Hydraulic Machines/ RK Bansal/Laxmi Publications (P) Ltd.
4. Fluid Mechanics by F.M. White McGraw Hill Education (India) Pvt. Ltd, New Delhi, 2011.

Reference Books:

1. Fluid Mechanics and Fluid Power Engineering by D.S. Kumar, Kotaria & Sons.
2. Fluid Mechanics and Machinery by D. Rama Durgaiah, New Age International.
3. Hydraulic Machines by Banga & Sharma, Khanna Publishers.
4. Instrumentation for Engineering Measurements by James W. Dally, William E. Riley ,John Wiley & Sons Inc.2004 (Chapter 12 – Fluid Flow Measurements)
5. Fluid Mechanics and Hydraulic Machines by Domkundwar & Domkundwar, Dhanpatrai &Co.

Course outcomes:

Upon successful completion of the course, the students will be able to

1. Know the concept of fluid and its properties, manometer, hydrostatic forces acting on different surfaces and also problem solving techniques.

2. Learn the basic laws of fluids, flow patterns, viscous flow through ducts and their corresponding problems.
3. Understand concepts related to boundary layer theory, flow separation, basic concepts of velocity profiles, dimensionless numbers and dimensional analysis.
4. Know the hydrodynamic forces acting on vanes and their performance evaluation.
5. Understand the importance, function and performance of hydraulic turbines.
6. Understand the importance, function and performance of hydraulic pumps.

APPLIED THERMODYNAMICS**Internal Marks: 30**
External Marks: 70**Course Objectives**

- To introduce the principles of operation of heat engines and compressors along with the performance characteristics.
- To familiarize with various thermodynamic cycles of Refrigeration and psychometric processes.

UNIT- I

Introduction to I. C Engines : Classification – components-nomenclature Working principles, Valve and Port Timing Diagrams, - Engine systems -Fuel, Carburetor, Fuel Injection System, Ignition, Cooling and Lubrication, MPFI, GDI.

UNIT -II

Combustion - S.I & C.I Engines– Importance of flame speed and effect of engine variables on ignition lag, delay period, Fuel requirements and fuel rating, knocking in SI and CI Engine and its importance – Effect of engine variables on knocking

Testing and Performance: Parameters of performance – Indicated power Brake power –Friction power-Mechanical, Indicated, Brake thermal efficiencies, sfc – Heat balance sheet and chart.

UNIT – III

BOILERS : Classification – working principles of L.P & H.P boilers with sketches – mountings and accessories– working principles, boiler horse power, equivalent evaporation, efficiency and heat balance – draught, classification – height of chimney for given draught and discharge, condition for maximum discharge, efficiency of chimney – artificial draught, induced and forced.

UNIT –IV

STEAM NOZZLES: Function of a nozzle – applications - types, flow through nozzles, thermodynamic analysis– assumptions -velocity of fluid at nozzle exit-Ideal and actual expansion in a nozzle, velocity coefficient, condition for maximum discharge, critical pressure ratio.

STEAM TURBINES: Classification – impulse turbine; mechanical details – velocity diagram – effect of friction– power developed, axial thrust, blade or diagram efficiency – condition for maximum efficiency.

De-laval turbine - methods to reduce rotor speed-velocity compounding, pressure compounding and velocity and pressure compounding, velocity and pressure variation along the flow – combined velocity diagram for a velocity compounded impulse turbine, condition for maximum efficiency

UNIT V

REACTION TURBINE: Mechanical details – principle of operation, thermodynamic analysis of a stage, degree of reaction –velocity diagram – Parson’s reaction turbine – condition for maximum efficiency – calculation of blade height.

STEAM CONDENSERS: Requirements of steam condensing plant – classification of condensers – working principle of different types – vacuum efficiency and condenser efficiency– air leakage, sources and its affects, air pump- cooling water requirement.

Text Books:

1. I.C. Engines / V. Ganesan- TMH
2. Heat engines, Vasandani & Kumar publications Thermal
3. Thermal Engineering-P.L.Bellaney/ Khanna publishers.

