BACHELOR OF TECHNOLOGY

MECHANICAL ENGINEERING

Course Structure and Syllabus

(Batches admitted from the academic year 2022 - 2023)

Note: The regulations hereunder are subject to amendments as may be made by the Academic Council of the College from time to time. Any or all such amendments will be effective from such date and to such batches of candidates (including those already pursuing the program) as may be decided by the Academic Council.

PRE-REQUISITES FOR PROFESSIONAL ELECTIVES

Professional Elective Number	Subject Code	Title of the Subject	Pre- Requisite Subject Code	Pre-Requisite Subject Title
1	R22A0315	Design of Hydraulic and Pneumatic Systems	R22A0304	Fluid Mechanics & Hydraulic Machines
			R22A0306	Kinematics of Machinery
			R22A0309	Strength of Materials
	R22A0352	Design Thinking	R22A0301	Computer Aided Engineering Graphics
			R22A0307	Computer Aided Machine Drawing
	R22A0323	Mechanical Vibrations	R22A0306	Kinematics of Machinery
			R22A0306	Kinematics of Machinery
			R22A0310	Dynamics of Machinery
2	R22A0317	Additive Manufacturing	R22A0305	Materials Engineering
			R22A0307	Computer Aided Machine Drawing
			R22A0311	Manufacturing Processes
	R22A0326	Finite Element Methods	R22A0023	Mathematics – I
			R22A0024	Mathematics – II
			R22A0302	Engineering Mechanics
	R22A0330	Tribology	R22A0302	Engineering Mechanics
			R22A0314	Design of Machine Elements
3	R22A0327	Refrigeration & Air Conditioning	R22A0303	Engineering Thermodynamics
	R22A0251	Renewable Energy Sources	R22A0303	Engineering Thermodynamics
			R22A0318	Heat Transfer
	R22A0322	Industrial Robotics	R22A0023	Mathematics – I
			R22A0201	Principles of Electrical and Electronics Engineering
			R22A0306	Kinematics of Machinery
4	R22A0332	Production and Operations Management	R22A0311	Manufacturing Processes
			R20A0061	Managerial Economics & Financial Analysis
	R22A0335	Maintenance and Safety Engineering	R22A0306	Kinematics of Machinery
			R22A0311	Manufacturing Processes
	R22A0329	Operations Research	R22A0026	Probability, Statistics and Queuing Theory
			R22A0312	Metrology & Machine Tools

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY
B TECH MECHANICAL ENGINEERING
COURSE STRUCTURE
Applicable from AY 2022-23 Batch

I YEAR I SEMESTER

S.No	Subject Code	SUBJECT	L	T	P	C	MAX. MARKS	
							INT	EXT
1	R22A0001	English	2	0	0	2	40	60
2	R22A0023	Mathematics –I	3	1	0	4	40	60
3	R22A0021	Applied Physics	3	1	0	4	40	60
4	R22A0022	Engineering Chemistry	3	0	0	3	40	60
5	R22A0501	Programming for Problem Solving	3	0	0	3	40	60
6	R22A0082	Applied Physics/Engineering Chemistry Lab	-	0	3	1.5	40	60
7	R22A0083	Engineering and Computing Hardware Workshop	-	0	2	1	40	60
8	R22A0581	Programming for Problem Solving Lab	-	0	3	1.5	40	60
9	R22A0003	Human Values and Professional Ethics	2	0	0	0	40	60
		Total	16	2	8	20	360	540

I YEAR II SEMESTER

S.No	Subject Code	SUBJECT	L	T	P	C	MAX. MARKS	
							INT	EXT
1	R22A0002	Professional English	2	0	0	2	40	60
2	R22A0024	Mathematics – II	3	1	0	4	40	60
3	R22A0201	Principles of Electrical and Electronics Engineering	3	0	0	3	40	60
4	R22A0301	Computer Aided Engineering Graphics	2	0	3	4	40	60
5	R22A0502	Python Programming	3	0	0	3	40	60
6	R22A0081	English Language and Communication Skills Lab	-	0	2	1	40	60
7	R22A0281	Principles of Electrical and Electronics Engineering Lab	-	0	3	1.5	40	60
8	R22A0582	Python Programming Lab	-	0	3	1.5	40	60
9	R22A0004	Environmental Science	2	0	0	0	40	60
		Total	15	1	11	20	360	540

II YEAR I SEMESTER

S.No	Subject Code	SUBJECT	L	T	P	C	MAX. MARKS INT	MAX. MARKS EXT
1	R22A0302	Engineering Mechanics	3	0	0	4	40	60
2	R22A0303	Engineering Thermodynamics	3	0	0	3	40	60
3	R22A0304	Fluid Mechanics & Hydraulic Machines	3	0	0	3	40	60
4	R22A0305	Materials Engineering	2	1	0	3	40	60
5	R22A0306	Kinematics of Machinery	3	0	0	3	40	60
6	R22A0307	Computer Aided Machine Drawing	2	0	2	2	40	60
7	R22A0381	Fluid Mechanics & Hydraulic Machines Lab	-	0	2	1	40	60
8	R22A0382	Materials Engineering lab	-	0	2	1	40	60
9	*R22A0006	Foreign Language: German	2	0	0	0	100	-
		Total	**18**	**1**	**6**	**20**	**420**	**480**

*Mandatory course: Non-credit course, 50% of scoring is required for the award of the degree

II YEAR II SEMESTER

S.No	Subject Code	SUBJECT	L	T	P	C	MAX. MARKS INT	MAX. MARKS EXT
1	R22A0308	Thermal Engineering - I	3	0	0	3	40	60
2	R22A0309	Strength of Materials	3	0	0	3	40	60
3	R22A0310	Dynamics of Machinery	3	0	0	3	40	60
4	R22A0311	Manufacturing Processes	3	0	2	3	40	60
5	R22A0026	Probability, Statistics and Queuing Theory	3	1	0	4	40	60
6	R22A0383	Manufacturing Processes Lab	0	0	2	1	40	60
7	R22A0384	Strength of Materials Lab	-	0	2	1	40	60
8	R22A0391	Industry Oriented Project	-	0	4	2	40	60
9	*R22A0061	Public Policy & Governance	2	0	0	0	100	-
		Total	**17**	**1**	**10**	**20**	**420**	**480**

*Mandatory course: Non-credit course, 50% of scoring is required for the award of the degree

III Year B. Tech – I Semester

S.No	Subject Code	SUBJECT	L	T	P	C	MAX. MARKS	
							INT	EXT
1	R22A0312	Metrology & Machine Tools	3	0	0	3	40	60
2	R22A0313	Thermal Engineering - II	3	0	0	3	40	60
3	R22A0314	Design of Machine Elements	3	1	0	3	40	60
4	R22AXXXX	**Open Elective-I**	3	0	0	3	40	60
5	R22A0315 R22A0316 R22A0317 R22A6215	**Professional Elective-I** Design of Hydraulic and Pneumatic Systems Microprocessors in Automation Additive Manufacturing Fundamentals of Cyber Security	3	0	0	3	40	60
6	R22A0385	Metrology & Machine Tools Lab	-	0	2	1	40	60
7	R22A0386	Thermal Engineering Lab.	-	0	2	1	40	60
8	R22A0392	Application Development-I	0	0	4	2	40	60
9	R22A0084	Professional Development Skills-I	0	0	2	1	40	60
		Total	**15**	**1**	**10**	**20**	**360**	**540**

*Mandatory course: Non-credit course, 50% of scoring is required for the award of the degree

Open Elective-I

S.No	Subject Code	SUBJECT
1	R22A0551	Java Programming
2	R22A1251	Web Development
3	R22A2151	Intellectual Property Rights
4	R22A0351	Robotics & Automation
5	R22A0451	Electronics for Health Care
6	R22A6751	Principles of Data Science
7	R22A0251	Renewable Energy Sources
8	R22A0063	Business Analytics

III Year B. Tech – II Semester

S.No	Subject Code	SUBJECT	L	T	P	C	MAX. MARKS INT	MAX. MARKS EXT
1	R22A0318	Heat Transfer	3	1	0	3	40	60
2	R22A0319	CAD/CAM	3	0	0	3	40	60
3	R22A0320	Machine Design	3	0	0	3	40	60
4	R22AXXXX	Open Elective -II	3	0	0	3	40	60
5	R22A0321 R22A0322 R22A0323 R22A0324	**Professional Elective-II** Artificial Intelligence in Mechanical Engineering Industrial Robotics Mechanical Vibrations Unconventional Machining Processes	3	0	0	3	40	60
6	R22A0387	Heat Transfer Lab	-	0	2	1	40	60
7	R22A0388	CAD/CAM lab	-	0	2	1	40	60
8	R22A0393	Application Development-II	0	0	4	2	40	60
9	R22A0085	Professional Development Skills - II	0	0	2	1	40	60
		Total	**15**	**1**	**10**	**20**	**360**	**540**

*Mandatory course: Non-credit course, 50% of scoring is required for the award of the degree

Open Elective-II

S.No	Subject Code	SUBJECT
1	R22A0553	Database Systems
2	R22A6753	Big data Architecture
3	R22A0352	Design Thinking
4	R22A0552	Principles of Cloud Computing
5	R22A6951	IOT & its Application
6	R22A2152	Nano Technology
7	R22A0252	Electrical & Hybrid Vehicles
8	R22A6251	Cyber Governance

IV Year B. Tech – I Semester

S.No	Subject Code	SUBJECT	L	T	P	C	MAX. MARKS	
							INT	EXT
1	R22A0325	Mechanical Measurements & Instrumentation	3	0	0	3	40	60
2	R22A0326	Finite Element Methods	3	0	0	3	40	60
3	R22A0327	Refrigeration & Air Conditioning	3	1	0	3	40	60
4	R22A0328 R22A0329 R22A0330 R22A0331	**Professional Elective-III** Automobile Engineering Operations Research Tribology Industrial Engineering	3	0	0	3	40	60
5	R22A0332 R22A0333 R22A0334 R22A0335	**Professional Elective-IV** Production and Operations Management Maintenance and Safety Engineering Automation and Control Engineering Computational Fluid Dynamics	3	0	0	3	40	60
6	R22A0390	Mechanical Measurements & Instrumentation lab and Computer Aided Engineering Laboratory	-	0	4	2	40	60
7	R22A0394	Project Phase-I	-	0	6	3	40	60
		Total	**15**	**1**	**10**	**20**	**280**	**420**

IV Year B. Tech – II Semester

S.No	Subject Code	SUBJECT	L	T	P	C	MAX. MARKS	
							INT	EXT
1	R22A0336	Innovation, Start-Up & Entrepreneurship	4	0	0	4	40	60
2	R22A0337 R22A0338 R22A0339 R22A0340	**Professional Elective-V** Production Planning & control Bio-Mass Engineering Mechatronics Energy conservation and Management	3	0	0	3	40	60
3	R22A0341 R22A0342 R22A0343 R22A0344	**Professional Elective-VI** Turbo Machinery Composite Materials Power Plant Engineering Total Quality Management	3	0	0	3	40	60
4	R22A0395	Project Phase-II	0	0	20	10	80	120
		Total	**10**	**0**	**20**	**20**	**200**	**300**

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

I Year B. TECH - I- SEM

L/T/P/C
2 /- /-/2

(R22A0001) ENGLISH

INTRODUCTION

English is a global language which is a means to correspond globally. Keeping in account of its vital role in the global market, emphasis is given to train the students to acquire language and communication skills. The syllabus is designed to develop and attain the competency in communicative skills.

The lectures focus on the communication skills and the selected excerpts support as resources for the teachers to develop the relevant skills in the students. The lessons stimulate discussions and help in comprehending the content effectively. The focus is on skill development, nurturing ideas and practicing the skills.

COURSE OBJECTIVES:

1. To enable students to enhance their lexical, grammatical and communicativecompetence.
2. To equip the students to study the academic subjects with better perspective throughtheoretical and practical components of the designed syllabus.
3. To familiarize students with the principles of writing and to ensure error-free writing
4. To sharpen the speaking skills of learners by involving them in diverse activities such asgroup discussions, debates, conversations and role plays.
5. To train students in soft skills with the help of case studies.

SYLLABUS
Reading Skills:

Objectives

1. To develop an awareness in the students about the significance of silent reading and comprehension.
2. To augment the ability of students to guess the meanings of words from context andgrasp the overall message of the text, draw inferences etc.,

- Skimming the text
- Understanding the gist of an argument
- Identifying the topic sentence
- Inferring lexical and contextual meaning
- Understanding discourse features
- Recognizing coherence/sequencing of sentences
- Scanning the text

NOTE:

The students will be trained in reading skills using the prescribed text for detailed study. They will be examined in reading and answering questions using 'unseen' passages which may be taken from authentic texts, such as magazines/newspaper articles.

Writing Skills:
Objectives
1. To develop an awareness in the students about basic formal writing skills.
2. To equip students with the components of different forms of writing, beginning with therequired ones:
- Writing sentences
- Use of appropriate vocabulary
- Coherence and cohesiveness
- Formal and informal letter writing

Unit –I
J K Rowling's Convocation Speech at Harvard

Grammar	–	Tenses and Question Tags
Vocabulary	–	word Formation - Affixes Writing
Writing	–	Paragraph Writing
Reading	–	The art of skimming and
scanning	-	Reading Exercise Type 1

(Match the statements to the text they refer to)

Unit – II
"The Road not taken" by Robert Frost

Grammar	–	Direct and Indirect Speech
Vocabulary	–	One-Word Substitutes, Standard Abbreviations,Synonyms and Antonyms
Writing	–	Essay Writing (Introduction, body and conclusion)
Reading	–	Reading –The art of Intensive and Extensive -ReadingExercise Type 2

Unit – III
Satya Nadella's Email to His Employees on his First Day as CEO of Microsoft

Grammar	–	Voices
Vocabulary	–	Transitive and Intransitive
Writing	–	E-mail Writing, Letter Writing (complaints, requisitions, apologies).
Reading	–	Reading Comprehension- Reading Exercise Type 3(Reading between the lines)

Unit – IV
"Abraham Lincoln's Letter to His Son's Teacher"

Grammar	–	Articles, Punctuation
Vocabulary	–	Phrasal Verbs
Writing	–	Précis Writing
Reading	–	Reading Exercise Type 4 (Cloze test)

Unit –V
Abdul Kalam's Biography

Grammar   –   Subject-Verb Agreement, Noun-Pronoun Agreement
Vocabulary–   Commonly Confused Words Writing   –   Memo Writing
Reading   -   Reading Exercise Type 5 (Identifying errors)

* Exercises apart from the textbook shall also be used for classroom tasks.

REFERENCE BOOKS:
1. Practical English Usage. Michael Swan. OUP. 1995.
2. Remedial English Grammar. F.T. Wood. Macmillan.2007
3. https://www.britannica.com/biography/A-P-J-Abdul-Kalam
4. Study Writing. Liz Hamp-Lyons and Ben Heasly. Cambridge University Press.2006.
5. Communication Skills. Sanjay Kumar and Pushpa Lata. Oxford University Press. 2011.

COURSE OUTCOMES:

After completion of the course students will be able to:

1. Gain competence and proficiency in 'productive' skills, i.e., writing and speaking with the recognition of the need for life-long learning of the same
2. Hone their language abilities in terms of comprehending complex technical texts with apotential to review literature
3. Present ideas clearly and logically to analyze data and provide valid conclusions in written communication
4. Enrich their grammatical accuracy and fluency to be adept at both the active and passiveskills
5. Represent old conventions with a set of the new by professional verbal communicativeability.

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

I Year B. TECH - I- SEM   **L/T/P/ C**
                                                                                                            3/1/-/ 4

(R22A0023) MATHEMATICS -I

COURSE OBJECTIVES: To learn

- The concept of a Rank of the matrix and applying the concept to know the consistency andsolving the system of linear equations.
- The concept of Eigen values, Eigen vectors and Diagonolisation.
- The maxima and minima of functions of several variables.
- The Applications of first order ordinary differential equations.
- The methods to solve higher order differential equations.

UNIT I: Matrices

Introduction ,Types of matrices ,Rank of a matrix - Echelon form and Normal form, Consistency of system of linear equations (Homogeneous and Non-Homogeneous)-Gauss elimination method and Gauss-Siedel iteration method.

UNIT II: Eigen values and Eigen vectors

Linear dependence and independence of vectors, Eigen values and Eigen vectors and their properties, Diagonalisation of a matrix. Cayley-Hamilton theorem(without proof), finding inverse and power of a matrix by Cayley-Hamilton Theorem; Quadratic forms and Nature of the Quadratic Forms; Reduction of Quadratic form to canonical forms by Orthogonal Transformation.

UNIT III: Multi Variable Calculus (Differentiation)

Functions of two variables, Limit, Continuity,Partial derivatives, Total differential and differentiability, Derivatives of composite and implicit functions, Jacobian-functional dependence and independence,Maxima and minima and saddle points, Method of Lagrange multipliers,Taylors theorem for two variables.

UNIT IV: First Order Ordinary Differential Equations

Exact, Equations reducible to exact form, Applications of first order differential equations - Newton's law of cooling, Law of natural growth and decay, Equations not of first degree-Equations solvable for p, equations solvable for y, equations solvable for x and Clairaut's type

UNIT V : Differential Equations of Higher Order

Linear differential equations of second and higher order with constant coefficients: Non-homogeneous term of the type $f(x) = e^{ax}$, sinax, cosax, x^n, $e^{ax} V$ and $x^n V$ - Method of variation of parameters, Equations reducible linear ODE with constant coefficients-Cauchy's Euler equation and Legendre's equation.

Text Books

i)   Higher Engineering Mathematics by B V Ramana ., Tata McGraw Hill.
ii) Higher Engineering Mathematics by B.S. Grewal, Khanna Publishers.
iii) Advanced Engineering Mathematics by Kreyszig ,John Wiley & Sons .

Reference Books

i)   Advanced Engineering Mathematics by R.K Jain & S R K Iyenger, Narosa Publishers.
ii) Ordinary and Partial Differential Equations by M.D. Raisinghania, S.Chand Publishers
iii) Engineering Mathematics by N.P Bali and Manish Goyal.

Course Outcomes: After learning the concepts of this paper the student will be able to

1. Analyze the solution of the system of linear equations and to find the Eigen values andEigen vectors of a matrix.
2. Reduce the quadratic form to canonical form using orthogonal transformations.
3. Find the extreme values of functions of two variables with / without constraints.
4. Solve first order, first degree differential equations and their applications.
5. Solve higher order differential equations.
6. Analyze the nature of sequence and series.

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

I Year B. TECH – I - SEM   **L/T/P/C**

3/1/-/4

(R22A0021) APPLIED PHYSICS

COURSE OBJECTIVES:

1   To understand the basic principles of lasers and optical fibers.
2   To interpret dual nature of the matter and behavior of a particle quantum mechanically.
3   To classify the solids depending upon electrical conductivity.
4   To understand the concepts of semiconductors and devices.
5   To analyze dielectric and magnetic properties of the materials.

UNIT – I

LASERS & FIBER OPTICS   **(15 Hours)**

Lasers: Characteristics of lasers, Absorption, Spontaneous and stimulated emissions, Einstein's Coefficients,Population inversion, meta stable state, types of pumping, lasing action, construction and working of Ruby Laser, Helium-Neon Laser, Semiconductor diode Laser, Applications of lasers.

Fiber Optics: Introduction to optical fiber, Construction and working principle of an Optical Fiber, Acceptance angle and Numerical aperture, Types of Optical fibers - Mode and index profile,Losses in optical fiber, Optical Fiber in Communication System, Applications of optical fibers.

UNIT – II

QUANTUM MECHANICS   **(10 Hours)**

Wave nature of particles, de Broglie's hypothesis, matter waves, Heisenberg's uncertainty principle, Davisson and Germer's experiment, G.P Thomson experiment, Schrodinger time-independent wave equation-significance of wave function, Particle in one dimensional square well potential.

UNIT – III

FREE ELECTRON THEORY OF METALS   **(12 Hours)**

Free electron theory (Classical & Quantum)- Assumptions, Merits and drawbacks, Fermi level, Density of states, Periodic potential, Bloch's theorem, Kronig – Penny model (qualitative) , E –k diagram, Effective mass, Origin of energy bands in solids, Classification of materials : Metals, semiconductors and insulators.

UNIT-IV

SEMICONDUCTOR PHYSICS   **(15 Hours)**

Intrinsic and Extrinsic semiconductors, Direct and Indirect band gap semiconductors, Carrier concentration in intrinsic and extrinsic semiconductors. Dependence of Fermi level on carrier concentration and temperature, Formation of PN Junction, V-I characteristics of PN Junction diode, Energy Diagram of PN diode, Hall effect, semiconductor materials for optoelectronic devices - LED, Photo diode, Solar cell.

UNIT – V

DIELECTRICS AND MAGNETIC PROPERTIES OF MATERIALS   **(12 Hours)**

Dielectrics: Introduction, Types of polarizations – Electronic, Ionic and Orientation polarization (qualitative) and calculation of polarizabilities, Internal fields in Solid, Clausius-Mossotti relation, Piezo-electricity and Ferro-electricity.

Magnetism: Introduction, Classification of Dia, Para, Ferro magnetic materials based on magnetic moment, Properties of Anti-Ferro and Ferri magnetic materials, Hysteresis curvebased on domain theory, Soft and Hard magnetic materials.

COURSE OUTCOMES:

1   Can apply the principles of laser to understand various lasers and fiber optic systems.
2   Basic principles of quantum mechanics can be used to analyze the microscopic behavior of a particle.
3   Classification of solids can be made by understanding the band structure of solids.
4   Concepts of semiconductors can be applied to predict the importance of electronic devices relevant to engineering domains.
5   Examine dielectric, magnetic properties of the materials and apply them in materialtechnology.

TEXT BOOKS:

1.   Engineering Physics by Kshirsagar&Avadhanulu, S. Chand publications.
2.   Modern Engineering Physics-Dr K Vijaya Kumar & Dr S Chandralingam, S. ChandPublications.
3.   Engineering Physics- B.K.Pandey, S.Chaturvedi, Cengage Learning.

REFERENCES:

1.   Engineering Physics – R.K. Gaur and S.L. Gupta, DhanpatRai Publishers.
2.   Engineering Physics, S Mani Naidu- Pearson Publishers.
3.   Engineering physics 2nd edition –H.K. Malik and A.K. Singh.
4.   Engineering Physics – P.K. Palaniswamy, Scitech publications.
5.   Physics by Resnick and Haliday.

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

I Year B. TECH - I- SEM   **L/T/P/C**
                                                                                                      3/0/0/3

(R22A0022) ENGINEERING CHEMISTRY

COURSE OBJECTIVES: The students will be able to

1. Acquire the knowledge of electrochemistry and batteries which are essential for theengineers and in industry.
2. Analyze engineering problems related to corrosion and develop different corrosion control techniques.
3. Identify different types of polymers, composites and their applications in variousengineering fields.
4. Gain knowledge on wide variety of advanced materials like nano and smart materials whichhave excellent engineering properties.
5. Analyze water for its various parameters and its significance in industrial and domestic applications.

Unit I Electrochemistry (8 hours)
Introduction - Types of cells - Electrolytic and Electrochemical cells (construction and working of Galvanic Cell) - Electrode potential- Cell potential (EMF); Nernst equation and its applications; Electrochemical series and its applications. Batteries - Classification of batteries - primary, secondary and fuel cells with examples. Primary cells - Lithium cells; Secondary cells - Lead acid battery and Lithium ion battery; Fuel cells - Differences between battery and a fuel cell; Construction, working and applications of H_2-O_2 fuel cell.

Unit II Corrosion: (8 hours)
Causes and effects of corrosion – Theories of corrosion - Chemical (oxidation) and Electrochemical corrosion – mechanism of electrochemical corrosion (Evolution of Hydrogen and Absorption of Oxygen); Corrosion control methods - Cathodic protection - Sacrificial anode and Impressed current cathodic methods; Surface coatings – methods of application - Electroplating (Cu-plating) and Electroless plating (Ni-plating) - advantages and applications of electroplating/electroless plating.

Unit III Water and its treatment: (8 hours)
Introduction – hardness of water – causes of hardness; Types of hardness - temporary and permanent – expression and units of hardness-numerical problems; Potable water and its specifications; Disinfectation of water by chlorination and ozonization. Boiler troubles - caustic embrittlement, scales and sludges; External treatment of water – Ion exchange process; Desalination of water – Reverse osmosis.

Unit IV Polymers: (10 hours)

Introduction - Classification of polymers; Types of polymerization - addition and condensation polymerisation with examples. **Plastics** - thermoplastic and thermosetting resins; preparation, properties and engineering applications of Polyvinylchloride (PVC), Teflon (PTFE), and Bakelite. **Rubbers -** Natural rubber and its vulcanization. **Conducting polymers** - classification of conducting polymers – mechanism of conduction in trans-Polyacetylene and applications of conducting polymers. **Bio-degradable polymers** – preparation, properties and applications of Poly-Lactic acid. **Composite materials:** Introduction - Fibre reinforced plastics (FRPs) - Glass fibre reinforced, Carbon fibre reinforced plastics and their applications.

Unit V Advanced Materials: (8 hours)

Nanomaterials: Introduction and classification of nanomaterials; preparation of nanomaterials - Sol-gel method; applications of nanomaterials (industrial and medicinal); Carbon nanotubes (CNTs)-applications.

Smart materials: Introduction - Types of smart materials - examples and applications of piezoelectric materials and shape memory alloys.

Suggested Text Books:

1. Engineering Chemistry by P.C. Jain & M. Jain: Dhanpat Rai Publishing Company (P) Ltd, NewDelhi. 16thEdition.

2. Engineering Chemistry by Prasanta Rath, B. Rama Devi, C. H. Venkata RamanaReddy, Subhendu Chakroborty, Cengage Learning Publication, India Private Limited, 2018.

3. Engineering Analysis of Smart Material Systems by Donald J. Leo, Wiley, 2007.

Reference Books:

1. Engineering Chemistry by Shashi Chawla, Dhanpat Rai Publishing Company (P) Ltd, NewDelhi.

2. Engineering Chemistry, by S. S. Dara, S. Chand & Company Ltd, NewDelhi.

3. P.W. Atkins, J.D. Paula, "Physical Chemistry", Oxford, 8thedition (2006).

4. B.R. Puri, L.R. Sharma and M.S. Pathania, "Principles of Physical Chemistry", S. Nagin Chand & Company Ltd., 46thedition (2013).

COURSE OUTCOMES: The student will be able to

1. Relate the knowledge of operating principles of various types of electrochemical cells,including batteries, to optimize the need for sustainable development.

2. Analyze and develop technically sound, economic and sustainable solutions for complex engineering problems related to corrosion and its effects.

3. Identify, formulate and develop polymeric compounds used in various engineering materialsfor futuristic engineering applications.

4. Apply the knowledge of nanotechnology and smart materials to find solutions for various engineering problems.

   Familiarize with the fundamentals of water treatment technologies and the considerationsfor its design and implementation in water treatment plants.

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

I Year B. TECH - I- SEM　　　　　　　　　　　　　　　　　　**L/T/P/C**

　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　3/-/-/3

(R22A0501) PROGRAMMING FOR PROBLEM SOLVING

COURSE OBJECTIVES:

1. To Understand the use of computer system in problem solving and to build program logic with algorithms and flowcharts.
2. To learn the syntax and semantics of C programming language.
3. To learn the usage of structured programming approach in solving problems.
4. To learn the usage of strings and pointers.
5. Understand the usage of structures and files.

UNIT - I: Introduction to Programming:

Computer Languages, Compilers, Compiling and executing a program, Representation of Algorithms and Flowcharts with examples.

Introduction to C Programming Language:

Structure of a C Program**,** I/O: Simple input and output with scanf() and printf(), C Tokens- Keywords, Identifiers, Constants, Variables, Data types, Operators, Expressions and precedence, Expression evaluation, Type conversion.

UNIT - II: Conditional Branching and Arrays:

Control Structures – Selection Statements (Decision Making)- if and switch statements, nested if-else, Iteration and loops: use of while, do-while and for loops, nested loops, use of goto, break and continue statements.

Arrays: Definition, one and two dimensional arrays, creating, accessing and manipulating elements of arrays.

UNIT - III: Designing Structured Programs using Functions:

Functions: Declaring a function, Categories of functions, passing parameters to functions: call by value, call by reference, passing arrays to functions, Scope- Local Vs Global, Storage classes, Recursion with example programs.

UNIT - IV: Strings and Pointers:

Strings: Introduction to strings, Declaration and Initialization, String input/output functions, String manipulation functions with example programs, Array of Strings.

Pointers: Defining pointers, Declaration and Initialization, accessing variables through pointers, Pointers to arrays, Pointers to functions, Pointers to structures, Command line arguments, Enumeration data type, Dynamic Memory Management Functions: malloc(), calloc(), realloc() and free().

UNIT - V: Structures and File handling in C:

Structures: Defining structures, Declaration and Initialization, Array of structures, unions.

Files: Text and Binary files, Opening and Closing files, File input /output functions, Creating and Reading and writing text files, Appending data to existing files.

TEXT BOOKS:

1. Jeri R. Hanly and Elliot B.Koffman, Problem solving and Program Design in C 7th Edition,Pearson.
2. Mastering C, K.R.Venugopal, S R Prasad, Tata McGraw-Hill Education.
3. Computer Programming, E.Balagurusamy, First Edition, TMH.
4. Computer Science: A Structured Programming Approach Using C, B.A.Forouzan and R.F. Gilberg, Third Edition, Cengage Learning.

REFERENCE BOOKS:

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall ofIndia.
2. Yashavant Kanetkar, Let Us C, 18th Edition, BPB.
3. Programming in C, Stephen G. Kochan, Fourth Edition, Pearson Education.
4. Herbert Schildt, C: The Complete Reference, Mc Graw Hill, 4th Edition.

COURSE OUTCOMES: The student will be able

1. To write algorithms and to draw flowcharts for solving problems.
2. To convert the algorithms/flowcharts to C programs.
3. To code and test a given logic in the C programming language.
4. To decompose a problem into functions and to develop modular reusable code.
5. To use arrays, pointers, strings, structures and files to write C programs.

