KITS KKR & KSR INSTITUTE OF TECHNOLOGY & SCIENCES

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Vinjanampadu, Guntur, Andhra Pradesh. INDIA -522 017.
(AUTONOMOUS) R20

DEPARTMENT OF MECHANICAL ENGINEERING
SEMESTER-I

S. No.	Course Code	Course Title	L	T	P	C	IM	EM	TM
1	20SH1T05	Engineering chemistry	3	0	0	3	30	70	100
2	20SH1T06	Differential Equations	3	0	0	3	30	70	100
3	20CS1T01	Problem Solving and Programming Using C	3	0	0	3	30	70	100
4	20ME1T01	Engineering Graphics	1	0	4	3	30	70	100
5	20EE1T02	Basics of Electrical and Electronics Engineering	3	0	0	3	30	70	100
6	20SH1L01	Engineering Chemistry Lab	0	0	3	1.5	15	35	50
7	20CS1L01	Problem Solving and Programming Using C Lab	0	0	3	1.5	15	35	50
8	20CS1L02	IT Workshop	0	0	3	1.5	15	35	50
		Total				19.5	195	455	650

Category	CREDITS
Basic Science Courses	7.5
Engineering Science Courses	12
TOTAL CREDITS	**19.5**

SEMESTER-II

S. No.	Course Code	Course Title	L	T	P	C	IM	EM	TM
1	20SH2T01	Communicative English	3	0	0	3	30	70	100
2	20SH2T03	Engineering Physics	3	0	0	3	30	70	100
3	20SH2T07	Linear Algebra and Vector Calculus	3	0	0	3	30	70	100
4	20ME2W01	Engineering Workshop	1	0	4	3	30	70	100
5	20ME2T03	Engineering Mechanics	3	0	0	3	30	70	100
6	20SH2L01	Communicative English Skills Lab	0	0	3	1.5	15	35	50
7	20SH2L03	Engineering Physics Lab	0	0	3	1.5	15	35	50
8	20CE2L01	Computer Aided Drawing Lab	0	0	3	1.5	15	35	50
9	20GE2M01	Environmental Science	2	0	0	0	_	_	_
		Total				19.5	195	485	650

III SEMESTER

S. No.	Course Code	Course Title	L	T	P	C	IM	EM	TM
1	20SH3T03	Numerical Methods and Laplace Transformations	3	0	0	3	30	70	100
2	20ME3T01	Mechanics of Solids	3	0	0	3	30	70	100
3	20ME3T02	Material Science & Metallurgy	3	0	0	3	30	70	100
4	20ME3T03	Manufacturing Processes	3	0	0	3	30	70	100
5	20ME3T04	Thermodynamics	3	0	0	3	30	70	100
6	20ME3L01	Solid Mechanics and Metallurgy Lab	0	0	3	1.5	15	35	50
7	20ME3L02	Manufacturing Processes Lab	0	0	3	1.5	15	35	50
8	20ME3L03	Computer Aided Machine Drawing	0	0	3	1.5	15	35	50
9	20ME3S01	Skill Oriented Course (Welding Certification Course)	1	0	2	2	–	50	50
10	20GE3M03	Essence of Indian Traditional Knowledge	2	0	0	0	–	–	–
		Total				**21.5**	**195**	**505**	**700**

Category	CREDITS
Basic Science Course	**3**
Professional Core courses	**16.5**
Skill Oriented Course	**2**
TOTAL CREDITS	**21.5**

DEPARTMENT OF MECHANICAL ENGINEERING
IV SEMESTER

S.No	Course Code	Course Title	L	T	P	C	IM	EM	TM
1	20ME4T01	Manufacturing Technology	3	0	0	3	30	70	100
2	20ME4T02	Applied Thermodynamics	3	0	0	3	30	70	100
3	20ME4T03	Kinematics of Machinery	3	0	0	3	30	70	100
4	20ME4T04	Fluid Mechanics & Hydraulic Machines	3	0	0	3	30	70	100
5	20SH40T1	Managerial Economics And Financial Accountancy	3	0	0	3	30	70	100
6	20ME4L01	Thermal Engineering Lab	0	0	3	1.5	15	35	50
7	20ME4L02	Machine Tools Lab	0	0	3	1.5	15	35	50
8	20ME4L03	Fluid Mechanics & Hydraulic Machines Lab	0	0	3	1.5	15	35	50
9	20ME4S01	Skill Oriented Course (Certification Course on Modeling)	1	0	2	2	–	50	50
		Total				**21.5**	**195**	**505**	**700**

Category	CREDITS
Professional Core courses	**12**
Engineering Science Course	**4.5**
Humanities and Social Sciences including Management	**3**
Skill Oriented Course	**2**
TOTAL CREDITS	**21.5**

SUMMER INTERNSHIP

Mandatory during summer vacation after second year (to be evaluated during V semester)

(INTER SEMESTER)

Programme: Common to CE & ME		Semester: I			
Course Code	Course Name	L	T	P	C
20SH1T05	**ENGINEERING CHEMISTRY**	4	1	3	3
Subject Category : Basic Science Course					

COURSE OUTCOMES:

After successful completion of this course, students should be able to

CO1 : Understand the importance of plastics and composites in various fields.

CO2 : Apply corrosion control methods to protect metals.

CO3 : Illustrate commonly used engineering materials.

CO4 : Understand the problems related to impure water and apply methods to avoid them.

CO5 : Understand the use of conventional and non-conventional energy sources

SYLLABUS

UNIT-I : POLYMER TECHNOLOGY

Polymerisation:- Introduction-methods of polymerization (emulsion and suspension)-physical and mechanical properties.
Plastics: Compounding-fabrication (compression, injection, blown film, extrusion) - preparation, properties and applications of PVC, polycarbonates and Bakelite-mention some examples of plastic materials used in electronic gadgets, recycling of e-plastic waste.
Elastomers: - Natural rubber-drawbacks-vulcanization-preparation, properties and applications of synthetic rubbers (Buna S, thiokol and polyurethanes).
Composite materials: Fiber reinforced plastics-conducting polymers-biodegradable polymers.

Learning Outcomes: At the end of this unit, the students will be able to
outline the properties of polymers and various additives added and different methods of forming plastic materials.
Explain the preparation, properties and applications of some plastic materials.
Interpret the mechanism of conduction in conducting polymers .
Discuss natural and synthetic rubbers and their applications.

UNIT-II : ANALYTICAL TECHNIQUES AND CORROSION

PART A: ANALYTICAL TECHNIQUES

Conductometric titrations – titrations between strong acid and strong base, strong acid and weak base.
Potentiometric titrations (redox titrations).
Complexometric titrations using EDTA

PART B: CORROSION

Definition-theories of corrosion (chemical and electrochemical)-galvanic corrosion, differential aeration corrosion, stress corrosion, waterline corrosion-passivity of metals-galvanic series -factors influencing rate of corrosion-corrosion control (proper designing, cathodic protection)-Protective coatings: Surface preparation, cathodic and anodic coatings, electroplating, electroless plating (nickel). Paints (constituents, functions, special paints).
Learning Outcomes: At the end of this unit, the students will be able to
understand the principles of different analytical instruments.
explain the different applications of analytical instruments.
Categorize the reasons for corrosion and study some methods of corrosion control

UNIT III: CHEMISTRY OF MATERIALS

PART- A: **NANO MATERIALS**:- Introduction- sol-gel method-characterization by BET , Chemical reduction and TEM methods , applications of graphene-carbon nanotubes and fullerenes:Types, preparation and applications.
LUBRICANTS: - Definition, mechanism of lubricants and properties (definition and importance).

PART-B: REFRACTORIES: - Definition, classification, properties (refractoriness, refractoriness under load, porosity and thermal spalling), failure of refractories.
CEMENT: - Constituents, manufacturing, parameters to characterize the clinker formation: lime saturation factor (LSF), silica ratio (SR) and alumina ratio (AR), chemistry of setting and hardening, deterioration of cement.

Learning Outcomes: At the end of this unit, the students will be able to
Outline the awareness of materials like nanomaterials and fullerenes and their uses.
Explain the techniques that detect and measure changes of state of reaction.
Illustrate the commonly used industrial materials

UNIT IV: WATER TECHNOLOGY

Hardness of water-determination of hardness by complexometric method-boiler troubles (priming and foaming, scale formation, boiler corrosion, caustic embrittlement)-internal treatments-softening of hard water (zeolite processs and related sums, ion exchange process)-treatment of industrial waste water Potable water and its specifications-steps involved in purification of water-chlorination, break point chlorination-reverse osmosis and electro dialysis.

Learning Outcomes: At the end of this unit, the students will be able to
Explain the impurities present in raw water, problems associated with them and how to avoid them are understood.

UNIT V: ENERGIES (CONVENTIONAL & NON CONVENTIONAL ENERGY

SOURCES)

PART A: CONVENTIONAL SOURCES OF ENERGY

FUELS- Introduction-calorific value-HCV and LCV-problems using Dulong's formula-proximate and ultimate analysis of coal sample-significance of these analyses-problems-Petroleum -cracking-Synthetic petrol (Fischer Tropsch and Bergius)- Bio-diesel- Natural gas, LPG, CNG

PART B: NON CONVENTIONAL ENERGY SOURCES

Design, working, schematic diagram, advantages and disadvantages of photovoltaic cell, hydropower, geothermal power, ocean thermal energy conversion, tidal and wave power.

Learning Outcomes: At the end of this unit, the students will be able to
Differentiate petroleum, petrol, synthetic petrol and have knowledge how they are produced.
Study alternate fuels
Generation of power by different natural sources.

TEXT BOOKS:
1.   Engineering Chemistry by Jain and Jain; Dhanpat Rai Publicating Co.

REFERENCE BOOKS:
1.   Engineering Chemistry by Shikha Agarwal; Cambridge University Press, 2019 edition.
2.   Engineering Chemistry by Bharathi kumari Yelamanchili, VGS series.

Programme: CE, ME, CSE, CSE(A.I), CSE(D.S) Semester : I And EEE , ECE , IT Semester : II					
Course Code **20SH1T06**	Course Name	L	T	P	C
	Differential Equations	3	0	0	3
Subject Category : : Basic Science Course					

Course Outcomes:

At the end of the Course, Student will be able to:

CO1 : Solve the differential equations and apply differential equations related to various engineering fields

CO2 : Solve linear differential equations of second and higher order

CO3 : Calculate Jacobian, maxima and minima of functions of two Variables.

CO4 Solve first order partial differential equations

CO5 : Solve the higher order partial differential equations

UNIT I: Differential equations of first order and first degree: (12)

Linear differential equations – Bernoulli equations – Exact equations and equations reducible to exact form.

Applications: Newton's Law of cooling - Law of natural growth and decay - Orthogonal trajectories.

UNIT II: Linear differential equations of higher order: (12)

Non-homogeneous equations of higher order with constant coefficients with RHS term of the type e^{ax}, sin ax, cos ax, polynomials in x, e^{ax} V(x), xnV(x)- Method of Variation of parameters.

Applications: L-R circuit, C-R circuit and L-C-R circuit.

UNIT III: Differential Calculus : (12)

Taylors and Mc Laurent's series for one & two variables – Functional dependence – Jacobian.

Applications: Maxima and Minima of functions of two variables with constraints and without constraints.

UNIT IV: First order Partial differential equations: (14)

Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions – solutions of first order linear (Lagrange) equation and nonlinear (standard type) equations

UNIT V: Higher order Partial differential equations: (10)

Solutions of Linear Partial differential equations with constant coefficients – RHS terms of the type eax+by , sin(ax+by), cos(ax+by), xmyn and Method of separation of Variables.

Text Books:

1. **B. S. Grewal,** Higher Engineering Mathematics, 43rd Edition, Khanna Publishers.

2. B. V. Ramana, Higher Engineering Mathematics, 2007 Edition, Tata Mc. Graw Hill Education.

Reference Books:

1. **Erwin Kreyszig,** Advanced Engineering Mathematics, 9th Edition, Wiley-India.

2. **Dass H.K., Rajnish Verma. Er.,** Higher Engineering Mathematics, S. Chand Co. Pvt. Ltd, Delhi.