References Books:

1. IC Engines – M.L.Mathur &R.P.Sharma – Dhanpath Rai & Sons.
2. I.C.Engines–AppliedThermosciences–C.R.Ferguson&A.T.Kirkpatrick- 2ndEdition-Wiley
3. I.C. Engines - J.B.Heywood /McGrawHill.
4. Thermal Engineering-M.L.Marthur & Mehta/Jain bros. Publishers
5. Thermal Engineering / RK Rajput/ Lakshmi Publications

Course out comes:

Upon successful completion of the course, the students will be able to

1. Understand the basic concepts of engine, ignition, cooling and lubrication system
2. Evaluate the performance parameters of indicated power, brake power, friction power and efficiencies
3. Identify the air and vapour cycles methods to improve the cycle performance
4. Understand the steam nozzles
5. Study the steam generators and accessories
6. Analyze the steam turbines and steam condensers

METAL CUTTING & MACHINE TOOLS**Internal Marks: 30****External Marks: 70****Course objectives:**

- The course provides students with fundamental knowledge and principles in material removal processes.
- In this course, the students apply the fundamentals and principles of metal cutting to practical applications through multiple labs using lathes, milling machines, grinding machines, and drill presses, Computer Numerical Control etc
- To demonstrate the fundamentals of machining processes and machine tools.
- To develop knowledge and importance of metal cutting parameters.
- To develop fundamental knowledge on tool materials, cutting fluids and tool wear mechanisms.
- To apply knowledge of basic mathematics to calculate the machining parameters for different machining processes.

UNIT – I

Fundamental of Machining: Elementary treatment of metal cutting theory – element of cutting process – geometry of single point cutting tool, tool angles, chip formation and types of chips – built up edge and its effects, chip breakers, mechanics of orthogonal cutting –Merchant's force diagram, cutting forces, cutting speeds, feed, depth of cut, tool life, tool wear, machinability, economics of machining, coolants, tool materials and properties.

UNIT – II

Lathe Machines: Engine lathe – principle of working, specification of lathe – types of lathe – work holders tool holders – box tools taper turning, thread turning – for lathes and attachments, constructional features of speed gear box and feed gear box. Turret and capstan lathes – collet chucks – other work holders – tool holding devices – box and tool layout. Principal features of automatic lathes.

UNIT – III

Shaping, Slotting and Planning Machines: Principles of working – principal parts – specifications, operations, machining time calculations.

Drilling & Boring Machines: Principles of working, specifications, types, operations performed –tool holding devices – twist drill – Boring Machines – fine Boring Machines – jig boring machine, deep hole Drilling Machine.

UNIT – IV

Milling Machines: Principles of working – specifications – classification of Milling Machines – principal features of horizontal, vertical and universal Milling Machine, machining operations, types of cutters, geometry of milling cutters – methods of indexing, accessories to milling machines.

UNIT –V

Finishing Processes: Theory of grinding – classification of grinding machines, cylindrical and surface grinding machines, tool and cutter grinding machines, different types of abrasives, bonds, specification and selection of a grinding wheel. Lapping, Honing & Broaching operations, comparison to grinding.

Text Books:

1. Manufacturing Processes / JP Kaushish/ PHI Publishers-2nd Edition
2. Manufacturing Technology Vol-II/P.N Rao/Tata McGraw Hill
3. Work shop technology vol –II / G.S. Raghuvamshi
4. Production technology / R.K.Jain

References Books:

1. Metal cutting and machine tools /Geoffrey Boothroyd, Winston A.Knight/ Taylor & Francis
2. Production Technology / H.M.T. Hand Book (Hindustan Machine Tools).
3. Production Engineering/K.C Jain & A.K Chitale/PHI Publishers
4. Technology of machine tools/S.F.Krar, A.R. Gill, Peter SMID/ TMH
5. Manufacturing Processes for Engineering Materials-Kalpakjian S & Steven R Schmid/Pearson Publications 5th Edition

Course Outcomes:

Upon successful completion of the course, the students will be able to

1. Apply cutting mechanics to metal machining based on cutting force and power consumption.
2. Operate lathe, drill machines, boring machines, etc.
3. Operate shaper, planer, slotting machines etc.
4. Learn various cutting tool materials and tool geometries milling cutters for different metals.
5. Understand the milling machining processes and conditions for different metals.
6. Operate grinding machines, Lapping, Honing & Broaching

KINEMATICS OF MACHINERY**Internal Marks: 30****External Marks: 70****Course Objective:**

The students completing this course are expected to understand the nature and role of the kinematics of machinery, the mechanisms and machines. The course includes velocity and acceleration diagrams, analysis of mechanisms joints, Cams and their applications. It exposes the students to various kinds of power transmission devices like belt, rope, chain and gear drives and their working principles and their merits and demerits.