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(R22A0082) Applied Physics/Engineering Chemistry Lab

COURSE OBJECTIVES:

1. To experience the mechanical oscillations and resonance phenomena.
2. To verify the concepts of light.
3. To analyze voltage/current phase behavior of RC and LCR circuits.
4. To study the characteristics of semiconductor devices.
5. To understand the concepts of laser.

LIST OF EXPERIMENTS:

1. Melde's experiment –Frequency of electrical vibrator.
2. Newton's Rings –Radius of curvature of Plano convex lens.
3. Laser -Wave length of light by using Diffraction grating.
4. CR circuit – Time constant of RC circuit.
5. LCR Circuit- Quality factor and resonance frequency of LCR circuit.
6. LED -Characteristics of LED.
7. Solar cell -Characteristics of Solar cell.
8. Optical fiber- Numerical aperture of an optical fiber.
9. Torsional pendulum- Rigidity modulus of given wire (demonstrative).
10. Hall Effect – Hall coefficient of semiconducting samples (demonstrative).

REFERENCE BOOKS:

1. Practical physics by Dr. Aparna, Dr K.V Rao, V.G.S. Publications.
2. Engineering physics practical lab manual – MRCET

COURSE OUTCOMES:

1. Students can compare the elastic constants of different metallic wires, and also determine the ac frequency of vibrating bar.
2. Students can illustrate the interference of light phenomena.
3. Wavelength of the given laser can be determined by using diffraction phenomenon
4. By understanding electrical principles, Time constant of RC and resonance phenomenon of LCR circuits can be analyzed.
5. V-I characteristics of various semiconductor devices can be illustrated.

(R22A0082) ENGINEERING CHEMISTRY LAB

COURSE OBJECTIVES:

The students will be able:

1. To understand and explain scientifically the various chemistry related problems in the industry/engineering and develop experimental skills for building technical competence.
2. To familiarize with the practical implementation of fundamental concepts.
3. To gain hands on experience in handling the instruments.
4. To demonstrate the digital and instrumental methods of analysis.
5. To correlate the practical aspects with theoretical concepts.

List of Experiments

Titrimetry:

1. Estimation of Hardness of water by EDTA method.
2. Estimation of Ferrous ion by Dichrometry

Instrumental Methods

Conductometry:

3. Estimation of concentration of HCl by Conductometric titrations.
4. Estimation of concentration of Acetic acid by Conductometric titrations.

Potentiometry:

5. Estimation of concentration of HCl by Potentiometric titrations.
6. Estimation of amount of Fe^{2+} by Potentiometric titration using $KMnO_4$.

Colorimetry:

7. Estimation of Copper by Colorimetric method.

Preparation

8. Preparation of a Polymer-**Bakelite**

Physical Property

9. Determination of Surface Tension of a given liquid by Stalagmometer.

Corrosion control method

10. Electroplating of Copper on an Iron object.

Text Book:

1. Inorganic quantitative analysis, Vogel
2. A text book on experiments and calculation in Engineering Chemistry by S.S. Dara

Suggested Readings:

1. Practical Engineering Chemistry by K. Mukkanti, etal, B.S. Publications, Hyderabad.
2. Text Book of engineering chemistry by R. N. Goyal and HarrmendraGoel, Ane Books Private Ltd.

COURSE OUTCOMES:

The students will be able:

1. To estimate the total hardness present in a sample of water.
2. To know the strength of an acid by conductometric and potentiometric methods.
3. To find the amount of Cu^{2+} present in unknown sample using colorimetric method.
4. To prepare a thermosetting polymer.
5. To determine the surface tension of a given liquid.
6. To understand the electroplating method for corrosion protection of metals.

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(R22A0083) Engineering and Computing Hardware Workshop

It is consisting of 2 parts: **Part I: Computing Hardware Workshop**

Part II: Engineering Workshop

COURSE OBJECTIVES:

• Understand the internal structure of computer system and learn to diagnose minor problems with the computer functioning.

• Know the proper usage and threats of the World Wide Web & Study in detail about the various features of Ms-Word, Excel, PowerPoint and Google Forms

• To obtain the knowledge about Electrical wiring and Soldering – Desoldering procedures.

• To provide hands on experience in usage of different engineering materials, tools equipments and processes which are common in the engineering field.

• To develop professional attitude, team work, precision and safety practices at work place.

Part I: COMPUTING HARDWARE WORKSHOP

Task- 1: PC HARDWARE
Identification of the peripherals of a computer, components in a CPU and its functions.Block diagram of the CPU along with the configuration of each peripheral. Functions of Motherboard. Assembling and Disassembling of PC. Installation of OS. Basic Linux commands.

Task- 2: TROUBLESHOOTING
Hardware Troubleshooting: Students are to be given a PC which does not boot due to proper assembly or defective peripherals and the students should be taught to identify and correct the problem.
Software Troubleshooting: Students have to be given a malfunctioning CPU due to system software problems. They should identify the problem and fix it to get the computer back to working condition.

Task 3: INTERNET
Web Browsers, Access of websites, Surfing the Web, Search Engines, Customization of web browsers, proxy settings, bookmarks, search toolbars, pop-up blockers. Antivirus downloads, Protection from various threats.

MS OFFICE
Task 4: MICROSOFT WORD
Overview of MS word features. Usage of Hyperlink, Symbols, Spell Check, Track Changes. Table of Content, Newspaper columns, Images from files and clipart, Drawing toolbar and Word Art,

Formatting Images, Textboxes, Paragraphs and Mail Merge in word. Using Word to create Project Certificate, Project Abstract, News Letter, Resume.

Task 5: MICROSOFT EXCEL
Overview of Excel Features Excel formulae & Functions, conditional formatting, Charts, Hyper linking, Renaming and Inserting worksheets, Data Analysis functions.
Creating a Scheduler (Features: - Gridlines, Format Cells, Summation, auto fill, Formatting)
Calculating GPA (Features: - Cell Referencing, Formulae and functions in excel

Task 6: MICROSOFT POWER POINT
Overview of PowerPoint features, Insertion of images, slide transition, Custom animation, Hyperlinks.

Task 7: GOOGLE FORMS
Google forms introduction, opening Google forms, editing forms, add questions, copy duplicate questions, delete questions, required questions, more button, form color and themes, preview form, advance form settings, send form, view responses, close form

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PART II: ENGINEERING WORKSHOP

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A.   List of Experiments:
1. Residential house wiring using switches, fuse, indicator, lamp and energy meter.
2. Fluorescent lampwiring
3. Stair casewiring
4. Soldering and Desoldering practice – components, devices and circuits using general

1. Purpose PCB.
Note: Minimum ONE experiment need to be conducted in each trade

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A.   TRADES FOR EXERCISES:

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At least two exercises from each trade:

1. Carpentry:
To prepare T-Lap Joint, Dovetail Joint.
To prepare Mortise & Tenon Joint.

2. Fitting:
To prepare V-Fit, Dovetail Fit & Semi-circular fit.

3. Tin-Smithy:
To make Square Tin, Rectangular Tray & Conical Funnel.

Note: Minimum ONE experiment need to be conducted in each trade

Trades to demonstrate:

1. Plumbing
2. Foundry
3. Welding
4. Black smithy
5. Metal cutting (Water Plasma)

Note: Minimum a total of 3 trades to be demonstrated.

TEXT BOOKS – IT WORKSHOP

1. Introduction to Information Technology, ITL Education Solutions limited, Pearson Education
2. Excel Functions and Formulae, Bernd held, Theodor Richardson, Third Edition

TEXT BOOKS – ENGINEERING WORKSHOP

1. Workshop Manual, P. Kannaiah and K. L. Narayana, 3rd Edition, Scitech,2015
2. Printed Circuit Boards - Design, Fabrication, Assembly and Testing, R. S. Khandpur, Tata McGraw-Hill Education, 2005.

COURSE OUTCOMES:

- Ability to identify, assemble and troubleshoot the major components of a computer and perform the installation of Operating System.
- Capacity to make effective usage of the internet for academics and develop professional documents, spreadsheets and presentations.
- Students will be able to understand the domestic, illumination, stair-case wiring procedures and soldering de soldering practice
- The student will have hands-on experience on manufacturing of components using different trades of engineering processes
- The student will be able to perform in a team, adhering to industrial safety practices and follow professional working standards.

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(R22A0581) PROGRAMMING FOR PROBLEM SOLVING LAB

COURSE OBJECTIVES:

1. To work with an IDE to create, edit, compile, run and debug programs.
2. To analyze the various steps in program development.
3. To develop programs to solve basic problems by understanding basic concepts inC likeoperators, control statements etc.
4. To develop modular, reusable and readable C Programs using the concepts likefunctions,arrays etc.
5. To create, read from and write to text and binary files.

Practice sessions:

a. Write a simple program that prints the results of all the operators available in C (including pre/post increment, bitwise and/or/not, etc.). Read required operandvalues from standard input.
b. Write a simple program that converts one given data type to another using autoconversion andcasting. Take the values from standard input.

Simple numeric problems:

a. Write a program for finding the max and min from the three numbers.
b. Write the program for the simple, compound interest.
c. Write a program that declares Class awarded for a given percentage of marks, wheremark <40%= Failed, 40% to <60% = Second class, 60% to <70%=First class, >= 70% =Distinction.Read percentage from standard input.
d. Write a program that prints a multiplication table for a given number and the numberof rows inthe table. For example, for a number 5 and rows = 3, the output should be:5 x 1 = 5
5 x 2 = 10
5 x 3 = 15

Expression Evaluation:

a. A building has 10 floors with a floor height of 3 meters each. A ball is dropped fromthe top of the building. Find the time taken by the ball to reach each floor. (Use the formula $s = ut+(1/2)at^2$ where u and a are the initial velocity in m/sec (= 0) and acceleration in m/sec^2 (= 9.8 m/s^2)).
b. Write a C program, which takes two integer operands and one operator from the user,performs the operation and then prints the result. (Consider the operators +,-,*, /, %

and use Switch Statement).

c. Write a C program to find the factorial of a given number.

d. Write a C program to find the sum of individual digits of a positive integer and test givennumberis palindrome.

e. A Fibonacci sequence is defined as follows: the first and second terms in the sequenceare 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence. Writea C program to generate the first n terms of the sequence.

f. Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.

g. Write a C program to find the roots of a Quadratic equation.

Arrays, Functions and Pointers:

a. Write a C program to find the minimum, maximum and average in an array of integers.

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

  1. Addition of Two Matrices

  2. Multiplication of Two Matrices

c. Write a C program to find the Transpose of a matrix.

d. Write a function to swap the values of two variables using call by value.

e. Write a function to swap the values of two variables using call by reference.

f. Write C programs that use both recursive and non-recursive functions

  1. To find the factorial of a given integer.

  2. To find the GCD (greatest common divisor) of two given integers.

g. Write a program for reading elements using a pointer into an array and display thevalues usingthe array.

h. Write a program for display values reverse order from an array using a pointer.

i. Write a program through a pointer variable to sum of n elements from an array.

Strings:

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

  1. To insert a sub-string into a given main string from a given position.

  2. To delete n Characters from a given position in a given string.

b. Write a C program to determine if the given string is a palindrome or not (Spelledsame in bothdirections with or without a meaning like madam, civic, noon, abcba,etc.)

c. Write a C program that displays the position of a character ch in the string S or – 1 if S doesn'tcontain ch.

d. Write a C program to count the lines, words and characters in a given text.

Structures:

a. Write a C program to create a structure named book and display the contents of abook.

b. Write a C program to create a structure named student and display the details of 5students using array of structures.

  c. Write a C program to calculate total and percentage marks of a student using structure.

Files:

a. Write a C program to display the contents of a file to standard output device.

b. Write a C program which copies one file to another file.

c. Write a C program to count the number of times a character occurs in a text file. Thefile nameand the character are supplied as command line arguments.

d. Write a C program to merge two files into a third file (i.e., the contents of the first filefollowedby those of the second are put in the third file).

Miscellaneous:

a. Write a menu driven C program that allows a user to enter n numbers and then choose betweenfinding the smallest, largest, sum, or average. The menu and all the choices areto be functions. Use a switch statement to determine what action to take. Display an error message if an invalidchoice is entered.

b. Write a C program to construct a pyramid of numbers as follows:

```
1           *              1
1           * *            2 2

2
1           * * *          3 3 3

2

3
                           4 4 4 4
```

TEXT BOOKS:

1. Jeri R. Hanly and Elliot B.Koffman, Problem solving and Program Design in C 7th Edition, Pearson.

2. B.A. Forouzan and R.F. Gilberg C Programming and Data Structures, Cengage Learning,(3rd Edition).

REFERENCE BOOKS:

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, PHI.

2. E. Balagurusamy, Computer fundamentals and C, 2nd Edition, McGraw-Hill.

3. Yashavant Kanetkar, Let Us C, 18th Edition, BPB.

4. R.G. Dromey, How to solve it by Computer, Pearson (16th Impression).

5. Programming in C, Stephen G. Kochan, Fourth Edition, Pearson Education.

6. Herbert Schildt, C: The Complete Reference, Mc Graw Hill, 4th Edition.

7. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill.

COURSE OUTCOMES:

After completion of the course, Students will be able to**:**

- formulate the algorithms for simple problems.
- identify and correct logical errors encountered during execution.

- represent and manipulate data with arrays, strings, structures and pointers.
- create, read and write to and from simple text and binary files.
- modularize the code with functions so that they can be reused.

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(R22A0003) HUMAN VALUES AND PROFESSIONAL ETHICS

COURSE OBJECTIVES:

This introductory course input is intended:

1. To help the students appreciate the essential complementarily between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.
2. To facilitate the development of a holistic perspective among students towards life, profession and happiness, based on a correct understanding of the Human reality and the rest of Existence. Such a holistic perspective forms the basis of value based living in a natural way.
3. To highlight plausible implications of such a holistic understanding in terms of ethical human conduct, trustful and mutually satisfying human behavior and mutually enriching interaction with Nature.

UNIT - I:

Course Introduction - Need, Basic Guidelines, Content and Process for Value Education: Understanding the need, basic guidelines, content and process for Value Education. Self-Explorjation - what is it? - its content and process; 'Natural Acceptance' and Experiential Validation - as the mechanism for self-exploration. Continuous Happiness and Prosperity A look at basic Human Aspirations- Right understanding, Relationship and Physical Facilities- the basic requirements for fulfillment of aspirations of every human being with their correct priority. Understanding Happiness and Prosperity correctly - A critical appraisal of the current scenario. Method to fulfill the above human aspirations: understanding and living in harmony at various levels.

UNIT - II:

Understanding Harmony in the Human Being - Harmony in Myself! : Understanding human being as a co-existence of the sentient 'I' and the material 'Body'.
Understanding the needs of Self ('I') and 'Body' - Sukh and Suvidha. Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer).
Understanding the harmony of I with the Body: Sanyam and Swasthya; correct appraisal of Physical needs, meaning of Prosperity in detail. Programs to ensure Sanyam and Swasthya.

UNIT - III:

Understanding Harmony in the Family and Society - Harmony in Human - Human Relationship: Understanding harmony in the Family the basic unit of human interaction. Understanding values in human - human relationship; meaning of Nyaya and program for its fulfillment to

ensure Ubhay-tripti; Trust (Vishwas) and Respect (Samman) as the foundational values of relationship.

Understanding the meaning of Vishwas; Difference between intention and competence. Understanding the meaning of Samman, Difference between respect and differentiation; the other salient values in relationship.

Understanding the harmony in the society (society being an extension of family): Samadhan, Samridhi, Abhay, Sah-astiva as comprehensive Human Goals. Visualizing a universal harmonious order in society - Undivided Society (Akhand Samaj), Universal Order (Sarvabhaum Vyawastha) - from family to world family!

UNIT - IV:

Understanding Harmony in the nature and Existence - Whole existence as Coexistence: Understanding the harmony in the Nature. Interconnectedness and mutual fulfillment among the four orders of nature - recyclability and self-regulation in nature.

Understanding Existence as Co-existence (Sah-astitva) of mutually interacting units in all-pervasive space. Holistic perception of harmony at all levels of existence.

UNIT - V:

Implications of the above Holistic Understanding of Harmony on Professional Ethics: Natural acceptance of human values, Definitiveness of Ethical Human Conduct, Basic for Humanistic Education, Humanistic Constitution and Humanistic Universal Order. Competence in professional ethics:

a. Ability to utilize the professional competence for augmenting universal human order.
b. Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems.
c. Ability to identify and develop appropriate technologies and management patterns for above production systems.

TEXT BOOKS:

1. R. R. Gaur, R Sangal, G P Bagaria, 2009, A Foundation Course in Human Values and Professional Ethics.
2. Prof. K. V. Subba Raju, 2013, Success Secrets for Engineering Students, Smart Student Publications, 3rd Edition.

REFERENCE BOOKS:

1. Ivan IIlich, 1974, Energy & Equity, The Trinity Press, Worcester, and HarperCollins, USA
2. E. F. Schumancher, 1973, Small is Beautiful: a study of economics as if people mattered. Blond & Briggs, Britain.
3. A Nagraj, 1998 Jeevan Vidya ek Parichay, Divya Path Sansthan, Amarkantak.
4. Sussan George, 1976, How the Other Half Dies, Penguin Press, Reprinted 1986, 1991.
5. P. L. Dhar, R. R. Gaur, 1990, Science and Humanism, Commonwealth Publishers.

A. N. Tripathy, 2003, Human Values, New Age International Publishers.

6. Subhas Palekar, 2000, How to practice Natural Farming, Pracheen(Vaidik) Krishi Tantra Shodh, Amravati.

7. Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972, Limits to Growth - Club of Rome's report, Universe Books.

8. E G Seebauer & Robert L.Berry, 2000, Fundamentals of Ethics for Scientists & Engineers, Oxford University Press.

9. M Govindrajan, S Natrajan & V. S Senthil kumar, Engineering Ethics (including Humna Values), Eastern Economy Edition, Prentice Hall of India Ltd.

Relevant CDs, Movies, Documentaries & Other Literature:

1. Value Education website, http://www.uptu.ac.in

2. Story of Stuff, http://www.storyofstuff.com

3. AI Gore, An Inconvenient Truth, Paramount Classics, USA

4. Charle Chaplin, Modern Times, United Artists, USA

5. IIT Delhi, Modern Technology - the Untold Story

COURSE OUTCOMES:

1. The students will be able to obtain happiness and prosperity in their life.

2. They will develop harmony at all levels.

3. They can have satisfying human behavior throughout their life.

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(R22A0002) PROFESSIONAL ENGLISH

INTRODUCTION:

English is a tool for global communication and is the dominant language, which is sweeping almost all the fields in the world. It has become a necessity for people to speak in English comfortably, if they want to enter the global workforce. Hence, the course is designed to help the students to meet the global standards. Each unit focuses on English skill-set to improve: Interview skills, giving presentations and professional etiquette.

COURSE OBJECTIVES:

1   To enrich students to express themselves appropriately and fluently in professional contexts.
2   To enhance their employability through regular participation in group discussions and interview skills.
3   To lay foundation with writing strategies for the future workplace needs.
4   To acquaint students with different components of professional presentation skills.
5   To equip students with necessary training in listening to comprehend dialects of English language.

UNIT-I
"*Mokshagundam Visvesvaraya*"

Speaking	- Description of Pictures, Places, Objects and Persons
Grammar	- 'If' Clauses
Vocabulary	- Homonyms, homophones and homographs
Writing	- Paragraph Writing

NOTE: Listening and speaking tasks are solely for lab purpose and not for testing in the examinations.

UNIT –II

Speaking	- SmallTalks
Grammar	- Finite and Non-finite verbs
Vocabulary	- Standard Abbreviations (Mini Project)
Writing	- Job Application – Cover letter

NOTE: Listening and speaking tasks are solely for lab purpose and not for testing in the examinations.

Unit –III

Speaking	- Oral presentations
Grammar	- Transformation of Sentences
Vocabulary	- Idioms
Writing	- Abstract Writing

NOTE: Listening and speaking tasks are solely for lab purpose and not for testing in the examinations.

Unit – IV

'How a Chinese Billionaire Built Her Fortune'

Speaking	- Telephonic Expressions and Conversations
Grammar	- Auxiliary verbs & model
Verbs, Degrees of Comparison	
Vocabulary	- Word Analogy
Writing	- Job Application - Resume

NOTE: Listening and speaking tasks are solely for lab purpose and not for testing in the examinations.

Unit – V

Speaking	- Group discussion
Grammar	- Common Errors, Prepositions
Vocabulary	- Technical Vocabulary
Writing	- Report Writing

NOTE: Listening and speaking tasks are solely for lab purpose and not for testing in the examinations.

REFERENCE BOOKS:
1. Practical English Usage. Michael Swan. OUP. 1995.
2. Remedial English Grammar. F.T. Wood. Macmillan.2007
3. Skills Annexe & Epitome of Wisdom - B.Tech 1st Year English Study Material, JNTUH.
4. Study Writing. Liz Hamp-Lyons and Ben Heasly. Cambridge University Press.2006.
5. Communication Skills. Sanjay Kumar and Pushpa Lata. Oxford University Press. 2011.
6. Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad. Oxford University Press
7. 'English for Engineers'. Cambridge University Press

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(R22A0024) MATHEMATICS-II

OBJECTIVES:

- The aim of numerical methods is to provide systematic methods for solving problems in a numerical form using the given initial data,also used to find the roots of an equation and to solve differential equations.

- The objective of interpolation is to find an unknown function which approximates the given data points and the objective of curve fitting is to find the relation between the variables x and y from given data and such relationships which exactly pass through the data (or) approximately satisfy the data under the condition of sum of least squares of errors.

- PDE aims at forming a function with many variables and also their solution methods, Method of separation of variables technique is learnt to solve typical second order PDE.

- Evaluation of multiple integrals.

- In many engineering fields the physical quantities involved are vector valued functions. Hence the vector calculus aims at basic properties of vector-valued functions and their applications to line, surface and volume integrals.

UNIT – I: Interpolation
Interpolation: Introduction, errors in polynomial interpolation, Finite differences - Forward differences, Backward differences, central differences. Newton's formulae for interpolation, Gauss's central difference formulae, Interpolation with unevenly spaced points - Lagrange's Interpolation.

Curve fitting : Fitting a straight line, second degree curve, exponential curve, power curve by method of least squares.

UNIT – II: Numerical Methods
Solution of algebraic and transcendental equations: Introduction, Bisection Method, Method of false position, Newton Raphson method and their graphical interpretations.

Numerical integration : Generalized quadrature - Trapezoidal rule, Simpson's $1/3^{rd}$ and Simpson's $3/8^{th}$ rules.

Numerical solution of ordinary differential equations: Solution by Taylor's series method, Euler's method, Euler's modified method, Runge-Kutta fourth order method.

UNIT III: Partial Differential Equations
Introduction, formation of partial differential equation by elimination of arbitrary constants and arbitrary functions, solutions of first order Lagrange's linear equation and non-linear equations, Charpit's method, Method of separation of variables for second order equations and applications of PDE to one dimensional equation (Heat equation).

Unit IV: Double and Triple Integrals
Double and triple integrals (Cartesian and polar), Change of order of integration in double integrals, Change of variables (Cartesian to polar). Applications: Areas (by double integrals) and volumes (by double integrals and triple).

Unit V: Vector Calculus
Introduction, Scalar point function and vector point function, Directional derivative, Gradient, Divergence, Curl and their related properties, Laplacian operator, Line integral - work done, Surface integrals, Volume integral. Green's Theorem, Stoke's theorem and Gauss's Divergence Theorems (Statement & their Verification).

Text Books:
a. Higher Engineering Mathematics by B V Ramana ., Tata McGraw Hill.
b. Higher Engineering Mathematics by B.S. Grewal, Khanna Publishers.
c. Mathematical Methods by S.R.K Iyenger, R.K.Jain, Narosa Publishers.

Reference Books:
i)   Elementary Numerical Analysis by Atkinson-Han, Wiley Student Edition.
ii) Advanced Engineering Mathematics by Michael Greenberg –Pearson publishers.
iii) Introductory Methods of Numerical Analysis by S.S. Sastry, PHI

Course Outcomes: After learning the contents of this paper the student will be able to
1. Find the most appropriate relation of the data variables using curve fitting and this method of data analysis helps engineers to understand the system for better interpretation and decision making.
2. Find the roots of algebraic, non algebraic equations.
3. Solve first order linear and non-linear partial differential equations.
4. Evaluate multiple integrals.
5. Evaluate the line, surface, volume integrals and converting them from one to another using vector integral theorems.

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(R22A0201) PRINCIPLES OF ELECTRICAL AND ELECTRONICS ENGINEERING

COURSE OBJECTIVES:
1. To understand the basic concepts of electrical circuits and analyze Circuits using Network Theorems.
2. To get overview of single phase A.C. circuits and three phase A.C. circuits.
3. To introduce the concept of DC Machines and Single-Phase Transformers.
4. To study the concepts of p-n diodes, rectifiers and Zener diodes.
5. To study the concepts of BJTs, JFET and MOSFETs.

UNIT –I: **INTRODUCTION TO ELECTRICAL CIRCUITS**: Concept of Circuit and Network, R-L-C Parameters, Ohms law and its limitations, Kirchhoff's Laws-KVL, KCL.

NETWORK ANALYSIS (D.C EXCITATION): Series and parallel connections of Resistive Networks, voltage division and current division, Meshanalysis, Nodal analysis

NETWORK THEOREMS: Thevenin's Theorem, Norton's Theorem and Superposition Theorem (for independent sources).

UNIT–II: SINGLE PHASE A.C. CIRCUITS: Average value, R.M.S. value, form factor and peak factor for sinusoidal wave form.Concept of phase, phasor representation of sinusoidal quantities phasedifference, Sinusoidal response of pure R, L, C.
THREE PHASE A.C. CIRCUITS: Advantages of Three phase over single phase, Voltage and Current relationship in star and delta connections.

UNIT-III: MACHINES:
DC Generator: principle of operation and working, Action of commutator, constructional features, basic concept of Lap and wave windings, emf equation.
DC Motor: principle of operation, Back emf and its significance, torque equation-Gross torque and Shaft torque.
Single Phase Transformer: principle of operation, emf equation, problems on emf equation.

UNIT–IV:
P-N JUNCTION DIODE: P-N junction diode, symbol and forward biased and reverse biased conditions, V-I characteristics of P-N junction diode, Half wave, Full wave and Bridge rectifiers.
ZENER DIODE: Symbol, construction, principle of operation and its applications.

UNIT–V:

BIPOLAR JUNCTION TRANSISTOR: Symbols, types, Construction and Principle of Operation of N-P-N and P-N-P transistors,Amplifying Action, Common Emitter, Common Base and Common Collector configurations.

JFET, Symbol, Construction, Principle of operation, and its Characterstics, MOSFET (Enhancement and Depletion mode) Symbol, Construction, Principle of Operation and its Characteristics.

TEXT BOOKS:

1. Engineering Circuit Analysis - William Hayt, Jack E. Kemmerly, S M Durbin, Mc GrawHill Companies.
2. Electric Circuits - A. Chakrabarhty, Dhanipat Rai & Sons.
3. Electrical Machines – P.S.Bimbra, Khanna Publishers.
4. "ElectronicDevices&Circuits", SpecialEdition–MRCET,McGrawHillPublications,2017.
5. IntegratedElectronicsAnalogDigitalCircuits,JacobMillmanandD.Halkias,McGrawHill.
6. ElectronicDevicesandCircuits, S.Salivahanan, N.Sureshkumar, McGrawHill.

REFERENCE BOOKS

1. Network analysis by M.E Van Valkenburg, PHI learning publications.
2. Network analysis - N.C Jagan and C. Lakhminarayana, BS publications.
3. Electrical Circuits by A. Sudhakar, Shyammohan and S Palli, Mc Graw Hill Companies.
4. Electrical Machines by I.J. Nagrath & D. P. Kothari, Tata Mc Graw-Hill Publishers.
5. Electronic Devices and Circuits, K.LalKishore, B.S Publications
6. Electronic Devices and Circuits, G.S.N.Raju, I.K.International Publications, NewDelhi,2006.

COURSE OUTCOMES:

After the course completion the students will be able to

1. Apply the basic RLC circuit elements and its concepts to networks and circuits.
2. Analyze the circuits by applying network theorems to solve them to find various electrical parameters.
3. Illustrate the single-phase AC circuits along with the concept of impedanceparametersand power.
4. Understand the Constructional Details and Principle of Operation of DC Machines and Transformers
5. To understand the concepts of p-n diode, rectifiers and Zener diode
6. To understand the concepts of BJTs, JFET and MOSFETs

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I Year B. TECH - II- SEM   **L/T/P/C**

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(R22A0301) COMPUTER AIDED ENGINEERING GRAPHICS

COURSE OBJECTIVES:

1 To learn basic engineering graphics and Auto CAD concepts.
2 To learn the 2D principles of orthographic projections and Multiple views of thesame
3 To know the planes and solid Projection
4 To gain the capability of designing 3D objects with isometric principles by usingComputer aided sketches
5 To know the conversion of Orthographic Views to isometric Views and isometric toOrthographic views

UNIT 1
Introduction to Auto CAD: Introduction to software interface Standard toolbar/menu, Understanding the co-ordinate systems-2D and 3D Visualisation, Setting the Paper sizes and title block importance, printing and plotting. **Draw commands:** line, arc, circle, rectangle, polygons, ellipse, polyline, splines, text. **Modify commands:** copy, mirror, offset, arrays, move, extend, break, trim, lengthen, chamfer, fillet.etc., **Constraints:** horizontal, vertical, parallel, concentric, perpendicular, symmetric, equal, collinear. **Dimensioning Commands:** Dimensioning and Dimension Style. **Division:** Line division, and circle division. **Polygons:** Constructing regular polygons - inscribed and circumscribed methods and general method.

UNIT 2
Projection of Points: Introduction to reference planes, four quadrants, importance of reference lines. Projection of points in all the four quadrants
Projection of Lines: Parallel to both the reference planes, Parallel to one plane and perpendicular to other plane, Inclined to one plane and parallel to other plane, Inclined to both planes

UNIT 3
Projections of Planes: Introduction to Regular planes. Parallel/Perpendicular to one reference plane, Inclined to one plane and Inclined to both the reference planes.
Projections of Solids: Introduction - Prisms, Pyramids, Cone and Cylinder, Axis parallel and perpendicular to one reference plane, Axis inclined to one reference plane.