3. Peter O'Neil, Advanced Engineering Mathematics, Cengage.

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(AUTONOMOUS) R20
DEPARTMENT OF MECHANICAL ENGINEERING

Program		Semester: I			
Course Code	Course Name	L	T	P	C
20CS1T01	**Problem Solving and Programming Using C**	3	0	0	3

COURSE OUTCOMES:

At the end of the Course, the student will be able to

CO1   :   Build algorithms and to draw flowcharts for solving problems

CO2   :   Convert flowcharts/algorithms to C Programs, compile and debug programs

CO3   :   Use different operators, data types and write programs that use two-way/ multi-way selection

CO4   :   Select the best loop construct for a given problem

CO5   :   Design and implement programs to analyze the different pointer applications

CO6   :   Decompose a problem into functions and to develop modular reusable code

SYLLABUS:

UNIT-I   :

Introduction to Computers: Creating and running Programs, Computer Numbering System, Storing Integers, Storing Real Numbers.

Introduction to the C Language: Background, C Programs, Identifiers, Types, Variable, Constants, Input/output, Programming Examples, Type Qualifiers.

Structure of a C Program: Expressions Precedence and Associativity, Side Effects, Evaluating Expressions, Type Conversion Statements, Simple Programs.

UNIT-II   :

Bitwise Operators: Exact Size Integer Types, Logical, Bitwise Operators, Shift Operators.

Selection & Making Decisions: Logical Data and Operators, Two Way Selection, Multiway Selection, More Standard Functions.

Repetition: Concept of Loop, Pretest and Post-test Loops, Initialization and Updating, Event and Counter Controlled Loops, Loops in C, Other Statements Related to Looping, Looping Applications, Programming Examples.

UNIT-III   :

10

Arrays: Concepts, Using Array in C, Array Application, Two Dimensional Arrays, Multidimensional Arrays, Programming Example- Calculate Averages

Strings: String Concepts, C String, String Input / Output Functions, Arrays of Strings, String Manipulation Functions String/ Data Conversion, A Programming Example- Morse Code

Enumerated, Structure, and Union: The Type Definition (Type def), Enumerated Types, Structure, Unions, and Programming Application.

UNIT-IV   :

Pointers: Introduction, Pointers to pointers, Compatibility, L value and R value

Pointer Applications: Arrays, and Pointers, Pointer Arithmetic and Arrays, Memory Allocation Function, Array of Pointers, Programming Application.

Processor Commands: Processor Commands.

UNIT-V   :

Functions: Designing, Structured Programs, Function in C, User Defined Functions, Inter-Function Communication, Standard Functions, Storage Classes, Scope, life time, Passing Array to Functions, Passing Pointers to Functions, Command Line Arguments, Recursion

Text Input / Output: Files, Streams, Standard Library Input / Output Functions, Formatting Input / Output Functions, Character Input / Output Functions

Binary Input / Output: Text versus Binary Streams, Standard Library, Functions for Files, Converting File Type.

TEXT BOOKS:

1. Programming for Problem Solving, Behrouz A. Forouzan, Richard F.Gilberg, CENGAGE.
2. The C Programming Language, Brian W.Kernighan, Dennis M. Ritchie, 2e, Pearson.

REFERENCE BOOKS:

1. Computer Fundamentals and Programming, Sumithabha Das, Mc Graw Hill.
2. Programming in C, Ashok N. Kamthane, Amit Kamthane, Pearson.
3. Computer Fundamentals and Programming in C, Pradip Dey, Manas Ghosh, OXFORD.

E-Resources:

1. https://www.tutorialspoint.com/cprogramming/index.htm
2. https://www.programiz.com/c-programming
3. https://www.javatpoint.com/c-programming-language-tutorial

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DEPARTMENT OF MECHANICAL ENGINEERING

Programme: Common to all branches [CSE, ME and CE(SEM-I) & ECE, EEE, and IT (SEM-II)					
Course Code	Course Name	L	T	P	C
20ME1T01	**ENGINEERING GRAPHICS**	1	0	4	3
Subject Category : Engineering Science Course					

COURSE OBJECTIVE To make students understand the conventions of engineering drawing and interpret engineering drawings.

COURSE OUTCOMES:

At the end of the Course student will be able to:

CO1 To illustrate the fundamental Engineering Drawing Standards and discuss about conics and scales.

CO2 Ability to draw the projection of points and straight lines.

CO3 Ability to draw the projection of planes

CO4 Understand the classification of solids and draw the projection of solids.

CO5 Ability to draw isometric and orthographic projections.

COURSE CONTENT

UNIT-I

Introduction to Engineering graphics: Conventions in drawing-lettering - BIS conventions.

Polygons: Constructing regular Polygon by general methods

Curves: Conic sections in general method and Cycloid, Involutes tangent and normal for the curves

 Scales: Plain scales, Diagonal scales and vernier scale

UNIT-II

Introduction to Orthographic Projections; Projections of Points in various quadrants, Projections of Straight Lines parallel to both planes Projections of Straight Lines-Parallel to one and inclined to other plane

Projections of Straight Lines inclined to both planes, determination of true lengths, angle of inclinations and traces

UNIT-III

Projections of Planes

Regular Planes Perpendicular / parallel to one Reference Plane and inclined to other Reference Plane, Planes inclined to both the Reference Planes.

UNIT-IV

Projections of solids: Projections of Prisms, Cylinders, with the axis inclined to one Reference Plane. Projections of Pyramids and Cones with the axis inclined to one Reference Plane

UNIT-V

Conversion of isometric views to orthographic views. Conversion of orthographic views to isometric views.

TEXT BOOKS

1. Elementary Engineering Drawing By N.D.Bhatt, Charotar Publishing House
2. Engineering Drawing, Agarwal & Agarwal, Tata McGraw Hill Publishers.
3. Engineering Drawing, K.L.Narayana& P. Kannaiah, Scitech Publishers.

REFERENCE BOOKS

1. A Text Book of Engineering Graphics By P.J.Shah S.Chand & Company Ltd., New Delhi
2. Engineering Graphics I and II By Arunoday Kumar Tech Max Publication, Pune
3. A text book of Engineering Drawing By P.S.Gill S.K.Kataria & sons, Delhi

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DEPARTMENT OF MECHANICAL ENGINEERING

Programme: Common to CSE,CAI,CSD,IT,ECE,EEE,ME, & CE		Semester: I			
Course Code	Course Name	L	T	P	C
20EE1T02	**Basic of Electrical and Electronics Engineering**	3	0	0	3
Subject Category : ESC					

COURSE OUTCOMES:

CO1   : Recognize the fundamentals of solar energy, simple DC and AC circuits.

CO2   : Demonstrate the construction, working principles and operating characteristics of DC machines and transformer

CO3   : Demonstrate the construction, working principles and operating characteristics of AC rotating machines.

CO4   : Demonstrate the working principles and operations of diode rectifiers and transistors

CO5   : Comprehend the concept of working principles and operations of operational amplifiers and CRO.

UNIT-I :DC & AC Fundamentals

Electrical Circuit Elements (R, L and C)-Voltage and Current Sources - Ohms Laws - Kirchoff's Laws - Series-Parallel- Series and Parallel Combination (Only Resistances)-Problems in Simple Circuits with DC Excitation - Representation of Sinusoidal Waveforms - Cycle, Time Period, Frequency, Instantaneous Value, Peak, Average and RMS Values- Phase Angle, Power Factor, Real Power, Reactive Power and Apparent Power (Definition and Simple Problems).

UNIT-II:DC Machines & Transformers

DC Machines: Principle of Operation of DC Generator – EMF Equation – Types of DC Machine – Torque Equation of DC Motor – Applications – Three-Point Starter, Speed Control Methods – OCC Of DC Generator Transformers: Principle of Operation of Single-Phase Transformers – EMF Equation – Losses – Efficiency and Regulation.

UNIT-III : AC Rotating Machines

Principle of Operation of Alternators – Regulation by Synchronous Impedance Method – Principle of Operation Of 3- Phase Induction Motor – Slip-Torque Characteristics - Efficiency – Applications.

UNIT-IV : Rectifiers and Transistors & Concept of uninterrupted power supply (UPS)

PN Junction Diodes – Diode Applications (Half, Full Wave and Bridge Rectifiers) - Zener Diode- Applications (Voltage Regulator) – LED - Photo Diode – SCR- UJT (Principle of Operation)- BJT FET (Types & Principle of Operation)- Concept of UPS-Introduction-Types-Block diagram- applications-Advantages

UNIT-V : Operational Amplifiers and CRO.

Characteristics of Operation Amplifiers (OP-AMP) – Application Of OP-Amps (Inverting, Non- Inverting, Integrator & Differentiator)- Simple Problems on Operation Amplifiers - Cathode Ray Oscilloscope –Construction and Operation.

TEXT BOOKS:

1. D.P. Kothari and I.J. Nagrath, Basic Electrical Engineering, 4th ed., Tata McGraw-Hill,2019.
2. J. Millman, C. Halkias, Electronic Devices and Circuits, 2nd ed., Tata Mc-Graw-Hill,2008
3. D. Roy Choudhury and Shail B. Jain, Linear Integrated Circuits, 2nd ed., New AgeInternational (p) Ltd, 2004.

REFERENCE BOOKS:

1. P. V. Prasad, S. Sivanagaraju, K. R. Varmah, and Chikku Abraham, Basic ElectricalEngineering, 1st ed., Cengage India, 2018.
2. D.C. Kulshreshtha, Basic Electrical Engineering, 1st ed., Revised, Tata McGraw-Hill,2012.
3. V K Mehta & Rohit Mehta, Principles of Electrical Engineering and Electronics, 3rd ed.,S Chand Publishers, 2019.
4. S. Salivahanan, N. Suresh Kumar, Electronic Devices and Circuits, Tata Mc-Graw HillEducation, 2018.
5. S. Salivahanan, V.S. Kanchana Bhaaskaran, Linear Integrated Circuits, 3rd ed., McGraw-Hill Education, 2018

6. https://www.slideshare.net/GautamMishra5/ups-uninterrupted-power-supply.

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Programme: Common to all branches		Semester: I			
Course Code	Course Name	L	T	P	C
20SH1L01	**ENGINEERING CHEMISTRY LABORATORY**	0	0	3	2
Subject Category : Basic Science Course					

COURSE OUTCOMES:
After successful completion of this course, students should be able to

CO1 : Estimate unknown solutions by using volumetric titration method.

CO2 : Analyse the quality of water.

CO3 : Determine the p^H of liquid samples.

CO4 : Measure the strength of acids by conductometric and potentiometric titrations.

CO5 : Estimate the acid content in fruit juices and soft drinks.

LIST OF EXPERIMENTS
1.Introduction to Chemistry laboratory – Molarity, normality, primary, secondary standard solutions, volumetric titrations, quantitative analysis

2. Estimation of HCl using standard Na_2CO_3 solution.

3. Estimation of alkalinity of a sample containing Na_2CO_3 and NaOH.

4. Estimation of total hardness of water using standard EDTA solution.

5. Estimation of copper using standard EDTA solution.

6. Estimation of zinc using standard EDTA solution.

7. Estimation of Ferrous iron using standard K_2Cr_2O7 solution.

8. Estimation of $KMnO_4$ using standard Oxalic acid solution.

9. Estimation of pH of the given sample solution using pH meter.

10. Conductometric Titrations between strong acid and strong base.

11. Conductometric Titrations between strong acid and Weak base.

12. Preparation of Bakelite.

13. Estimation of acid content in soft drinks.

14. Potentiometric Titrations between ferrous iron with potassium dichromate.

15. Estimation of copper (II) using standard hypo solution.

16. Estimation of iron (III) by colorimetric method.

 Of the above experiments atleast 10 assessment experiments should be completed in a semester.

Outcomes: The students entering into the professional course have practically very little exposure to lab classes. The experiments introduce volumetric analysis; redox titrations with different indicators; EDTA titrations; then they are exposed to a few instrumental methods of chemical analysis. Thus at the end of the lab course, the student is exposed to different methods of chemical analysis and use of some commonly employed instruments. They thus acquire some experimental skills.

 Reference Books
1. A Textbook of Quantitative Analysis, Arthur J. Vogel.
2. Dr.Bharathi Kumari Yelamanchili - Laboratory Manual of Engineering Chemistry, VGS Techno Series

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DEPARTMENT OF MECHANICAL ENGINEERING

Program		Semester: I			
Course Code	Course Name	L	T	P	C
20CS1L01	**Problem Solving and Programming Using C Lab**	0	0	3	1.5

COURSE OUTCOMES:

After successful completion of this course, students will be able to

CO1   :   gains knowledge on various concepts of a C language

CO2   :   draw flowcharts and write algorithms.