UNIT – I

MECHANISMS : Elements or Links – Classification – Rigid Link, flexible and fluid link – Types of kinematic pairs – sliding, turning, rolling, screw and spherical pairs – lower and higher pairs – closed and open pairs – constrained motion – completely, partially or successfully constrained and incompletely constrained . Grublers criterion , Grashoff's law , Degrees of freedom, Kutzbach criterion for planar mechanisms, Mechanism and machines – classification of machines – kinematic chain – inversion of mechanism – inversion of mechanism – inversions of quadric cycle, chain – single and double slider crank chains.

UNIT – II

LOWER PAIR MECHANISM: Exact and approximate copiers and generated types – Peaucellier, Hart and Scott Russel – Grasshopper – Watt T. Chebicheff and Robert Mechanisms and straight line motion, Pantograph.

Conditions for correct steering – Davis Steering gear, Ackermans steering gear – velocity ratio; Hooke's Joint: Single and double – Universal coupling–application–problems.

UNIT – III

KINEMATICS: Velocity and acceleration – Motion of a link in machine – Determination of Velocity and acceleration diagrams – Graphical method – Application of relative velocity method four bar chain. Velocity and acceleration analysis of for a given mechanism, Kleins construction, Coriolis acceleration, determination of Coriolis component of acceleration.

Plane motion of body: Instantaneous centre of rotation, centroids and axodes – relative motion between two bodies – Three centres in line theorem – Graphical determination of instantaneous centre, diagrams for simple mechanisms and determination of angular velocity of points and links.

UNIT – IV

CAMS Definitions of cam and followers – their uses – Types of followers and cams – Terminology –Types of follower motion: Uniform velocity, Simple harmonic motion and uniform acceleration and retardation. Maximum velocity and maximum acceleration during outward and return strokes in the above 3 cases.

Analysis of motion of followers: Roller follower – circular cam with straight, concave and convex flanks.

UNIT – V

GEARS

Higher pairs, friction wheels and toothed gears–types – law of gearing, condition for constant velocity ratio for transmission of motion, Form of teeth: cycloidal and involute profiles. Velocity of sliding – phenomena of interferences – Methods of interference. Condition for minimum number of teeth to avoid interference, expressions for arc of contact and path of contact – Introduction to Helical, Bevel and worm gearing.

Introduction to gear Trains, Train value, Types – Simple and reverted wheel train – Epicyclic gear Train. Methods of finding train value or velocity ratio – Epicyclic gear trains. Selection of gear box-Differential gear for an automobile.

Text Books:

1. Mechanism and Machine Theory by Ashok G. Ambekar, PHI Publishers
2. Theory of Machines – S. S Rattan- TMH
3. Theory of machines and Mechanisms – J.J Uicker, G.R.Pennock & J.E.Shigley - Oxford publishers.

References Books:

1. Theory of Machines Sadhu Singh, Pearsons Edn
2. Theory of machines and Machinery /Vickers /Oxford .
3. Theory of Machines by Thomas Bevan/ CBS
4. Kinematics of Machinery through Hyper Works – J.S. Rao – Springer Publ
5. Theory of Mechanisms and machines – A.Ghosh & A.K.Malik – East West Press Pvt. Ltd.

Course Outcomes:

Upon successful completion of the course, the students will be able to

1. Understand the basic concepts of different mechanisms and their inversions.
2. Understand and analyze mechanisms like straight line motion mechanisms and steering mechanisms and Hooke's joint.
3. Perform kinematic analysis of any given simple mechanisms.
4. Design cam profiles based on the prescribed follower motion and perform kinematic analysis on cams with specified contours.
5. To understand the power transmission through different types of gears including gear profiles and its efficiency
6. Get acquainted with gear terminology, distinguish gears & perform kinematic analysis of gears & gear trains.