UNIT 4
Isometric Projection: Introduction, Isometric projection of simple plane figures, Solids - right regular prisms, pyramids, cylinder, cone – H.P, V.P

UNIT 5
Conversions: Conversion of Isometric Views to Orthographic Views and Orthographic Views to Isometric Views

TEXT BOOKS:

1. Engineering Drawing – N.D. Bhatt & V.M. Panchal, 48th edition, 2005 Charotar Publishing House, Gujarat.
2. "Computer Aided Engineering Drawing" by Dr. M H Annaiah, Dr C N Chandrappa and Dr B Sudheer Prem Kumar Fifth edition, New Age International Publishers

REFERENCE BOOKS:

1. Computer Aided Engineering Drawing – S. Trymbaka Murthy, - I.K. International Publishing House Pvt. Ltd., New Delhi, 3rd revised edition-2006.
2. Engineering Graphics - K.R. Gopalakrishna, 32nd edition, 2005- Subash Publishers,Bangalore.

COURSE OUTCOMES:
After the completion of course the student will be capable to

1. To produce geometric construction, dimensioning & Curves and detail drawings.
2. To compile Projections of points, lines, then create virtual drawing by using computer
3. To sketch the Planes and Solid Projections
4. To develop isometric drawings of simple objects reading the orthographic projections ofthose objects.
5. To understand and visualize the 3-D view of engineering objects. Elaborate the conversionsof 2D -3D and Vice-Versa.

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(R22A0502) Python Programming

COURSE OBJECTIVES:

This course will enable students

1. To read and write simple Python programs.
2. To develop Python programs with conditionals and loops.
3. To develop Python programs with using arrays and functions.
4. To use Python data structures–-lists, tuples, dictionaries.
5. To do input/output with files in Python.

UNIT-I

Introduction to Python Programming Language: Introduction to Python Language, Features of Python, Python Installation, Python Input and Output Statements,   Numeric Data Types: int, float, boolean, complex and string and its operations, Standard Data Types: List, Tuples, Sets and Dictionaries, Data Type conversions, Comments in Python.

UNIT-II

Variables and Operators: Understanding Python variables, multiple variable declarations, Operators in Python: Arithmetic operators, Assignment operators, Comparison operators, Logical operators, Identity operators, Membership operators, Bitwise operators, Precedence of operators, Expressions.

Control Flow and Loops: Indentation, if statement, if-else statement, chained conditional if-elif -else statement, Loops: While loop, for loop using ranges, Loop manipulation using break, continue and pass.

UNIT- III

Arrays: Advantages of Arrays, Creating an Array, Importing the Array Module, Indexing and Slicing on Arrays, Types of arrays, working with arrays using numpy.

UNIT-IV

Functions: Defining a function, Calling Functions, Passing parameters and arguments, Python Function arguments: Positional Arguments, Keyword Arguments, Default Arguments, Variable-length arguments, Scope of the Variables in a Function–Local and Global Variables, Fruitful Functions, Anonymous functions or Lambda functions, Powerful Lambda functions in Python.

UNIT-V

File Handling in Python: Introduction to files, Text files and Binary files, Access Modes, Writing Data to a File, Reading Data from a File, File input / output functions.

Error Handling in Python: Introduction to Errors and Exceptions: Compile-Time Errors, Logical Errors, Runtime Errors, Types of Exceptions, Python Exception Handling Using try, except and finally statements.

COURSE OUTCOMES:

Upon completion of the course, students will be able to

1. Read, write, execute by hand simple Python programs.
2. Structure simple Python programs for solving problems.
3. Decompose a Python program into arrays and functions.
4. Represent compound data using Python lists, tuples, dictionaries.
5. Read and write data from/to files in Python programs.

TEXT BOOKS

1. R.NageswaraRao,"Core Python Programming",dream tech.
2. Allen B. Downey,``Think Python: How to Think Like a Computer Scientist" 2nd edition,Updated for Python3, Shroff/O'Reilly Publishers,2016.
3. Python Programming: A Modern Approach,Vamsi Kurama,Pearson.

REFERENCEBOOKS:

1. Core Python Programming,W.Chun,Pearson.
2. Introduction to Python,Kenneth A. Lambert, Cengage.
3. Learning Python,Mark Lutz,Orielly.

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

I Year B. TECH - II- SEM   **L/T/P/C**

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(R22A0081) ENGLISH LANGUAGE AND COMMUNICATION SKILLS LAB

The Language Lab focuses on the production and practice of sounds of the English language and familiarizes the students with its use in everyday situations and contexts.

OBJECTIVES:

1. To facilitate computer-aided multi-media instruction enabling individualized and independent language learning
2. To sensitize the students to the nuances of English speech sounds, word accent, intonation and rhythm
3. To bring about a consistent accent and intelligibility in their pronunciation, ample speaking opportunities are provided.
4. To improve the fluency in spoken English and neutralize mother tongue influence
5. To train students to use language appropriately for interviews, group discussions and public speaking

English Language and Communication Skills Labs two parts:

A.Computer Assisted Language Learning (CALL) Lab

B.Interactive Communication Skills (ICS) Lab

The following course content is prescribed for the English Language and Communication Skills Lab

UNIT –I
CALL Lab: Introduction to Phonetics –Speech Sounds –Vowels and Consonants- Transcriptions
ICS Lab: Ice-Breaking activity - JAM session

UNIT –II
CALL Lab: Pronunciation: Past Tense Markers and Plural Markers
ICS Lab: Situational Dialogues/Role Plays-–Greetings - Taking Leave – Introducing Oneself and Others - Requests and Seeking Permissions

UNIT–III
CALL Lab: Syllable and Syllabification
ICS Lab: Communication at Workplace- Situational Dialogues/Role Plays – Seeking Clarifications – Asking for and Giving Directions – Thanking and Responding – Agreeing and Disagreeing – Seeking and Giving Advice

UNIT –IV
CALL Lab: Word Stress and Intonation
ICS Lab:Information transfer – from visual to verbal - maps, charts, tables and graphs

UNIT –V
CALL Lab: Errors in Pronunciation- Accent - the Influence of Mother Tongue (MTI)
ICS Lab: Making a Short Speech - Extempore
ELCS Lab:Computer Assisted Language Learning (CALL) Lab:

The Computer aided Language Lab for 60 students with 60 systems, one master console, LAN facility and English language software for self-study by learners.

System Requirement (Hardware component):
Computer network with LAN with minimum 60 multimedia systems with the following specifications:
   i) P –IV Processor
      a) Speed –2.8 GHZ
      b) RAM –512 MB Minimum
      c) HardDisk –80 GB

   ii) Headphones of High quality

2. Interactive Communication Skills (ICS) Lab :
A Spacious room with movable chairs and audio-visual aids with a Public Address System, a T. V., a digital stereo –audio & video system and camcorder etc.

DISTRIBUTION AND WEIGHTAGE OF MARKS
English Language Laboratory Practical Examination:
1. The practical examinations for the English Language Laboratory shall be conducted as per the University norms prescribed for the core engineering practical sessions.

2. For the Language lab sessions, there shall be a continuous evaluation during the year for 30 marks and 70 year-end Examination marks. Of the 30 marks, 20 marks shall be awarded for day-to-day work and 10 marks to be awarded by conducting Internal Lab Test(s). The year-end Examination shall be conducted by the teacher concerned with the help of another member of the staff of the same department of the other institution.

OUTCOMES:

1. Learning with precision through computer-assisted individualized and independent language learning to work independently in engineering set up.

2. Improved conversational reception and articulation techniques in the course of repetitive instruction thereby gaining confidence both in institutional and professional environment.

3. Accuracy in pronunciation and restoring Standard English thereby crafting better command in English language so that the students have a cutting edge over others in society.

4. Imbibing appropriate use of language in situations to work as an individual and as o leader in diverse teams

5. Equip themselves with the pre-requisites, and relevant techniques to effectively attend corporate interviews

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(R22A0281) PRINCIPLES OF ELECTRICAL AND ELECTRONICS ENGINEERING LAB

COURSE OBJECTIVES:

1. To design an electrical system.
2. To analyze a given network by applying various circuit laws and network theorems.
3. To expose the students to the operation of DC machine and transformer.
4. To exhibit the students to the operation of PN junction diode and Zener diode.
5. To expose the students to the operation of Rectifier.

Among the following experiments any 10 are to be conducted

1. Verification of KVL and KCL.
2. Verification of Thevenin's theorem.
3. Verification of Norton's theorem.
4. Verification of Super position theorem.
5. Magnetization characteristics of DC shunt generator.
6. Speed control of DC shunt motor using armature control method.
7. Speed control of DC shunt motor using flux control method
8. Load test on single phase transformer.
9. PN Junction diode characteristics.
10. Zener diode characteristics.
11. Half wave rectifier.
12. Full wave rectifier.

COURSE OUTCOMES:

At the end of the course, students would be able to

2. Explain the concept of circuit laws and network theorems and apply them to laboratory measurements.
3. Be able to systematically obtain the equations that characterize the performance of an electric circuit as well as solving them.
4. Perform the required tests on transformers and DC motors.
5. Plot the characteristics of Zener diodes.
6. Determine the working of rectifiers in detail.

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I Year B. TECH - II- SEM   **L/T/P/C**
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(R22A0582) PYTHON PROGRAMMING LAB

COURSE OBJECTIVES
This course will enable the students:

1. Able to understand Syntax and Semantics and create Arrays and Functions in Python.
2. Able to learn different data types Lists, Dictionaries in Python.
3. Able to know how to execute the programs using loops and control statements.
4. Able to learn decision making and Functions in Python.
5. Able to know how to handle Files and exceptions in Python.

Week 1:
  A) Write python program to print HelloWorld.
  B) Write a python program to get string,int,float input from user.
  C) Write a python program to add 2 numbers.

Week 2:
  A) Create a list and perform the following methods
          1) insert() 2)remove()   3)append()   4)len()   5)pop()   6) clear()
  B) Write a python program to find the length of list.
  C) Write a python program to find the smallest and largest number in the list.

Week 3:
  A) Create a tuple and perform the following methods
        1) Add items   2) len()   3)check for item in tuple   4)Access iems
  B) Write a python program using the following methods:1)count2)index
  C) Write a python program using "+" and "*" operations which resulting a new tuple.

Week 4:
  A) Create a dictionary and apply the following methods
        1) Print the dictionary items   2)access items 3)use get() 4)change values 5)use len()
  B) Write a python code to convert list of tuples into dictionaries.
  C) Write python program to store data in list, tuple, set, dictionary and then try to print them.

Week 5:
  A) Write a python program to perform arithmetic, assignment, logical and comparison
      operators.
  B) Write a Python program to add two positive integers without using the '+' operator. (use
      bitwise operator)
  C) Write a Python program to perform the basic four operators(+,-,*,/).

Week 6:
  A)   Write a simple python program to declare a variable in different possible ways.
  B)   Write a python program to show precedence of operators using the expression:
       z=(v+w)*x/y
  C)   Write a python program to check whether the values of a list exist or not (use
       membership operator) and also perform identity operation.

Week 7:
  A) Write a python program to print a number is positive/negative using if-else.
  B) Write a python program to find largest number among three numbers.
  C) Write a python Program to read a number and display corresponding day using if-elif-else.
  D) Write a python program to print list of numbers using range and for loop.

Week 8:
  A)   Write a python code to print the sum of natural numbers using while loop.
  B)   Write a python program to print the factorial of given number.
  C)   Write a python program to find the sum of all numbers stored in a list using for loop.

Week 9:
  A) Using a numpy module create an array and check the following:
  1. Type of array   2. Axes of array   3. Shape of array   4. Type of elements in array
  B) Using a numpy module create array and check the following:
  1. List with type float 2. 3*4 array with all zeros 3. From tuple 4. Random values

Week10:
  A)   Write python program in which a function is defined and calling that function prints
       Hello World.
  B)   Write python program in which a function (with single string parameter) is defined and
       calling that function prints the string parameters given to function.
  C)   Write a python program using with any one of python function argument.

Week11:
  A) Write a program to double a given number and add two numbers using lambda().
  B) Write a program for filter() to filter only even numbers from a given list.
  C) Write a program for map() function to double all the items in the list?
  D) Write a program to find sum of the numbers for the elements of the list by using
       reduce().

Week12:
  A) Write a python program to open and write "hello world" into a file.
  B)   Write a python program to write the content "hi python programming" for the existing
  file.
  C) Write a python program to read the content of a file.

Week 13:

A) Write a python program to append data to an existing file and then displaying the entire file.

B) Write a python program to open a new file, add some data into it and display the contents of that file.

Week 14:

A) Write a python program to handle the Zero Divison Error exception.

B) Write a python program to demonstrate multiple except block with a single try block.

TEXT BOOKS:

1. R.NageswaraRao,"Core Python Programming",dream tech.
2. Allen B. Downey,"Think Python: How to Think Like a Computer Scientist",Second Edition,Updated for Python3,Shroff /O' Reilly Publishers,2016.

COURSE OUTCOMES:

After completion of the course, Students will be able to**:**

1. Evaluate Problem solving and programming capability.
2. Describe the Numbers, Math functions, Strings, List, Tuples and Dictionaries in Python.
3. Implement conditional and loop for python programs.
4. Express different Decision Making statements, Arrays and Functions.
5. Understand and summarize different File handling operations and exceptions.

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I Year B. TECH - I- SEM   **L/T/P/C**
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(R22A0004) ENVIRONMENTAL SCIENCE

COURSE OBJECTIVES: On successful completion of this course, students will be able:

1. CO1: To distinguish the inter relationship between living organism and environment.
2. CO2: To categorize various types of natural resources available on the earth surface.
3. CO3: To detect the causes, and control measures of various types of environmental pollution.
4. CO4: To articulate the issues related to solid waste and its management.
5. CO5: To explain and understand the importance of Sustainable development.

COURSE OUTCOMES: The basic concepts included in this course will help the student to:

1. CO1: Differentiate between various biotic and abiotic components of ecosystem.
2. CO2: Describe the various types of natural resources.
3. CO3: Examine the problems associated with waste management.
4. CO4: Evaluate the causes, and apply control measures of various types of environmental pollutions.
5. CO5: Develop technologies on the basis of ecological principles on environment which in turn helps in sustainable development.

UNIT-I ECOSYSTEMS (6 hours)

Definition, Scope and Importance of Ecosystem; Structure of an Ecosystem - abiotic and biotic component; Functions of an ecosystem- food chains, food webs and ecological pyramids.
Activities: **Activities**: Case studies, poster making, Essays on biotic components.

UNIT-II NATURAL RESOURCES (6hours)

Classification of Resources: Definition of natural resource - renewable and non -renewable resources. Forest resources - functions and uses of forests, Deforestation - causes and consequences. Water resources – Dams - benefits and environmental problems over dams. Renewable resources - solar energy (solar cells), hydro power, biogas and bio-fuel.
Activities: Case studies, seminars, Group Project works, to prepare rain water harvesting models, to demonstrate the generation of electricity with the utilization of non-conventional energy resources.

UNIT-III ENVIRONMENTAL POLLUTION AND TECHNIQUES (6 hours)

Definition, Types of pollution- Air pollution- causes, effects, control measures of air pollution and prevention techniques. Water pollution- causes, effects, control measures and techniques.
Activities: Work sheets, Debate, seminars, surrounding case studies.

UNIT-IV SOLID WASTE MANAGEMENT (5 hours)

Definition of Solid waste, characteristics of solid waste; Solid waste management- collection, transportation, processing treatment and disposal methods; e-waste management; 3R techniques- reduce, reuse and recycle.

Activities: Quiz, Puzzles, Seminars, Case studies.

UNIT-V SUSTAINABLE DEVELOPMENT (4 hours)

Definition of sustainable development, sustainable development goals, threats to sustainability, strategies to achieve sustainable development.

Activities: Worksheets, seminars, slogans, group projects.

TEXT BOOKS

1. Textbook of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission
2. Environmental Studies by R. Rajagopalan, Oxford University Press.
3. Textbook of Environmental Science and Technology - Dr. M. Anji Reddy 2007, BS Publications
4. Dr. P. D Sharma, "Ecology and Environment", Rastogi Publications, New Delhi, 12 Edition, 2015

REFERENCE BOOKS

1. Environmental Studies by Anubha Kaushik, 4 Edition, New age international publishers
2. Environmental Science: towards a sustainable future by Richard T. Wright. 2008 PHL Learning Pvt. Ltd, New Delhi
3. Environmental Engineering and science by Gilbert M. Masters and Wendell P. Ela. 2008 PHL Learning Pvt. Ltd, New Delhi
4. Environmental Science by Daniel B. Botkin & Edward A. Keller, Wiley INDIA edition

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3/-/-/4

(R22A0302) ENGINEERING MECHANICS

COURSE OBJECTIVES:

1. To understand the resolution of a system of forces, compute their resultant and solve problems using equations of equilibrium.
2. Perform analysis of bodies lying on rough surfaces. To understand the concept of analysis of trusses using method of joints and method of sections.
3. Locate the centroid of a simple figure and composite figures.
4. Locate the centroid of a body and compute the area moment of inertia and massmoment of inertia of standard and composite sections.
5. To understand kinetics and kinematics of particles motion of rigid bodies.

UNIT I

Resultants of Force System: Introduction, Parallelogram law –Forces and components- Resultant of coplanar Concurrent Forces Moment of Force-problems.

Equilibrium of Force Systems: Free Body Diagrams, Equations of Equilibrium - Equilibrium of planar Systems

UNIT II

Friction: Introduction **–** Theory of Friction – Angle of friction - Laws of Friction – Static and Dynamic Frictions

Analysis of Pin-Jointed Plane Frames: Determination of Forces in members of plane, pin jointed, perfect trusses by (i) method of joints and (ii) method of sections. Analysis of various types of cantilever & simply–supported trusses-by method of joints, method of sections

UNIT III

Centroids and Centers of Gravity: Introduction – Centroids and Centre of gravity of simple figures (from basic principles) – Centroids of Composite Figures - Theorem of Pappus – Center of gravity of bodies and centroids of volumes.

UNIT IV

Moments of Inertia: Definition – Polar Moment of Inertia –Radius of gyration - Transfer formula for moment of inertia - Moments of Inertia for Composite areas.

Mass Moment of Inertia: Moment of Inertia of Masses - Transfer Formula for Mass Moments of Inertia – Mass moment of inertia of composite bodies.

UNIT V

Kinematics of a Particle: Motion of a particle- Rectangular motion-motion curves-Rectangular components of curvilinear motion.

Kinetics of Particles: D'Alemberts Principle for plane motion and connected bodies.

TEXT BOOKS:

1. Engineering Mechanics/ S. Timoshenko and D.H. Young, Mc Graw Hill Book Company.
2. Engineering Mechanics - Statics and Dynamics by Vijaya Kumar Reddy K, Suresh Kumar J.BS Publications
3. Engineering Mechanics / S.S. Bhavikati & K.G. Rajasekharappa

REFERENCES:

1. A text of Engineering Mechanics / YVD Rao / K. Govinda Rajulu/ M. Manzoor Hussain, Academic Publishing Company
2. Engg. Mechanics / M.V. Seshagiri Rao & D Rama Durgaiah/ Universities Press
3. Engineering Mechanics, Umesh Regl / Tayal.
4. Engineering Mechanics / KL Kumar / Tata McGraw Hill.
5. Engineering Mechanics / Irving Shames / Prentice Hall

COURSE OUTCOMES:

1. Gain the knowledge on the concepts of force and moment also apply the knowledge on drawing free body diagrams in problem solving.
2. Students able to do analysis of trusses using method of joints and method of sections.
3. Students are capable of finding centroid and Centre of gravity of simple and composite Figures.
4. Students are capable of finding centroid and moment of inertia, mass moment of Inertia of simple and composite figures.
5. Students able to understand the motion of a particle in a straight line and apply concepts of D'Alemberts principle in particle motion.

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3/-/-/3

(R22A0303) ENGINEERING THERMODYNAMICS

COURSE OBJECTIVES:

1. To understand the concepts of energy transformation, conversion of heat into work.
2. To acquire knowledge about the fundamentals of thermodynamic laws, the concept of entropy, and principles.
3. To understand how the change of state results in a process.
4. To understand the various gas laws, psychrometric properties and chart.
5. To learn the importance of thermodynamic cycles, and the derivation of efficiency.

UNIT-I

Basics of thermodynamics: System - Types of Systems - Control Volume - Macroscopic and Microscopic viewpoints - Thermodynamic Equilibrium- State, Property, Process, Cycle – Reversibility – Quasi static Process, Irreversible Process, Causes of Irreversibility – Work and Heat, Point and Path functions. Zeroth Law of Thermodynamics– PMM I - Joule's Experiment – First law of Thermodynamics and its Corollaries – First law applied to a Process– Steady Flow Energy Equation.

UNIT-II

Entropy: Limitations of the First Law - Thermal Reservoir - Heat Engine - Heat pump - Parameters of performance - Second Law of Thermodynamics - Kelvin-Planck and Clausius Statements and their Equivalence / Corollaries - PMM of Second kind - Carnot's principle - Carnot cycle and its specialties - Clausius Inequality - Entropy, Principle of Entropy Increase – Energy Equation - Availability and Irreversibility – Thermodynamic Potentials, Gibbs and Helmholtz Functions - Maxwell Relations – Elementary Treatment of the Third Law of Thermodynamics.

UNIT-III

Properties of pure substances: p-V-T- surfaces, T-S and h-s diagrams, Phase Transformations – Triple point at critical state properties during change of phase - Dryness Fraction – Mollier charts – Various Thermodynamic processes and energy Transfer – Steam Calorimetry - Perfect Gas Laws – Equation of State, specific and Universal Gas constants – Various Non-flow processes, properties, end states, Heat and Work Transfer, changes in Internal Energy – Throttling and Free Expansion Processes – Flow processes – Deviations from perfect Gas Model – Vander Waals Equation of State.

UNIT-IV

Mixtures of perfect Gases: Mole Fraction, Mass fraction Gravimetric and volumetric Analysis – Dalton's Law of partial pressure Avogadro's 's law of additive volumes – Mole fraction , Volume fraction and partial pressure - Equivalent Gas constant, Enthalpy, Specific Heats and Entropy of Mixture of perfect Gases- Vapour, and Atmospheric air - Psychrometric Properties – Dry Bulb Temperature, Wet Bulb Temperature, Dew Point Temperature, Thermodynamic Wet Bulb

Temperature, Specific Humidity, Relative Humidity, Saturated Air, Vapour pressure, Degree of saturation – Adiabatic Saturation – Psychrometric chart.

UNI-V

Power Cycles: Otto cycle, Diesel cycle, Dual Combustion cycle and Brayton cycle description and representation on P–V and T-S diagram, Thermal Efficiency, Mean Effective Pressures on Air standard basis – Comparison of Cycles. Basic Rankine cycle – Performance Evaluation.

TEXT BOOKS:

1. Engineering Thermodynamics, Special Edition. MRCET, McGrahill Publishers.
2. Engineering Thermodynamics / PK Nag /TMH, III Edition
3. Thermodynamics – J.P.Holman / McGrawHill
   REFERENCE BOOKS:

1. Engineering Thermodynamics – Jones & Dugan
2. Thermodynamics – An Engineering Approach – YunusCengel& Boles /TMH
3. An introduction to Thermodynamics / YVC Rao / New Age
4. Engineering Thermodynamics – K. Ramakrishna / Anuradha Publisher
   COURSE OUTCOMES:

1. Analyse the work and heat interactions associated with a prescribed process path and to perform an analysis of a flow system.
2. Quantify the irreversibility associated with each possibility and choose an optimal cycle.
3. Able to analyse Mollier chart, and to find the quality of steam.
4. Able to analyse psychrometric chart, to estimate thermodynamic properties such as WBT, DBT, RH, etc.
5. Analyse the thermodynamic cycles and evaluate performance parameters.

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(R22A0304) FLUID MECHANICS & HYDRAULIC MACHINES

COURSE OBJECTIVES:

1. To give insight knowledge on fluid statics.

2. To gain knowledge on fluid kinematics and dynamics.

3. To give basic understanding of boundary layer concept and analyze different types of losses and measurement of flow.

4. To become familiar about different types of turbines & able to analyze their performance characteristics of various turbines.

5. To be able to understand the working of power absorbing devices like pumps & able to analyze their performance characteristics.

UNIT-I:
Fluid Statics: Dimensions and units: physical properties of fluids- specific gravity, viscosity, capillarity, surface tension- vapor pressure and their influence on fluid motion- atmospheric gauge and vacuum pressure – measurement of pressure- Piezometer, U-tube and differential manometers.

UNIT-II:
Fluid Kinematics: Stream line, path line and streak lines and stream tube, classification of flows-steady & unsteady, uniform, non-uniform, laminar, turbulent, rotational, and ir-rotational flows-equation of continuity for one dimensional flow.
Fluid Dynamics: Surface and body forces –Euler's and Bernoulli's equations for flow along a stream line, momentum equation and its application on force on pipe bend.

UNIT-III:
Boundary Layer Concept: Definition, thickness, characteristics along thin plate, laminar and turbulent boundary layers (No derivation).
Closed conduit flow: Reynold's experiment- Darcy Weisbach equation- Major and Minor losses - pipes in series and pipes in parallel- total energy line-hydraulic gradient line. Measurement of flow: Pitot tube, Venturi meter and Orifice meter.

UNIT-IV:
Basics of Turbo Machinery: Hydrodynamic force of jets on stationary and moving flat, inclined, and curved vanes.
Hydraulic Turbines: Classification of turbines, impulse and reaction turbines, Pelton wheel turbine, Francis turbine and Kaplan turbine-working proportions, work done, efficiencies. Hydraulic design- draft tube theory- functions and efficiency.
Performance of hydraulic turbines: Geometric similarity, Unit and specific quantities, characteristic curves, cavitation, surge tank, water hammer.

UNIT-V:
Centrifugal Pumps: Classification, working, work done – manometric head and efficiencies specific speed- performance characteristic curves, NPSH.
Reciprocating Pumps: Working, Discharge, slip, indicator diagrams.

TEXT BOOKS:

1. Hydraulics, fluid mechanics and Hydraulic machinery MODI and SETH.

2. Fluid Mechanics and Hydraulic Machines by Rajput.

3. Fluid Mechanics and Machinery by D. Rama Durgaiah, New Age International

REFERENCE BOOKS:

1. Fluid Mechanics and Fluid Power Engineering by D.S. Kumar, Kotaria & Sons.

2. Hydraulic Machines by Banga & Sharma, Khanna Publishers.

3. Instrumentation for Engineering Measurements by James W. Dally, William E. Riley, Wiley & Sons Inc. 2004 (Chapter 12 – Fluid Flow Measurements).

COURSE OUTCOMES:

1. Students will gain the knowledge on fluid mechanics fundamentals like fluid statics.

2. Student will have basic idea on fluid dynamics and kinematics which are used in real working environment.

3. Student will study the fundamental of boundary layer concepts and its applications.

4. Student will understand the principles of turbo machinery and measure the performance of different types of turbines.

5. Student will calculate the performance of different types of pumps.

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(R22A0305) MATERIALS ENGINEERING

COURSE OBJECTIVES:
1. To understand the basic structure, mechanism of crystallization andimperfections in crystals.
2. To study the importance of binary phase diagrams.
3. To acquire knowledge on properties and structure of ferrous and nonferrous alloys andto select suitable materials for various engineering applications.
4. To learn various methods of heat treatment processes.
5. To gain knowledge on advanced Composite materials.

UNIT I
Structure of Metals: Atoms, atomic models, miller indices -Bonds in Solids – Metallic bond - crystallization of metals, imperfections, grain and grain boundaries, effect of grain boundaries on the properties of metal / alloys – determination of grain size.

Constitution of Alloys: Necessity of alloying, types of solid solutions, Hume Rothers rules, intermediate alloy phases, and electron compounds.

UNIT II
Equilibrium Diagrams

Experimental methods of construction of equilibrium diagrams, Isomorphous alloy systems, equilibrium cooling and heating of alloys, Lever rule, eutectic systems, congruent melting intermediate phases, peritectic reaction.

Transformations in the solid state, allotropy, eutectoid, peritectoid reactions, phase rule, relationship between equilibrium diagrams and properties of alloys. Study of binary phase diagram of Fe-Fe3C.

UNIT III
Cast Iron & Steel: Structure and properties of White Cast iron, Malleable Cast iron, Grey cast iron, Spheroidal graphite cast iron, Alloy cast irons. Classification of steels, structure and properties of plain carbon steels, Low alloy steels, had field manganese steels, tool and die steels.

Nonferrous metals & Alloys: Structure and properties of copper and its alloys, Aluminium and its alloys, Titanium and its alloys.

UNIT IV
Heat treatment of Alloys: Effect of alloying elements on Iron – Iron carbon system, Annealing, normalizing, Hardening, TTT diagrams, tempering, Harden ability, surface - hardening methods, Age hardening

Ceramic Materials: Crystalline ceramics, glasses, cermets.

UNIT V

Composite Materials: Classification of composites, various methods of component manufacture of composites, particle – reinforced materials, fiber reinforced materials, metal ceramic mixtures, metal – matrix composites and Carbon–Carbon composites.

TEXT BOOKS:

1. Kodgire, Material Science and Metallurgy, 42nd edition Everest Publishing House2017.
2. Donald R.Askeland, Essential of Materials Science and Engineering. Thomson Publications2014.
3. V.Raghavan, Material Science and Engineering, Prentice –Hall of India Pvt. Ltd., 2007
4. Sidney H. Avner, Introduction to physical metallurgy, Tata Mc-Graw-Hill, Inc. 1997.

REFERENCES:

1. Sidney H. Avener, Introduction to Physical Metallurgy, TMH
2. William and collister, Materials Science and Engineering, wiley pub. 2014.
3. V. Raghavan, Material scienceand engineering, PH Pub. 2015.
4. R.K.Rajput, Engineering materials and metallurgy. S.Chand & Co. 2006.
5. O.P. Khanna, Material Science and Metallurgy. Dhanpatrai Pub. 2014

COURSE OUTCOMES:

1. Understand the mechanism of crystallization, methods of determining grain size andfactors affecting the solid solubility.
2. Use the phase diagrams of binary systems and iron-carbide diagram to select the material composition.
3. Understand the structure and properties of various cast irons, steels and nonferrousalloys.
4. Apply the various heat treatment processes, TTT diagram, surface hardening methods &coatings depending on material requirements.
5. Understand the importance of ceramics, composites and concepts of metallurgy.