CO3   :   design and development of C problem solving skills

CO4   :   design and develop modular programming skills.

CO5   :   trace and debug a program

LIST OF EXPERIMENTS:

Exercise 1:

1. Write a C program to print a block F using hash (#), where the F has a height of six characters and width of five and four characters.

2. Write a C program to compute the perimeter and area of a rectangle with a height of 7 inches and width of 5 inches.

3. Write a C program to display multiple variables.

Exercise 2:

1. Write a C program to calculate the distance between the two points.

2. Write a C program that accepts 4 integers p, q, r and s from the user where r and s are positive and p is even. If q is greater than r and s is greater than p and if the sum of r and s is greater than the sum of p and q print "Correct values", otherwise print "Wrong values".

Exercise 3:

1. Write a C program to convert a string to a long integer.

2. Write a program in C which is a Menu-Driven Program to compute the area of the various geometrical shape.

3. Write a C program to calculate the factorial of a given number.

Exercise 4:

1. Write a program in C to display the n terms of even natural number and their sum.

2. Write a program in C to display the n terms of harmonic series and their sum. $1 + 1/2 + 1/3 + 1/4 + 1/5 \ldots 1/n$ terms.

3. Write a C program to check whether a given number is an Armstrong number or not.

Exercise 5:

1. Write a program in C to print all unique elements in an array.

2. Write a program in C to separate odd and even integers in separate arrays.

3. Write a program in C to sort elements of array in ascending order.

Exercise 6:

1. Write a program in C for multiplication of two square Matrices.

2. Write a program in C to find transpose of a given matrix.

Exercise 7:

1. Write a program in C to search an element in a row wise and column wise sorted matrix.

2. Write a program in C to print individual characters of string in reverse order.

Exercise 8:

1. Write a program in C to compare two strings without using string library functions.

2. Write a program in C to copy one string to another string.

Exercise 9:

1. Write a C Program to Store Information Using Structures with Dynamically Memory Allocation

2. Write a program in C to demonstrate how to handle the pointers in the program.

Exercise 10:

1. Write a program in C to demonstrate the use of & (address of) and *(value at address) operator.

2. Write a program in C to add two numbers using pointers.

Exercise 11:

1. Write a program in C to add numbers using call by reference.

2. Write a program in C to find the largest element using Dynamic Memory Allocation.

Exercise 12:

1. Write a program in C to swap elements using call by reference.

2. Write a program in C to count the number of vowels and consonants in a string using a pointer.

Exercise 13:

1. Write a program in C to show how a function returning pointer.

2. Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using malloc () function.

Exercise 14:

1. Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using calloc () function. Understand the difference between the above two programs

2. Write a program in C to convert decimal number to binary number using the function.

Exercise 15:

1. Write a program in C to check whether a number is a prime number or not using the function.

2. Write a program in C to get the largest element of an array using the function.

Exercise 16:

1. Write a program in C to append multiple lines at the end of a text file.

2. Write a program in C to copy a file in another name.

3. Write a program in C to remove a file from the disk.

Program		Semester: I			
Course Code	Course Name	L	T	P	C
20CS2L02	IT Workshop	0	0	3	1.5

COURSE OUTCOMES:

After successful completion of this course, students will be able to

CO1 : Describe evolution of computers, storage devices, networking devices, transmission media and peripherals of a computer.

CO2 : Configure, evaluate and select hardware platforms for the implementation and execution of computer applications, services and systems

CO3 : Construct a fully functional virtual machine, Summarize various Linux operating system commands.

CO4 : Develop presentation, documents and small applications using productivity tools such as word processor, presentation tools, spreadsheets, HTML, LaTex.

LIST OF EXPERIMENTS

Computer Hardware:

Experiment 1: Identification of peripherals of a PC, Laptop, Server and Smart Phones:
Prepare a report containing the block diagram along with the configuration of each component and its functionality, Input/ Output devices, I/O ports and interfaces, main memory, cache memory and secondary storage technologies, digital storage basics, networking components and speeds.

Operating Systems:

Experiment 2: Virtual Machine setup:
- Setting up and configuring a new Virtual Machine
- Setting up and configuring an existing Virtual Machine
- Exporting and packaging an existing Virtual Machine into a portable format

Experiment 3: Operating System installation:
- Installing an Operating System such as Linux on Computer hardware.

Experiment 4: Linux Operating System Commands
- General command syntax, Basic help commands, Basic File system commands, Date and Time

- Basic Filters and Text processing, Basic File compression commands

- Miscellaneous: apt-get, vi editor

Networking and Internet

Experiment 5: Networking Commands

ping, ssh, ifconfig, scp, netstat, ipstat, nslookup, traceroute, telnet, host, ftp, arp.

Internet Services:

Experiment 6:

- Web Browser usage and advanced settings like LAN, proxy, content, privacy, security, cookies, extensions/ plugins

- Antivirus installation, configuring a firewall, blocking pop-ups

- Email creation and usage, Creating a Digital Profile on LinkedIn

Productivity Tools:

Office Tools

Experiment 7:

Demonstration and Practice on Text Editors like Notepad++, Sublime Text, Atom, Brackets, Visual code, etc

Experiment 8:

Demonstration and practice on Microsoft Word, Power Point

Experiment 9:

Demonstration and practice on Microsoft Excel.

Experiment 10:

Demonstration and practice on LaTeX and produce professional PDF documents.

Experiment 11:

Internet of Things (IoT): IoT fundamentals, applications, protocols, Architecture, IoT Devices communication models.

Introduction to HTML:

Experiment 12:

Understanding   HTML tags and creation of simple web pages.

Assignment: Develop your home page using HTML Consisting of your photo, name, address and education details as a table and your skill set as a list.

TEXT BOOKS:

1. Computer Fundamentals, Anita Goel, Pearson Education, 2017
2. PC Hardware Trouble Shooting Made Easy, TMH
3. Essential Computer and IT Fundamentals for Engineering and Science Students, Dr.N.B.Vekateswarlu, S.Chand.
4. HTML & CSS, The Complete Reference, Fifth Edition, Thomas A. powell
5. LaTeX Companion – Leslie Lamport, PHI/Pearson.

REFERENCE TEXT BOOKS:

1. B. Govindarajulu, "IBM PC and Clones Hardware Trouble shooting and Maintenance", 2nd edition, Tata McGraw-Hill, 2002.
2. "MOS study guide for word, Excel, Powerpoint& Outlook Exams", Joan Lambert, Joyce Cox, PHI.
3. "Introduction to Information Technology", ITL Education Solutions limited, Pearson Education.
4. Bigelows, "Trouble shooting, Maintaining& Repairing PCs", TMH.
5. Excel Functions and Formulas, Bernd held, Theodor Richardson, Third Edition

E-RESOURCES:

1. https://explorersposts.grc.nasa.gov/post631/20062007/computer_basics/ComputerPorts.doc
2. https://explorersposts.grc.nasa.gov/post631/2006-2007/bitsnbyte/Digital_Storage_Basics.doc
3. https://www.thegeekstuff.com/2009/07/linux-ls-command-examples
4. https://www.pcsuggest.com/basic-linux-commands/
5. https://www.vmware.com/pdf/VMwarePlayerManual10.pdf
6. https://gsuite.google.com/learning-center/products/#!/
7. https://www.raspberrypi.org

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(AUTONOMOUS) R20

DEPARTMENT OF MECHANICAL ENGINEERING

Programme: Common to all Programmes		Semester-II			
Course Code	Course Name	L	T	P	C
20SH2T01	**COMMUNICATIVE ENGLISH**	3	0	0	3
Subject Category : Humanities Course					

INTRODUCTION:

The course is designed to train students in receptive (listening and reading) as well as productive and interactive (speaking and writing) skills by incorporating a comprehensive, coherent and integrated approach that improves the learners' ability to effectively use English language in academic/ workplace contexts. The shift is from learning about the language to using the language. On successful completion of the compulsory English language course/s in B.Tech., learners would be confident of appearing for international language qualification/proficiency tests such as IELTS, TOEFL, or BEC, besides being able to express themselves clearly in speech and competently handle the writing tasks and verbal ability component of campus placement tests. Activity based teaching-learning methods would be adopted to ensure that learners would engage in actual use of language both in the classroom and laboratory sessions.

Course Objectives:

➢ Facilitate effective listening skills for better comprehension of academic lectures and English spoken by native speakers

➢ Focus on appropriate reading strategies for comprehension of various academic texts and authentic materials

➢ Help improve speaking skills through participation in activities such as role plays, discussions and structured talks/oral presentations

➢ Impart effective strategies for good writing and demonstrate the same in summarizing, writing well organized essays, record and report useful information

➢ Provide knowledge of grammatical structures and vocabulary and encourage their appropriate use in speech and writing.

COURSE OUTCOMES:

After successful completion of this course, students should be able to

CO1 : Recall life in one's past which had fine balancing act.

CO2 : Decide the qualities required to take up a promising career.
CO3 : Evaluate the obstacles hinder of student's progress and find the ways to overcome them.
CO4 : Explain the environment activism and empowerment of women.
CO5 : Interpret the efforts of successful persons to keep idealistic approach
in achieving goals.

SYLLABUS

UNIT-I: A Drawer full of happiness
Speaking: Asking and answering general questions on familiar topics such as home, family, work, Study and interests. Self introduction and introduce others.

Vocabulary: Technical vocabulary from a cross technical branches, GRE Vocabulary (Antonyms and Synonyms, Word applications).

Grammar: Content words and function words; word forms: verbs, nouns, adjectives and adverbs; nouns-
Countable and uncountable; singular and plural, basic sentence structures; simple question
form–'wh' questions; word order in sentences.

Writing : Note Making and Note Taking.

Employability Skills: Teamwork

UNIT-II: Nehru's letter to daughter Indira on her Birthday
Speaking: Discussion in pairs, small groups on specific topics followed by short structured talks.
Functional English: Greetings and leave takings.
.
Vocabulary: Technical vocabulary from across technical branches. GRE Vocabulary, Analogies
(Antonyms and Synonyms, Word applications)

Grammar: Use of articles and zero article; prepositions.

Writing : Resume, Cover Letter.

Employability Skills: Time Management

UNIT-III: Stephen Hawking-Positivity 'Benchmark'

Speaking: Discussing specific topics in pairs o r in small groups and reporting what is discussed.
Functional English: Complaining and Apologizing.

25

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

Vocabulary : Technical vocabulary from a cross technical branches,GREVocabulary(Antonyms and

Synonyms, Word applications) Association, sequencing of words- Grammar:Verbs–

Tenses; subject-verbagreement.

Writing   : Letter Writing: -Formal, Business, Editorial,Complaints, Applications, Permissions.

Employability Skills: Leadership skills.

UNITI-V: Like a Tree, Unbowed: Wangari Maathai-biography

Reading: Studying the use of graphic elements in texts to convey information, reveal trends / patterns /

relationships, communicative process or display complicated data.

Reading for Writing: Information transfer; describe, compare, contrast, identify significance/trends

based on information provided in figures/charts/graphs/tables.

Vocabulary: Technical vocabulary from across technical branches, GRE Vocabulary,(Antonyms and

Synonyms, Word applications) Cloze Encounters.

Writing   : Essay Writings: - Paragraph Writing, Precis Writing,

Employability Skills: Management skills.

UNIT-V: Stay Hungry-Stay Foolish

Reading: RAP Strategy Intensive reading and Extensive reading techniques.

Reading for Writing: Writing academic proposals- writing research articles: format and style.
Vocabulary: Technical vocabulary from across technical branches, GRE Vocabulary
        (Antonyms and Synonyms, Word applications) Coherence, matching emotions.

Grammar: Editing short texts–identifying and correcting common errors in grammar and usage (Articles, prepositions, tenses, subject verb agreement)

Writing   : E- Mail, Reports, Reporting to media.

Employability Skills: Creative Thinking.

TEXTBOOKS:
01. "InfotechEnglish", Maruthi Publications.

REFERENCEBOOKS:

01. Bailey,   Stephen.Academicwriting:Ahandbookforinternationalstudents.Routledge, 2014.
02. Chase, Becky Tarver. Pathways: Listening, Speaking and Critical Thinking. Heinley ELT; 2ndEdition, 2018.
03. SkillfulLevel2 Reading & Writing Student's Book Pack (B1) Macmillan Educational.
04. Hewings, Martin.Cambridge Academic English (B2).CUP,2012.