MANAGERIAL ECONOMICS & FINANCIAL ANALYSIS**Internal Marks: 30****External Marks: 70****Course Objectives:**

- To understand the concept and nature of Managerial Economics and its relationship with other disciplines, Concept of Demand and Demand forecasting
- To understand the concept of Production function, Input Output relationship, different Cost Concepts and Concept of Cost-Volume-Profit Analysis
- To understand the Nature of Competition, Characteristics of Pricing in the different market structure and significance of various pricing methods.
- To know the different forms of Business organization and their Merits and Demerits both public & private Enterprises and the concepts of Business Cycles.
- To understand the different Accounting Systems preparation of Financial Statements and uses of different tools for performance evaluation.
- To understand the concept of Capital, Capitalization, Capital Budgeting and to know the techniques used to evaluate Capital Budgeting proposals by using different meth

Unit – I**Introduction to Managerial Economics and demand Analysis:**

Definition of Managerial Economics and Scope-Managerial Economics and its relation with other subjects- Concepts of Demand-Types-Determents-Law of Demand its Exception-Elasticity of Demand-Types and Measurement- Demand forecasting and its Methods.

Unit – II**Production and Cost Analyses:**

Production function-Isoquants and Isocosts-Law of Variable proportions- Cobb-Douglas Production function-Economics of Sale-Cost Concepts- Opportunity Cost-Fixed vs Variable Costs-Explicit Costs vs Implicit Costs- Out of Pocket Costs vs Imputed Costs-Cost Volume Profit analysis- Determination of Break-Even Point (Simple Problem).

Unit – III**Introduction to Markets, Theories of the Firm & Pricing Policies:**

Market Structures: Perfect Competition, Monopoly and Monopolistic and Oligopoly – Features – Price, Output Determination – Managerial Theories of firm: Maris and Williamson's models – Methods of Pricing: Limit Pricing, Market Skimming Pricing.

Unit – IV

Types of Business Organization and Business Cycles:

Features and Evaluation of Sole Trader – Partnership – Joint Stock Company – State/Public Enterprises and their forms – Business Cycles – Meaning and Features – Phases of Business Cycle.

Unit – V

Introduction to Accounting & Financing Analysis:

Introduction to Double Entry Systems – Preparation of Financial Statements- Analysis and Interpretation of Financial Statements-Ratio Analysis – Preparation of Funds flow cash flow statements (Simple Problems)

Capital and Capital Budgeting: Capital Budgeting: Meaning of Capital- Capitalization-Meaning of Capital Budgeting-Need for Capital Budgeting- Techniques of Capital Budgeting-Traditional and Modern Methods.

Text Books:

1. Dr. N. Appa Rao, Dr. P. Vijay Kumar: ‘Managerial Economics and Financial Analysis’, Cengage Publications, New Delhi – 2011. 104
2. Dr. A. R. Aryasri – Managerial Economics and Financial Analysis, TMH 2011.
3. Prof. J.V.Prabhakara Rao, Prof. P. Venkatarao. ‘Managerial Economics and Financial Analysis’, Ravindra Publication.

References Books:

1. V. Maheswari : Managerial Economics, Sultan Chand.
2. Suma Damodaran : Managerial Economics, Oxford 2011.
3. Dr. B. Kuberudu and Dr. T. V. Ramana : Managerial Economics & Financial Analysis, Himalaya Publishing House 2011.
4. Vanitha Agarwal : Managerial Economics, Pearson Publications 2011.
5. Sanjay Dhameja : Financial Accounting for Managers, Pearson.
6. Maheswari : Financial Accounting, Vikas Publications.
7. S. A. Siddiqui & A. S. Siddiqui : Managerial Economics and Financial Analysis, New Age International Publishers, 2012

Course Outcomes:

Upon successful completion of the course, the students will be able to

1. Learn the knowledge of estimating the Demand for a product and the relationship between Price and Demand
2. understand the Cost Concepts for decision making and to estimate the least cost combination of inputs

3. understand the nature of different markets and Price Output determination under various market conditions
4. Learn the knowledge of different Business Units
5. Learn Financial Statements and the usage of various Accounting tools for Analysis
6. Learn various investment project proposals with the help of capital budgeting techniques for decision making

FLUID MECHANICS & HYDRAULIC MACHINERY LAB**Internal Marks: 20**
External Marks: 30**Course Objective:**

To impart practical exposure on the performance evaluation methods of various flow measuring equipment and hydraulic turbines and pumps.