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(R22A0306) Kinematics of Machinery

Course Objectives:
1. To impart knowledge on various types of links and synthesis and to understand the concept of machines, mechanisms and related terminologies .
2. To understand the Principles and working of various straight line motion mechanisms. To analyze Steering gear mechanisms.
3. Formulate the concept of synthesis and analysis of different mechanisms and working of hooks joint..
4. Distinguish a mechanism for displacement, velocity and acceleration at any point in a moving link this is prerequisite for dynamics of machines.
5. To understand the theory of gears, gear trains and cams.

UNIT-I
Introduction of Mechanisms and Machines:
Mechanisms : Elements or Links , Classification, Rigid Link, flexible and fluid link, Types of kinematic pairs , sliding, turning, rolling, screw and spherical pairs lower and higher pairs, closed and open pairs, constrained motion, completely, partially or successfully constrained and incompletely Constrained .
Machines: Mechanism and machines, classification of machines, kinematic chain inversion of mechanism, inversions of quadric cycle, chain, single and double slider crank chains.

UNIT-II
Straight Line Motion Mechanisms: Exact and approximate copiers and generated types Peaucellier, Hart and Scott Russell Grasshopper Watt T. Chebicheff and Robert Mechanisms and straight line motion, Pantograph.
Steering Gear Mechanisms: Conditions for correct steering Davis Steering gear Mechanism, Ackerman's steering gear mechanism.

UNIT–III
Kinematics: Velocity and acceleration - Motion of link in machine - Determination of Velocity and acceleration diagrams - Graphical method - Application of relative velocity method four bar chain.
Hooke's Joint: Single and double Hook's joint Universal coupling application problems.

UNIT–IV
Cams: Definitions of cam and followers their uses Types of followers and cams Terminology Types of follower motion - Uniform velocity Simple harmonic motion .Maximum velocity and maximum acceleration during outward and return strokes in the above 2 cases.

UNIT–V
Gears: Higher pairs, friction wheels and toothed gears types law of gearing, condition for constant velocity ratio for transmission of motion, Form of teeth: cycloid and involutes profiles. Velocity of sliding phenomena of interferences.

Gear Trains: Introduction - Train value - Types - Simple and reverted wheel train Epicycle gear Train. Methods of finding train value or velocity ratio - Epicycle gear trains. Selection of gear box-Differential gear for an automobile.

TEXT BOOKS:

1. Rattan S.S, "Theory of Machines" Tata McGraw-Hill Publishing Company Ltd., New Delhi, and 2nd edition -2005.
2. Sadhu Singh, "Theory of Machines," Pearson Education (Singapore) Pvt. Ltd., Indian Branch, New Delhi, 2ND Edi. 2006.
3. Theory of machines, (4th Edition), by R.S. Khurmi, S.chand Publications.

REFERENCE BOOKS:

1. Shigley. J. V. and Uickers, J.J., "Theory of Machines & Mechanisms" OXFORD University press.2004
2. "Theory of Machines -I", by A.S.Ravindra, Sudha Publications, Revised 5th Edi. 2004

Course outcomes:

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

1. Build up critical thinking and problem-solving capacity of various mechanical engineering problems related to kinematics of machines.
2. Asses various concepts of mechanisms like straight line motion mechanisms, Steering gear mechanisms and working principles of power elements (Gears, gear trains, Cams, Belt and Chain drives) and design related problems effectively.
3. Utilize analytical, mathematical and graphical aspects of kinematics of Machines for effective design.

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(R22A0307) COMPUTER AIDED MACHINE DRAWING

COURSE OBJECTIVES:

1. To familiarize with the standard conventions for different materials and machine parts in working drawings.
2. To gain knowledge of conventional representation of various machining and mechanical details as per IS.
3. To gain knowledge of threads, bolts, nuts, stud bolts, tap bolts, set screws, Keys, cottered joints and knuckle joint.
4. To make part drawings including sectional views for various machine elements.
5. To prepare assembly drawings given the details of part drawings.

Part A: Drawing of Machine Elements and simple parts

1. Selection of Views, additional views for the following machine elements and parts with every drawing proportion.
2. Popular forms of Screw threads, bolts, nuts, studbolts, tapbolts, setscrews.
3. Keys, cottered joints and knuckle joint.
4. Rivetted joints for plates
5. Solid Journal Bearing & Couplings

Part B: Assembly Drawings

1. Drawings of assembled views for the part drawings of the following using conventions and easy drawing proportions.
2. Steam engine parts– Stuffing box, Crosshead, Eccentric.
   Machine parts-Screw jack.
3. Petrol engine connecting rod

NOTE:

1. First angle projection to be adopted. The student should be able to provide working drawings of actual parts.
2. Part A need to be done by using AUTOCAD and Part B need to be done by using Creo.

TEXT BOOKS:

1. Machine Drawing –K.L.Narayana, P.Kannaiah&K.VenkataReddy / New Age/ Publishers
2. Machine Drawing with Auto CAD / Goutham Pohit, Goutam Ghosh / Pearson
3. Machine Drawing / N.D. Bhatt / Charotar

REFERENCE BOOKS:

1. Machine Drawing by / Bhattacharyya / Oxford
2. Machine Drawing / Ajeet Singh / Mc Graw Hill
3. Machine Drawing –P.S.Gill.

COURSE OUTCOMES:

1. Preparation of engineering and working drawings with dimensions and bill of material during design and development. Developing assembly drawings using part drawings of machine components.
2. Conventional representation of materials, common machine elements and parts such as screws, nuts, bolts, keys, gears, webs, ribs.
3. Types of sections – selection of section planes and drawing of sections and auxiliary sectional views. Parts not usually sectioned.
4. Methods of dimensioning, general rules for sizes and placement of dimensions for holes, centers, curved and tapered features.
5. Title boxes, their size, location and details - common abbreviations and their liberal usage. Types of drawings – working drawings for machine parts.

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(R22A0381) Fluid Mechanics & Hydraulic Machines Lab

COURSE OBJECTIVES:

1. To gain knowledge in performance testing of Hydraulic Turbines and Hydraulic Pumps at constant speed and head.
2. To provide practical knowledge in verification of principles of fluid flow.
3. To calculate cd, cc, cv and Coefficient of impact of various hydraulic systems
4. To understand Major and minor losses.
5. Student able to learn about measuring pressure, discharge and velocity of fluid flow.

LIST OF EXPERIMENTS

1. Determination of coefficient of discharge of Orifice meter.
2. Determination of coefficient of discharge of Venturimeter.
3. Determination of friction factor for a given pipe line.
4. Verification of Bernoulli's theorem.
5. Determination of loss of head in a pipeline.
6. Performance Test on Single Stage Centrifugal Pump.
7. Performance Test on Multi Stage Centrifugal Pump.
8. Performance Test on Reciprocating Pump.
9. Performance Test on Pelton Wheel.
10. Performance Test on Francis Turbine.
11. Performance Test on Kaplan Turbine.
12. Determination of Impact of Jet on Vanes

NOTE: Minimum a total of 8 experiments are to be conducted.

COURSE OUTCOMES:

1. To provide the students' knowledge in calculating performance analysis in turbines.
2. Students exposure to study various operating characteristics of Centrifugal pump and Reciprocating pump.
3. Analyze a variety of fluid flow devices and utilize fluid mechanics principles in design.
4. Get Exposure to verification of Bernoulli's Theorem.
5. To provide the students with a solid foundation in fluid flow principles.

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(R22A0382) MATERIALS ENGINEERING LAB

COURSE OBJECTIVES:

1. Ability to function on multi-disciplinary teams in the area of materials testing.
2. Ability to use the techniques, skills and modern engineering tools necessary for handling ferrous and non – ferrous metals engineering.
3. Understanding of professional and ethical responsibility in the areas of material testing.
4. Ability to communicate effectively the mechanical properties of materials

LIST OF EXPERIMENTS

To prepare the specimen by mounting powder. The
study of Microstructure of Low Carbon Steels.
The study of Microstructure of Medium Carbon SteelsThe
study of Microstructure of High Carbon Steels
The study of Microstructure Cast Irons. (Grey cast Iron & White cast Iron).
The study of Microstructure Non – Ferrous pure metals. (Copper & Aluminum).The
study of Microstructure Non-Ferrous alloys. (Brass & Bronze).
The study of Microstructure Heat treated steels.
To find out the hardenability of steels by Jominy End Quench Test.To
find out the hardness of various treated and untreated steels.
To Study of Microstructure of Composite Material subjected to tensile testingTo
find Tensile Strength of the Composite Material with the help of UTM.

NOTE: Minimum a total of 8 experiments are to be conducted.

COURSE OUTCOMES:

1. To provide the students' knowledge in finding the microstructure of metals and alloys.
2. To know the characteristics of grain structure.
3. Get Exposure metallurgical microscope.
4. To provide students hands on experience to handle the etchants.

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(*R22A00XX) Foreign Language: German

INTRODUCTION

This is the age of globalization. Faster communication, extensive travel, greater interaction, outsourcing of jobs, demand of skilled person had made the engineering graduates to learn GERMAN language. Nowadays Aircraft and mechanical domain require more and more graduates with minimum knowledge to speak in German language.

German language has been one of the fastest learning language in the world. This course is customized according to the demand of the requirement in job industries.

COURSE OBJECTIVES:

1. To equip with the vocabulary to create new sentences, sentence pattern, correct pronunciation.
2. To make the students an efficient German language speaker.
3. To focus on basic linguistic and communicative structures of the German language.

UNIT 1: Basics of Deutsch
Introduction – (About German Country, Language & Culture)
Formal and Informal Greetings
Alphabet
Numbers (0-50)
Days of The Week and Months of The Year
Vocabulary, Exercises and Assignments
UNIT 2: Getting closer with Deutsch
Family
Seasons & Weather
Time & Directions, Days of Weak, Months
Colours & Shapes, Numbers (51 – 100)
Subject Pronouns
Vocabulary, Exercises and Assignments
Unit 3: Construction of Simple Sentences
Formal Introduction
Asking Questions
Responding to the Questions
Simple Sentences

Articles, Numbers (101 And Above)
Vocabulary, Exercises and Assignments

Unit 4: Dialogue Writing

Introduce Oneself
Introduce Others
At the Restaurant
At the Railway Station
At the University
Vocabulary, Exercises and Assignments

REFERENCE BOOKS
1. Collins easy learning GERMAN dictionary
2. Hallo deutsch – Parul sharma
3. Studio D A1 – Hermann
4. So geht das – New Saraswati book house
5. Practice German language for beginners – Dominic
6. German Made easy – Diego Agundez.

COURSE OUTCOMES
After completion of the course, Student will be able to:
1. stand ahead of getting the opportunity in the Job market by learning German language.
2. learn German language with engineering degree that will give them a sense of identity among

the competitive global engineering industry.
3. learn German language on a regular basis that will help them in improving multi-lingual ability

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(R22A0308) Thermal Engineering - I

COURSE OBJECTIVES:

1. To have Knowledge in steam power plants and their components, performance and analysis of Steam Turbines, Gas Turbines.
2. To understand Steam nozzles, Steam Condensers and their performances in Industries.
3. The purpose of this course is to enable the student to gain an understanding of how thermodynamic principles govern the behavior of various systems.
4. Evaluate the performance of critical components and accessories steam and gas power plants.
5. To understand the concept of jet propulsion, Rockets and their propellants.

UNIT-I

Basic Concepts: Rankine cycle – Schematic layout, Thermodynamic Analysis, Concept of Mean Temperature of heat addition, Methods to improve cycle performance Regeneration & reheating

Boilers: Classification - Working principles with sketches including H.P. Boilers - Mountings and Accessories - Working principle.

UNIT-II

Steam Nozzles: Function of nozzle - Applications and Types- Flow through nozzles- Thermodynamic analysis.

Steam Condensers: Requirements of steam condensing plant - Classification of condensers - Working principle of different types.

UNIT-III

Steam Turbines: Classification - Impulse turbine; Mechanical details - Velocity diagram - Effect of friction - Power developed, axial thrust, Blade or diagram efficiency - Condition for Maximum efficiency.

Reaction Turbine: Mechanical details - Principle of operation, Thermodynamic analysis of a stage, Degree of reaction - Velocity diagram - Parson's reaction turbine - Condition for Maximum efficiency.

UNIT-IV

Gas Turbines: Simple gas turbine plant - Ideal cycle, essential components - Parameters of Performance - Actual cycle - Regeneration, Inter cooling and Reheating - Closed and Semi - Closed cycles - Merits and Demerits.

UNIT-V

Jet Propulsion: Principle of Operation - Classification of jet propulsive engines – Working Principles with schematic diagrams and representation on T-S diagram- Thrust, Thrust Power and Propulsion Efficiency - Turbo jet engines - Needs and Demands met by Turbo jet -Schematic Diagram, Thermodynamic Cycle, Performance Evaluation Thrust Augmentation - Methods.

Rockets: Application - Working Principle - Classification- Solid and Liquid propellant Rocket Engines

TEXT BOOKS:

1. Thermal Engineering / Rajput / Lakshmi Publications.
2. Gas Turbines / V. Ganesan / TMH.
3. Thermal Engineering /P.L. Ballaney / Khanna Publishers, NewDelhi.

REFERENCE BOOKS:

1. Gas Turbines and Propulsive Systems / P. Khajuria & S.P. Dubey / Dhanapatrai Pub.
2. Thermal Engineering / R.S. Khurmi & J.K. Gupta / S. Chand Pub.
3. Thermodynamics and Heat Engines / R. Yadav / Central Book Depot

COURSE OUTCOMES:

1. Describe knowledge of Rankine cycle and heat equation in different processes, and improving efficiency techniques.
2. Demonstrate knowledge of ability to identify & apply fundamentals to solve problems involving nozzles and turbines, jet propulsion systems and rockets.
3. Design nozzles, turbines and condensers with desired needs within realistic constraints related thermal fields like different types of power plants etc.
4. Explore their knowledge & ability to design the constructional features of various types of boilers in various fields of energy transfer equipments and to understand the velocity triangles in Steam Turbines & Reaction Turbines
5. Knowledge of impact of engineering solutions on the society and also on contemporary issues related to different types of steam cycles and propulsion systems.

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(R22A0309) Strength of Materials

Course Objectives:

1. To impart preliminary concepts of Strength of Material and Principles of Elasticity and Plasticity Stress conditions and to develop diagrams of variation of various stresses across the length.
2. To give concepts of stresses developed in the cross section and bending equations calculation of section modulus of sections with different cross sections
3. The concepts above will be utilized in measuring deflections in beams under various loading and support conditions
4. To classify cylinders based on their thickness and to derive equations for measurement of stresses across the cross section when subjected to external pressure.

UNIT-I

Simple Stresses & Strains : Elasticity and plasticity – Types of stresses & strains–Hooke's law – stress – strain diagram for mild steel – Working stress – Factor of safety – Lateral strain, Poisson's ratio & volumetric strain – Elastic modules & the relationship between them – Deformation in Bars of varying cross section – composite bars – Thermal stresses. Strain energy – Resilience – Gradual, sudden, impact and shock loadings.

UNIT-II

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

UNIT-III

Flexural Stresses:

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

Shear Stresses:

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

UNIT-IV

Deflection of Beams: Bending into a circular arc – slope, deflection and radius of curvature – Differential equation for the elastic curve of a beam – Double integration and Macaulay's methods – Determination of slope and deflection for cantilever, simply supported and overhanging beams subjected to point loads, uniformly distributed loads, uniformly varying loads, partial uniformly distributed loads, couple and combination of these loads. Mohr's theorems – Moment area method – application to simple cases of cantilever

UNIT-V

Thin cylinders & spheres: Hoop and axial stresses and strain, Volumetric strain. Thick cylinders: Radial, axial and circumferential stresses in thick cylinders subjected to internal or external pressures, Compound cylinders. Stress due to interference fits.

Torsion of Circular Shafts: Theory of pure torsion, Derivation of torsion equations: $T/J=q/r=N\theta/L$. Assumptions made in theory of pure torsion-Tensional moment of resistance – Polar section modulus – Power transmitted by shafts.

TEXT BOOKS:

1. A Textbook of Strength of Materials, by R. K. Rajput, 7e (Mechanics of Solids) SI Units S. Chand & Co, NewDelhi
2. Strength of Materials by R.K. Bansal, Laxmi Publications 2010.
3. Strength of materials by S. Ramamrutham, Dhanpat Rai and Sons, Delhi
4. Strength of materials by Sadhu Singh. Khanna Publications.

REFERENCE BOOKS:

1. Strength of Materials -By Jindal, Umesh Publications.
2. Strength of materials by Bhavikatti, Lakshmi publications.
3. Mechanics of Structures Vol-III, by S.B. Junnarkar.

Course Outcomes:

1. The student will be able to understand the basic materials behavior under the influence of different external loading conditions and the support conditions
2. The student will be able to draw the diagrams indicating the variation of the key performance features like bending moment and shear forces
3. The student will have knowledge of bending concepts and calculation of section modulus and for determination of stresses developed in the beams and deflections due to various loading conditions
4. The student will be able to assess stresses across section of the thin and thick cylinders to arrive at optimum sections to withstand the internal pressure using Lame's equation

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(R22A0310) Dynamics of Machinery

Course objectives:
1. To analyze the forces in clutches, brakes and dynamometers involving friction.
2. To Understand the effect gyroscopic couple in motor cycles, aero planes and ships.
3. To understand the static and dynamic force analysis of four bar and slider crank mechanisms.
4. To study the turning moment diagrams of reciprocating engines and to learn design procedure of a flywheel
5. To learn analytical and graphical methods for calculating balancing of rotary and reciprocating masses
6. Understanding of vibrations and its significance on engineering design

UNIT-I
Precession: Gyroscopes, effect of precession motion on the stability of moving vehicles such as motor car, motor cycle, aero planes and ships.

UNIT-II
Static and Dynamic Force Analysis of Planar Mechanisms: Introduction -Free Body Diagrams – Conditions for equilibrium – Two, Three and Four Members – Inertia forces and D'Alemberts Principle – planar rotation about a fixed centre.
Friction and Friction Drives: Introduction to friction, Laws of friction, Coefficient of friction, Inclined plane, Pivot and Collars, Friction clutches-centrifugal clutch.

UNIT–III
Brakes and Dynamometers: Simple block brakes, internal expanding brake, band brake of vehicle. Dynamometers – absorption and transmission types.
Turning moment Diagrams: Single cylinder double acting steam engine, Four Stroke Cycle Internal Combustion Engine, Multi-cylinder Engine, and Flywheel.

UNIT–IV
Balancing: Balancing of rotating masses Single and multiple – single and different planes. Balancing of Reciprocating Masses- Primary, Secondary balancing of reciprocating masses using Analytical methods.
Governors: Introduction, its types, pendulum, and Gravity Governors

UNIT–V
Vibration: Free Vibration of mass attached to vertical spring – Simple problems on forced damped vibration, Vibration Isolation & Transmissibility Whirling of shafts, critical speeds, torsional vibrations, two and three rotor systems.

TEXT BOOKS:
1. Rattan S.S, "Theory of Machines" Tata McGraw-Hill Publishing Company Ltd., New Delhi, and 2nd edition - 2005.
2. Sadhu Singh, "Theory of Machines," Pearson Education (Singapore) Pvt. Ltd., Indian Branch, New Delhi, 2ND Edi. 2006.
3. Theory of machines, (4th Edition), by R.S. Khurmi, S.chand Publications.

REFERENCE BOOKS:
1. Shigley. J. V. and Uickers, J.J., "Theory of Machines & Mechanisms" OXFORD University press.2004
2. "Theory of Machines -I", by A.S.Ravindra, Sudha Publications, Revised 5th Edi. 2004

Course outcomes:

1. To compute the frictional losses and transmission in clutches, brakes and dynamometers
2. To determine the effect of gyroscopic couple in motor vehicles, ships and aero planes
3. To analyze the forces in four bar and slider crank mechanisms and design a flywheel
4. To determine the rotary unbalanced mass in reciprocating equipment
5. To determine the unbalanced forces and couples in reciprocating and radial engines
6. To determine the natural frequencies of discrete systems undergoing longitudinal, torsional and transverse vibrations.

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II Year B. TECH - II- SEM   **L/T/P/C**
                                                  3/-/2/3

(R22A0311) Manufacturing Processes

COURSE OBJECTIVES:

1. The primary objective of this course is to introduce the concept of manufacturing technology with the help of various casting processes widely employed in industries.
2. The course consists of welding and its classifications with the related details of equipment and applications.
3. To understand various metal forming, hot and cold working process. To appreciate the capabilities, advantages and the limitations of the processes.
4. To understand the various concepts of extrusion, forging processes, drawing, its classification and their applications.
5. To understand the various concepts of additive manufacturing and its advance techniques along with their applications.

UNIT-I

Casting: Pattern, Pattern materials, Pattern making, allowances of pattern and Pattern types., Casting process

Types of casting: Continuous casting, Squeeze casting, vacuum mould casting, Evaporative pattern casting, ceramic shell casting, Casting defects., Molding process, Types of Molding process: Injection Molding, Blow molding.

UNIT-II:

Welding: Introduction, Types of weld joints, Types of welding process: Gas welding, Arc welding, Electron beam Welding, Laser beam welding, Friction Stir Welding, Ultrasonic Welding, Thermite welding., Types of Arc welding process: Shielded metal arc welding, Submerged arc welding., Types of Gas welding process: GTAW, GMAW., Types of Resistance welding process: Spot welding, Seam welding., welding defects – causes and remedies, Heat affected zones in welding.

UNIT-III:

Extrusion and Forging: Basic Extrusion process and types, Forging operations and its classification., drawing: wire and tube drawing, Swaging, Blanking, Piercing, Punching and Trimming.

Cutting of Metals: Oxy – Acetylene Gas cutting, Water Plasma Cutting, TIG cutting, MIG cutting, Soldering, Brazing.

UNIT-IV:

Metal Forming: Introduction, forming processes - Bending, Coining, embossing, rolling: types of Rolling and Roll mills, Strain Hardening, Recovery, Recrystallization and Grain growth

Advanced Metal Forming Process: Details of High energy rate forming process, Electro Magnetic Forming, Explosive Forming, Electro-Hydraulic Forming, Contour Roll forming.

UNIT-V:

Additive manufacturing: Introduction to Rapid Prototyping, material, applications, limitations., Techniques: Photo polymerization, Stereo lithography, Powder Bed Fusion, Selective Laser Sintering, 3D Printing, Laminated Object Manufacturing.

TEXTBOOKS:

1. Manufacturing Technology, P.N.Rao,TMH
2. Manufacturing Technology, Kalpak Jain, Pearson education.
3. Production Technology, R.K.Jain

REFERENCE BOOKS:

1. Principles of Metal Castings, Rosenthal.
2. Welding Process, Parmar
3. Manufacturing Technology, R.K. Rajput, Laxmi Pub
4. Manufacturing Engineering &Technology, Kalpak Jain,S.

COURSE OUTCOMES:

1. Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. Acquire knowledge and hands-on competence in applying the concepts of manufacturing science in the design and development of mechanical systems.
3. Competence to design a system, component or process to meet societal needs within realistic constraints.
4. Demonstrate creativeness in designing new systems components and processes in the field of engineering in general and mechanical engineering in particular.
5. An ability to formulate solve complex engineering problem using modern engineering and information Technology tools.

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(R22A0026) Probability , Statistics and Queuing Theory

COURSE OBJECTIVES:

• To understand a random variable that describes randomness or an uncertainty in certain realistic situation. It can be either discrete or continuous type.

• To learn important probability distributions like: in the discrete case, study of the Binomial and the Poisson Distributions and in the continuous case the Normal Distributions.

• To Understand linear relationship between two variables and also to predict how a dependent variable changes based on adjustments to an independent variable.

• To learn the types of sampling, sampling distribution of means and variance, Estimations of statistical parameters.

• Use of probability theory to make inferences about a population from large and small samples.

• To understand different queuing models.

UNIT – I: Basic Probability and Random Variables

Basic Probability: Definition,The axioms of probability and basic problems. Single Random Variables: Discrete and Continuous. Probability distribution function,Probability mass and density functions, mathematical expectation.

Multiple Random variables: Discrete and Continuous, Joint probability distributions-Joint probability mass and density functions, Marginal probability mass and density functions.

UNIT-II: Probability Distributions

Binomial distribution – properties, mean, variance and recurrence formula for Binomial distribution, Poisson distribution – Poisson distribution as Limiting case of Binomial distribution, properties, mean variance and recurrence formula for Poisson distribution,Normal distribution – mean, variance, median,mode and characteristics of Normal distribution.

UNIT -III: Correlation and Regression

Correlation -Coefficient of correlation, Rank correlation, Regression- Regression coefficients, Lines of regression.

Multiple correlation and regression- Coefficient of multiple Correlation, multiple regression, Multiple linear regression equations.

UNIT –IV: Testing of Hypothesis

Sampling: Definitions ,Standard error . Estimation - Point estimation and Interval estimation.

Testing of hypothesis: Null and Alternative hypothesis - Type I and Type II errors, Critical region - confidence interval - Level of significance, One tailed and Two tailed test.

Large sample Tests: Test of significance - Large sample test for single mean, difference of means, single proportion, difference of proportions.

Small samples: Test for single mean, difference of means, paired t-test, test for ratio of variances (F-test) ,Chi-square test for goodness of fit and independence of attributes.

UNIT V: Queuing Theory

Queuing theory –Structure of a queuing system and its characteristics-Arrival pattern and service pattern-Pure birth and Death process.

Terminology of Queuing systems-queuing models and its types - M/M/1 Model of infinite queue(without proofs) and M/M/1 Model of finite queue(without proofs).

Suggested Text Books:

1. Fundamental of Statistics by S.C. Gupta,7thEdition,2016.
2. Fundamentals of Mathematical Statistics by SC Gupta and V.K.Kapoor
3. Higher Engineering Mathematics by B.S. Grewal, Khanna Publishers, 35th Edition,2000.
4. R. A. Johnson, Miller and Freund's "Probability and Statistics for Engineers", Pearson Publishers, 9th Edition, 2017.

References :

1. Introduction to Probability and Statistics for Engineers and Scientists by SheldonM.Ross.
2. Probability and Statistics for Engineers by Dr. J. Ravichandran.

Course Outcomes: After learning the contents of this paper the student must be able to

1. Describe randomness in certain realistic situation which can be either discrete or continuoustype and compute statistical constants of these random variables.
2. Provide very good insight which is essential for industrial applications by learning probability distributions.
3. Make objective, data-driven decisions by using correlation and regression.
4. Draw statistical inference using samples of a given size which is taken from a population.
5. To design balanced systems that serve customers quickly and efficiently but it is not cost effective.

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(R22A0383) Manufacturing Processes Lab

COURSE OBJECTIVES:

1. Ability to function on multi-disciplinary teams in the area of materials processing.
2. Ability to use the techniques, skills and modern engineering tools necessary for handling welding techniques.
3. Understanding of professional and ethical responsibility in the areas of materials management.
4. Ability to communicate effectively the joining processes in welding.

LIST OF EXPERIMENTS

1. To design and making of pattern - for one casting drawing.
2. To determine sand properties- Exercise -for strengths, and permeability.
3. To Prepare Mould for Casting.
4. To prepare a butt joint with the specimens by Arc Welding.
5. To join the specimens by gas welding process.
6. To perform Plasma welding operation
7. To perform Spot welding operation.
8. To perform blanking & piercing operation.
9. To perform deep drawing and extrusion operation.
10. To prepare the product by Injection Moulding machine.
11. To prepare the product by Blow Moulding machine.
12. To manufacture components using by 3D printing.

NOTE: Minimum a total of 8 experiments are to be conducted.

COURSE OUTCOMES:

1. To provide the students' knowledge in finding the different techniques in manufacturing processes.
2. To gain knowledge on welding techniques.
3. Get Exposure different types of plastic moulding processes.
4. To provide students hands on experience to handle the joing processes.

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(R22A0384) Strength of Materials Lab

COURSE OBJECTIVES:
1. Analyze the tensile and compressive strength of a specimen.
2. Determine the hardness, impact strength, fatigue strength
3. to analyze the application of a specific material for a given design requirements
4. Understanding the bending in beams and to analyze the bending stresses
5. Evaluate the capacity of a material to withstand torsional stresses for a safe and sustainable

LIST OF EXPERIMENTS
1. Direct Tension Test.
2. Brinell's Hardness Test.
3. Rockwell Hardness Test.
4. Charpy Impact Test.
5. Izod Impact Test.
6. Torsion Test.
7. Compression test on spring.
8. Tension test on spring.
9. Deflection of Simply supported beam.
10. Deflection of Cantilever beam.
11. Shear Test.
12. Compressive Test on Cube

NOTE: Minimum a total of 8 experiments are to be conducted.

COURSE OUTCOMES:
1. To provide the students' knowledge in finding the materials testing of metals and alloys.
2. To know the hardness of metals.
3. Get Exposure different kinds of materials testing.
4. To provide students hands on experience to handle the machines.

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(R22A0391) Industry Oriented Project

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(*R22A0061) Public Policy & Governance

Course objectives:

1.To make the students understand in-depth analysis of public policy and to solve its ills prevailing in the society.

2. To provide an opportunity for the students to learn the basic areas of public policy analysis, implementation and evaluation.

3. To make understand the process and various approaches in public policy making.

4. To understand the theories and issues of social coordination and the nature of all patterns of rule.

5. To make the students understand the techniques of governance and emerging trends in public and private governance its policy-making and implementation.

Unit-I
Introduction of Public Policy: Definition, Nature, Scope and Importance of Public Policy, Evolution of Public Policy and Policy Sciences, Public Policy and Public Administration. **Approaches to Public Policy Analysis:** The Process Approach, The Logical Positivist Approach, The Phenomenological Approach, The Participatory Approach and Normative Approach.

Unit-II
Theories and Process of Public Policy Making: Theories and Models of Policy Making, Perspectives of Policy Making Process, Institutions of Policy Making.