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(AUTONOMOUS) R20

DEPARTMENT OF MECHANICAL ENGINEERING

Programme : Common to Non circuit Branches (CIVIL/MECH)			Semester: II		
Course Code	Course Name	L	T	P	C
20SH2T03	**ENGINEERING PHYSICS**	3	0	0	3
Subject Category : Basic Science Course					

COURSE OUTCOMES:

After successful completion of this course, students should be able to

CO1 : **Explain** the need of coherent sources and the conditions for sustained interference.

CO2 : **Understand** the basic concepts of LASER light Sources

CO3 : **Study** different types of moduli and their relation

CO4 : **Apply** the concept of magnetism to magnetic devices.

CO5 : **Analyze** acoustic properties of typically used materials in buildings

SYLLABUS

UNIT-I WAVE OPTICS   12 Hours

Interference: Principle of superposition –Interference of light - Interference in thin films (Reflection Geometry) & applications -Colors in thin films- Newton's Rings- Determination of wavelength and refractive index.

Diffraction: Introduction - Fresnel and Fraunhofer diffraction - Fraunhofer diffraction due to single slit, double slit - N-slits(Qualitative) – Grating - Dispersive power and resolving power of Grating(Qualitative).

Polarization: Introduction-Types of polarization - Polarization by reflection, refraction and Double refraction - Nicol's Prism -Half wave and Quarter wave plates.

UNIT-II LASERS & FIBER OPTICS   8 Hours

LASERs: Introduction – Characteristics of laser – Spontaneous and Stimulated missions of radiation- Einstein's coefficients – Population inversion –Lasing   action- Pumping mechanisms – Ruby laser – He-Ne laser - Applications of lasers.

FIBER OPTICS: Introduction –Principle of optical fiber- Acceptance Angle- Numerical Aperture - Classification of optical fibers based on refractive index profile and modes – Propagation of electromagnetic wave through optical fibers - Applications.

UNIT-III MAGNETISM & DIELECTRICS   10 Hours

MAGNETISM: Introduction - Magnetic dipole moment - Magnetization-Magnetic susceptibility and permeability- Origin of permanent magnetic   moment - Bohr magneton- Classification of magnetic materials: Dia, para & Ferro – Domain concept of Ferromagnetism – Hysteresis – soft and hard magnetic materials – applications of Ferromagnetic material.

DIELECTRICS: Introduction - Dielectric polarization-Dielectric polarizability, Susceptibility

and Dielectric constant- Types of polarizations: Electronic and Ionic (Quantitative), Orientation Polarizations (Qualitative) - Lorentz Internal field-Claussius –Mossotti's equation- Frequency dependence of polarization - Applications of dielectrics.

UNIT-IV : CRYSTALLOGRAPHY AND X-RAY DIFFRACTION   8 Hours

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

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

UNIT – V : ACOUSTICS AND ULTRASONICS   10 hours

ACOUSTICS: Introduction **–** Reverberation - Reverberation time - Sabine's formula – absorption coefficient and its determination- factors affecting acoustics of buildings and their remedies.

ULTRASONICS: Properties – Production of ultrasonics by Magnetostriction & Piezoelectric methods – Non Destructive Testing – pulse echo system through transmission and reflection modes - A, B and C – scan displays – applications.

TEXT BOOKS:
2. B. K. Pandey, S. Chaturvedi .,"Engineering Physics" - Cengage Publications, 2012
3. M.N. Avadhanulu, P.G.Kshirsagar., "A Text book of Engineering Physics" – S.Chand, 2017.
4. D.K.Bhattacharya and Poonam Tandon., "Engineering Physics", Oxford press (2015).
5. R.K Gaur. and S.L Gupta., "Engineering Physics" - Dhanpat Rai publishers, 2012.

REFERENCE BOOKS:
1. M.R.Srinivasan, "Engineering Physics", New Age international publishers (2009).
2. Ajoy Ghatak "Optics", 6th Edition McGraw Hill Education, 2017.
3. A.J.Dekker "Solid State Physics", Mc Millan Publishers (2011).

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DEPARTMENT OF MECHANICAL ENGINEERING

Programme: EEE, ECE, IT Semester : I And CE, ME, CSE, CSE(A.I), CSE(D.S) Semester : II				
Course Code **20SH2T07**	Course Name	L	T	P	C
	LINEAR ALGEBRA & VECTOR CALCULUS	3	0	0	3
Subject Category		Basic Science		

COURSE OUTCOMES:

After successful completion of this course, students should be able to

CO1 : solve simultaneous linear equations numerically using various matrix methods

CO2 : find the eigen values and eigen vectors of a given matrix and nature of quadratic form

CO3 : determine double integral over a region and triple integral over a volume

CO4 : calculate gradient of a scalar function, divergence and curl of a vector function

CO5 : determine line, surface and volume integrals and apply green, stokes and gauss divergence theorems to calculate line, surface and volume integrals

UNIT I: Linear systems of equations: (12)
Rank - Echelon form – Normal form – Solving system of homogeneous and Non–Homogeneous equations – Gauss elimination – Gauss Jordon.
Applications: Finding the current in electrical circuits.

UNIT II: Eigen values - Eigen vectors and Quadratic forms: (12)
Eigen values – Eigen vectors– Properties (without proof) – Clayey-Hamilton theorem (Without of proof) – Inverse and powers of a matrix by using Clayey-Hamilton theorem– Diagonalisation – Reduction of quadratic form to canonical form by Orthogonalisation – Rank – Positive, negative and semi definite – Index – Signature.

UNIT III: Multiple integrals: (12)
Double and Triple integrals – Change of order of integration – Change of variables. Applications: Finding Areas.

UNIT IV: Vector Differentiation: (10)
Gradient– Directional derivative – Divergence – Curl – Scalar Potential – Laplacian and second order operators -Vector identities.

UNIT V: Vector Integration: (14)

Line integral – Work done – Potential function – Surface and volume integrals – Vector integral theorems: Greens, Stokes and Gauss Divergence theorems (without proof)

Text Books:

1. **B. S. Grewal,** Higher Engineering Mathematics, 43rd Edition, Khanna Publishers.

2. B. V. Ramana, Higher Engineering Mathematics, 2007 Edition, Tata Mc. Graw Hill Education.

Reference Books:

1. **Erwin Kreyszig,** Advanced Engineering Mathematics, 10th Edition, Wiley-India.

2. **Dass H.K., Rajnish Verma. Er.,** Higher Engineering Mathematics, S. Chand Co. Pvt. Ltd, Delhi

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DEPARTMENT OF MECHANICAL ENGINEERING

Programme: Common to MECH & CE , Semester: II					
Course Code	Course Name	L	T	P	C
20ME2W01	**ENGINEERING WORK SHOP**	1	0	4	3
Subject Category : Engineering Science Course					

COURSE OBJECTIVE   To impart knowledge and hands-on practice on basic engineering trades and skills**.**

COURSE OUTCOMES:

At the end of the Course student will be able to:

CO1   Understand the use of various hand tools used in the basic mechanical engineering workshop sections-smithy, carpentry, assembling, welding etc.

CO2   Ability to design and model different prototypes in the carpentry trade

CO3   Ability to design and model various basic prototypes in the trade of fitting

CO4   Ability to make various basic prototypes in the trade of Tin smithy

CO5   Ability to perform various basic House Wiring techniques and welding

WORKSHOP PRACTICE

Trade/Division	No.of Experiments	Title of the job
Carpentry	2	1. T-Lap Joint 2. Dovetail Joint
Fitting	2	1. Square Fit **2.** V-Fit
Tin Smithy	4	1. Taper Tray 2. Square Box without lid 3. Open Scoop 4. Funnel
House Wirring	3	1.Parallel / Series Connection of three bulbs **2.**Stair Case wiring **3.**Florescent Lamp Fitting
Welding Technology	4	**Metal arc welding** **Gas welding:** 1. Lap joint 1. Lap joint 2. Butt joint 2. Butt joint

Reference Books

1. Workshop Technology by Manchanda Vol. I,II,III India Publishing House, Jalandhar.
2. Basic Workshop Practice Manual by T Jeyapoovan; Vikas Publishing House (P) Ltd.,New Delhi
3. Workshop Technology I,II,III, by S K Hajra, Choudhary and A K Chaoudhary. Media Promoters and Publishers Pvt. Ltd., Bombay.

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DEPARTMENT OF MECHANICAL ENGINEERING

Programme: Common to MECH & CE , Semester: II					
Course Code	Course Name	L	T	P	C
20ME2W01	**ENGINEERING MECHANICS**	3	0	0	3
Subject Category : Engineering Science Course					

Objectives:

- To study Concurrent force systems in plane & Space.

- To study Non concurrent force system in plane. & Space.

- To study friction & its Applications.

- To understand Concurrent & Non concurrent force systems in space.

- To study Principle of virtual work

. •To study Kinematic & kinetics of bodies in motion.

- To Understand work-Energy & Impulse-momentum principles.

Course Outcomes:

Describe the basic concepts of Statics.

Apply the knowledge of Statics

Describe the basic concepts of centroid, Centre of gravity and moment of inertia.

Solve the centroid, center of gravity & moment of inertia problems.

Describe the basic concepts of dynamics.

Apply the knowledge of dynamics.

UNIT-I: Concurrent Force System

Introduction-Basic concepts, Effect of force, classification of system of forces, Composition & Resolution of concurrent forces in a plane, Resultant of concurrent force System-basic concepts, coplanar force systems, non-coplanar force system.

Equilibrium-Free Body Diagram, Degrees of freedom, Conditions of Equilibrium of concurrent force system, Equilibrium of concurrent force System-Coplanar force systems, non-coplanar force system.

Friction- Introduction & basic concepts of friction, Impending motion of connected bodies, Relative Motion, application of friction-wedges.

UNIT-II: Non Concurrent force system

Resultant of Non Concurrent force system-Coplanar & general force system. Equilibrium-Conditions of Equilibrium of non-concurrent force system, Equilibrium of- Coplanar non concurrent forces system, **Friction-** Ladder friction.

Centroid & Center of Gravity: Expressions for centroid & center gravity from basic principle, Centroids of simple figures-Lines & Areas, Axis of symmetry, Centroids of composite figures. Centre of gravity of simple solid bodies, Centre of gravity of composite bodies.

UNIT-III: Moment of Inertia Area moment of Inertia:

Introduction, Transfer theorem & perpendicular axis theorem, Area moment of inertia of simple plane figures, Area moment of inertia of composite figures.

Mass moment of inertia- Mass moment of inertia of single & system of particles, mass moment of inertia of simple plates and Solids.

Virtual Work: Equilibrium of Ideal systems-Virtual displacement, virtual work, principle of virtual work.

UNIT-IV: Dynamics

Introduction, Classification of Motions and Basic terms in dynamics. Kinematics: Kinematics of particles–Rectilinear motions, uniformly accelerated motion, and curvilinear motions, projectiles. **Kinetics:** Kinetics of a particle–In rectangular coordinates, connected bodies, D'Alembert's principle for rectilinear motion.

UNIT-V: Work-Energy & Impulse-Momentum Principles Work-energy principle: Energy,

classification of mechanical energies, Principle of conservation of energy, work-energy principle for-rectilinear motions of particles.

Impulse-momentum principle: Impulse & momentum, Impulse-momentum principle for-rectilinear motion of particles.

Text books:

1. Engineering Mechanics - S. Timoshenko & D. H. Young., 4th Edition, Mc Graw Hill publications.

2. Engineering Mechanics, dynamics, Bhavikatti S.S – New Age International Publishers.

References:

1. Engineering Mechanics, A. K Tayal, 13th Edition, Umesh Publications.

2. Engineering Mechanics, R. K Bansal, Laxmi publications.

3. Engineering Mechanics statics and dynamics, A Nelson, Mc Graw Hill publications.

4. Engineering Mechanics, statics and Dynamics, J. L. Meriam, 6th Edition – Wiley India Pvt Ltd.

COURSE CODE	I Year-II SEM	L	T	P	C
20SH2L01		**0**	**0**	**3**	**1.5**
	ENGLISH COMMUNICATION SKILLS LAB				

Module - I:

Introduction to Phonetics.

a) Brief Introduction to Consonants
b) Brief Introduction to Vowels & Diphthongs

Module - II:

Listening Comprehension

a) Comprehending Spoken material in British English.
b) Comprehending Spoken material in American English.
c) Intelligent Listening in Situations.