1. Impact of jets on Vanes.
2. Performance Test on Pelton Wheel.
3. Performance Test on Francis Turbine.
4. Performance Test on Kaplan Turbine.
5. Performance Test on Single Stage Centrifugal Pump.
6. Performance Test on Multi Stage Centrifugal Pump.
7. Performance Test on Reciprocating Pump.
8. Calibration of Venturimeter.
9. Calibration of Orifice meter.
10. Determination of friction factor for a given pipe line.
11. Determination of loss of head due to sudden contraction in a pipeline.
12. Turbine flow meter.

Course Outcomes:

Upon successful completion of the course, the students will be able to

1. Measure the fluid flow using different flow measuring devices
2. Conduct a performance test on turbo machines at different operating conditions.

Note: Minimum 12 experiments of duration 3 periods each must be completed for the eligibility to appear for the semester end examinations.

In case if the student fails to get eligibility for semester end exams in the current semester, he has to take the permission of HOD and complete the required number of experiments and appear for semester end exam as and when conducted.

THERMAL ENGINEERING LAB**Internal Marks: 20**
External Marks: 30**Course Objective:**

- To study experimentally the performance of IC engines, compressors, refrigeration and air conditioning systems.

List of Experiments

1. I.C. Engines valve / port timing diagrams.
2. Testing of Fuels – Viscosity, flash point/fire point, carbon residue, calorific value.
3. I.C. Engines performance test and Exhaust emission measurements (4 -stroke diesel engine)
4. I.C. Engines performance test and Exhaust emission measurements (2-stroke petrol engine)
5. Evaluation of engine friction by conducting Morse test on 4-stroke multi cylinder petrol engine.
6. Determination of FP by retardation and motoring test on IC engine.
7. I.C. Engines heat balance at different loads and show the heat distribution curve.
8. Economical speed test of an IC engine.
9. Performance test on variable compression ratio engines.
10. Performance test on reciprocating air compressor unit.
11. Dis-assembly / assembly of different parts of two wheelers. 3 wheelers & 4 wheelers. Tractor & Heavy duty engines covering 2-stroke and 4 stroke, SI and CI engines.
12. Study of boilers, mountings and accessories.

Course Outcomes:

Upon successful completion of the course, the students will be able to

1. Conduct various performance tests on I.C engines and plot the performance characteristic curves
2. Conduct the load test and evaluate the performance of a reciprocating air compressor
3. Conduct a performance test on refrigeration and air conditioning test rigs and determine the C.O.P for the given conditions.

Note: Minimum 12 experiments of duration 3 periods each must be completed for the eligibility to appear for the semester end examinations.

In case if the student fails to get eligibility for semester end exams in the current semester, he has to take the permission of HOD and complete the required number of experiments and appear for semester end exam as and when conducted.

MACHINE TOOLS LAB**Internal Marks: 20**
External Marks: 30**Course Objectives:**

- To impart hands-on practical exposure on manufacturing processes and equipment.
 - The students are required to understand the parts of various machine tools and operate them. They are required to understand the different shapes of products that can be produced on these machine tools.
1. Step turning on **Lathe Machine**
 2. Taper turning on **Lathe Machine**
 3. Thread cutting on **Lathe Machine**
 4. Knurling on **Lathe Machine**
 5. **Drilling** on a plate
 6. Tapping operation
 7. Producing grooves on **shaping machine**
 8. Producing keys on **shaping machine**
 9. Producing internal or external grooves & keys on **Slotting machine**
 10. **Planing** at an angle and machining dovetails
 11. Gear making on the round bar on **milling machine**
 12. Cylindrical surface grinding, Tool angles on **Grinding machine**

Course outcomes:

Upon successful completion of the course, the students will be able to

1. Learn produce different parts from various manufacturing processes.
2. Learn operate different machine tools with understanding of work holders and operating principles to produce different part features to the desired quality

Note: Minimum 12 experiments of duration 3 periods each must be completed for the eligibility to appear for the semester end examinations.

In case if the student fails to get eligibility for semester end exams in the current semester, he has to take the permission of HOD and complete the required number of experiments and appear for semester end exam as and when conducted.

PROFESSIONAL ETHICS AND HUMAN VALUES**Course Objectives:**

- Overall understanding of professional ethics
- Basic understanding of human values
- To maintain ethical conduct and discharge their professional duties
- To inculcate Human values to grow as a responsible human beings with proper personality

UNIT – I

Human Values: Morals, Values and Ethics – Integrity –Trustworthiness - Work Ethics – Service Learning – Civic Virtue – Respect for others – Living Peacefully – Caring – Sharing – Honesty – Courage – Value Time – Co-operation – Commitment – Empathy – Self confidence – Spirituality-Character.