Unit-III
Policy Implementation and Evaluation: Concept of Policy Implementation, Techniques of Policy Implementation, Concept of Policy Evaluation, Constraints of Public Policy Evaluation.

Unit-IV
Introduction of Governance: Definitions, Issues and Controversies, Reinventing Government, Reforming Institutions: The State, Market and Public domain. **State and Governance:** Origin and types of State, Democratic State and Democratic Administration, Neo-Liberalism and Rolling Back State and Governance as Government.

Unit-V
Citizen and Techniques of Governance: Rule of Law and Human Rights, Accountability, Participation, Representation. **Techniques of Governance**: Openness and Transparency, Citizen Charter, Social Audit. **Emerging Trends in Public and Private Governance:** An Overview, Market, Civil Society, Information and Communication Technology.

TEXT AND REFERENCE BOOKS:
1.Introduction to Public Policy- Charles Wheelan, Naked Economics 2010.
2. Birkland Thomas A., (2005), An Introduction to The Policy Process: Theories, Concepts, And Models of Public Policy Making, Armonk; M.E. Sharpe.
3.Anderson J.E., (2006) Public Policy-Making: An Introduction, Boston, Houghton

4. Bardach, Eugene (1977), The Implementation Game: What Happens After a Bill Becomes a Law, Cambridge, MA: MIT.

5. Bell, S., and Hind moor, A. (2009) Rethinking Governance: The Centrality of the State in Modern Society, Cambridge: Cambridge University Bell, Stephen and Andrew Hind moor.

6. Joyee M. Mitchell & William C. Mitchell, Political Analysis & Public Policy: An Introduction to Political Science, Thomson Press Limited, New Delhi, 1972.

7. R.K. Sapru, Public Policy, Art and Craft of policy Analysis, PHI learning private limited, New Delhi, 2011.

8. Brian W. Hogwood & Lewis A. Gunn, Policy Analysis for the Real world, Oxford University, Press, 1986.

COURSE OUTCOMES

After completion of the course, student will be able to

1.Understand public policy analysis and they will be able to understand policy evaluation and implementation.

2. Understand the public policy and governance on the largest gamut of its canvas.

3. Students will understand the what are emerging trends in public and private governance and various theories in public policy making.

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(R22A0312) METROLOGY AND MACHINE TOOLS

Course Objectives:
1. Equip with knowledge of limits, fits, tolerances and gauging.
2. The principles of linear and angular measuring instruments for accurate measurement of a given component.
3. To impart knowledge of mechanism of metal cutting
4. To describe the mechanisms of the various metal cutting machines, types of machines, various operations that can be performed on them, machining time and force calculations etc.
5. To Learn about the ways to reduce the surface roughness by using different machines.

UNIT–I

Introduction to Metrology: Need, Types, Terminology, Methods of measurements, Selection of measuring Instruments Linear Measurement: Line and end standard, slip gauges, micrometers, spirit level.

Limits, Fits and Tolerances-Types of Fits-Unilateral and bilateral tolerance system, hole and shaft basis system. Interchangeability and selective assembly.

UNIT-II

Limit Gauges: Taylor's principle, Design of GO and NO-GO gauges.
Measurement of angles using Bevel protractor and Sine bar. Measurement of flatness using straight edges, surface plates, optical flat and autocollimator.

Measuring Instruments: Surface Roughness Measurement: Factors affecting the surface roughness, reasons for controlling the surface texture, elements of surface texture-Roughness, Waviness, evaluation of surface roughness-CLA, RMS, Rz Values. Methods of measurement of surface finish, Talysurf. Screw thread measurement.

UNIT-III

Mechanism of Metal Cutting: Metal cutting: Introduction, elements of cutting process – Geometry of single point tool, Chip formation and types of chips, tool materials, tool life, tool wear, cutting fluids, Analysis of orthogonal cutting-Merchant's force diagram, Machinability.

Engine lathe – Principle of working, types of lathes, specifications, operations on lathe, Taper turning methods, Lathe attachments. Capstan and Turret lathe – Single spindle and multi-spindle automatic lathes–tool layouts.

UNIT-IV

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

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

UNIT-V

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

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

TextBooks
1. "A Textbook of Metrology ", M Mahajan, Dhanpatrai, 5th edition, 2019
2. Manufacturing Technology II, P.N Rao. TMH Ltd 1998(Revised edition)
3. Production Engineering by P.C. Sharma, S. Chand and Company.

ReferenceBooks
1. Geofrey, "Fundamentals of metal machining and machine tools", Tata McGraw Hill Education, 4th edition, 2019.
2. Process and Materials of Manufacture (4th Edition) by Roy A. Lindberg, Prentice-Hall of India Private Limited
3. Engineering Metrology, R. K. Jain, Khanna Publishers, 1st Edition, 2013.

CourseOutcomes

CO1: Apply the various methods for the measurements of screw threads, surface roughness parameters and the working of optical measuring instruments.

CO2: Apply the principles of limits, fits and tolerance while designing and manufacturing the components of their requirement.

CO3: Understand the importance of geometry of cutting tools, coolants and tool materials for the analysis of material behavior during manufacturing processes and explain the operational principles of different lathe machines.

CO4: Explain the working principles of Milling, drilling machines for manufacturing the components of their requirement.

CO5: Identify different types of operations, specifications and principles of shaping, slotting, planning machines, finishing operations on grinders, lapping and honing.

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(R22A0313) Thermal Engineering-II

COURSE OBJECTIVES:
1. Student will learn applications and the principles of thermodynamics to components and systems.
2. Student will understand the thermodynamic principles which govern the behaviour of various Engines.
3. Student have knowledge of methods of analysis and design of complicated thermodynamic systems
4. Student will acquire knowledge about thermodynamic analysis for compressors.
5. Student will obtain knowledge on various types of compressors and its functions.

UNIT-I

Actual Cycles and their Analysis: Introduction, Comparison of Air Standard and Actual Cycles, Time Loss Factor, Heat Loss Factor, Exhaust Blow down-Loss due to Gas exchange process, Volumetric Efficiency. Loss due to Rubbing Friction, Actual and Fuel-Air Cycles of CI Engines.
I.C. ENGINES: Classification - Working principles, Valve and Port Timing Diagrams, Air – Standard, air-fuel and actual cycles - Engine systems – Fuel, Carburetor, Fuel Injection System, Ignition, Cooling and Lubrication.

UNIT-II

Combustion in S.I. Engines: Normal Combustion and abnormal combustion – Importance of flame speed and effect of engine variables – Type of Abnormal combustion, pre-ignition and knocking (explanation of) – Fuel requirements and fuel rating, anti-knock additives – combustion chamber – requirements, types.
Combustion in C.I. Engines: Four stages of combustion – Delay period and its importance – Effect of engine variables – Diesel Knock– Need for air movement, suction, compression and combustion induced turbulence – open and divided combustion chambers and nozzles used – fuel requirements and fuel rating.

UNIT-III

Testing and Performance of IC Engines: Parameters of performance - measurement of cylinder pressure, fuel consumption, air intake, exhaust gas composition, Brake power – Determination of frictional losses and indicated power – Performance test – Heat balance sheet and chart.

UNIT-IV

Compressors – Classification –positive displacement and roto dynamic machinery – Power producing and power absorbing machines, fan, blower and compressor – positive displacement and dynamic types – reciprocating and rotary types.
Reciprocating: Principle of operation, work required, Isothermal efficiency volumetric efficiency and effect of clearance, stage compression, under cooling, saving of work, minimum work condition for stage compression.
Rotary (Positive displacement type): Roots Blower, vane sealed compressor, Lysholm compressor – mechanical details and principle of working – efficiency considerations.

UNIT-V

Dynamic Compressors: Centrifugal compressors: Mechanical details and principle of operation –velocity and pressure variation. Energy transfer-impeller blade shape-losses, slip factor, power input factor, pressure coefficient and adiabatic coefficient – velocity diagrams – power.

Axial Flow Compressors: Mechanical details and principle of operation – velocity triangles and energy transfer per stage degree of reaction, work done factor - isentropic efficiency- pressure rise calculations – Polytropic efficiency.

TEXT BOOKS:

1. I.C. Engines / V. Ganesan- TMH
2. Thermal Engineering / Rajput / Lakshmi Publications.
3. IC Engines – Mathur & Sharma – Dhanpath Rai& Sons.

REFERENCE BOOKS:

1. Thermal Engineering / Rudramoorthy - TMH
2. Thermodynamics & Heat Engines / R.S. Yadav/ Central Book Depot., Allahabad
3. Thermal Engineering – R.S. Khurmi&J.K.Gupta – S.Chand

COURSE OUTCOMES:

1. Graduate will recognize and recall the importance of thermodynamic analysis for improvement of efficiency.
2. Graduate will understand the working principles of SI and CI Engines.
3. Student will be able to do thermodynamic analysis for various powers and efficiencies of IC Engines.
4. Student will evaluate the thermodynamic analysis and various efficiencies of Compressors.
5. Student will develop the skill required in solving problems related to Compressors and do the thermodynamic analysis.

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(R22A0314) DESIGN OF MACHINE ELEMENTS

COURSE OBJECTIVES:

1. To apply the various design procedures, principles and various stresses in the design of machine elements. To apply different materials of construction and their properties and factors determining the selection of material for various applications.
2. To develop good and careful problem formulation and solution skills for designing selected machine components and systems
3. To learn the design of temporary and Permanent Joints.
4. To learn the design Procedure for the different Shafts under loading condition, able to know various shafts coupling.
5. To apply the design procedure of support rotating element.

UNIT I

Fundamentals of design and Stresses in Machine Members: General considerations in the design of Engineering Materials and their properties – selection – Manufacturing consideration in design.BIS codes of steel. Simple stresses – Combined stresses – Torsional and Bending stresses – Impact stresses – Stress strain relation – Various theories of failure – Factor of safety – Design for strength and rigidity – preferred numbers. The concept of stiffness in tension, bending, torsion and combined situations.

UNIT II

Strength of Machine Elements: Stress concentration – Theoretical stress Concentration factor – Fatigue stress concentration factor- Notch Sensitivity – Design for fluctuating stresses – Endurance limit – Estimation of Endurance strength – Gerber's curve, Goodman's line – Modified Goodman's line – Soderberg's line.

UNIT III

Fasteners (Temporary and Permanent Joints): Riveted joints- Methods of failure of riveted joints-strength equations-efficiency of riveted joints - eccentrically loaded riveted joints - Welded joints - Design of fillet welds-axial loads-circular fillet welds under bending, torsion- Welded joints under eccentric loading - bolted joints, Knuckle joints - Cotter joints.

UNIT IV

Designs of Keys, Shaft and Shaft Couplings: Design of solid and hollow shafts based on strength, rigidity– Keys, keyways and splines - Rigid couplings – Muff, Split muff and Flange couplings. Flexible couplings –Flange coupling (Modified).

UNIT V

Bearings: Typesof Journal bearings – Lubrication – Bearing Modulus – Full and partial bearings –Clearance ratio – Heat dissipation of bearings, bearing materials – journal bearing design – Ball and roller bearings – Static loading of ball & roller bearings, Bearing life.

TEXT BOOKS:

1. Machine Design by R.S Khurmi and J.K.Gupta, S.Chand Publishers, New Delhi.
2. Machine Design, S MD Jalaludin, Anuradha Publishers.
3. Design of Machine Elements by V. Bhandari TMH

REFERENCE BOOKS:

1. Machine Design Data Book by S MD Jalaludin, Anuradha Publisher.
2. Machine Design Data Book by P.S.G. College of Technology.
3. Machine Design by Pandya and Shah, Chortar Publications.

4. Machine Design / R.N. Norton.
5. Mechanical Engineering Design / JE Shigley.

COURSE OUTCOMES:

1. Student acquires the knowledge about design procedure, material selection, and influence of steady and variable stresses in machine component design.
2. Acquire the Knowledge on various stresses and theories of failures.
3. Understand the concept of joints.
4. Able to understand the design Procedure for the different Shafts and shaft couplings.
5. Able to understand suitable bearings and its constituents from manufacturers catalogues under given loading conditions

NOTE: Design Data Book is permitted. Design of all components should include design for strength and rigidity apart from engineering performance requirements.

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(R22A0315) DESIGN OF HYDRAULIC AND PNEUMATIC SYSTEMS
(PROFESIONAL ELECTIVE-I)

COURSE OBJECTIVES:

1.To provide student with knowledge on the application of fluid power in process, construction and manufacturing Industries.

2. To study the fundamental principles, design and operation of hydraulic and pneumatic machines, components and systems and their application in recent automation revolution.

3. To provide students with an understanding of the fluids and components utilized in modern industrial fluid power system.

4. To develop a measurable degree of competence in the design, construction and operation of fluid power circuits.

5. To emphasize basic theory, components sizing, construction and function, how to read pneumatics and fluid power circuit diagrams using the correct symbols and troubleshooting techniques.

UNIT-I

FLUID POWER PRINICIPLES AND HYDRAULIC PUMPS: Introduction to Fluid power – Advantages and Applications – Fluid power systems – Types of fluids - Properties of fluids and selection – Basics of Hydraulics – Pascal's Law, Sources of Hydraulic power, Pump Classification – Construction, Working, Design, Advantages, and Disadvantages.

UNIT-II

HYDRAULIC ACTUATORS AND CONTROL COMPONENTS: Hydraulic Actuators: Cylinders – Types and construction, Application, Hydraulic cushioning – Hydraulic motors - Control Components: Direction Control, Flow control and pressure control valves – Types, Construction and Operation – Servo and Proportional valves.

UNIT-III

HYDRAULIC CIRCUITS AND SYSTEMS: accumulators, Intensifiers, Industrial hydraulic circuits – Regenerative, Pump Unloading, Double-Pump, Pressure Intensifier, Air-over oil, Sequence, Reciprocation, Synchronization, Fail-Safe, Speed Control, Hydrostatic transmission, Mechanical hydraulic servo systems.

UNIT-IV

PNEUMATIC AND ELECTRO PNEUMATIC SYSTEMS: Properties of air – Perfect Gas Laws – Compressor – Filters, Regulator, Lubricator, Muffler, Air control Valves, Quick Exhaust Valves, Pneumatic actuators, Design of Pneumatic circuit – Cascade method – Electro Pneumatic System.

UNIT-V

TROUBLE SHOOTING AND APPLICATIONS: Installation, Selection, Maintenance, Trouble Shooting and Remedies in Hydraulic and Pneumatic systems, Design of hydraulic circuits for Drilling, Surface grinding, Press and Forklift applications. Design of Pneumatic circuits for Pick and Place applications and tool handling in CNC Machine tools.

TEXT BOOKS:
1. Anthony Esposito, "Fluid Power with Applications", Prentice Hall, 2009.
2. James A. Sullivan, "Fluid Power Theory and Applications", Fourth Edition, Prentice Hall, 1997.

REFERENCES:
1. Shanmugasundaram.K, "Hydraulic and Pneumatic Controls". Chand & Co, 2006.
2. Majumdar, S.R., "Oil Hydraulics Systems – Principles and Maintenance", Tata McGRaw Hill, 2001.

COURSE OUTCOMES:
Upon completion of this course, the students will be able to:
1. Identify hydraulic and pneumatic components and its symbol and usage.
2. Ability to design hydraulic and pneumatic circuits.
3. Identify and analyse the functional requirements of a power transmission system for a given application.
4. Ability to visualize how the hydraulic/pneumatic circuit will work to accomplish the function.
5. Ability to Design and understand the electro-hydraulic and electro-pneumatic circuits.

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(R22A0316) MICROPROCESSORS IN AUTOMATION
(PROFESIONAL ELECTIVE-I)

1. To Understand the basics of PLC programming.
2. Understand the different parameters of PLC.
3. Design different process control applications through ladder logic.
4. Analyze & explain different functions of PLC.
5. Build and experiment with PLC based SCADA systems for various industrial applications

UNIT-I: Basic Concepts of Digital Circuits
Number Systems, Logic Gates, Combinational Circuits, Flip flops, Sequential Logic Circuits: Counters, Shift Registers.
Basic components and computer architecture-CPU, Memory and Peripherals

UNIT-II: Architecture of Microprocessor
Introduction, Origin, Historical Developments, Introductionto8085Functional Block Diagram, Registers, ALU, Bus Systems, Timing and Control Signals, PIN diagram, Machine Cycles, Instruction Cycle and Timing States, Instruction Timing Diagrams, Addressing Modes. Concept of Interrupt, Need for Interrupts, Interrupt structure, Multiple Interrupt requests and their handling, Programmable interrupt controller

UNIT-III: Assembly Language Programming
Instruction Set, Simple programs in 8085 mainly on Addition, Subtraction, Multiplication, Rotation, Ascending and Descending of the given data

UNIT-IV: Memory and I/O Device Interfacing
Memory Interfacing - Memory structure and its requirements, Basic Concept in Memory Interfacing, Address Decoding, Interfacing Circuits, Address Decoding and Memory Addresses, Typical Examples on Memory interfacing: Interface (2k x 8) ROM, (8k x8) EPROM, and(1kx8) RAMwith8085.
IO Interfacing–Basic Interfacing Concepts-Peripheral I/O instructions, I/O Execution, Device Selection and data transfer, absolutevs. Partial Decoding, Input Interfacing, Interfacing I/Os using Decoders

UNIT-V: Architecture of Microcontroller
Introduction to Microcontrollers and how they differ from microprocessors, Block diagram of Microcontrollers, Architecture of 8051 microcontroller, Pin Diagram, Instruction set, simple8051 programming, introduction to ARM microcontroller and its applications.

TEXTBOOKS:
1. Microprocessor Architecture, Programming, and Applications with the 8085, Ramesh Gaonkar, PENRAM International Publishers.
2. The 8051 Microcontroller and Embedded Systems: Using Assembly and C, Muhammad Ali Mazidi, Janice Gillispie Mazidi and RolinD,Mckinlay,2ndEdition,Pearsonpublication,2007.

REFERENCEBOOKS:

1. Microprocessors and Interfacing: Programming and Hardware, DouglasV.Hall
2. Microcomputer Experimentation with the IntelSDK-85,LanceA.Leventhal,PrenticeHall
3. Introduction to Microprocessors, Aditya PMathur,TataMcGraw-Hill,Europe;3rdEdition,1990.
4. Digital Electronics: An Introduction to Theory and Practice, WilliamH.Gothmann, PHILearning Private Limited.
5. Digital and microprocessor technology, PatrickJO'Connor,Prentice-Hall,1983.
6. Digital and Microprocessor Engineering, S.J.Cahill,WllisHorwoodLimited(JohnWiley&Sons).
7. Digital Control Systems, Benjamin C.Kuo, Oxford UniversityPress(2/e,IndianEdition,2007).
8. Digital Computer Electronics: An Introduction to Microcomputers, Albert Pual Malvino, Tata Mc Graw-HillPublishingCompanyLtd.

Course Outcomes (COs): At the end of this course students will be able to:
 1. Understand the basics of PLC programming.
2. Understand the different parameters of PLC.
3. Design different process control applications through ladder logic.
4. Analyze & explain different functions of PLC.
5. Build and experiment with PLC based SCADA systems for various industrial applications.

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(R22A0317) ADDITIVE MANUFACTURING
(PROFESIONAL ELECTIVE-I)

Course Objectives:
1. Generating a good understanding of AM history, its development and applications.
2. To expose the students to different types of Additive Manufacturing processes.
3. To expose the students to different types of powder-based AM techniques.
4. To expose the students to different types of materials used in AM Techniques
5. It helps the students to get familiarized with the various methods of rapid prototyping technologies and rapid tooling.

UNIT-I
INTRODUCTION: History Development of AM systems Applications in Product Development, Reverse Engineering, Rapid Tooling, Rapid Manufacturing- Principle Fundamental File format Other translators medical applications of RP - On demand manufacturing Direct material deposition - Shape Deposition Manufacturing.

UNIT-II
LIQUID AND SOLID BASED AM SYSTEMS: Classification – Liquid based system - Stereo lithography Apparatus (SLA), details of SL process, products, Advantages, Limitations, Applications and Uses. Solid based system - Fused Deposition Modeling, principle, process, products, advantages, applications and uses - Laminated Object Manufacturing

UNIT-III
POWDER BASED AM TECHNIQUES: Selective Laser Sintering – principles of SLS process, principle of sinter bonding process, Laser sintering materials, products, advantages, limitations, applications and uses. Three Dimensional Printing – process, major applications, research and development. Direct shell production casting – key strengths, process, applications and uses, case studies, research and development. Laser Sintering System, e-manufacturing using Laser sintering, customized plastic parts, customized metal parts, emanufacturing - Laser Engineered Net Shaping (LENS).

UNIT-IV
MATERIALS FOR ADDITIVE MANUFACTURING SYSTEMS: Nature of material – type of material – polymers, metals, ceramics and composites- liquid based materials, photo polymer development – solid based materials, powder based materials - case study.

UNIT-V
RAPID TOOLING: Classification: Soft tooling, Production tooling, Bridge tooling; direct and indirect – Fabrication processes, Applications. Case studies - automotive, aerospace and electronics industries.

Text books :
1. Rafiq I. Noorani, Rapid Prototyping, "Principles and Applications", Wiley & Sons, 2006.
2. Chua C.K, Leong K.F and Lim C.S, "Rapid Prototyping: Principles and Applications", Second Edition, World Scientific, 2003.

Reference books :

1. N.Hopkinson, R.J.M, Hauge, P M, Dickens, "Rapid Manufacturing – An Industrial revolution for the digital age", Wiley, 2006
2. Ian Gibson, "Advanced Manufacturing Technology for Medical applications: Reverse Engineering, Software conversion and Rapid Prototying", Wiley, 2006
3. Paul F.Jacobs, "Rapid Prototyping and Manufacturing : Fundamentals of Stereolithography", McGraw Hill 1993. 4. Pham. D.T., and Dimov. S.S., "Rapid Manufacturing", Springer Verlog 2001.

Course Outcomes

CO 1 Understand the principle methods, areas of usage, possibilities and limitations as well as environmental effects of the Rapid Prototyping and tooling Technologies.

CO 2 Understand the process capabilities of liquid and solid based rapid prototyping methods.

CO 3 Understand the process capabilities and advantages of powder based rapid prototyping techniques.

CO4 Select the appropriate material for processing through various rapid prototyping techniques.

CO 5 Develop innovative components and products through RP applications and case studies.

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(R22A6215) FUNDAMENTALS OF CYBER SECURITY
(PROFESIONAL ELECTIVE-I)

COURSE OBJECTIVES
1. To understand the basic concepts of cyber-Security.
2. To study different attacks in cyber-crimes.
3. To understand different tools and methods used in cyber-crime.
4. To study cyber security challenges and implications.
5. To know about Cyber Security Organizational Issues, Policies.

UNIT I-Introduction to Cyber Security: Basic Cyber Security Concepts, layers of security, Vulnerability, threat, Harmful acts, Internet Governance – Challenges and Constraints, Computer Criminals, CIA Triad, Assets and Threat, motive of attackers, active attacks, passive attacks, Software attacks, hardware attacks, Spectrum of attacks, Taxonomy of various attacks, IP spoofing, Methods of defense, Security Models, risk management, Cyber Threats-Cyber Warfare, Cyber Crime, Cyber terrorism, Cyber Espionage, etc., Comprehensive Cyber Security Policy

UNIT II-Cyber Offenses: How Criminals Plan Them: Introduction, How Criminals plan the Attacks, Social Engineering, Cyber stalking, Cyber cafe and Cybercrimes, Botnets: The Fuel for Cybercrime, Attack Vector, Cloud Computing.

UNIT III

Cybercrime: Mobile and Wireless Devices: Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication service Security, Attacks on Mobile/Cell Phones, Mobile Devices: Security Implications for Organizations, Organizational Measures for Handling Mobile, Organizational Security Policies an Measures in Mobile Computing Era, Laptops.

UNIT IV

Types of Attacks and Cybercrime: Introduction, Proxy Servers and Anonymizers, Phishing, Password Cracking, Keyloggers and Spywares, Virus and Worms, Trojan Horse and Backdoors, Steganography, DoS and DDoS attacks, SQL Injection, Buffer Overflow.

UNIT V

Cyber Security Organizational Policies, Risk and Chanllenges: Organizational Implications. Introduction, Cost of Cybercrimes and IPR issues, Web threats for Organizations, Security and Privacy Implications, Social media marketing: Security Risks and Perils for Organizations, Social Computing and the associated challenges for Organizations.

TEXT BOOKS:
1. **Cyber Security:** *Understanding Cyber Crimes, Computer Forensics and Legal Perspectives*, Nina Godbole and Sunil Belapure, Wiley INDIA.

REFERENCE BOOKS:
1. Cyber Security Essentials, James Graham, Richard Howard and Ryan Otson, CRC Press.
2. Introduction to Cyber Security , Chwan-Hwa(john) Wu,J.David Irwin.CRC Press T&F Group

COURSE OUTCOMES: Student will be able to

1. Understand basic concepts of Cyber Security.
2. Ability to identify the attacks in Cyber Crimes
3. Able to specify the suitable methods used in Cyber Crime
4. Ability to face cyber security challenges
5. Understand Cyber Security

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(R22A0551) Java Programming
(OPEN ELECTIVE-I)

COURSE OBJECTIVES:
1.To create Java programs that leverage the object-oriented features of the Java language, such as encapsulation, inheritance and polymorphism; Use data types, arrays and strings.
2. Implement error-handling techniques using exception handling,
3. To know about Applets and Event Handling
4. Create and event-driven GUI using AWT components.
5. To learn Multithreading concepts.

UNIT I
Java Programming-OOP Concepts, History of Java, Java buzzwords, Data types, Variables, Constants, Scope and Life time of variables, Operators, Type conversion and casting, Control Flow Statements, simple java programs, concepts of classes, objects, arrays, strings, constructors, methods, access control, this keyword, overloading methods and constructors, garbage collection, recursion.

UNIT II
Inheritance – Types of Inheritance, super keyword, and preventing inheritance: final classes and methods.
Polymorphism – Dynamic binding, method overriding, abstract classes and methods. Interfaces-Interfaces Vs Abstract classes, defining an interface, implement interfaces, extending interface.
Packages- Defining, creating and accessing a package, importing packages.

UNIT III
Exception handling - Benefits of exception handling, exception hierarchy, Classification of exceptions - checked exceptions and unchecked exceptions, usage of try, catch, throw, throws and finally, built in exceptions.
Multi-threading- Differences between multi-threading and multitasking, thread life cycle, creating threads, synchronizing threads.

UNIT IV
Applets – Concepts of Applets, differences between applets and applications, life cycle of an applet, types of applets, creating applets, passing parameters to applets.
Event Handling: Events, Handling mouse and keyboard events.
Files- Streams, Byte streams, Character streams, Text input/output.

UNIT V
GUI Programming with Java – AWT class hierarchy, AWT controls - Labels, button, text field, check box, and graphics.
Layout Manager – Layout manager types: border, grid and flow. Swing – Introduction, limitations of AWT, Swing vs AWT.

TEXT BOOKS:

1. Java- The Complete Reference, 7th edition, Herbert schildt,TMH.
2. Understanding OOP with Java, updated edition, T. Budd, Pearsoneducation.
3. Core Java an integrated approach, dreamtech publication, Dr. R.NageswaraRao.

REFERENCE BOOKS:

1. Java for Programmers, P.J.Deitel and H.M.Deitel, PEA (or) Java: How to Program,P.J.Deitel and H.M.Deitel, PHI
2. Object Oriented Programming through Java, P. Radha Krishna, Universities Press.

COURSE OUTCOMES:

1. An understanding of the principles and practice of object-oriented programming and design in the construction of robust, maintainable programs which satisfy their requirements;
2. A competence to design, write, compile, test and execute straightforward programs using a high-level language;
3. An awareness of the need for a professional approach to design and the importance of good documentation to the finished programs.
4. Be able to make use of members of classes found in the Java API.
5. Demonstrate the ability to employ various types of constructs and a hierarchy of Java classes to provide solution to a given set of requirements.

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(R22A1251) Web Development
(OPEN ELECTIVE-I)

COURSE OBJECTIVES:
1. To learn the basics of web & html programming
2. To understand CSS and its style
3. To know about Java Scripting & Dynamic Html
4. To understand the concepts of XML
5. To gain knowledge about web server software PHP.

UNIT I
Web Basics- Introduction, Concept of Internet- History of Internet, Protocols of Internet, World Wide Web, URL, Web Server, Web Browser, HTML-Introduction HTML-Basic Formatting Tags, HTML- Grouping Using Div Span, HTML-Lists, HTML-Images, HTML Hyperlink, HTML-Table, HTML- Frames, HTML – Forms, Form Elements, HTML – Meta Tags, HTML-Miscellaneous using tool Dreamweaver/ Visual studio.

UNIT II
CSS –Introduction, Syntax, CSS and page layout, CSS-Selectors, CSS-Attribute selectors, CSS-Color Background Cursor, CSS-Text Fonts, CSS-Lists Tables, CSS -Box Model, CSS-Display Positioning, CSS Floats. Using tool Visual studio, Net Beans.

UNIT III
Java Script: JavaScript characteristics, Objects in Java Script, Events-Handlers, Event objects, DOM, Advanced Java script and HTML Forms, Form Validation, Dynamic HTML with Java Script, DHTM- Events, CSS with JavaScript in DHTML.

UNIT IV
XML: Introduction to XML, Benefits, Holding Data, XML-DOM, Document Type Definition -DTD, XML Schema, Separates Structure from Formatting, Data Sharing XM, , XML HTTP Request, Accessing, Creating and Modifying XML Nodes, Loading XML Data into an HTML Page, Receiving XML Responses, Handling Response XML.

UNIT V
PHP: PHP Introduction, Structure of PHP, PHP Namespace, PHP Functions, PHP-File Handling, PHP Form-handling, PHP Form-validation, Connecting to database, Simple AJAX application.

TEXT BOOKS:
1. Web Programming, Building Internet Applications, CHRIS BATES II Edition, Wiley Dreamtech.
2. Programming world wide web, SEBESTA, PEARSON.