Module -III:

Role – Play / Dialogue Writing

a) Introducing one and others.
b) Asking for and giving information.
c) Asking for and responding to give directions.
d) Seeking permission, requests.
e) Apologizing.

Module - IV:

Communication Skills

a) Verbal and Non – verbal communications
b) Barriers of communication.
c) Body Language – Voluntary and Involuntary.

Module - V:

Presentation Skills.

a) Extempore
b) JAM Sessions
c) Paper Presentation

Module - VI:

a) Group Discussions: Dos and Don'ts- Types, Modalities
b) Resume Preparation.

References:

1. Infotech English, Maruthi Publications (with Compact Disc).
2. Exercises in Spoken English Part 1,2,3,4, OUP and CIEFL.
3. English Pronunciation in use- Mark Hancock, Cambridge University Press.
4. English Phonetics and Phonology-Peter Roach, Cambridge University Press.
5. English Pronunciation in use- Mark Hewings, Cambridge University Press.
6. English Pronunciation Dictionary- Daniel Jones, Cambridge University Press.
7. English Phonetics for Indian Students- P. Bala Subramanian, Mac Millan Publications.
8. Technical Communication- Meenakshi Raman, Sangeeta Sharma, Oxford University Press.
9. Technical Communication- Gajendrea Singh Chauhan, SmitaKashiramka, Cengage Publications.

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(AUTONOMOUS) R20

DEPARTMENT OF MECHANICAL ENGINEERING

Programme : Common to Non circuit Branches		(CIVIL/MECH-II SEM)			
Course Code	Course Name	L	T	P	C
20SH2L03	**ENGINEERING PHYSICS LAB**	0	0	3	1.5
Subject Category : Basic Science Course					

COURSE OUTCOMES:

After successful completion of this course, students should be able to

CO1   :   **Memorize** the conditions for sustained Interference and Diffraction.

CO2   :   **Understand** the basic concepts of LASER.

CO3   :   **Identify** the properties of various materials.

CO4   :   **Apply** the concept of dielectrics on the materials.

CO5   :   **Analyze** the acoustic properties of sound.

(Any 10 of the following listed 20 experiments)

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. Magnetic field along the axis of a current carrying coil – Stewart and Gee's apparatus.

4. Energy Band gap of a Semiconductor p - n junction.

5. Characteristics of Thermistor – Temperature Coefficients

6. Determination of dielectric constant.

7. LASER - Determination of wavelength by plane diffraction grating

8. Rigidity modulus of material by wire-dynamic method (Torsional pendulum)

9. Verification of laws of vibrations in a stretched string – Sonometer

10. LASER - Determination of particle size using laser.

11. Determination of moment of inertia of a fly wheel.

12. Melde's Experiment – Transverse and longitudinal waves.

13. Determination of time constant – C- R Circuit.

14. I/V Characteristics of ZENAR diode.

15. Determination of Young's Modules of the given Beam – Cantilever.

Programme: Common to Mechanical and Civil Engineering Semester: II					
Course Code	Course Name	L	T	P	C
20CE2L01	**COMPUTER AIDED DRAWING LAB**	0	0	3	1.5
Subject Category : Engineering Science Course LAB					

COURSE OBJECTIVE: To develop skill to use software to create 2D and 3D models.

COURSE OUTCOMES:
    CO1: Understand the basic concept of product design.
    CO2: Ability to use the software packers for drafting and modeling
    CO3: Ability to create 2D and 3D models of Engineering Components

LIST OF EXPERIMENTS

1. Introduction to AutoCAD
2. AutoCAD – BASICS
   - Starting with AutoCAD
   - Layout and sketching
   - Drawing environment
3. Model given objects using basic Drawing commands in AutoCAD
4. Model given objects employing basic Modifying commands in AutoCAD
5. Give Dimensioning to given objects using basic Annotation commands in AutoCAD
6. Perform Two-dimensional Wireframe modeling of given object using AutoCAD
7. Perform Three-dimensional Wireframe modeling of given object using AutoCAD
8. Isometric Drawing of connecting rod using AUTOCAD.
9. Isometric Drawing of V block using AUTOCAD
10. Generate Orthographic Projections for Isometric Drawing of connecting rod.
11. Generate Orthographic Projections for Isometric Drawing of V Block.
12. Model a simple Three-Dimensional object using AutoCAD
13. Model a Gear using AutoCAD
14. Model a Bolt and Nut in AutoCAD
15. Generate Sectional Isometric View of a Joint using AutoCAD
16. Model a thread profile using AutoCAD

REFERNCE BOOKS
1. Engineering Graphics, K.C. john, PHI Publications
2. Engineering graphics with Auto CAD- R.B. Choudary/Anuradha Publishes
3. Engineering Drawing and Graphics, Venugopal
4. Engineering Drawing & Graphics using Auto CAD 2000 By T. Jeyapoovan Vikas Publishing House Pvt. Ltd., New Delh

Program		Semester: I			
Course Code	Course Name	L	T	P	C
20GE1M01	**Environmental Science**	2	0	0	0

COURSE OUTCOMES:

After successful completion of this course, students should be able to

CO1 : identify the fundamental concepts and the first global initiatives towards sustainable development and the possible means to combat the challenges

CO2 : examine the natural resources, their availability for the sustenance of the life and recognize the need to promote the green technologies to conserve the natural resources

CO3 : assess the concepts of the ecosystem, its function in the environment and the need for protecting various ecosystems

discuss the biodiversity of India and the threats to biodiversity, and conservation practices to protect the biodiversity

CO4 : explain various attributes of the pollution and their impacts and measures to control the pollution along with waste management practices

CO5 : outline the social issues including the environmental legislations of india and environmental assessment and also to investigate the industrial, urban and rural conditions in the surroundings.

SYLLABUS

UNIT-I : Scope and Importance of Environmental Studies

Definition and components of environment, Scope and Importance: Sustainability: Stockholm and Rio Summit: Global Environmental Challenges: Global warming and climate change- Acid rains, Ozone layer depletion, Population Explosion and effects, Role of IT in environmental protection and human health.

UNIT-II : 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.

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

Energy resources: Growing energy needs, renewable and non-renewable energy sources

Land resources: Land as a resource, land degradation, Wasteland reclamation, man induced landslides, soil erosion and desertification.

UNIT-III   :   Ecosystems and Biodiversity and its conservation

Concept of an ecosystem. - Structure and function of an ecosystem. - Producers, consumers and decomposers. - Energy flow in the ecosystem –Bio geo chemical cycles-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.

Green Campus and Green Energy. Identification of species by involving in activities like plantation inside or outside the campus.

Biodiversity and its conservation: Definition: genetic, species and ecosystem diversity-classification - Value of biodiversity: consumptive use, productive use, social-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.

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,

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.

Industrial Disasters and Pollution Case studies: -Bhopal Disaster, Chernobyl accident, Love canal Disaster.

UNIT-V   :   Environmental Legislation and the Environmental Management

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

Impact Assessment and its significance-various stages of EIA, preparation of EMP and EIS, Eco-tourism.

Visit to an Industry / Urban/Rural/Agricultural Ecosystem and submit a report individually on any issues or Documentation of Plants and Animals

(Field work Equal to 3 lecture hours).

TEXT BOOKS:

1. Environment Studies, Fourth Edition, Anubha Kaushik, C P Kaushik, New Age International Publishers.

2. A Textbook of Environmental Studies, Shaashi Chawla, TMH, New Delhi.

3. Fundamentals of Environment Studies, Mahua Basu and S. Xavier, Cambridge Publishers, 2014.

4. Textbook of Environmental Science, M. Anji Reddy, B S Publications, Hyderabad.

REFERENCE 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

Perspectives in Environment Studies, Anubha Kaushik, C P Kaushik, New Age International Publishers,2014

Programme: ME Semester : III					
Course Code	Course Name	L	T	P	C
20SH3T03	**NUMERICAL METHODS & TRANSFORMATIONS**	3	0	0	3
Subject Category : Basic Science Course					

COURSE OBJECTIVE   To impart the knowledge on Numerical methods and Transformations.

COURSE OUTCOMES:

At the end of the Course, Student will be able to:

CO1   Evaluate approximating the roots of polynomial and transcendental equations

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

CO3   Apply different algorithms for approximating the solutions of ordinary differential equations to its analytical computations

CO4   Apply the Laplace transform for solving differential equations.

CO5   Find or compute the Fourier series of periodic signals.

COURSE SYLLABUS
UNIT I : ITERATIVE METHODS

Introduction – Bisection method – Secant method – Method of false position – Iteration method – Newton-Raphson method (One variable) – Jacobi and Gauss-Seidel methods for solving system of equations.

UNIT II:INTERPOLATION:

Introduction – Errors in polynomial interpolation – Finite differences – Forward differences – Backward differences – Central differences – Relations between operators – Newton's forward and backward formulae for interpolation – Interpolation with unequal intervals – Lagrange's interpolation formula – Newton's divide difference formula.

UNIT III: NUMERICAL INTEGRATION AND SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS

Trapezoidal rule – Simpson's $1/3^{rd}$ and $3/8^{th}$ rule – Solution of ordinary differential equations by Taylor's series – Picard's method of successive approximations – Euler's method – Runge-Kutta method (second and fourth order).

UNIT-IV: LAPLACE TRANSFORM

Laplace transforms of standard functions-ShiftingTheorems, Transforms of derivatives and integrals , Inverse Laplace transforms– Convolution theorem (with out proof).Application : Solutions of ordinary differential equations using Laplace transforms.

UNIT V:FOURIER SERIES:

Introduction- Periodic functions – Fourier series of -periodic function - Dirichlet's conditions – Even and odd functions –Change of interval– Half-range sine and cosine series.

TEXT BOOKS:

1. B. S. Grewal**, "**Higher Engineering Mathematics", 43rd Edition, Khanna Publishers.
2. B. V. Ramana**, "**Higher Engineering Mathematics", 2007 Edition, Tata Mc. Graw Hill Education.

REFERENCE BOOKS:

1. Erwin Kreyszig**,** Advanced Engineering Mathematics, 9th Edition, Wiley-India.
2. Dass H.K., Rajnish Verma. Er., Higher Engineering Mathematics, S. Chand Co. Pvt. Ltd, Delhi.

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(AUTONOMOUS) R20

DEPARTMENT OF MECHANICAL ENGINEERING

Programme: ME Semester: III					
Course Code	Course Name	L	T	P	C
20ME3T01	**MECHANICS OF SOLIDS**	3	0	0	3
Subject Category : Professional Core Course					

COURSE OBJECTIVE   To impart the knowledge on internal behaviour of mechanical elements under the action of applied loads.

COURSE OUTCOMES:

At the end of the Course student will be able to:

CO1   Determine stresses and strains in machine members subjected to various loads.

CO2   To draw shear force and bending moment diagrams for beams.

CO3   Determine bending stresses and shear stress induced in sections.

CO4   Calculate the deflections in beams subjected to transverse loads and design of shafts subjected to torsion based on strength and rigidity.

CO5   Determine the stresses induced in thick and thin cylinders subjected to pressures.

COURSE SYLLABUS

UNIT-I : 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- relation between elastic constants, principal stresses, Mohr's circle.

UNIT-II :SHEAR FORCE AND BENDING MOMENT DIAGRAMS

Types of beams – Introduction, types of beams, Concept of shear force and bending moment – Relation between S.F., B.M and rate of loading at a section of a beam.

Shear force diagrams and bending moment diagrams for cantilever, simply supported and overhanging beams subjected to point loads, uniformly distributed load, uniformly varying loads, point of contra flexure

UNIT-III :

BENDING STRESS AND SHEAR STRESSES

Bending Stress : Theory of simple bending, bending equation, neutral axis, determination bending stresses, section modulus of rectangular and circular sections (Solid and Hollow), I,T, Angle and Channel sections

Shear Stresses: Shear stress equation, shear stress distribution across various beams with rectangular and circular sections (Solid and Hollow), I, T, Angle and Channel 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 – Moment area method -Determination of slope and deflection for cantilever and simply supported beams subjected to point loads, - U.D.L uniformly varying load.