Principles for Harmony: Truthfulness – Customs and Traditions -Value Education – Human Dignity – Human Rights – Fundamental Duties - Aspirations and Harmony (I, We & Nature) – Gender Bias - Emotional Intelligence – Salovey – Mayer Model – Emotional Competencies – Conscientiousness.

UNIT – II

Engineering Ethics and Social Experimentation: History of Ethics - Need of Engineering Ethics - Senses of Engineering Ethics- Profession and Professionalism —Self Interest - Moral Autonomy – Utilitarianism – Virtue Theory - Uses of Ethical Theories - Deontology- Types of Inquiry –Kohlberg’s Theory - Gilligan’s Argument –Heinz’s Dilemma - Comparison with Standard Experiments — Learning from the Past –Engineers as Managers – Consultants and Leaders – Balanced Outlook on Law - Role of Codes – Codes and Experimental Nature of Engineering.

UNIT – III

Engineers’ Responsibilities towards Safety and Risk: Concept of Safety - Safety and Risk – Types of Risks – Voluntary v/sInvoluntary Risk – Consequences - Risk Assessment – Accountability – Liability - Reversible Effects - Threshold Levels of Risk - Delayed v/sImmediate Risk - Safety and the Engineer – Designing for Safety – Risk-Benefit Analysis-Accidents.

UNIT – IV

Engineers’ Duties and Rights: Concept of Duty - Professional Duties – Collegiality - Techniques for Achieving Collegiality – Senses of Loyalty - Consensus and Controversy - Professional and Individual

Rights – Confidential and Proprietary Information - Conflict of Interest-Ethical egoism - Collective Bargaining – Confidentiality - Gifts and Bribes - Problem solving- Occupational Crimes Industrial Espionage- Price Fixing-Whistle Blowing

UNIT – V

Global Issues: Globalization and MNCs – Cross Culture Issues - Business Ethics – Media Ethics - Environmental Ethics – Endangering Lives - Bio Ethics - Computer Ethics - War Ethics – Research Ethics - Intellectual Property Rights.

Text Books:

1. Professional Ethics, R. Subramaniam – Oxford Publications, New Delhi.
2. Ethics in Engineering, Mike W. Martin and Roland Schinzinger - Tata McGraw-Hill – 2003.
3. Professional Ethics and Morals, A. R. Aryasri, Dharanikota Suyodhana - Maruthi Publications.
4. Engineering Ethics, Harris, Pritchard and Rabins, Cengage Learning, New Delhi.
5. Human Values & Professional Ethics, S. B. Gogate, Vikas Publishing House Pvt. Ltd., Noida.

References Books:

1. Engineering Ethics & Human Values, M. Govindarajan, S. Natarajan and V. S. SenthilKumar-PHI Learning Pvt. Ltd – 2009.
2. Professional Ethics and Human Values, A. Alavudeen, R.Kalil Rahman and M. Jayakumaran – University Science Press.
3. Professional Ethics and Human Values, D. R. Kiran-Tata McGraw-Hill - 2013
4. Human Values and Professional Ethics, Jayshree Suresh and B. S. Raghavan, S.Chand Publications

Course Outcomes:

Upon successful completion of the course, the students will be able to

1. Identify the essentials of human values and skills.
2. Facilitate a correct understanding between profession and happiness
3. Understand variety of issues that are encountered by every professional in discharging professional duties.
4. Understand practically the importance of trust, mutually satisfying human behavior and enriching interaction with nature.
5. Develop appropriate technologies and management patterns to create harmony in professional and personal life.
6. Provide the student the sensitivity and global outlook in the contemporary world to fulfill the professional obligations effectively.

SOCIALLY RELAVANT MINI PROJECT

Internal Marks: 20

End semester Marks: 30

External Marks: 0

Guidelines to be followed:

7. Batch formation : Max 3 per batch
8. A 10 page report to be submitted at the end of semester.
9. Project may be design based/fabrication based/experimental or testing based.
10. Simulation or analysis works will be permitted with prior permission of Head of the Department
11. Project should have novelty and address real life problems.

Evaluation:

All the students of each batch should present a demonstration in front of evaluation committee constituted by the Head of the department.