REFERENCE BOOKS:
1. Internet and World Wide Web – How to program, Dietel and Nieto PHI/Pearson
2. PHP: The Complete reference-steven Holzner Tata McGraw-Hill.
3. An Introduction to web Design and Programming –Wang-Thomson
4. Web Warrior Guide to Web Programming -Bai/Ekedaw-Thomas

5. Beginning Web Programming-Jon Duckett WROX.

COURSE OUTCOMES:
1. Ability to design a web application.
2. Ability to develop a specific style sheet.
3. Ability to build a java scripting web application.
4. Ability to create a web design using XML.
5. Ability to develop web pages using PHP.

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(R22A2151) Intellectual Property Rights
(OPEN ELECTIVE-I)

COURSE OBJECTIVES
1. To understand the concepts IPR
2. To understand Trademarks, Trade Secretes and GI of goods.
3. To understand Copyrights, Patents and Industrial Designs.
4. To learn about how to manage IP rights and legal aspects.
5. To understand the concepts of Cyber laws in IPR.

UNIT – I:
Introduction: Introduction to Intellectual Property Rights, types of intellectual property, importance of intellectual property rights, Evolution of IP acts and treaties, Agencies responsible for IPR registrations, Role and value of IP in international commerce, Issues affecting IP internationally.

UNIT – II
Trade Marks: Purpose and function of trademarks, Acquisition of trade mark rights, transfer of rights, Selecting and evaluating trademark, registration of trademarks, claims.
Trade Secrets: Trade secret law, determination of trade secret status, liability for misappropriation of trade secrets, trade secret litigation.
Geographical Indication of Goods: Basic aspects and need for the registration

UNIT – III
Copyrights: Fundamentals of copyright law, originality of material, right of reproduction, right to perform the work publicly, copyright ownership issues, notice of copyright.
Patents: Foundation of patent law, patent searching process, Basic Criteria of Patentability
Industrial Designs: Kind of protection provided in Industrial design

UNIT – IV:
Managing IP Rights: Acquiring IP Rights: letters of instruction, joint collaboration agreement, **Protecting IP Rights:** Non-disclosure agreement, cease and desist letter, settlement memorandum. **Transferring IP Rights**: Assignment contract, license agreement, deed of assignment

UNIT- V
Introduction to Cyber law: Information Technology Act, cyber-crime and e-commerce, data security, confidentiality, privacy, international aspects of computer and online crime.
TEXT BOOKS:
1. Intellectual property right by Deborah E Bouchoux
2. Cyber law, Text and cases South western special topics collection.
3. Intellectual property rights by N.K Acharya

4. Fundamentals of IPR for engineers, BY Komal
Bansal

COURSE OUTCOMES:
- Learner should be able to demonstrate understanding of basic concepts of IPR.
- Able to differentiate between Trademarks, Trade secrets and GI of goods.
- Able to understand Copyrights, Patents and Industrial Designs.
- Able to manage and protect IP
- Will gain Knowledge on Cyber law

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(R22A0351) ROBOTICS AND AUTOMATION
(OPEN ELECTIVE-I)

COURSEOBJECTIVES:
This course will enable the students:
1. To study overview of Embedded Systems, Robots, Microprocessors & Microcontrollers.
2. To study in detail about Robotics and sensors.
3. To study about AVR RISC Microcontroller architecture in detail.
4. To study about ARM Processor in detail.
5. To study about Artificial Intelligence in Robotics.

UNIT -I
Introduction to Embedded System Design, Categories of ES, Overview of Embedded System Architecture, Recent Trends in Embedded Systems, Hardware Architecture of Embedded System, Real- time Embedded Systems, Robots and Robotics, Microprocessors and Microcontrollers, Microcontroller or Embedded Controller

UNIT – II
Robotics: Classification of Robots, Links and Joint, Degree of freedom, Motors-DC motors, Stepper Motors, Servo Motors; Power Transmission-Type of Gears, Robotic Sensors, Applications of Robot, S/w used for Robot programming.

UNIT- III
The AVR RISC microcontroller architecture: Introduction, AVR family architecture, register file, Pin diagram of AVR, memory organization, I/O ports, timers, USART, Interrupt structure.

UNIT-IV
ARM Processor: Fundamentals, Registers, current program status register, pipeline concept, Interrupt and the vector table.

UNIT V
AI IN ROBOTICS: Robotic perception, localization, mapping- configuring space, planning uncertain movements, dynamics and control of movement, Ethics and risks of artificial intelligence in robotics.

TEXT BOOKS:
1. Subrata Ghoshal, "Embedded Systems &Robots", Cengage Learning
2. Stuart Russell, Peter Norvig, "Artificial Intelligence: A modern approch", Pearson Education,India2003.
3. ARM System Developer's Guide: Designing and Optimizing System SoftwareAndrew N.Sloss, Dominic Symes, Chris Wright, Elsevier Inc., 2007.

REFERENCE BOOKS:
1. M.A. Mazidi, J.G. Mazidi, R.D. Mckinlay, "8051 Microcontroller and Embedded Systems",Pearson.
2. Dr. K.V.K. Prasad, "Embedded/Real-Time Systems: Concepts Design & Programming",Dreamtech
3. Microcontrollers and applications, Ajay V Deshmukh , TMGH,2005

COURSE OUTCOMES:
At the end of the course, the students will be able to
1. Understand the overview of Embedded Systems, Robots, Microprocessors & Microcontrollers.
2. Understand in detail about Robotics and sensors.
3. Understand AVR RISC Microcontroller architecture in detail.
4. Understand about ARM Processor in detail.
5. Understand about Artificial Intelligence in Robotics

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(R22A0451) Electronics for Health Care
(OPEN ELECTIVE-I)

COURSE OBJECTIVES:
1. To understand x-ray generation and biological effects.
2. To study different x-ray diagnostic methods.
3. To study CT imaging concepts, fundamental of Magnetic resonance imaging..
4. To study Generation and detection of ultrasound and its techniques.
5. To study the principles of Radio nuclide imaging

UNIT-I
X- RAY IMAGING: Generation and Detection of X-rays – X-ray generation, X-ray generators, Filters, Beam restrictors and grids, Intensifying screens, fluorescent screens, and image intensifiers, X-ray detectors, X-ray image characteristics – Spatial resolution, Image noise, Image contrast, Biological effects of ionizing radiation.

UNIT-II
X- RAY DIAGNOSTIC METHODS: Conventional X-ray radiography, Fluoroscopy, Angiography, Mammography and Xeroradiography, Image subtraction.
COMPUTED TOMOGRAPHY: Conventional tomography, Computed tomography, Algorithms for image reconstruction: parallel and Fan beam data, Spiral CT. Recent developments – Digital radiography.

UNIT-III
ULTRASOUND IMAGING: Generation and detection of Ultrasound- Piezoelectric effect, Ultrasonic transducers,
ULTRASONIC DIAGNOSTIC METHODS :Pulse echo systems- Amplitude mode(A-mode),Brightness mode(B-mode), Motion mode (M- mode), Constant depth mode (C-mode), Doppler methods, Duplex imaging, Tissue characterization, Colour Doppler flow imaging, Image characteristics – Ultrasonic texture or speckle, Speckle reduction, Compensation of phase aberration, Biological effects of ultrasound

UNIT-IV
RADIO NUCLIDE IMAGING: Generation & Detection of Nuclear Emission – Radionuclide generators, nuclear radiation detectors, Collimators, Radionuclide imaging systems-Gamma Camera, SPECT, PET.
BASICS OF MAGNETIC RESONANCE IMAGING: fundamentals of nuclear magnetic resonance-Angular momentum, magnetic dipole moment, magnetization, Larmor frequency, Rotating frame of reference and RF magnetic field, Free induction decay (FID), Fourier spectrum of the NMR signal, Spin density, Relaxation times, Pulse sequences.

UNIT-V
MRI SYSTEM & IMAGING METHODS : Magnetic field gradients, NMR Coil/Probe, Transmitter, Receiver, Data acquisition. Imaging Methods- Introduction, slice selection, frequency encoding, phase encoding, Spin-Echo imaging- Characteristics of MRI images- spatial resolution, image contrast. Functional MRI.

`TEXTBOOKS:

1. Principles of Medical Imaging, Kirk Shung, Michael B. Smith and Banjamin Tsui, Academic Press, 1992.
2. Handbook of Biomedical Instrumentation,R.S.Khandpur,TataMcGrawHill,2nd Edition,2003.

REFERENCE BOOK:

1. Fundamentals of Medical Imaging, Paul Suetens,Cambridge UniversityPress, 2002

COURSE OUTCOMES:

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

1. Understand the X-ray fundamentals and its characteristics.
2. Understand the X-ray diagnostic methods and CT imaging.
3. Understand the Ultra sound imaging and diagnostics methods.
4. Understand the properties of radio nuclides and its applications.
5. Understand the MRI system and imaging methods.

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(R22A6751) Principles of Data Science
(OPEN ELECTIVE-I)

Course Objectives:
1. To gain knowledge in the basic concepts of Data Analysis
2. To acquire skills in data preparatory and preprocessing steps.
3. To understand the mathematical skills in statistics.
4. To understand the concepts of Artificial Intelligence Roles and Skills in Data Science.
5. To understand the role of Data Science in Real-time applications

UNIT I
INTRODUCTION Need for data science – benefits and uses – facets of data – data science process – setting the research goal – retrieving data – cleansing, integrating, and transforming data – exploratory data analysis – building the models – presenting and building applications.

UNIT II
DESCRIBING DATA - I Frequency distributions – Outliers – relative frequency distributions cumulative frequency distributions – frequency distributions for nominal data – interpreting distributions – graphs – averages – mode – median – mean – averages for qualitative and ranked data – describing variability – range – variance – standard deviation – degrees of freedom – interquartile range – variability for qualitative and ranked data.

UNIT III
DESCRIBING DATA - II Normal distributions – z scores – normal curve problems – finding proportions – finding scores – more about z scores – correlation – scatter plots – correlation coefficient for quantitative data – computational formula for correlation coefficient – regression – regression line – least squares regression line – standard error of estimate – interpretation of r2 – multiple regression equations – regression toward the mean.

UNIT IV
AI ROLES AND SKILLS AI Cognitive Computing: Learning Perceptions – Terminologies - Machine Learning – Neural Networks – Deep Learning - NLP – Speech Processing – Big Data and AI – Ethics in AI Research - Advanced Applications – AI Myths – Data Science Roles Data Scientist, Data Architect, Data Analyst – Machine Learning Engineer – Skills.

UNIT V
DATA SCIENCE USE CASES Data Science Use cases Specifications and Discussion – Data Sources Identification – Data Types –Data Classification – Data Characteristics of Big V"s – Data Science P"s – Applications of AI: Domains: Customer Insights – Behavioral Analysis –- Marketing – Retails – Insurance – Risk and Security – Health care – Supply Chain Logistics.

Text Books:
1. David Cielen, Arno D. B. Meysman, and Mohamed Ali, "Introducing Data Science", Manning Publications, 2016. (first two chapters for Unit I)

2.Robert S. Witte and John S. Witte, "Statistics", Eleventh Edition, Wiley Publications, 2017.

(Chapters 1–7 for Units II and III)
3. Joel Grus, "Data Science from Scratch", 2nd Edition, O'Reilly Publisher, ISBN: 9781492041139, May 2019 (for Unit IV and V).

Reference Books:
1. Lillian Pierson, Jake Porway, "Data Science for Dummies", Second Edition, John Wiley & Sons, Publishers, ISBN: 9781119327639, 2017 (EBook)
2. Sinan Ozdemir, Sunil Kakade, "Principles of Data Science", Second Edition (EBook) ELearning Resources:
• Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

Course Outcomes:
On successful completion of this course, students would be able to
• Understand the foundational concepts of Data Science.
• Understand the nature of Data.
• Determine the relationship between data dependencies using statistics.
• Understand the concepts of Artificial Intelligence Roles and Skills in Data Science

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(R22A0251) Renewable Energy Sources
(OPEN ELECTIVE-I)

Course Objectives:

1. To recognize the awareness of energy conservation in students
2. To identify the use of renewable energy sources for electrical power generation
3. To collect different energy storage methods and detect about environmental effects of energy conversion.

UNIT-I

Introduction

Renewable Sources of Energy- Grid- Supplied Electricity- Distributed Generation-Renewable Energy Economics- Calculation of Electricity Generation

Wind Power Plants:

Appropriate Location -Evaluation of Wind Intensity -Topography -Purpose of the Energy Generated – General Classification of Wind Turbines- Rotor Turbines- Multiple-Blade Turbines Drag Turbines- Lifting Turbines- Generators and Speed Control used in Wind Power Energy Analysis of Small Generating Systems.

UNIT-II

Photo voltaic Power Plants

Solar Energy- Generation of Electricity by Photo voltaic Effect- Dependence of a PV Cell Characteristic on Temperature- Solar cell Output Characteristics-Equivalent Models and Parameters for Photo voltaic Panels- Photo voltaic Systems-Applications of Photo voltaic Solar Energy- Economical Analysis of Solar Energy.

Fuel Cells: The Fuel Cell- Low and High Temperature Fuel Cells- Commercial and Manufacturing Issues Constructional Features of Proton Exchange- Membrane Fuel Cells– Reformers- Electrolyzer Systems and Related Precautions- Advantages and Disadvantages of Fuel Cells-Fuel Cell Equivalent Circuit- Practical Determination of the Equivalent Model Parameters -Aspects of Hydrogen as Fuel.

UNIT-III

Induction Generators

Principles of Operation-Representation of Steady- State Operation-Power and Losses Generated-Self-Excited Induction Generator-Magnetizing Curves and Self-Excitation Mathematical Description of the Self-Excitation Process-Interconnected and Stand-alone operation-Speed and Voltage Control - Economical Aspects

UNIT-IV

Storage Systems

Energy Storage Parameters-Lead-Acid Batteries-Ultra Capacitors-Flywheels–Super conducting Magnetic Storage System-Pumped Hydroelectric Energy Storage- Compressed Air Energy Storage-Storage Heat-Energy Storage as an Economic Resource.

UNIT-V

Integration of Alternative Sources of Energy

Principles of Power Injection-Instantaneous Active and Reactive Power Control Approach Integration of Multiple Renewable Energy Sources-Islanding and Interconnection Control-DG Control and Power Injection.

Inter connection Of Alternative Energy Sources with the Grid:

Inter connection Technologies-Standards and Codes for Inter connection-Inter connection Considerations-Inter connection Examples for Alternative Energy Sources.

TEXTBOOKS:

1. Felix A. Farret, M. Godoy Simoes, "Integration of Alternative Sources of Energy", John Wiley& Sons, 2006.
2. Solanki: Renewable Energy Technologies: Practical Guide For Beginners, PHI Learning Pvt. Ltd., 2008.

REFERENCE BOOKS:

1. D.Mukherjee: Fundamentals of Renewable Energy Systems, New Age International publishers, 2007.
2. Remus Teodorescu, Marco Liserre, PedroRodríguez: Grid Converters for Photo voltaic and Wind Power Systems, John Wiley & Sons, 2011.
3. Gilbert M.Masters: Renewable and Efficient Electric Power Systems, John Wiley& Sons, 2004.

Course Out comes:

Costs- Demand side Management Options –Supply side Management Options-Modern Electronic Controls of Power Systems. At the end of the course the student will be able to:

1. Understand the principles of wind power and solar photo voltaic power generation, fuel cells.
2. Assess the cost of generation for conventional and renewable energy plants
3. Design suitable power controller for wind and solar applications and analyze the issues involved in the integration of renewable energy sources to the grid

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(R22A0063) Business Analytics
(OPEN ELECTIVE-I)

Course Aim/s:
To help students in understanding how the managers use business analytics for managerial decision making.

Learning Outcome/s:
 The students will be familiar with the practices of analyzing and reporting the businessdata useful for the insights of business growth and development.

Unit-I: Understanding Business Analytics
Introduction: Meaning of Analytics - Evolution of Analytics - Need of Analytics - Business Analysis vs. Business Analytics - Categorization of Analytical Models - Data Scientist vs. Data Engineer vs. Business Analyst - Business Analytics in Practice - Types of Data - Role of Business Analyst.

Unit-II: Dealing with Data and Data Science
Data: Data Collection - Data Management - Big Data Management - Organization/Sources of Data - Importance of Data Quality - Dealing with Missing or Incomplete Data - Data Visualization - Data Classification.
Data Science Project Life Cycle: Business Requirement - Data Acquisition - Data Preparation - Hypothesis and Modeling - Evaluation and Interpretation - Deployment - Operations - Optimization - Applications for Data Science

Unit-III: Data Mining and Machine Learning
Data Mining: The Origins of Data Mining - Data Mining Tasks - OLAP and Multidimensional Data Analysis - Basic Concept of Association Analysis and Cluster Analysis.
Machine Learning: History and Evolution - AI Evolution - Statistics vs. Data Mining vs. Data Analytics vs. Data Science - Supervised Learning - Unsupervised Learning - Reinforcement Learning - Frameworks for Building Machine Learning Systems.

Unit-IV: Applications of Business Analytics
Overview of Business Analytics Applications: Financial Analytics - Marketing Analytics - HR Analytics - Supply Chain Analytics - Retail Industry - Sales Analytics - Web & Social Media Analytics - Healthcare Analytics - Energy Analytics - Transportation Analytics - Lending Analytics - Sports Analytics - Future of Business Analytics.
Unit-V: Ethical, Legal and Organizational Issues Issues & Challenges: Business Analytics Implementation Challenges - Privacy and Anonymizaiton - Hacking and Insider Threats - Making Customer Comfortable.

REFERENCES:
1. James R Evans, Business Analytics, Global Edition, Pearson Education
2. U Dinesh Kumar, Business Analytics, Wiley India Pvt. Ltd., New Delhi
3. Ger Koole, An Introduction to Business Analytics, Lulu.com, 2019
4. J.D. Camm, J.J. Cochran, M. J. Fry, J.W. Ohlmann, D.R. Anderson, D.J. Sweeney, T. A.Williams - Essentials of Business Analytics, 2e; Cengage Learning.

5. Vipin Kumar, Introduction to Data Mining, Pang-Ning Tan, Michael Steinbach,
    PearsonEducation India
    Bhimasankaram Pochiraju, Sridhar Seshadri, Essentials of Business Analytics: An
    Introduction to the Methodology and its Application, Springer

5. Vipin Kumar, Introduction to Data Mining, Pang-Ning Tan, Michael Steinbach,
    PearsonEducation India

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

III Year B. TECH - I- SEM   **L/T/P/C**

-/-/2/1

(R22A0385) METROLOGY AND MACHINE TOOLS LAB

COURSEOBJECTIVES:
1. To learn about basic measuring instruments vernier calipers, screw gauge, vernier height gauge.
2. To learn the measurement of the Angle and taper's by Bevel protractor, Sine bar, etc.
3. TolearnaboutMechanicalparametermeasuringsystemsanddifferentalignmenttechniques
4. To understand the working principles of various machines viz lathe, Drilling, milling, shaping.
5. To understand the usage of CNC in Lathe and Milling machines.

CYCLE-1
1. Measurements of lengths, heights, diameters by Vernier calipers, micrometers etc.
2. Measurements of bores by internal micrometers and dial bore indicators.
3. To Study the Angle and taper measurements by Bevel protractor, Sinebars, etc.
4. Measurements by Gear Tooth Vernier Calipers
5. To study about the Toolmakers microscope and its application
6. Surface Roughness Measurement.

CYCLE-2
1. Introduction of general-purpose machines -Lathe, drilling machine, Milling machine, Shaper, Planning machine, slotting machine, Cylindrical Grinder, surface grinder and tool and cutter grinder.
2. To perform Step turning and taper turning by lathe,
3. To perform Thread cutting and knurling operations by lathe
4. To perform spur gear cutting using milling machine
5. To perform flat surface operation on a block using shaper
6. To perform Drilling & Tapping operations.
7. To perform precision surface grinding operations
8. To perform precision cylindrical grinding operations
9. To perform splines on a block using slotting machine
10.   To perform Step turning operation using CNC lathe

COURSEOUTCOMES:
Students get exposure to
1. Apply the procedures to measure length, width, depth, bore diameters, external tapers, tool angles, and surface roughness by using different instruments.
2. Demonstrate knowledge of different machine tools used in machine shops.
3. Perform step, taper turning, knurling and threading operations on lathe.
4. Practical exposure on Flat Surface machining, Shaping, Slotting, Milling and grinding operations.
5. Develop programs on CNC lathe and Milling machines.

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(R22A0386) THERMAL ENGINEERING LAB

COURSE OBJECTIVES:

1. To study procedure to draw the valve and port timing diagram of CI/SI engines.
2. To understand the performance characteristics of IC engines (SI and CI) in terms of heat balancing, economical speed variations, air fuel ratio influence on the engine.
3. To demonstrate and understand Morse test on multi cylinder SI engine
4. To understand the working and performance of reciprocating air compressor
5. To Study the design and working of the different types of boilers

LIST OF EXPERIMENTS

1. I.C. Engine Valve / Port Timing Diagrams
2. I.C. Engine Performance Test for 4 Stroke SI engines
3. I.C. Engine Performance Test for 2 Stroke SI engines
4. I.C. Engine Morse/ Retardation/ Motoring Tests
5. I.C. Engine Heat Balance - CI/SI Engines
6. I.C. Engine Economical speed Test on a SI engine
7. I.C. Engine Effect of A/F Ratio in a SI engine
8. Performance Test on Variable Compression Ratio of IC Engine
9. IC Engine Performance Test on a 4S CI Engine at constant speed
10. Volumetric efficiency of Air - Compressor Unit
11. Disassembly / Assembly of Engines
12. Study of Boilers

Note: Total 10 experiments are to be conducted.

COURSE OUTCOMES:

1. Draw the valve and port timing diagram of SI engine & CI engine.
2. Calculate & Compare the performance characteristics of diesel and petrol engines.
3. Apply the concept of Morse test on multi cylinder SI engine.
4. Analyze the efficiency of reciprocating air compressor.
5. Understand the working of boilers

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(R22A0392 Application Development-I

COURSE OBJECTIVES:

MODULE-I / UNIT–I

Fundamentals Of Android: OOPS Concept, SQL queries, Basics of Designing, Android Basics - Installing Android Studio, Creating an Android app project, Deploying the app to an emulator and a device, Layouts, Views and Resources, Text and Scrolling views (working with TextView Elements), PHP and HTML basics

MODULE-II / UNIT–II

Learning the Language(Java): Classes and Object, Encapsulation, Constructors, Inheritance, Method Overriding, Polymorphism, Abstract method and classes, Interface and Packages, Exception Handling, Multitasking and Multithreading, Synchronization

MODULE-III / UNIT–III

Android OS: Activities and Intents, Activity Lifecycle and Saving State, Activities and Implicit Intents, Debugging Your App, Testing Your App, User Input Controls, Menus, Screen Navigation, Recycler View, Delightful User Experience - Drawable, Themes and Styles, Material design, Supporting landscape, multiple screen sizes, Async Task and Async Task Loader, Broadcast receivers, Notifications, Transferring data efficiently

MODULE-IV / UNIT–IV

Database connectivity: SQLite Data Types, Adding, Updating and Deleting Content using SQLite Database, Working with MySQL

MODULE-V / UNIT–V

Project Work

COURSE OUTCOMES:

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(R22A0084) Professional Development Skills -I

OBJECTIVES:
1. To strengthen the students with the professional skill set.
2. To make the students recognize the role of technical English in their academic and professional fields.
3. To improve language proficiency and to develop the required professional ethics.
4. To equip students, organize, comprehend, write, and present, short and long forms of any technical work within the broad framework of the Scientific Method.
5. To facilitate communication about projects and ideas throughout the industry and also to the non-technical people.

SYLLABUS

UNIT- I:
- Communication Skills: Verbal & Non-verbal communication
- Body Language: Facial expressions, Gestures, Eye Contact, Shrugging, and Standing Postures
- Writing: Letter Writing: requisition, complaint, Enquiry and response
- Exploring Career Opportunities

UNIT-2:
- Self-Introduction
- Ice-Breaking
- Writing: E-Mail Writing, Email Etiquette
- Social and Cultural Etiquette

UNIT-3:
- Oral Presentation Skills: PPTs, Paper Presentation, Poster Presentation etc.,
- JAM Session
- Writing: Paragraph writing and Types of Paragraph Writing (descriptive, narrative, expository, and persuasive)
- Ethics and Integrity

UNIT-4:
- Describing People, Places, things etc.
- Telephonic Conversation: Telephonic Expressions, and Etiquette
- Writing: Essay writing and Types of Essay Writing
- Digital Literacy and Social Media

UNIT-5:
- Extempore
- Role play and Situational dialogues
- Writing: Memo Writing
- Digital Ethics and Cyber Security

OUTCOMES:

Students will be able to

1. Understand information which assists in completion of the assigned job tasks more successfully
2. Market them with the rich professional skills that they acquire.
3. Adhere to ethical norms of scientific communication
4. Strengthen their individual and collaborative work strategies
5. Successfully market them and sell themselves to the employer of their choice.

REFERENCE BOOKS:

1. Curriculum and Guide line for Life Skills, By UGC, August 2023
2. David F. Beer and David McMurrey, Guide to writing as an Engineer, John Willey. New York, 2004
3. Diane Hacker, Pocket Style Manual, Bedford Publication, New York, 2003. (ISBN 0312406843)
4. Shiv Khera, You Can Win, Macmillan Books, New York, 2003.
5. Raman Sharma, Technical Communications, Oxford Publication, London, 2004.
6. Meenakshi Raman, Prakash Singh, Business communication, Oxford Publication, New Delhi 2012.
7. Dale Jung k, Applied Writing for Technicians, McGraw Hill, New York, 2004. (ISBN: 07828357-4)
8. Sharma, R. and Mohan, K. Business Correspondence and Report Writing, TMH New Delhi 2002.
9. Xebec, Presentation Book, TMH New Delhi, 2000. (ISBN 0402213).

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III Year B. TECH - II- SEM   **L/T/P/C**
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(R22A0318) Heat Transfer

*Note: Heat and Mass Transfer data books are permitted
COURSE OBJECTIVES:
1. Student can able to learn about modes of heat transfer and conduction heat transfer.
2. Student can learn types of convection and dimensional analysis.
3. Student can learn phases of heat transfer
4. Student able to learn about heat exchanger performance.
5. Student able to learn different laws of Radiation and its applications.

UNIT-I
Introduction: Basic modes of heat transfer - General discussion about applications of heat transfer –
Fourier Heat transfer equation General heat conduction equation in Cartesian, Cylindrical and Spherical
coordinate systems. Steady state one dimensional heat conduction solutions for plain and composite
slabs and cylinders - Critical thickness of insulation.

UNIT-II
Heat conduction through extended surfaces (Fins) -Long Fin, Fin with insulated tip and Short Fin - Fin
effectiveness and efficiency.
Unsteady state Heat Transfer-Conduction: One Dimensional Transient Conduction Heat Transfer -
Lumped system analysis, and solutions by use of Heisler charts.

UNIT-III
Convection: Dimensional analysis - Buckingham π theorem - Application of dimensional analysis to free
and forced convection problems- Dimensionless numbers and Empirical correlations.
Free and Forced convection:
Continuity, momentum and energy equations - Boundary layer theory concept - Approximate solution
of the boundary layer equations - Laminar and turbulent heat transfer correlation

UNIT- IV
Heat Exchangers: Classification of heat exchangers- Parallel flow- Counter flow- Cross flow heat
exchangers- Overall heat transfer coefficient- Fouling factor - Concepts of LMTD and NTU
methods Problems using LMTD and NTU methods - Heat exchangers with phase change.

UNIT-V
Boiling and Condensation: Different regimes of boiling- Pool, Nucleate, Transition and Film boiling.

Condensation: Film wise and drop wise condensation - Nusselt's theory of condensation on a vertical
plate.
Radiation Heat Transfer: Emission characteristics and laws of Black body radiation- Laws of Kirchhoff,
Planck, Wien, Stefan Boltzmann – concepts of shape factor – Radiation shields

TEXT BOOKS:
1. Heat Transfer, by J.P.Holman, Int.Student edition, McGraw Hill Book Company.
2. Fundamentals of Heat and Mass Transfer- Sachdeva, New Age Publications.
REFERENCE BOOKS:
1. Heat Transfer by S.P.Sukhatme.
2. Heat transfer by Yunus A Cengel.
3. Heat transfer by Arora and Domakundwar, Dhanpat Rai & sons, New Delhi.

COURSE OUTCOMES:
1. To identify the modes of heat transfer and calculate the conduction in various solids.
2. To solve the heat transfer rate in convection for various geometric surfaces.
3. To evaluate the heat transfer rate in phase change process,
4. To design heat exchange equipment based on the need that fit to application.
5. To learn about the radiation and its use in real life

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(R22A0319) CAD/CAM

Course Objectives:

1. To provide an overview of how computers are being used in design, development of manufacturing plans and manufacture
2. Understand the Mathematical representations of curves and surfaces used in geometric construction.
3. To study the Mathematical representations of solids used in geometric construction.
4. To apply the transformation for 2D drafting.
5. To provide basic foundation in computer aided manufacturing.

UNIT–I

Introduction: Computers in Industrial Manufacturing, Product cycle, CAD/CAM Hardware, Basic structure.

Computer Graphics:Display Devices: Cathode Ray Tube, DVST, Raster display, pixel value, estimation of graphical memory, LCD, LED fundamentals. Concept of Coordinate Systems: Working Coordinate System, Model Coordinate System, Screen Coordinate System. Graphics exchange standards and Database management systems.

UNIT–II

Curves and Surfaces: Introduction to curve representation, Classification of curves, Line generation algorithm: DDA algorithm, Bresenham Algorithm. Synthetic Curves: Concept of continuity,

Cubic Spline: equation, properties and blending. Bezier Curve: equations, properties; Properties and advantages of B-Splines. Various types of surfaces along with their typical applications

UNIT–III

Mathematical representation of solids: Geometry and Topology, Comparison of wireframe, surface and solid models, Properties of solid model, properties of representation schemes, Boolean operations. Schemes: B-rep, CSG, Sweep representation, ASM, Primitive instancing, Cell Decomposition and Octree encoding

UNIT–IV

Geometric Transformations: Homogeneous representation; Translation, Scaling, Reflection, Rotation, Shearing in 2D; Orthographic and perspective projections.

Drafting and Modeling systems: Basic geometric commands, editing, dimensioning.