TORSION: Introduction-Derivation- Torsion of Circular shafts- Pure Shear-Transmission of power by circular shafts, Shafts in series, Shafts in parallel

UNIT – V : THIN AND THICK PRESSURE VESSELS

THIN CYLINDERS: Thin seamless cylindrical shells – Derivation of formula for longitudinal and circumferential stresses – hoop, longitudinal and volumetric strains – changes in diameter, and volume of thin cylinders.
THICK CYLINDERS: Lame's equation – cylinders subjected to inside & outside pressures

TEXT BOOKS
1. Dr. R K Bansal, "A text book of strength of materials", Lakshmi Publications, 3rd edition.
2. S.S. Bhavikatti, " Strength of Materials", S. Chand publications, 4th Edition.

REFERENCE BOOKS
1. Beer and Johnson, "Mechanics of Materials", Tata Mc GrawHill publications, 5th edition.
2. Popov and Egor P., "Engineering Mechanics of Soilds", Prentice Hall India.
3. S.S. Rattan, "Strength of materials", Tata Mc Graw-Hill Publications, 2nd edition.
4. Gere and Timoshenko. "Mechanics of Materials", CBS Publishers and distributors Private Ltd.

Programme: ME Semester: III					
Course Code	Course Name	L	T	P	C
20ME3T02	**MATERIAL SCIENCE & METALLURGY**	3	0	0	3
Subject Category : Professional Core Course					

COURSE OBJECTIVE   To familiarize with the fundamentals of crystallography, metallurgy, heat treatment and mechanical properties.

COURSE OUTCOMES:

At the end of the Course student will be able to:

CO1   Illustrate crystallization and grain growth of metals.

CO2   Identify the effect of alloying elements and invariant reactions on the behavior of metals.

CO3   Choose a suitable heat treatment process to impart desired properties of   metals.

CO4   Appraise nature of non ferrous metals and alloys.

CO5   Appraise nature of Ceramic and Composite materials.

COURSE SYLLABUS

UNIT-I

STRUCTURE OF METALS: Bonds in Solids, Metallic bond, crystallization of metals, Packing Factor - SC, BCC, FCC& HCP-line density, plane density. Grain and grain boundaries, effect of grain boundaries on the Properties of metal / alloys – determination of grain size. Imperfections – point, line, surface and volume- Slip and Twinning.

Constitution of alloys: Necessity of alloying, types of solid solutions, Hume Rotherys rules, intermediate alloy phases, and electron compounds

UNIT-II

PHASE DIAGRAMS AND IRON CARBON EQUILIBRIUM DIAGRAM

Phase Diagrams: Construction of equilibrium diagrams involving complete and partial solubility, Gibbs phase rule, lever rule. Different types invariant reactions – peritectic, eutectic, eutectoid, peritectectoid reactions etc. with examples

UNIT-III

HEAT TREATING OF STEELS

Introduction, Steels, Iron-Carbon Phase Diagram, Heat Treatment, Study of Fe-Fe3C phase diagram, Construction of TTT diagrams, Annealing, Normalizing, Hardening and Tempering of steels.

UNIT - IV

NON FERROUS METALS AND ALLOYS

Introduction - Cast Irons, Structure and properties of White Cast iron, Malleable Cast iron, Grey cast iron, Non-ferrous Metals and Alloys, Structure and properties of copper and its alloys,

Aluminium and its alloys, Al-Cu phase diagram, Titanium and its alloys. Super Alloys, Shape Memory Alloys.
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UNIT-V CERAMIC AND COMPOSITE MATERIALS:

Introduction to Ceramics, Polymers, Composites, Nano Composites Crystalline ceramics structure, properties & Applications, Glasses, cermets structure, properties & applications, Classification, properties & applications of composites, Classification, Properties and Applications of Polymers.

TEXT BOOKS
1. Sidney H. Avener, "Introduction to physical metallurgy", Tata Mc Graw Hill Publications, 2nd edition.
2. V.D.Kodgire, S.V Kodgire. "Material science and Metallurgy for Engineers", Everest publishing house, 2nd edition.

REFERENCE BOOKS
1. V.Raghavan, "Material Science and Engineering" PHI Publication, 6th edition
2. Donald R.Askeland and Wendelin J.Wright , "Essential of Materials science and engineering", CL Engineering publications, 2nd edition
3. Agarwal, "Science of engineering materials", S.Chand Publications.

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(AUTONOMOUS) R20

DEPARTMENT OF MECHANICAL ENGINEERING

Programme: ME Semester: III					
Course Code	Course Name	L	T	P	C
20ME3T03	**MANUFACTURING PROCESSES**	3	0	0	3
Subject Category : Professional Core Course					

COURSE OBJECTIVE   To introduce the principles of manufacturing processes to convert materials into desired shapes and sizes.

COURSE OUTCOMES:

At the end of the Course student will be able to:

CO1   Understand Sand Casting techniques, Pattern materials and special casting techniques.

CO2   Choose appropriate type of Fusion welding process for joining of metals.

CO3   Choose appropriate type of Plastic welding processes and weld test methods.

CO4   Identify suitable metal forming technique to impart desired geometry to the product.

CO5   Understand different sheet metal forming techniques and plastic processing methods.

COURSE SYLLABUS

UNIT - I:

Introduction: Classification of manufacturing processes

Sand Casting: Steps involved in making casting, Pattern Materials, Types of patterns, Pattern Allowances, Molding sand, Types of molding sand and its properties, Types of Furnaces ,cupola, Electric arc.

Gating System: Elements and their functions, Types of Gating systems, Types of Gates, Types of Risers, Centrifugal casting, Investment casting, Die casting, Shell molding, Slush casting. Casting Defects- Cause and Remedies.

UNIT - II:

Metal Joining Processes: Classification of Metal joining processes, Principle of Oxy Acetylene welding, Equipment Setup, Types of flames, Applications Principle of Arc welding. Types of Arc welding processes : SMAW, TIG, MIG, Plasma Arc Welding, Thermit welding.

UNIT - III:

Principle of Resistance welding, Equipment set up, Different resistance welding methods, Heat & power requirements in resistance welding. Friction welding, Induction welding and Explosive welding.Welding Defects: Their causes – remedies, Soldering, Brazing and Braze welding

UNIT - IV:

Metal Forming: Classification of metal working processes, Types of Rolling mills, Rolling defects and remedies, Analysis of drawing, drawing of rod, wire and tube – Drawing defects, Classification of Extrusion process, Impact Extrusion, Hydrostatic Extrusion . Basic forging operations, Open die forging, closed die forging, press forging, Drop forging, Roll forging.

Unit-V:

Sheet Metal Forming Operations: Blanking and piercing, Bending, Spring back in sheet metal operation Deep drawing, Stretch forming, Embossing, Coining.

Plastics – thermo plastics and thermo setting plastics. Compounding of plastics. Moulding techniques – Compression, Injection and Blow film moulding

TEXT BOOKS:

1. "Manufacturing Technology"-P.N.Rao- Tata McGraw-Hill Education-Volume1-4e
2. "Production Technology" - P.C .Sharma -S.Chand & Co

REFERENCE BOOKS:
1. "Principles of Foundry technology" –P.L. Jain, McGraw-Hill Education, 5th edition.
2. "Manufacturing Processes for Engineering Materials" - Kalpak Jain .S& S.R Schmid-Pearson Publications
3. "Production Technology" -R.K Jain –Khanna Publications

Programme: ME Semester: III					
Course Code	Course Name	L	T	P	C
20ME3T04	**THERMODYNAMICS**	3	0	0	3
Subject Category : Professional Core Course					

COURSE OBJECTIVES	1. To familiarize with basic concepts of system, properties and cycles.
	2. To introduce the laws of thermodynamics and their applications to various thermodynamic processes and cycles.

COURSE OUTCOMES:

At the end of the Course student will be able to:

CO1   Learn the basic concepts of thermodynamics and analyse Zeroth and first law of thermodynamics

CO2   Analyze Second law of thermodynamics and working of various devices with heat and work transactions.

CO3   Understand the concept of entropy and availability of energy in steady flow and non-flow processes.

CO4   Recognize and understand different phases of pure substances and familiarize with saturated and superheated steam property tables and charts.

CO5   Learn power producing thermodynamic cycles capable of making their analysis and evaluate the relative performance

COURSE SYLLABUS
UNIT - I: BASIC CONCEPTS
INTRODUCTION: Macroscopic and microscopic view points, definitions of thermodynamic terms, quasi–static process, point and path function, forms of energy, ideal gas and real gas, various forms of Work, Zeroth law of thermodynamics.
FIRST LAW OF THERMODYNAMICS: Joule's experiment -first law of thermodynamics, corollaries-perpetual motion machines of first kind, first law applied to non-flow and flow process-limitations of first law of thermodynamics.

UNIT -II:
SECOND LAW OF THERMODYNAMICS: Kelvin -Planck statement and Clausius statement and their equivalence, corollaries-perpetual motion machines of second kind-reversibility and irreversibility, cause of irreversibility -Carnot cycle, heat engine, heat pump and refrigerator, Carnot theorem, Carnot efficiency.

UNIT -III:

ENTROPY: Clausius inequality -Concept of Entropy-entropy equation for different processes and systems, Maxwell relations, TdS equations

AVAILABILITY AND IRREVERSIBILITY: Definition of energy and energy, expressions for availability and irreversibility. Availability in steady flow, non-flow processes, irreversibility

UNIT -IV:

PROPERTIES OF STEAM AND USE OF STEAM TABLES: Pure Substances, P-V-T surfaces, dryness fraction, property tables, T-s and h-s diagram (Mollier chart),analysis of steam undergoing various thermodynamic processes using Mollier chart–steam calorimetry

UNIT -V:

THERMODYNAMIC CYCLES: Otto, Diesel, Dual Combustion cycles, Sterling Cycle, Atkinson Cycle, Ericsson Cycle, Lenoir Cycle, Brayton 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. P.K.Nag, "Engineering Thermodynamics", 5/e, Tata McGraw Hill,2013.
2. R.K.Rajput , "Fundamentals of Thermodynamics",7/e,Wiley,20096.,S.Chand&Co.

REFERENCES:
1. V.P. Vasandani and D.S. Kumar "Treatise on Heat Engineering" Metropolitan Book co, New Delhi. 4th edition.
2. Yunus A.Cengel,MichaelaA.Boles, "Thermodynamics",7/e,TataMcGrawHill,2011.
3. J.B.Jones and G.A.Hawkins, "Introduction to Thermodynamics", 2/e, John wiley & Sons, 2012.

Programme: ME Semester: III					
Course Code	Course Name	L	T	P	C
20ME3L01	**SOLID MECHANICS AND METALLURGY LAB**	0	0	2	1.5
Subject Category : Professional Core Course Lab					

Any 6 experiments are to be conducted from each of the following.
A) SOLID MECHANICS LAB

COURSE OBJECTIVES
1. To impart hands on training to examine the mechanical properties of materials.
2. To impart hands on training in preparation of metal specimen so as to observe the microstructure.

COURSE OUTCOMES:

At the end of the Course student will be able to:

CO1   Determine the young's modulus, rigidity modulus of materials and stresses induced in bars and beams of uniform cross section.

CO2   Determine the hardness number and stiffness of spring.

CO3   Determine the impact strength and shear stress under single shear & double shear

CO4   Understand the microstructure of different materials.

CO5   Perform Jominy End Quench test

List of Experiments

1. Determination of modulus of elasticity using universal Testing machine.

2. Determination of modulus of elasticity and bending stress in

a) Simply Supported Beam b) Cantilever beam

3. Determination of modulus of rigidity using torsion testing machine.

4. Determination of Hardness number using

a) Brinells hardness test.

b) Rockwell hardness test.

5. Determination of stiffness of springs using Spring Testing machine.

6. Determination of Impact strength using Impact Testing Machine

a) Izod test and Charpy test

7. Determination of shear strength using Universal testing machine.

8. Determination of compressive strength using compression testing machine.

B) METALLURGY LAB

List of Experiments

1. Preparation and study of the Microstructure of pure metals like Cu and Al.

2. Preparation and study of the Microstructure of Mild steels, low carbon steels, high – C steels.

3. Preparation and study of the Micro Structures of Cast Irons.

4. Preparation and study of the Micro Structures of Non-Ferrous alloys.

5. Preparation and study of the Micro structures and hardness of Heat treated steels.

6. Hardenability of steels by Jominy End Quench Test.

Programme: ME Semester: III					
Course Code	Course Name	L	T	P	C
20ME3L02	**MANUFACTURING PROCESSES LAB**	0	0	2	1.5
Subject Category : Professional Core Course Lab					

COURSE OBJECTIVES   To impart hands-on practical exposure on manufacturing processes and equipment**.**

COURSE OUTCOMES:

At the end of the Course student will be able to:

CO1   Prepare moulds for single and two piece patterns

CO2   Test the properties of moulding sand.