UNIT–V

Group Technology: Part family, coding and classification, production flow analysis, advantages and limitations, Computer Aided Processes Planning, Retrieval type and Generative type.

Numerical control: NC, NC modes, NC elements, NC machine tools, CNC Part Programming fundamentals, manual part programming methods, Computer Aided Part Programming.

TEXTBOOKS:
1. CAD/CAM Theory and Practice/IbrahimZeid/TMH Publishers
2. CAD/CAM/ AZimmers &P.Groover/PE/PHIPublishers

REFERENCE BOOKS:
1. CAD/CAM/CIM/Radhakrishnan and Subramanian/New Age Publishers
2. Principles of Computer Aided Design and Manufacturing/FaridAmirouche/Pearson Edu
3. CAD/CAM: Concepts and Applications/Alavala/PHI Publishers Computer Numerical
Control Concepts and programming / Warren S Seames / Thomson Publishers
CAD/CAM–PNRAO McGraw Hill Publications

Course outcomes:
1. Understand the applications of computer in the design and manufacturing.
2. Understand and develop the Mathematical representations of curves used in geometric construction.
3. Understand and develop the Mathematical representations of solids used in geometric construction.
4. Able to get the transformations in 2D using transformation equations.
5. Understand the concept of group technology and prepare the CNC part program for any type of geometry given.

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(R22A0320) Machine Design

Note: Design data books are permitted

COURSE OBJECTIVES:

1. To gain knowledge on the principles and procedure for the design of Mechanicalpower Transmission components or flexible elements.
2. To design the engine parts like piston, connecting rod and analyze design proceduredifferent loading conditions.
3. To design of elastic object that stores mechanical energy.
4. To apply principles of design and analyze the forces in mechanical power transmission elements such gears (spur & Helical Gears).
5. Implement basic principles for the design of power screws.

UNIT-I

Design of Flexible Elements: Design of Transmission of power by Belt and Rope drives, Transmission efficiencies, Belts – Flat and V Types.

UNIT-II

Design of I.C engine Parts: Connecting Rod: Thrust in connecting rod – stress due to whipping action on connecting rod ends – Pistons, Forces acting on piston – Construction - Design and proportions of piston.

UNIT-III

Mechanical Energy storing Elements : Introduction-Types of springs - terms used in springs- spring material Stresses in Helical Springs of Circular Wire - Deflection of Helical Springs of Circular Wire - Eccentric Loading of Springs - Buckling of Compression Springs - Energy Stored in Helical Springs of Circular Wire - Stress and Deflection in Helical Springs of Non- circular Wire - Helical Springs Subjected to Fatigue Loading - Springs in Series and Parallel - Helical Torsion Springs - Design of Leaf Springs.

UNIT-IV

Spur and Helical Gears: Spur gears & Helical gears- important Design parameters – Design ofgears using AGMA procedure involving Lewis and Buckingham equations-Check for wear.

UNIT-V

Power Screw drives and their efficiency: Design of screw - Square ACME - Buttress screws -compound screw-design of screw jack - differential screw.

TEXT BOOKS:
1. Machine Design by R.S Khurmi and J.K.Gupta, S.Chand Publishers, New Delhi.
2. Machine Design, S MD Jalaludin, Anuradha Publishers.
3. Design of Machine Elements by V. Bhandari TMH

REFERENCE BOOKS:

1. Machine Design Data Book by S MD Jalaludin, Anuradha Publisher.
2. Machine Design Data Book by P.S.G. College of Technology.
3. Machine Design by Pandya and Shah, Chortar Publications.
4. Machine Design / R.N. Norton.
5. Mechanical Engineering Design / JE Shigley.

COURSE OUTCOMES:

1. Acquires the knowledge on belts, ropes.
2. Calculate the design parameter for energy storage element and engine components,connecting rod and piston
3. To understand the design and forces acting on gears
4. Select appropriate gears for power transmission on the basis of given load and speedDesign gears based on the given conditions Apply the design concepts to estimatethe strength of the gear.
5. Analyze power screws subjected to loading.

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(R22A0553) Database Systems
(OPEN ELECTIVE-II)

COURSE OBJECTIVES:
1. To understand the basic concepts and the applications of database systems
2. To Master the basics of SQL and construct queries using SQL
3. To understand the relational database design principles
4. To become familiar with the basic issues of transaction processing and concurrency control
5. To become familiar with database storage structures and access techniques.

UNIT I
INTRODUCTION
Database: Purpose of Database Systems, File Processing System Vs DBMS, History, Characteristic- Three schema Architecture of a database, Functional components of a DBMS, DBMS Languages- Database users and DBA.

UNIT II
DATABASE DESIGN
ER Model: Objects, Attributes and its Type. Entity set and Relationship set-Design Issues of ER model-Constraints, Keys-primary key, Super key, candidate keys. Introduction to relational model-Tabular, Representation of Various ER Schemas. ER Diagram Notations Goals of ER Diagram- Weak Entity Set- Views

UNIT III
STRUCTURED QUERY LANGUAGE
SQL: Overview, The Form of Basic SQL Query -UNION, INTERSECT, and EXCEPT– join operations: equi join and non equi join -Nested queries - correlated and uncorrelated Aggregate Functions-Null values. Views, Triggers.

UNIT IV
DEPENDENCIES AND NORMAL FORMS
Importance of a good schema design, - Problems encountered with bad schema designs, Motivation for normal forms- functional dependencies, -Armstrong's axioms for FD's Closure of a set of FD's, - Minimal covers-Definitions of 1NF,2NF, 3NF and BCNF Decompositions and desirable properties

UNIT V
Transactions: Transaction concept, transaction state, System log, Commit point, Desirable Properties of a Transaction, concurrent executions, serializability, recoverability, implementation of isolation, transaction definition in SQL, Testing for serializability, Serializability by Locks- Locking Systems with Several Lock Modes- Concurrency Control by Timestamps, validation.

TEXT BOOKS:
1. Abraham Silberschatz, Henry F. Korth, S. Sudarshan,‖ Database System Concepts‖, McGraw-Hill, 6th Edition , 2010.
2. Fundamental of Database Systems, by Elmasri, Navathe, Somayajulu, and Gupta, Pearson Education

REFERENCE BOOKS:
1. Raghu Ramakrishnan, Johannes Gehrke, —Database Management System‖, McGraw Hill., 3rd Edition 2007.
2. Elmasri& Navathe, ‖Fundamentals of Database System, ‖ Addison-Wesley Publishing, 5thEdition, 2008.
3. Date.C.J, —An Introduction to Database, Addison-Wesley Pub Co, 8th Edition, 2006.
4. Peterrob, Carlos Coronel, —Database Systems – Design, Implementation, and Management, 9th Edition, Thomson Learning, 2009

COURSE OUTCOMES:
At the end of this course, students will be able to :
1. Understand the basic concepts and the applications of database systems
2. Master the basics of SQL and construct queries using SQL.
3. Understand the relational database design Principles.
4. Familiarize with the basic issues of transaction processing and concurrency control.
5. Familiarize with database storage structures and access techniques.

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(R22A6753) Big data Architecture
(OPEN ELECTIVE-II)

Prerequisite: DBMS, DWDM
Course Objectives:
1. The purpose of this course is to provide the students with the knowledge of Big data Analytics principles and techniques.
2. This course is also designed to give an exposure of the frontiers of Big data Analytics
3. To Understand the knowledge of Hadoop, HDFC and MapReduce Techniques
4. To gain the acknowledge on Hadoop Architecture.
5. To learn the machine learning approaches using R

UNIT - I
Introduction to Big Data: Big Data and its Importance – Four V's of Big Data – Drivers for Big Data –Introduction to Big Data Analytics – Big Data Analytics applications.

UNIT - II
Big Data Technologies: Hadoop's Parallel World – Data discovery – Open source technology for
Big Data Analytics – cloud and Big Data –Predictive Analytics – Mobile Business Intelligence and Big Data.

UNIT - III
Introduction Hadoop: Big Data – Apache Hadoop & Hadoop Eco System – Moving Data in and
out of Hadoop – Understanding inputs and outputs of MapReduce - Data Serialization

UNIT - IV
Hadoop Architecture: Hadoop: RDBMS Vs Hadoop, Hadoop Overview, Hadoop distributors, HDFS, HDFS Daemons, Anatomy of File Write and Read., Name Node, Secondary Name Node,
and Data Node, HDFS Architecture, Hadoop Configuration, Map Reduce Framework, Role of HBase in Big Data processing, HIVE, PIG.

UNIT - V
Data Analytics with R Machine Learning: Introduction, Supervised Learning, Unsupervised Learning, Collaborative Filtering, Social Media Analytics, Mobile Analytics, Big Data Analytics
with BigR.

TEXT BOOKS:
1. Big Data Analytics, Seema Acharya, Subhasini Chellappan, Wiley 2015.
2. Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's
3. Business, Michael Minelli, Michehe Chambers, 1st Edition, Ambiga Dhiraj, Wiely CIO Series, 2013
4. Hadoop: The Definitive Guide, Tom White, 3rd Edition,O"Reilly Media, 2012.

REFERENCE BOOKS

1. Big Data and Business Analytics,Jay Liebowitz, Auerbach Publications, CRC press (2013).
2. Professional Hadoop Solutions, Boris lublinsky, Kevin t. Smith, Alexey Yakubovich, Wiley, ISBN: 9788126551071, 2015.
3. Understanding Big data, Chris Eaton, Dirk deroos et al. McGraw Hill, 2012.

Course Outcomes

1. Ability to explain the foundations, definitions, and challenges of Big Data and various Analytical tool
2. Ability to program using HADOOP and Map reduce, NOSQL
3. Ability to understand the importance of Big Data in Social Media and Mining.

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(R22A0352) Design Thinking
(OPEN ELECTIVE-II)

COURSE OBJECTIVES:

1. To understand the engineering design process and identification of customer need.
2. To understand innovative problem solving concepts.
3. To understand the principles of Design for Manufacturing and FMEA.
4. To know about the design for assembly principles.
5. To know about the concepts of design for environment and design for recycling.

UNIT-I

Introduction: Innovations in Design, Engineering Design Process, Prescriptive and integrativemodels of design, Design Review and societal considerations.

Identification of Customer Need: Evaluating Customer requirements and survey on customer needs, Conversion of customer needs into technical Specifications, Information sources.

UNIT-II

Theory of Inventive Problem solving (TRIZ), Creativity and Problem solving, Functional Decomposition of the problem for innovative concept development, Introduction to Axiomatic Design, Concept evaluation and decision making.

UNIT-III

Design for Manufacturing: Technical estimating, design of experiments, design for manufacturability, statistical process control, Introduction to FMEA (failure modes and effects analysis), and Case study of design for manufacturing: Manufacturing System Design Based on Axiomatic Design: Case of Assembly Line

UNIT-IV

Design for Assembly: Assembly Principles, Process, Worksheet, Assumptions. Case study of design for Assembly: Manufacturing System Design Based on Axiomatic Design: Case of Assembly Line

UNIT-V

Design for Environment: Design for recycling; Design for disassembly, Design for energy Efficiency, Design for remanufacture, Design for disposability, Hazardous material minimization. Case study of design for Environment.

TEXT BOOKS:

1. Nigel Cross, Engineering Design Methods, John Wiley, 2009.
2. George E. Dieter, Engineering Design, McGraw-Hill, 2009.
3. GenrichAltshuller, The Innovation Algorithm, Technical Innovation Centre, 2011.

REFERENCE BOOKS

1. The Art of Innovation, by Tom Kelley.
2. Design Thinking, by Nigel Cross.
3. The Design of Business: by Roger Martin.

COURSE OUTCOMES:

1. The importance of design in innovation.
2. Design tools and processes can generate innovative new ideas.
3. Design and design thinking to innovative in areas such as engineering, software development and business operations.
4. Strengthen students' individual and collaborative capabilities to identify customer needs, create sound concept hypotheses, collect appropriate data, and develop a prototype that allows for meaningful feedback in a real-world environment.
5. To describe the various case studies for design for environment.

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(R22A0552) Principles of Cloud Computing
(OPEN ELECTIVE-II)

COURSE OBJECTIVES:

1. To understand the various distributed system models and evolving computing paradigms
2. To gain knowledge in virtualization of computer resources
3. To realize the reasons for migrating into cloud
4. To introduce the various levels of services that can be achieved by a cloud.
5. To describe the security aspects in cloud and the services offered by a cloud.

UNIT - I

Cloud Computing Fundamentals: Definition of Cloud computing, Roots of Cloud Computing, Layers and Types of Clouds, Desired Features of a Cloud, Cloud Infrastructure Management, Infrastructure as a Service Providers, Platform as a Service Providers.

Computing Paradigms: High-Performance Computing, Parallel Computing, Distributed Computing, Cluster Computing, Grid Computing.

UNIT- II

Migrating into a Cloud: Introduction, Broad Approaches to Migrating into the Cloud, the Seven-Step Model of Migration into a Cloud.

Virtualization: Virtual Machines and Virtualization of Clusters and data centers Implementation Levels of Virtualization -Virtualization Structures/Tools and Mechanisms Virtualization of CPU, Memory, and I/O Devices-Virtual Clusters and Data Centers

UNIT- III

Infrastructure as a Service (IAAS) & Platform (PAAS): Virtual machines provisioning and Migration services, Virtual Machines Provisioning and Manageability, Virtual Machine Migration Services, VM Provisioning and Migration in Action. On the Management of Virtual machines for Cloud Infrastructures- Aneka—Integration of Private and Public Clouds.

UNIT- IV

Software as a Service (SAAS) &Data Security in the Cloud: Software as a Service SAAS), Google App Engine – Centralizing Email Communications- Collaborating via Web- Based Communication Tools-An Introduction to the idea of Data Security.

UNIT- V

SLA Management in cloud computing: Traditional Approaches to SLO Management, Types of SLA, Life Cycle of SLA, SLA Management in Cloud.

TEXT BOOKS:

1. Cloud Computing Principles and Paradigms, by Rajkumar Buyya
2. Essentials of cloud Computing: K. Chandrasekhran, CRC press, 2014
3. Michael Miller, Cloud Computing: Web-Based Applications That Change the Way You Work

and Collaborate Online, Que Publishing, August 2008.

REFERENCE BOOKS:

1. Cloud Computing : A Practical Approach, Anthony T.Velte, Toby J.Velte, Robert Elsenpeter, Tata McGraw Hill,rp2011.

2. Enterprise Cloud Computing,Gautam Shroff, Cambridge University Press,2010.

3. Cloud Computing: Implementation, Management and Security, John W.Rittinghouse, James F.Ransome, CRC Press,rp2012.

4. Cloud Application Architectures: Building Applications and Infrastructure in the Cloud, George Reese,O'reilly, SPD,rp2011.

5. Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance, Tim Mather, Subra Kumaraswamy, Shahed Latif, O'Reilly, SPD, rp2011.

COURSEOUTCOMES:

1. Ability to analyze various service delivery models of cloud computing
2. Ability to interpret the ways in which the cloud can be programmed and deployed.
3. Ability to comprehend the virtualization and cloud computing concepts
4. Assess the comparative advantages and disadvantages of Virtualization technology
5. Analyze security issues in cloud computing.

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(R22A6951) IOT & its Application
(OPEN ELECTIVE-II)

COURSE OBJECTIVES:
1) To study IoT Networking Core
2) To study IoT related network fundamentals
3) To study IoT Architecture.
4) To study IoT Application Development procedure
5) To study various case studies and IoT application.

UNIT I:
FUNDAMENTALS OF IoT- Evolution of Internet of Things, Enabling Technologies, M2M Communication, IoT World Forum (IoTWF) standardized architecture, Simplified IoT Architecture, Core IoT Functional Stack, Fog, Edge and Cloud in IoT, Functional blocks of an IoT ecosystem, Sensors, Actuators, Smart Objects and Connecting Smart Objects.

UNIT II:
 IoT PROTOCOLS- IoT Access Technologies: Physical and MAC layers, topology and Security of IEEE 802.15.4, 802.11ah and Lora WAN, Network Layer: IP versions, Constrained Nodes and Constrained Networks,6LoWPAN, Application Transport Methods: SCADA, Application Layer Protocols: CoAP and MQTT.

UNIT III:
DESIGN AND DEVELOPMENT- Design Methodology, Embedded computing logic, Microcontroller, System on Chips, IoT system building blocks IoT Platform overview: Overview of IoT supported Hardware platforms such as: Raspberry pi, Arduino Board details

UNIT IV:
DATA ANALYTICS AND SUPPORTING SERVICES: Data Analytics: Introduction, Structured Versus Unstructured Data, Data in Motion versus Data at Rest, IoT Data Analytics Challenges, Data Acquiring, Organizing in IoT/M2M, Supporting Services: Computing Using a Cloud Platform for IoT/M2M Applications/Services, Everything as a service and Cloud Service Models.

UNIT V:
CASE STUDIES/INDUSTRIAL APPLICATIONS: IoT applications in home, infrastructures, buildings, security, Industries, Home appliances, other IoT electronic equipment's, Industry 4.0 concepts.

TEXT BOOKS:

1. 6LoWPAN:The Wireless Embedded Internet, ZachShelby, Carsten Bormann, Wiley
2. Internet of Things: Converging Technologies for Smart Environments and Integrated Eco systems, Dr.Ovidiu Vermesan, Dr.Peter Friess, River Publishers
3. Interconnecting Smart Objects with IP: The Next Internet, Jean-Philippe Vasseur, Adam Dunkels, Morgan Kuffmann.

REFERENCES:

1. The Internet of Things: From RFID to the Next-Generation Pervasive Networked Lu Yan, Yan Zhang, Laurence T.Yang, Huansheng Ning
2. Internet of Things (A Hands-on-Approach), Vijay Madisetti, Arshdeep Bahga
3. Designing the Internet of Things, Adrian McEwen (Author),Hakim Cassimally
4. Asoke K Talukder and Roopa R Yavagal, "MobileComputing,"Tata Mc Graw Hill, 2010.
5. Vijay Madisetti and Arshdeep Bahga, "Internet of Things (A Hands-onApproach)", 1st Edition,VPT, 2014
6. Computer Networks; By: Tanenbaum, AndrewS; Pearson Education Pte.Ltd., Delhi, 4thEdition
7. Data and Computer Communications; By: Stallings, William; Pearson Education Pte.Ltd.,
Delhi, 6thEdition

COURSE OUTCOMES:

At the end of the course, the student will be able to
1) Understand IoT Networking Core
2) Understand IoT related network fundamentals
3) Understand IoT Architecture.
4) Understand IoT Application Development procedure
5) Understand various case studies and IoT applications.

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(R22A2152) Nano Technology
(OPEN ELECTIVE-II)

Course objectives

1. To provide a comprehensive overview of synthesis and characterization of nano particles, Nano
composites and hierarchical materials with Nano scale features.
2. To provide the engineering students with necessary back ground for understanding various
nano material's characterization techniques
3. To develop an understanding of the basis of the choice of material for device applications
4. To give an insight into complete systems where nano technology can be used to improve our
everyday life.

UNIT I:

Introduction to Nanomaterials Nanotechnology, Frontier of future-an overview, Length Scales, Variation of physical properties from bulk to thin films to nano materials, Confinement of electron in 0D, 1D, 2D and 3D systems, Synthesis of Nano materials: Bottom – Up approach: Chemical Routes for Synthesis of nano materials - Sol-gel, Precipitation, Solution Combustion synthesis, Hydro thermal, Top – Down approach – Ball milling technique, Sputtering, Laser Ablation.

UNIT II:

Characterization of Nanomaterials Basic principles and instrumentations of Electron Microscopy –Transmission Electron Microscope, ScanningElectron Microscope, Scanning Probes- Scanning Tunneling microscope, Atomic Force Microscope –different imaging modes, comparison of SEM and TEM, AFM and STM, AFM and SEM.

UNIT III:

Carbon Based Materials Introduction, Synthesis, Properties (electrical, Electronic and Mechanical), and Applications of Graphene, SWCNT, MWCNT, Fullerenes and other Carbon Materials: Carbon nano composites, nano fibers, nano discs, nano diamonds.

UNIT IV:

Nano technology in Energy storage and conversion Solar cells: First generation, Second generation and third generation solar cells: Construction and working of Dye sensitized and Quantum dot sensitized solar cells. Batteries: Nano technology in Lithium ion battery - working, Requirements of anodic and cathodic materials. Fuel Cells: Introduction, construction, working of fuel cells and nanotechnology in hydrogen storage and proton exchange membranes.

UNIT V:

Applications of Nano technology Nano tech Applications and Recent Breakthroughs: Introduction, Significant Impact of Nano technology and Nanomaterial, Electronic

Applications (Nano electronics), Computing Applications (Nano computers), ChemicalApplications (Nano chemistry), Optical Applications (Nano photonics).

TextBooks
1. Nano Materials – A.K.Bandyopadhyay/New Age Publishers
2. Nanocrystals: Synthesis, Properties and Applications – C.N.R. Rao, P. John Thomas and G. U.
   Kulkarni, Springer Series in Materials Science
3. NanoEssentials-T.Pradeep/TMH.

References
1. Introduction to Nanotechnology, C.P.Poole and F.J.Owens,Wiley,2003
2. Understanding Nanotechnology, Scientific American 2002
3. Nanotechnology, M. Ratner and D.Ratner, Prentice Hall 2003
Outcomes:
1. Demonstrate the synthesis of nano particles by various techniques.
2. Explain working of basic instruments used in characterization of nano particles.
3. Discuss the application of nanotechnology to mechanical and civil domains
4. Classify the nano materials based on the dimensions.
5. Assess the suitability of nano materials for various device applications.

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(R22A0252) Electrical & Hybrid Vehicles
(OPEN ELECTIVE-II)

COURSE OBJECTIVES:

1. To understand the basic working and characteristic performance of EHV & PHEVs.
2. To study and understand the basic functioning of both Electric and Hybrid vehicles and the drive
train topologies.
3. To study in detail electric propulsion systems, types of motors in Electric vehicles.
4. To understand the different concepts of charging related to both EHV & PHEV operation& energy
management.
5. To study and understand different possible energy storage systems for both EHV & PHEV.

UNIT 1:

INTRODUCTION TO EV: History of hybrid and electric vehicles, social and environmental importance of hybrid and electric vehicles, Classification of EV.
ARCHITECTURE OF HEV: Series HEV, Parallel HEV and Series-Parallel HEV, Power flow control
in hybrid drive train topologies: Series hybrid drive train, Parallel hybrid drive train and Series- Parallel
hybrid drive train.

UNIT 2:

FUNDAMENTALS OF ELECTRIC VEHICLES: General description of vehicle movement, Vehicle resistance: Rolling Resistance, Aerodynamic drag, Grading resistance, Dynamic Equation, Vehicle
Transmission Characteristics: Manual gear transmission and Hydro dynamic transmission, Vehicle
performance: Maximum Cruising Speed, Gradeability, Acceleration performance

UNIT 3:

PLUG-IN HYBRID ELECTRIC VEHICLES: Introduction, Functions and Benefits of PHEV, Operating Principles of Plug-in Hybrid Vehicle: Charge-Depleting Mode, Charge-Sustaining Mode,
AER Mode, Engine-Maintenance Mode, And Control Strategy of PHEV
FUNDAMENTALS OF CHARGERS: Charger Classification and Standards, Charger Requirements,
Topology Selection for Level 1 and 2 AC Chargers: Front-End AC–DC Converter Topologies.

UNIT 4:

ELECTRIC PROPULSION SYSTEMS: Introduction to electric components used in HEV's, DC Motor drives: Combined armature and Field Control method, Chopper control DC drives, Multi quadrant control of Chopper fed DC drive.
PERMANENT MAGNET BLDC MOTOR DRIVES: Closed loop Torque control of BLDC motor drive and Sensor less Control of BLDC Motor drive using Back EMF method.

UNIT 5:
ENERGY STORAGE: Introduction to Energy Storage Requirements in Electric Vehicles, Battery
Parameters, Battery based energy storage: Lead acid battery, Lithium Ion Battery and Super Capacitor
based energy storage, Fuel Cell based energy storage, Hybridization of different energy storage devices.

TEXT BOOKS:
1. M. Ehsani, Y. Gao, S. E. Gay and A. Emadi, "Modern Electric, Hybrid Electric, and Fuel Cell
Vehicles: Fundamentals, Theory, and Design", CRC Press, 2004.
2. Ali Emadi, "Advanced Electrical Hybrid Vehicles" CRC Press, 2015, Taylor & FrancisGroup.
3. C. Mi, M. A. Masrur and D. W. Gao, "Hybrid Electric Vehicles: Principles and Applications with
Practical Perspectives", John Wiley & Sons, 2011.

REFERENCE BOOKS:
1. T. Denton, "Electric and Hybrid Vehicles", Routledge,2016
2. S. Onori, L. Serrao and G. Rizzoni, "Hybrid Electric Vehicles: Energy Management Strategies",
Springer, 2015.

COURSE OUTCOMES:
At the end of this course, students would be able to:
1. Get a good understanding of the basic functioning of both Electric and Hybrid vehicles and their
performance.
2. Develop a good concept of the electrical vehicle modeling and its power plant characteristics
3. To understand the fundamentals of chargers related to both electric & hybrid vehicle operation &
energy management
4. Have a detailed understanding of electric propulsion systems, types of motors and the other
important subsystems in Electric vehicles.
5. Have clear concepts of the different possible energy storage systems for both electric and hybrid
vehicles.

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(R22A6251) Cyber Governance
(OPEN ELECTIVE-II)

Course Objectives:
1. To learn Principles of Cyber Security.
2. To learn various types of attacks and the precautions.
3. To gain the knowledge of security and governance measurements
4. To learn the analyticals and various security compliance in Cyber Security through governance.
5. To gain the knowledge of various countries Cyber Security Principles and Governance.

UNIT - I:
Principles of cyber-security governance, Assessment of cyber security maturity, Theories of governance – introduction, Governance – definitions and typologies, Tools, methods and processes,

UNIT - II:
Vulnerability management, Threat management, Endpoint management , Intrusion detection and
prevention (IDPS), Security incident management, Security operations center (SOC) and related
concepts.

UNIT - III:
Measurement of governance: Metrics – concepts, Application security metrics, Network security
metrics, Security incident metrics, Vulnerability metrics, Service level objectives / agreement (SLO / SLA), NIST metrics.

UNIT - IV:
Basics of security analytics, Threat intelligence and governance, Data driven security governance, Impact of cognitive security on security governance, Industry specific security compliance.

UNIT - V:
Cyber security governance India and Other countries, NIST mandates for compliance, Security reporting basics, CISO – role and organization structure.

TEXT BOOKS:
1. Hayden, Lance. IT Security Metrics: A Practical Framework for Measuring Security & Protecting Data. McGraw-Hill Education Group, 2010.
2. Jacobs, Jay, and Bob Rudis. Data-driven security: analysis, visualization and dashboards.John
Wiley & Sons, 2014
3. Collins, Michael. Network Security Through Data Analysis: From Data to Action. "O'Reilly Media, Inc.", 2017.

4. Jaquith, Andrew. Security metrics: replacing fear, uncertainty, and doubt. PearsonEducation,
2007.
REFERENCE BOOKS:
1. Cybersecurity, Critical Infrastructure. "Framework for Improving Critical Infrastructure Cybersecurity." Framework 1 (2014): 11.

Course Outcomes:
1. Students will be able to understand the basis of cyber-security.
2. Students will be able to know various governance principles
3. Students will learn about various types of attacks and threats in Security
4. Students will gain the knowledge of other countries standards, methods in governance.

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(R22A0321) Artificial Intelligence in Mechanical Engineering
(PROFESSIONAL ELECTIVE-II)

COURSE OBJECTIVES:
1. To train the students to understand different types of AI & Applications of AI.
2. To understand various AI search algorithms.
3. To Understand different types of Machine learning & to know about data Preparation
4. To introduce the basic concepts and techniques of machine learning and the need for Machine learning techniques for real world problem
5. To provide understanding of various Machine learning algorithms and the way to evaluate the performance of ML algorithms

UNIT - I:
Introduction to Artificial Intelligence
Definition, History, Present state of Artificial Intelligence (AI), Phases of AI, Approaches to AI - Hard or Strong AI, Soft or Weak AI, Applied AI, Cognitive AI, and Applications domains focused on mechanical engineering.

UNIT - II:
Problem Solving Methods
1.Uninformed search includes Depth First Search (DFS), Breadth First Search (BFS), Uniform Cost Search (UCS), Depth Limited Search, Iterative Deepening Depth First Search (IDDFS) and bidirectional search. 2. Informed Search (heuristic search) includes greedy best first search, A* search.

UNIT - III:
Machine-Learning: Introduction. Machine Learning Systems, Forms of Learning: Supervised and Unsupervised Learning, reinforcement – theory of learning – feasibility of learning – Data Preparation– training versus testing and split.

UNIT - IV:
Supervised Learning - Definition, basic concepts, applications, Linear Regression, Multiple Linear Regression, Logistic Regression, Naive Bayes Classifiers, Support Vector Machines (SVM), Simple Examples.

Unit- V:
Unsupervised learning- Definition, basic concepts, applications, Nearest neighbor models- K-means Clustering, hierarchical Clustering– k-d trees, Simple Examples
Reinforcement Learning (RL) - Framework, Component of RL Framework, Simple Examples.

TEXT BOOK:
1. Artificial Intelligence: A Modern Approach, Stuart Russell & Peter Norvig, Prentice-Hall, Third Edition (2009).
2. MACHINE LEARNING An Algorithmic Perspective 2nd Edition, Stephen Marsland,2015, by Taylor & Francis Group, LLC
3. Introduction to Machine Learning, The Wikipedia Guide.

REFERENCE BOOKS:

1. Artificial Intelligence, Ela Kumar, Wiley, 2021
2. Artificial Intelligence: Concepts and Applications, Lavika Goel, Kindle Edition, Wiley, 2021.
3. Nature-Inspired Optimization in Advanced Manufacturing Processes and Systems, Edited by Ganesh M. Kakandikar and Dinesh G. Thakur, CRC press, First edition, 2021.