CO3   Perform pre welding operations filing and cleaning.

CO4   Perform Arc welding and Spot welding.

CO5   Perform MIG welding

1. **Design and making of pattern**
    i. Single piece pattern
    ii. Split pattern
2**. Sand properties testing**
    i. Sieve analysis (dry sand)
    ii. Clay content test
    iii. Strength test (Compression test & Shear test)
    iv. Permeability test
3. **Mould preparation**
    i. Straight pipe
    ii. Dumble
    iii. Gear blank
4. **Gas welding**
5. **Manual metal arc welding**
    i. Lap joint
    ii. Butt joint
6. Injection Molding
7. Simple models using sheet metal operations
8. Study of deep drawing and extrusion operations
9. Study of Basic powder compaction and sintering
10. Study of TIG/MIG Welding
11. Study of Resistance Spot Welding
12. Study of Brazing and soldering

Programme: ME Semester: III					
Course Code	Course Name	L	T	P	C
20ME3L03	**COMPUTER AIDED MACHINE DRAWING**	0	0	4	1.5
Subject Category : Professional Core Course Lab					

COURSE OBJECTIVES   To impart hands on training for drafting, modeling and assembly of machine parts using modeling package.

COURSE OUTCOMES:

At the end of the Course student will be able to:

CO1   To draft different views of machine elements and parts

CO2   To model individual parts and assemble them.

LIST OF EXPERIMENTS

1. Drafting of Cotter joint

2. Drafting of Coupling

3. Drafting of bearing

4. Drafting of riveted joint

5. Drafting of Connecting Rod

6. Modeling of Stuffing Box parts.

7. Modeling of Lathe single way tool post parts.

8. Modeling and Assembly of Knuckle joint parts.

9. Modeling and Assembly of Plummer Block parts

10. Modeling and Assembly of Screw Jack parts

11. Modeling and Assembly of IC engine piston parts

12. Modeling of parts of Eccentric and generation of orthographic views.

TEXT BOOKS
1. K.L.Narayana, P.Kannaiah & K. Venkata Reddy, "Machine Drawing", New Age Publications.
2. P.S. Gill, "Machine Drawing", S K Kataria & Sons.

Programme: ME Semester: III					
Course Code	Course Name	L	T	P	C
20GE3M03	**ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE**	2	0	0	0
Subject Category:	Mandatory Course				

COURSE OBJECTIVES To facilitate the students with the concepts of Indian traditional knowledge and to make them understand the Importance of roots of knowledge system

COURSE OUTCOMES:

At the end of the Course student will be able to:

CO1 Understand the concept of Traditional knowledge and its importance

CO2 Know the need and importance of protecting traditional knowledge

CO3 Know the various enactments related to the protection of traditional knowledge

CO4 Understand the concepts of Intellectual property to protect the traditional knowledge

COURSE SYLLABUS

UNIT-I

Introduction to traditional knowledge: Define traditional knowledge, nature and characteristics, scope and importance, kinds of traditional knowledge, the physical and social contexts in which traditional knowledge develop, the historical impact of social change on traditional knowledge systems. Indigenous Knowledge (IK), characteristics, traditional knowledge vis-à-vis indigenous knowledge, traditional knowledge Vs western knowledge traditional knowledge vis-à-vis formal knowledge

UNIT-II

Protection of traditional knowledge: the need for protecting traditional knowledge Significance of TK Protection, value of TK in global economy, Role of Government to harness TK

UNIT-III

Legal framework and TK: A: The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006, Plant Varieties Protection and Farmers Rights Act, 2001 (PPVFR Act);B:The Biological Diversity Act 2002 and Rules 2004, the protection of traditional knowledge bill, 2016. Geographical indications act 2003.

UNIT-IV

Traditional knowledge and intellectual property: Systems of traditional knowledge protection, Legal concepts for the protection of traditional knowledge, Certain non IPR mechanisms of traditional knowledge protection, Patents and traditional knowledge, Strategies to increase protection of traditional knowledge, global legal FORA for increasing protection of Indian Traditional Knowledge.

UNIT-V

Traditional knowledge in different sectors: Traditional knowledge and engineering, Traditional medicine system, TK and biotechnology, TK in agriculture, Traditional societies depend on it for their food and healthcare needs, Importance of conservation and sustainable development of environment, Management of biodiversity, Food security of the country and protection of TK

TEXT BOOKS:

1. Swami Jitatmanand, Modern Physics and Vedant, Bharatiya Vidya Bhavan Fritz of Capra, Tao of Physics
2. Knowledge Traditions and Practices of India" Kapil Kapoor, Michel Danino
3. Yoga Sutra of Patanjali, Ramakrishna Mission, Kolkatta
4. Traditional Knowledge System and Technology in India by Basanta Kumar Mohanta and Vipin Kumar Singh, Pratibha Prakashan 2012

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(AUTONOMOUS) R20

DEPARTMENT OF MECHANICAL ENGINEERING

Programme: ME- SEMSTER-IV

Course Code	Course Name	L	T	P	C
20ME4T01	**MANUFACTURING TECHNOLOGY**	3	0	0	3
Subject Category	: Professional Core Course				

COURSE OBJECTIVES	1. To expose the students to the mechanics of metal cutting, so as to equip them with adequate knowledge about elements of metal cutting process.
	2. To emphasize upon the prominent theories, concepts and constructional features of machine tools related to turning, shaping, planning, drilling, grinding and milling etc.

COURSE OUTCOMES:

At the end of the Course student will be able to:

CO1 Provide the basic concepts in mechanics of metal cutting, chip formation, various tool materials and tool life.

CO2 Impart the concept of types of lathe, various operations that can be performed in various lathes, various mechanisms adopted.

CO3 Educate the basic fundamentals of reciprocating machine tools shaper, slotter and planning machines.

CO4 Instruct the operations performed on drilling and grinding machines.

CO5 Instruct the operations performed on milling machines and its attachments.

COURSE SYLLABUS

UNIT I

BASICS OF METAL CUTTING:

Elementary treatment of metal cutting theory – elements of cutting process – geometry of single point cutting tools, chip formation and types of chips – built up edge and its effects, chip breakers. Mechanics of orthogonal cutting – Merchant's force diagram, cutting forces, Tool wear, tool life, machinability, cutting fluids, tool materials.

UNIT II

LATHE: Engine lathe – principle of working, specification of lathe – types of lathe – work, tool holding devices for lathes, accessories and attachments- Taper turning, Thread cutting – lathe operations, Capstan and Turret lathes – collet chucks – other work holding, tool holding devices – tool layout. Principal features of automatic lathes – classification – single spindle and multi-spindle automatic lathes.

UNIT III

SHAPING, SLOTTING AND PLANING MACHINES: Types, Principles of working – principal parts – specifications, operations performed, work holding devices, machining time calculations.

UNIT IV

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

GRINDING: 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.

UNIT V

MILLING MACHINE: Types, 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, work holding devices, cutter holding devices – methods of indexing, accessories to milling machines, gear cutting.

TEXT BOOKS:

1. P.N Rao "Manufacturing technology –Metal cutting and Machine tools", 2nd edition, TMH publications, 2000.
2. J.P.Kaushish "Manufacturing processes", Prentice Hall, 2nd Edition.

REFERENCE BOOKS:

1. "Metal cutting Principles", M.C. Shaw, 3rd ed., Oxford, 1957.
2. "Production Technology", HMT, (Hindustan Machine Tools), TMH publications 2001.
3. "Workshop Technology Vol II", (10th edition), by B.S.Raghu Vamshi, Dhanpat Rai & co (p) Ltd., 2009.

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Vinjanampadu, Guntur, Andhra Pradesh. INDIA -522 017.

(AUTONOMOUS) R20

DEPARTMENT OF MECHANICAL ENGINEERING

Programme: ME- Semester-IV					
Course Code	Course Name	L	T	P	C
20ME4T02	**APPLIED THERMODYNAMICS**	3	0	0	3
Subject Category : Professional Core Course					

COURSE OBJECTIVES To introduce the principles of operation of heat engines and compressors along with the performance characteristics.

COURSE OUTCOMES:

At the end of the Course student will be able:

CO1 To distinguish between 2-stroke and 4- stroke, S.I and C.I engines and draw the heat balance sheet

CO2 To determine the indicated power of single and multistage reciprocating air compressors

CO3 To analyze the performance of steam power cycle under various conditions and study of boilers.

CO4 To impart the knowledge on working principle of Steam nozzles and condensers.

CO5 To illustrate the principle of working of gas and steam turbines

COURSE SYLLABUS

UNIT_I

IC ENGINES: IC Engine Components, Classification, SI and CI engines, Four Stroke and Two Stroke Engines, Valve and Port Timing Diagrams, Comparison of 2-stroke and 4-stroke, SI and CI Engines.

TESTING AND PERFORMANCE OF I.C ENGINES: Measurement of Fuel consumption, Air consumption, Brake power, Frictional Power and Indicated Power, Performance tests, Heat balance sheet

UNIT-II

COMPRESSORS – Classification, Reciprocating, Principle of operation, work required, Isothermal efficiency, volumetric efficiency and effect of clearance, multi stage compression, under cooling, saving of work, minimum work condition for two stage compression.

ROTARY (POSITIVE DISPLACEMENT TYPE): Roots Blower, vane type compressor.

DYNAMIC COMPRESSORS: Centrifugal compressors, mechanical details and principle of operation, velocity and pressure variation, Energy transfer, velocity diagrams, Axial Flow Compressors.

UNIT-III

STEAM POWER CYCLES: Rankine cycle - schematic layout, Thermodynamic analysis, concept of mean temperature of heat addition, Methods to improve cycle performance - Regeneration & Reheating cycles.

BOILERS: Classification, working of water tube and fire boilers, Mountings and Accessories.

UNIT-IV

STEAM NOZZLES: Working principle, functions of a nozzle, applications, Types of nozzles, flow through nozzles, thermodynamic analysis, velocity of fluid at nozzle exit, Ideal and actual expansion in a nozzle, velocity coefficient, condition for maximum discharge, critical pressure ratio, general relationship between area velocity and pressure in a nozzle flow, Super saturated flow

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

UNIT-V

STEAM TURBINES: Classification, Working Principle of Simple Impulse Turbine, Vector diagrams of velocities, Compounding of Impulse Turbine, Working Principle of Reaction Turbine, Velocity Diagram for Reaction Turbine, Degree of Reaction

GAS TURBINES: Simple gas turbine plant, applications, ideal cycle, essential components, classification of gas turbines, comparison between close cycle and open cycle gas turbines, parameters of performance, actual cycle, regeneration, inter cooling and reheating , types of combustion chambers. Combined Gas - Vapour Power cycles.

TEXT BOOKS
1. V.P. Vasandani and D.S. Kumar, "Treatise on Heat Engineering" Metropolitan Book co, New Delhi. 4th edition.
2. RK Rajput, "Thermal Engineering", Lakshmi Publications, 2010.

REFERENCE BOOKS
1. M. L. Mathur & R. P. Sharma, " A Course in Internal Combustion Engines", Dhanpat Rai & Sons, 2010.
2. R. Yadav, "Thermodynamics and Heat Engines" Vol. II, central Publishing House Allahabad. 7th edition.
3. V. Ganesan , "I.C. Engines" - Tata McGraw- Hill,4th edition.

Programme: ME- Semester-IV					
Course Code	Course Name	L	T	P	C
20ME4T03	**KINEMATICS OF MACHINERY**	3	0	0	3
Subject Category : Professional Core Course					

COURSE OBJECTIVES
1. To introduce the concepts to study the relative motion between the links of mechanisms
2. To familiarize with the kinematic analysis of machines

COURSE OUTCOMES:

At the end of the Course student will be able to:

CO1 Distinguish different mechanisms with their applications.

CO2 Determine the velocities and accelerations of links in mechanisms.

CO3 Construct cam profiles for different types of follower motions.

CO4 Analyze belt and rope drives for the rated conditions of the machines.

CO5 Perform kinematic analysis of gears and gear trains.

COURSE SYLLABUS

UNIT - I:

MECHANISMS

Link , kinematic pair, constrained motion, kinematic chain, degrees of freedom, Kutzbach criterion for planar mechanism, Grashoff's law, mechanism, inversion of mechanism , inversions of four bar, single slider and double slider mechanisms, pantograph, Hooke's Joint - single and double Hooke's joint, velocity ratio, polar diagram

UNIT - II:

VELOCITY ANALYSIS OF MECHANISMS

Instantaneous center, Kennedy theorem, velocity analysis using instantaneous centre method, absolute and relative velocities, velocity analysis using relative velocity method .

ACCELERATION ANALYSIS OF MECHANISMS Acceleration analysis of slider crank and four bar mechanism using relative acceleration method, Coriolis component of acceleration

UNIT - III:

CAM AND FOLLOWERS Types, terminology, types of follower motion- uniform velocity, simple harmonic motion, uniform acceleration and retardation, construction of cam profiles

UNIT - IV

BELT, ROPE AND CHAIN DRIVES: Introduction - Selection of belt drive- Types of belt drives- materials-Velocity ratio-Slip-Creep-Tensions for flat belt drives & V-belt drive-Angle of contact- Centrifugal tension- Maximum tension – Rope drives. Terminology of Chain drives.

UNIT - V:

GEARS Types, terminology, law of gearing, velocity of sliding, forms of teeth, path of contact, arc of contact, phenomena of interference

GEAR TRAINS Types- simple, compound, reverted and epicyclic gear train, kinematic analysis of gear trains - differential of an automobile

TEXT BOOKS
1. S.S Ratan, "Theory of Machines" , Tata McGraw Hill Publications.
2. R.S.Khurmi and J.K. Gupta, "Theory of Machines", S.Chand Publications.

REFERENCE BOOKS
1. Thomas Bevan , "Theory of Machines" , Pearsons Education.
2. J.S.Rao and R.V.Dukkipati , "Mechanism and Machine Theory", New Age Publishers.
3. J.E. Shigley "Theory of machine and Mechanisms", 2ndEdition, Mc-Graw Hill.

Programme: ME- Semester-IV					
Course Code	Course Name	L	T	P	C
20ME4T04	**Fluid Mechanics & Hydraulic Machines**	3	0	0	3
Subject Category	: Engineering Science Course				

COURSE OBJECTIVES To demonstrate the fluid properties, fluid statics, fluid flow, flow measurements and flow through pipes. Acquire knowledge of various turbines and pumps.

COURSE OUTCOMES:

At the end of the Course student will be able to:

CO1 Understand the concepts of Fluid properties, Pressure measuring devices.

CO2 Examine the applications of Bernoulli's equation and flow measurements.

CO3 Evaluate the performance and characteristics of jets on different vanes.

CO4 Distinguish various hydraulic turbines with working proportions and efficiencies

CO5 Infer the concepts of centrifugal and reciprocating pumps.

COURSE SYLLABUS

UNIT I

FLUID STATICS: Dimensions and units: physical properties of fluids-specific gravity, viscosity, surface tension and vapor pressure-Pascal's law, Hydrostatic law -Measurement of pressure: Piezometer, U-tube and differential manometers.

FLUID KINEMATICS: Description of fluid flow, Stream line, path line, streak lines and stream tube. Classification of flows: Steady, unsteady, uniform, nonuniform, laminar, turbulent, rotational and irrotational flows.

UNIT II

FLUID DYNAMICS: Surface and body forces-Equation of continuity for one, two, and three dimensional flows, Euler's and Bernoulli's equations for flow along a stream line. Measurement of flow: pitot tube, venturimeter and orifice meter.

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

DIMENSIONAL ANALYSIS: Rayleigh's method and Buckingham π theorem. Similitude and modeling.

IMPACT OF JETS: Hydrodynamic force of jets on stationary and moving flat, inclined and curved vanes, jet striking centrally and at tip –velocity triangles at inlet and outlet –expressions for work done and efficiency -angular momentum principle

UNIT IV

HYDRAULIC TURBINES: Classification- Pelton wheel-Reaction Turbines-Inward and Outward radial flow reaction turbines-Francis Turbine-Axial flow reaction turbine -Kaplan turbine -Draft tube-Types-Theory-and efficiency of draft tube.

PERFORMANCE OF HYDRAULIC TURBINES: Geometric similarity, Unit and specific quantities, characteristic curves, governing of turbines, selection of type of turbine

UNIT V

CENTRIFUGAL PUMPS: Classification, working, work done –mano metric head -losses and efficiencies-specific speed-pumps in series and parallel -performance characteristic curves, NPSH.

RECIPROCATING PUMPS: Main parts -Classification -Discharge -Slip -Velocity and acceleration variation in suction and delivery pipes due to piston acceleration-Effect of variation of velocity on friction in suction and delivery pipes-Effect of acceleration in suction and delivery pipes on indicator diagram-Effect of friction

TEXT BOOKS
1. P.N.Modi and S.M.Seth, "Hydrualics and Fluid Mechanics", Standarard book house
2. R.K.Bansal, "Fluid Mechanics and Hydraulic Machines", Laxmi publications.

REFERENCE BOOKS
1. R.K.Rajput ,"Fluid Mechanics and Hydraulic Machines", S.Chand limited publications.
2. K.R.Arora "Fluid Mechanics and Hydraulic Machines", Standard Publishers Distributors.
3. Jagadish Lal, "Elements of Hydraulic Machines & Fluids" Metropolitan Book Co.

Programme: ME- Semester-IV					
Course Code	Course Name	L	T	P	C
20SH40T1	**Managerial Economics & Financial Accountancy**	3	0	0	3
Subject Category : Humanities and Social Science Course including Management					

COURSE OBJECTIVES   To familiarize with the concepts of managerial economics and accountancy principles.

COURSE OUTCOMES:
At the end of the Course student will be able to:
CO1   Apply managerial economic concepts in business decision making
CO2   Identify the influencing factors of Demand for a product.
CO3   Categorize Production with respect to time and cost.
CO4   Relate the market structures and pricing to a product
CO5   Establish the suitable business organization with available resources

COURSE SYLLABUS
UNIT - I:
INTRODUCTION TO ENGINEERING ECONOMICS
Definition, Nature and Scope of Managerial Economics – Relation of Managerial Economics with other disciplines, Concept of Engineering Economics.
DEMAND ANALYSIS: Demand Determinants, Law of Demand and its exceptions, Significance & Types of Elasticity of Demand, Factors governing demand forecasting- Methods of Demand forecasting.

UNIT - II:
THEORY OF PRODUCTION AND COST ANALYSIS
Production Function – Isoquants and Isocosts, MRTS, Least Cost Combination of Inputs, Cobb-Douglas production function. Production function, Laws of Returns, Internal and External Economies of Scale.
Cost Analysis: Cost concepts & BEP Analysis Break-Even Point (simple problems)

UNIT - III:
INTRODUCTION TO MARKETS & PRICING STRATEGIES
Market structures: Types of competition, Features of Perfect competition, Monopoly and Monopolistic Competition and Oligopoly.
Pricing strategies: Methods of Pricing: Cost based pricing, Demand based pricing, Competition based pricing and Strategy based pricing.

UNIT - IV: INTRODUCTION TO BUSINESS ORGANIZATIONS

Characteristics and features of Business, Features and evaluation of Sole Proprietorship, Partnership, Joint Stock Company, Public Enterprises and their types.

UNIT - V: FINANCIAL ACCOUNTANCY

Introduction to Accountancy, Types of Accounts, Journal, Ledgers, Trial Balance,I ntroduction to Final Accounts and Problems

Capital Budgeting and Financial Analysis

Introduction to capital budgeting - traditional methods and discounted cash flow methods (simple problems). Introduction to financial Analysis, Interpretation of financial statements through ratios.

TEXT BOOKS

1. Aryasri , "Managerial Economics and Financial Analysis", TMH.
2. H. Craig Peterson & W. Cris Lewis , "Managerial Economics", PHI.

REFERENCE BOOKS

1. Ambrish Gupta , "Financial Accounting for Management", Pearson Education, New Delhi.
2. Varshney & Maheswari, "Managerial Economics", S Chand Pubications.
3. Narayanaswamy , "Financial Accounting - A Managerial Perspective'', PHI.

Programme: ME- Semester-IV					
Course Code	Course Name	L	T	P	C
20ME4L01	**THERMAL ENGINEERING LAB**	3	0	0	3
Subject Category : Professional Core Course Lab					

COURSE OBJECTIVES   To study experimentally the performance of IC engines and compressors.

COURSE OUTCOMES:

At the end of the Course student will be able to:

CO1   Conduct various performance tests on I.C engines and plot the performance characteristic curves

CO2   Conduct the load test and evaluate the performance of a reciprocating air compressor

CO3   Identify the accessories and mountings of various boilers and its working   principles

CO4   Examine the properties of fuels and lubricants.

LIST OF EXPERIMENTS

1. Valve/port timing diagrams of a single cylinder engine.

2. Port timing diagrams of a single cylinder engine.

3. Disassembly & assembly of 4- stroke single cylinder diesel engine.

4. Load and Heat balance test on 4-stroke single cylinder diesel engine.

5. Performance test on 2-stroke single cylinder petrol engine.

6. Motoring and retardation test on 4-stroke single cylinder diesel engine.

7. Morse test on Multi cylinder Petrol Engine

8. Speed test on 4-stroke low speed diesel engine

9. Performance test on reciprocating air compressor.

10. Testing of Fuels:

   - Flash point/fire point of given fuel by Penskymartin and Cleavelands/Ables apparatus

   - Calorific value of given fuel by Bomb calorimeter

11. Testing of oils:

   - Viscosity test of given lubricating oil by Redwood viscometer

   - Cloud and Pour point of given oil

11. Study of boilers

12. Performance test on variable compression ratio engines

Programme: ME- Semester-IV					
Course Code	Course Name	L	T	P	C
20ME4L02	**MACHINE TOOLS LAB**	3	0	0	3
Subject Category : Professional Core Course Lab					

COURSE OBJECTIVES   To impart hands on training in the operation of basic machine tools.

COURSE OUTCOMES:

At the end of the Course student will be able to:

CO1   Operate lathe machine to carry out step turning, taper turning, knurling,   and   thread cutting, drilling and boring operations.

CO2   Perform drilling operation and distinguish tap set and perform tapping   operation.

CO3   Perform shaping, planing, cylindrical and surface grinding operations.

CO4   Perform indexing operation to prepare gear on milling machine.

LIST OF EXPERIMENTS

1. Step turning on lathe machine.

2. Taper turning on lathe machine.

3. Thread cutting and knurling on lathe machine.

4. Drilling and boring on lathe.

5. Drilling using radial drilling machine and tapping.

6. Shaping.

7. Planing.

8. Slotting.

9. Spur Gear cutting on milling machine.

10. Helical Gear cutting on milling machine.

11. Cylindrical grinding.

12. Grinding of tool angles.

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DEPARTMENT OF MECHANICAL ENGINEERING

Programme: ME- Semester-IV		L	T	P	C
Course Code	Course Name	L	T	P	C
20ME4L03	**Fluid Mechanics & Hydraulic Machines Lab**	3	0	0	3
Subject Category : Engineering Science Course Lab					

COURSE OBJECTIVES   Determine experimentally the co-efficient of discharge of various flow measuring devices and study the performance of various turbo machines.

COURSE OUTCOMES:

At the end of the Course student will be able to:

CO1   Measure the fluid flow using different flow measuring devices

CO2   Conduct a performance test on turbo machines at different operating conditions.

LIST OF EXPERIMENTS

1. Determine coefficient of discharge of Venturimeter

2. Determine coefficient of discharge of Orifice meter.

3. Determination of friction factor for a given pipe line.

4. Verification of Bernoulli's theorem.

5. Determine the efficiency of jet.

6. Performance Test on Pelton Wheel.

7. Performance Test on Francis Turbine.

8. Performance Test on Single Stage Centrifugal Pump.

9. Performance Test on Reciprocating Pump.

10. Performance Test on Multi Stage Centrifugal Pump.

11. Determine coefficient of discharge of Turbine Flow Meter.

12. Determination of minor losses for a given pipe line.