COURSE OUTCOMES:

1. Understand different types of AI & Applications of AI
2. Understand the informed and uninformed problem types and apply search strategies to solve them.
3. Apply machine learning techniques in the design of computer systems
4. To differentiate between various categories of ML algorithms
5. Design and make modifications to existing machine learning algorithms to suit an

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(R22A0322) Industrial Robotics
(PROFESSIONAL ELECTIVE-II)

Pre-requisites: Basic principles of Kinematics and mechanics

Course Objectives: The goal of the course is to familiarize the students with the concepts and techniques in robotic engineering, manipulator kinematics, dynamics and control, chose, and incorporate robotic technology in engineering systems.

- Make the students acquainted with the theoretical aspects of Robotics
- Enable the students to acquire practical experience in the field of Robotics through design projects and case studies.
- Make the students to understand the importance of robots in various fields of engineering.
- Expose the students to various robots and their operational details.

Course Outcomes: At the end of the course, the student will be able to:

- understand the basic components of robots.
- Differentiate types of robots and robot grippers.
- Model forward and inverse kinematics of robot manipulators.
- Analyze forces in links and joints of a robot.
- Programme a robot to perform tasks in industrial applications.
- Design intelligent robots using sensors.

UNIT – I:

Introduction: Automation and Robotics – An over view of Robotics – present and future applications.

Components of the Industrial Robotics: common types of arms. Components, Architecture, number of degrees of freedom — Requirements and challenges of end effectors, Design of end effectors, Precision of Movement: Resolution, Accuracy and Repeatability, Speed of Response and Load Carrying Capacity.

UNIT – II:

Motion Analysis: Basic Rotation Matrices, Equivalent Axis and Angle, Euler Angles, Composite Rotation Matrices. Homogeneous transformations as applicable to rotation and translation – problems

Manipulator Kinematics-H notation-H method of Assignment of frames-H Transformation Matrix, joint coordinates and world coordinates, Forward and inverse kinematics – problems on Industrial Robotic Manipulators.

UNIT – III:

Differential transformation of manipulators, Jacobians – problems.

Dynamics: Lagrange – Euler and Newton — Euler formations — Problems.

Trajectory planning and avoidance of obstacles, path planning, Slew motion, joint interpolated

motion straight line motion.

UNIT – IV:

Robot actuators and Feedback components: Actuators: Pneumatic, Hydraulic actuators, electric & stepper motors, comparison of Actuators, Feedback components: position sensors – potentiometers, resolvers, encoders – Velocity sensors, Tactile and Range sensors, Force and Torque sensors – End Effectors and Tools

UNIT V:

Robot Application in Manufacturing: Material Transfer - Material handling, loading and unloading-Processing - spot and continuous arc welding & spray painting - Assembly and Inspection. Robotic Programming Methods – Languages: Lead Through Programming, Textual Robotic Languages such as APT, MCL.

TEXT BOOKS:
1. Industrial Robotics / Groover M P /Mc Graw Hill
2. Introduction to Industrial Robotics / Ramachandran Nagarajan / Pearson

REFERENCE BOOKS:
1. Robot Dynamics and Controls / Spony and Vidyasagar / John Wiley
2. Robot Analysis and control / Asada, Slotine / Wiley Inter-Science.
3. Robotics – Fu et al / TMH Publications.

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(R22A0323) Mechanical Vibrations
(PROFESSIONAL ELECTIVE-II)

COURSE OBJECTIVES:

1. Able to understand and appreciate the importance of vibrations in mechanical design of machine parts
2. To understand the fundamentals of Vibration Theory
3. Operate in different vibratory conditions.
4. To know about different degrees of freedom.
5. To be able to mathematically model real-world mechanical vibration problems.

UNIT- I

Single degree of freedom systems: Un-damped and damped free vibrations; forced
vibrations coulomb damping; Response to excitation; rotating unbalance and support excitation;
vibration isolation and transmissibility- Response to Non-Periodic Excitations: unit impulse, unit step
and unit Ramp functions; response to arbitrary excitations, The Convolution Integral; shock spectrum;
System response by the Laplace Transformation method.

UNIT-II

Two-degree freedom systems: Principal modes- Un-damped and damped free and forced vibrations;
Un-damped vibration absorbers.

UNIT-III

Multi degree freedom systems: Matrix formulation, stiffness and flexibility influence coefficients;
Eigen value problem; normal modes and their properties; Free and forced vibration by Modal
analysis; Method of matrix inversion; Torsional vibrations of multi- rotor systems and geared systems;
Discrete- Time systems.

UNIT-IV

Vibration measuring instruments: Seismic instruments, vibrometers, velocity meters & accelerometers, frequency measuring devices-Fullarton and Fruhm Tachometers.

UNIT-V

Numerical methods: Raleigh's stodola's, Matrix iteration, Rayleigh- Ritz Method and Holzer's methods.

TEXT BOOKS:
1. Mechanical Vibrations/Groover/Nem Chand and Bros
2. Elements of Vibration Analysis by Meirovitch, TMH, 2001
3. Mechanical Vibrations/Schaum Series/ McGraw Hill.

REFERENCE BOOKS:
1.Mechanical Vibrations / SS Rao/ Pearson/ 2009, Ed 4,
2. Vibration problems in Engineering / S.P. Timoshenko.
3. Theory and Practice of Mechanical Vibrations/JS Rao & K. Gupta/New Age Intl. Publishers/Revised 2nd Edition.

COURSE OUTCOMES:
Mechanical Vibrations / SS Rao/ Pearson/ 2009, Ed 4, 2. Vibration problems in Engineering / S.P. Timoshenko. 3. Theory and Practice of Mechanical Vibrations/JS Rao & K. Gupta/New Age Intl. Publishers/Revised 2nd Edition.

COURSE OUTCOMES:
Upon completion of this course, the students will be able to:
1.Ability to analyze the mechanical model of a linear vibratory system.
2. To be able to model reciprocating and oscillatory motions of mechanical systems.
3. To be able to model undamped and damped mechanical systems and structures.
4. To be able to model single- and multi-degree of freedom systems.
5. An ability to identify, formulate and solve engineering problems.

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(R22A0324) Unconventional Machining Processes
(PROFESSIONAL ELECTIVE-II)

Course Objectives:

1. To understand the need and importance of nontraditional machining methods.
2. To know the basic principle, equipment, process variables and mechanics of metal removal in abrasive jet machining and water jet machining.
3. To study the fundamentals of tool design, surface finishing and metal removal rate of electro chemical grinding, electro chemical machining and electro chemical honing.
4. To understand principles of operation, types of electrodes and process parameters and machine tool selection in EDM and Electric discharge grinding and wire cut process.
5. To know the basics of Electron Beam Machining and comparison of thermal and non-thermal processes.

UNIT I: INTRODUCTION AND MECHANICAL ENERGY BASED PROCESSES

Unconventional machining Process – Need – classification – merits, demerits and applications. Abrasive Jet Machining – Water Jet Machining – Abrasive Water Jet Machining - Ultrasonic Machining. (AJM, WJM, AWJM and USM). Working Principles – equipment used – Process parameters – MRR- Applications.

UNIT II: THERMAL AND ELECTRICAL ENERGY BASED PROCESSES

Electric Discharge Machining (EDM) – Wire cut EDM – Working Principle-equipments-Process Parameters-Surface Finish and MRR- electrode / Tool – Power and control Circuits-Tool Wear – Dielectric – Flushing —– Applications. Laser Beam machining and drilling, (LBM), plasma, Arc machining (PAM) Principles – Equipment –Types - Beam control techniques – Applications.

UNIT III: CHEMICAL AND ELECTRO-CHEMICAL ENERGY BASED PROCESSES

Chemical machining and Electro-Chemical machining (CHM and ECM)- Etchants – Maskant - techniques of applying maskants - Process Parameters – Surface finish and MRR- Applications. Principles of ECM- equipment's-Surface Roughness and MRR Electrical circuit- Process Parameters- ECG and ECH - Applications.

UNIT IV: ADVANCED NANO FINISHING PROCESSES

Abrasive flow machining, chemo-mechanical polishing, magnetic abrasive finishing, magneto rheological finishing, magneto rheological abrasive flow finishing their working principles, equipments, effect of process parameters, applications, advantages and limitations.

UNIT V: RECENT TRENDS IN NON-TRADITIONAL MACHINING PROCESSES

Recent developments in non-traditional machining processes, their working principles, equipments, effect of process parameters, applications, advantages and limitations. Comparison of Traditional and non-traditional machining processes.

TEXT BOOK:

1. Advanced machining processes - VK Jain, Allied publishers.

2. Modern Machining Process - Pandey P.C. and Shah H.S., TMH.

REFERENCES:

1. New Technology - Bhattacharya A, The Institution of Engineers, India 1984.
2. Unconventional Machining Processes - C. Elanchezhian,B. Vijaya Ramnath and M Vijayan, Anuradha Publications, 2005.
3. Unconventional Manufacturing Processes – M.K. Singh, New Age International Publishers.

Course Out comes:

1. Understand the knowledge on need for unconventional machining process and can perform experiments on USM process and are able to apply these concepts in academic research.

2. Learn the working of AJM, WAJM and WJM, can perform experiments on those processes and are able to apply these concepts in academic research.

3. Understand the fundamental concepts of CM, ECM, EDM process and can perform experiments on those processes and are able to apply these concepts in academic research.

4. Selection of machining process for various work materials
   Apply suitable machining process for the typical component

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(R22A0387) Heat Transfer Lab

Pre-requisite: Thermodynamics

COURSE OBJECTIVES

1. Student to learn how to find efficiency of the fin experimentally by pin fin apparatus.
2. Student can learn how to find overall heat transfer co-efficient experimentally by composite wall apparatus.
3. Student to perform how to find heat transfer rate experimentally by logged pipe, concentric sphere, forced, free and condensation apparatus.
4. Student to learn how to find effectiveness of heat exchanger experimentally by heat exchanger apparatus.
5. Student to understand how to find critical heat flux, emissivity and Stefan Boltzmann constant experimentally by critical heat flux, emissivity and Stefan Boltzmann apparatus

LIST OF EXPERIMENTS:

1. Composite Slab Apparatus – Overall heat transfer co-efficient.
2. Heat transfer through lagged pipe.
3. Heat Transfer through a Concentric Sphere
4. Thermal Conductivity of given metal rod.
5. Heat transfer in pin-fin.
6. Experiment on Transient Heat conduction.
7. Heat transfer in forced convection apparatus.
8. Heat transfer in natural convection.
9. Parallel and counter flow heat exchanger.
10. Emissive apparatus.
11. Stefan Boltzmann apparatus.
12. Critical Heat flux apparatus.
13. Study of heat pipe and its demonstration.
14. Condensation apparatus.

Note: Total 10 experiments are to be conducted.

COURSE OUTCOMES:

1. Student able to evaluate efficiency of the fin experimentally by pin fin apparatus.
2. Student can learn how to find overall heat transfer co-efficient experimentally by composite wall apparatus.
3. Student able to learn how to find heat transfer rate experimentally by logged pipe, concentric sphere, forced, free and condensation apparatus.
4. Student able to evaluate effectiveness of heat exchanger experimentally by heat exchanger apparatus.
5. Student able to learn how to find critical heat flux, emissivity and Stefan Boltzmann constant experimentally by critical heat flux, emissivity and Stefan Boltzmann apparatus.

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(R22A0388) CAD/CAM lab

COURSE OBJECTIVES:

1. To design 3D part models

2. To enhance the students with computer aided modeling skills.

3. To impart the students with knowledge of assemblies.

4. To understand about CNC programming.

5. To develop CNC programming for the given simple turning and milling operations.

LIST OF EXPERIMENTS

1. 3D Modeling of Plummer Block Body

2. 3D Modeling of Angular Block

3. 3D Modeling of Fork of Knuckle Joint.

4. 3D Modeling of Screw Jack Body.

5. 3D Modeling of Stuffing Box.

6. 3D Modeling of Journal Bearing Housing.

7. 3D Modeling of Spur Gear.

8. Assembly of Petrol Engine Connecting Rod

9. Manual Part Programming For Step Turning Operation In CNC Turning Center

10. Manual Part Programming For Taper Turning Operation In In CNC Turning Center

11. Manual part program for contouring and pocketing for CNC Mill.

12. NC Code Generation for Facing Operation.

   Note: At least 10 experiments are to be conducted.

   Any Two Software Packages from the following:

   Use of Auto CAD, CATIA, Creo, Solidworks

Course Outcomes

1. Designing 3D part models
2. Enhancing computer aided modeling skills.
3. Gaining knowledge on assemblies.
4. Understanding the basics of CNC programming.
5. Developing CNC programming for the given simple turning and milling operations.

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(R22A0393) Application Development-II

COURSE OBJECTIVES:

1. To gain the knowledge on web structure and types of web hosting.
2. To understand the basics of HTML.
3. To learn the Programming with the use of JavaScript.
4. To understand the Basics & Properties of CSS.
5. To create HTML forms.

MODULE-I / UNIT–I

Website Structure and Hosting: Homepage web structure, Navigation or menu web structure, Categories and subcategories web structure best practices, Add tags and categories, Different types of Web Hosting

MODULE-II / UNIT–II

Basics of HTML: Introduction to HTML, HTML Tags, HTML Doctype, Head Tag in HTML, <body> Tag in HTML, Inline and Block Elements in HTML, Heading and Paragraph Tags in HTML, Classes, IDs and Names in HTML, HTML Links, HTML Lists, HTML Style tag

MODULE-III / UNIT–III

Intro to Programming with the use of JavaScript: Variables and data types, Operators, Control flow (if statements, loops, etc.), Functions, Objects, The Document Object Model (DOM) , Events, AJAX, JavaScript Program & Testing, Creating stylish Websites

MODULE-IV / UNIT–IV

CSS Basics & Properties: CSS borders, CSS outline, Background, CSS combinators, CSS fonts, Display, Padding, CSS colors, CSS links

MODULE-V / UNIT–V

Creating HTML Forms: HTML Form is a document that stores information of a user on a web server using interactive controls. An HTML form contains different kinds of information such as username, password, contact number, email id, etc. The elements used in an HTML form are the check box, input box, radio buttons, submit buttons, etc.

Creating Web Applications, Project Work

COURSE OUTCOMES:

1. Gaining the knowledge on web structure and types of web hosting.
2. Understanding the basics of HTML.
3. Learning the Programming with the use of JavaScript.
4. Understanding the Basics & Properties of CSS.
5. Creating HTML forms.

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(R22A0085) Professional Development Skills - II

OBJECTIVES:

1. To strengthen the students with the professional skill set.
2. To make the students recognize the role of technical English in their academic and professional fields.
3. To improve language proficiency and to develop the required professional ethics.
4. To equip students, organize, comprehend, write, and present, short and long forms of any technical work within the broad framework of the Scientific Method.
5. To facilitate communication about projects and ideas throughout the industry and also to the non-technical people.

SYLLABUS

UNIT- I:

- Inter-personal & Intra-Personal Communication
- Sub Skill of Reading: Skimming
- Writing: Resume Writing: Functional, Chronological, Targeted
- Innovative Leadership and Design Thinking

UNIT-2:

- Group Discussion: Factual, Opinion-Based, Abstract
- Sub Skill of Reading: Scanning
- Writing: Cover Letter
- Trust and Collaboration

UNIT-3:

- Debate
- Sub Skill of Reading: Intensive Reading
- Writing: Report Writing: Research Report, Analytical and Projects
- Managing Personal Finance

UNIT-4:

- Interview skills
- Sub Skill of Reading: Extensive reading
- Writing: PrécisWriting
- Leadership and Managerial Skills

UNIT-5:

- Mock Interviews
- Reading: Cloze-Test
- Writing: Mini Projects
- Entrepreneurial Skills

OUTCOMES:
Students will be able to

1. Understand information which assists in completion of the assigned job tasks more successfully
2. Market them with the rich professional skills that they acquire
3. Adhere to ethical norms of scientific communication
4. Strengthen their individual and collaborative work strategies
5. Successfully market them and sell themselves to the employer of their choice.

REFERENCE BOOKS:

1. Curriculum and Guide line for Life Skills, By UGC, August 2023
2. David F. Beer and David McMurrey, Guide to writing as an Engineer, John Willey. New York, 2004
3. Diane Hacker, Pocket Style Manual, Bedford Publication, New York, 2003. (ISBN 0312406843)
4. Shiv Khera, You Can Win, Macmillan Books, New York, 2003.
5. Raman Sharma, Technical Communications, Oxford Publication, London, 2004.
6. Meenakshi Raman, Prakash Singh, Business communication, Oxford Publication, New Delhi 2012.
7. Dale Jung k, Applied Writing for Technicians, McGraw Hill, New York, 2004. (ISBN: 07828357-4)
8. Sharma, R. and Mohan, K. Business Correspondence and Report Writing, TMH New Delhi 2002.
9. Xebec, Presentation Book, TMH New Delhi, 2000. (ISBN 0402213)

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MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

IV Year B. TECH - I- SEM   **L/T/P/C**
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(R22A0325) Mechanical Measurements & Instrumentation

Course Objectives:
1. To study the concept of the structure of a measurement system.
2. To learn the various techniques of measurement of temperature, pressure, level, etc.
3. To impart knowledge of measurement principles of flow, speed, acceleration, and vibration.
4. To acquire knowledge on stress and strain measurements and humidity measurements.
5. To understand the measurement of force, torque, and power elements in control systems.

UNIT – I

Introduction - Classification of Measuring Instruments - Basic principles of measurement – Generalized configuration and functional descriptions of measuring instruments; examples - Performance characteristics of measuring instruments – sources of error, classification and elimination of error.
Measurement of Displacement: Theory and construction of various transducers to measure displacement – Piezo electric, Inductive, capacitance, resistance, ionization and photoelectric transducers - Calibration.

UNIT – II

Measurement of Temperature: Classification – Ranges – Various Principles of measurement – Expansion, Electrical Resistance, Thermistor, Thermocouple, Pyrometers - Temperature Indicators.
Measurement of Pressure: Classification – Different principles used - Manometers, Piston gauge, Bourdon pressure gauges Bellows, Diaphragm gauges. Low pressure measurement - Thermal conductivity gauge, Ionization pressure gauge, McLeod pressure gauge.
Measurement of Level: Direct method – Indirect methods – capacitive, ultrasonic, magnetic, Bubbler level indicator, cryogenic fuel level indicators.

UNIT – III

Flow Measurement: Rotameter, Magnetic, Ultrasonic, Turbine flow meter, Hotwire anemometer, Laser Doppler Anemometer (LDA).
Measurement of Speed: Mechanical Tachometers – Electrical tachometers – Stroboscope, Non-contact type of tachometer.
Measurement of Acceleration and Vibration: Different simple instruments – Vibrometer and accelerometer using the seismic principle.

UNIT – IV

Stress Strain Measurements: Various types of stress and strain measurements – electrical strain gauge – gauge factor – method of usage of resistance strain gauge for bending compressive and tensile strains – usage for measuring torque, Strain gauge Rosettes.
Measurement of Humidity: Moisture content of gases, sling psychrometer, Dew point meter, Mechanical and Electrical Hygrometer.

UNIT – V
Measurement of Force, Torque and Power: Elastic force meter, loadcell, Torsion meter, Hydraulic Dynamometer.
Elements of Control Systems: Introduction - Importance – Open and closed control systems, Servomechanisms – Examples with block diagrams– Temperature, speed & position control systems.

Text Books
1. Mechanical Measurements /Beck With, Marangoni, Linehar /PHI Publisher
2. Measurement Systems: Applications & design /D.S. Kumar/McGraw Hill Publishers
3. Mechanical Measurements /Shawney/McGraw Hill Publishers

Reference Books
1. Experimental Methods for Engineers /Holman/McGraw-Hill Education
2. Mechanical and Industrial Measurements /R.K. Jain/ Khanna Publishers.
3. Instrumentation and Mechanical Measurements /A.K. Tayal / Galgotia Publications.

Course Outcomes
1. Able to Identify and select proper measuring instrument for specific application.
2. Analyse the calibration methodology and error analysis related to measuring instruments.
3. Illustrate the working principle of measuring instruments.
4. Demonstrate an ability to select and calibrate measuring systems based on used propriate sensors
5. Identify, analysis, and solve mechanical engineering problems useful to the society.

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IV Year B. TECH - I- SEM   **L/T/P/C**

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(R22A0326) Finite Element Methods

COURSE OBJECTIVES

The general objectives of the course are to enable the students to

1.Introduce basic concepts of finite element methods including domain discretization, polynomial interpolation and application of boundary conditions

2. Understand the theoretical basics of governing equations and convergence criteria of finite element method.

3. Develop of mathematical model for physical problems and concept of discretization of continuum.

4. To learn the application of FEM equations for Iso-Parametric and heat transfer problems and Discuss the accurate Finite Element Solutions for the various field

problems

5. Use the commercial Finite Element packages to build Finite Element models and solve a selected range of engineering problems.

UNIT-I

FUNDAMENTAL CONCEPTS & ONE-DIMENSIONAL PROBLEM: Introduction to Finite Element Method for solving field problems, Stress and Equilibrium, Strain – Displacement relations, Stress- Strain relations. One -Dimensional Problem: Finite element modeling, local coordinates and shape functions. Potential Energy approach, Assembly of Global stiffness matrix and load vector. Finite element equations, Treatment of boundary conditions.

UNIT-II

Trusses: Element matrices, assembling of global stiffness matrix, solution for displacements, reaction, stresses. BEAMS: Element matrices, assembling of global stiffness matrix, solution for displacements, reaction, stresses.

UNIT-III

Two Dimensional Problems: Basic concepts of plane stress and plane strain, stiffness matrix of CST element, finite element solution of plane stress problems. Axi-Symmetric Model: Finite element modeling of axi-symmetric solids subjected to axi- symmetric loading with triangular elements.

UNIT-IV

Iso-Parametric Formulation: Concepts, sub parametric, super parametric elements, two dimensional four nodes iso-parametric elements, and numerical integration. Heat Transfer Problems: One dimensional steady state analysis composite wall. One dimensional fin analysis and two dimensional of thin plate.

UNIT-V

DYNAMIC ANALYSIS: Formulation of finite element model, element matrices, evaluation of Eigen values and Eigen vectors for a stepped bar and a beam.

TEXT BOOKS:

1. Tirupathi.R. Chandrupatla and Ashok D. Belegundu, Introduction to Finite elements in Engineering. PHI.

2. S Senthil, Introduction of Finite Element Analysis. Laxmi Publications.

3. SMD Jalaluddin, Introduction of Finite Element Analysis.Anuradha Publications.

4. The Finite Element Method for Engineers – Kenneth H. Huebner, Donald John Wiley & sons (ASIA) Pte Ltd.

REFERENCES:

1. K. J. Bathe, Finite element procedures. PHI.
 2. SS Rao, The finite element method in engineering. Butterworth Heinemann.
3. J.N. Reddy, An introduction to the Finite element method. TMH.
4. Chennakesava, R Alavala, Finite element methods: Basic concepts and applications. PHI.
5. K. J. Bathe, Finite element procedures. PHI. 6. SS Rao, The finite element method in engineering. Butterworth Heinemann.

COURSE OUTCOMES: Upon completion of this course, the students will be able to:

1. Describe the concept of FEM and difference between the FEM with other methods and problems based on 1-D bar elements and shape functions.
2. Derive elemental properties and shape functions for truss and beam elements and related problems.
3. Understand the concept deriving the elemental matrix and solving the basic problems of CST and axi-symmetric solids
4. Formulate FE characteristic equations for iso-parametric problems and Explore the concept of steady state heat transfer in fin and composite slab
5. Understand the concept of consistent and lumped mass models and solve the dynamic analysis of all types of elements.

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IV Year B. TECH - I- SEM   **L/T/P/C**
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(R22A0327) Refrigeration & Air Conditioning

Course Objectives:

1.To understand the principles of refrigeration & to know aircraft air refrigeration systems.
2.To understand Vapour compression refrigeration system.
3.To gain knowledge about refrigerants
4.To understand different vapor absorption systems
5.To apply the principles of Thermodynamics to analyze different types air conditioning systems

UNIT – I

Introduction to Refrigeration: – Necessity and applications – Unit of refrigeration and C.O.P.
Air Refrigeration: Bell Coleman cycle and Brayton Cycle, Open and Dense air systems – Actual air refrigeration system – Refrigeration needs of Air crafts- Air Systems-Application of air refrigeration system

UNIT – II

Vapour compression refrigeration – working principle and essential components of the plant – Simple Vapour compression refrigeration cycle – COP – Representation of cycle on T-S and p-h charts – effect of sub cooling and super heating – cycle analysis – Actual cycle Influence of various parameters on system performance – Use of p-h charts – Problems.

UNIT – III

System Components: Compressors – General classification – comparison – Advantages and Disadvantages. Condensers – classification – Working Principles. Evaporators – classification – Working   Principles. Expansion devices – Types – Working Principles.
Refrigerants – Desirable properties – Nomenclature - Global Warming.

UNIT – IV

Vapor Absorption System – description and working of NH3 –water system Li – Br system. Principle of operation Three Fluid absorption system, salient features.
Steam Jet Refrigeration System – Working Principle and Basic Components

UNIT – V

Psychometric Properties & Processes – Sensible and latent heat loads – Characterization – Need for Ventilation, Consideration of Infiltration – Load concepts of RSHF, ASHF, ESHF and ADP.
Introduction to Air Conditioning: Summer Air Conditioning, Winter Air Conditioning & Year Round Air Conditioning

Text Books

A Textbook of Refrigeration & Air conditioning by R.S Khurmi & JK Gupta.
Refrigeration and Air conditioning / CP Arora / Mc Graw Hill
Refrigeration and Air-Conditioning / RC Aora / PHI

Reference Books

1.Principles of Refrigeration – Dossat / Pearson
2.Basic Refrigeration and Air-Conditioning / Ananthanarayanan / Mc Graw Hill

Course Outcomes

1.Illustrate the basic concepts of refrigeration system.
2.Analyze the vapour compression cycle and interpret the usage of refrigerants.
3.Explain the components of vapour absorption systems.
4.Differentiate between different types of refrigeration systems with respect to application   as well as conventional and unconventional refrigeration systems.
 5.Apply the principles of Psychometrics to design the air conditioning loads

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IV Year B. TECH - I- SEM   **L/T/P/C**
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(R22A0328) Automobile Engineering
(Professional Elective-III)

COURSE OBJECTIVES:

1.To understand basics of automobile engineering, conversant with vehicle structure & Engines.

2. To make the student conversant with auxiliary systems.

3. To make the student conversant with transmission systems.

4. To make the student conversant with steering, brakes & suspension systems

5. To make the student conversant with alternative energy sources.

UNIT–I

VEHICLE STRUCTURE AND ENGINES: Types of automobiles vehicle construction and different layouts, chassis, frame and body, Vehicle aerodynamics (various resistances and moments involved), IC engines components-functions and materials, variable valve timing (VVT).

UNIT–II

ENGINE AUXILIARY SYSTEMS: Electronically controlled gasoline injection system for SI engines, Electronically controlled diesel injection system (Unit injector system, Rotary distributor type and common rail direct injection system), Electronic ignition system (Transistorized coil ignition system, capacitive discharge ignition system), Turbo chargers (WGT, VGT), Engine emission control by three way catalytic converter system, Emission norms (Euro and BS).

UNIT–III

TRANSMISSION SYSTEMS: Clutch-types and construction, gear boxes- manual and automatic, gear shift mechanisms, over drive, transfer box, fluid flywheel, torque converter, propeller shaft, slip joints, universal joints, Differential and rear axle, Hotchkiss Drive and Torque Tube Drive.

UNIT–IV

STEERING, BRAKES AND SUSPENSION SYSTEMS: Steering geometry and types of steering gear box-Power Steering, Types of Front Axle, Types of Suspension Systems, Pneumatic and Hydraulic Braking Systems, Antilock Braking System (ABS), electronic brake force distribution (EBD) and Traction Control.

UNIT–V

ALTERNATIVE ENERGY SOURCES: Use of Natural Gas, Liquefied Petroleum Gas, Bio-diesel, Bio-ethanol, Gasohol and Hydrogen in Automobiles- Engine modifications required Performance, Combustion and Emission Characteristics of SI and CI engines with these alternate fuels - Electric and Hybrid Vehicles, Fuel Cells.

TEXTBOOKS:

1. Jain K.K. and Asthana .R.B, Automobile Engineeri Tata McGraw Hill Publishers, New Delhi, 2002

2. Kirpal Singh, Automobile Engineering, Vol 1 & 2, Seventh Edition, Standard Publishers, New Delhi, 13th Edition 2014.

REFERENCEBOOKS:

1. Ganesan V. Internal Combustion Engines, Third Edition, Tata McGraw-Hill, 2012.

2. Heinz Heisler, Advanced Engine Technology, SAE International Publications USA, 1998.

3. Joseph Heitner, Automotive Mechanics, Second Edition, East-West Press, 1999.

4. Martin W, Stockel and Martin T Stockle , Automotive Mechanics Fundamentals, The Good heart - Will Cox Company Inc, USA ,1978.

5. Newton ,Steeds and Garet, Motor Vehicles, Butterworth Publishers,1989.

COURSE OUTCOMES:

1. Ability to identify & description of different components & system of automobile.
2. Students will able to explain working principle of various systems automobile.
3. Students will able to explain working principle of transmission systems.
4. Able to understand steering, brakes & suspension systems.
5. Students will be able to understand different alternative energy sources used in IC engine.

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(R22A0329) Operations Research
(Professional Elective-III)

Course Objectives:
1. To impart knowledge of basic tools of Operations research in solving the management problems using mathematical approaches for decision making.
2. To teach the methods of solving Linear Programming Problems.
3. To impart knowledge on assignment model and transportation problem.
4. To impart knowledge on the significance of decision tree and Network analysis.
5. To highlight the importance of Queuing Theory.

UNIT – I
Introduction to Operations Research: Nature and Scope of Operations Research: Origins of OR, Applications of OR in different Managerial Areas, Problem Solving and Decision- making, Quantitative and Qualitative Analysis. Defining a Model, Types of Models, Process for Developing an Operations Research Model, Practices, Opportunities and Shortcomings of using an OR Model.

UNIT – II
Linear Programming Method: Structure of LPP, Assumptions of LPP, Application Areas of LPP, Guidelines for Formulation of LPP, Formulation of LPP for Different Areas, Solving of LPP by Graphical Method: Extreme Point Method, Simplex Method, Converting Primal LPP to Dual LPP, Limitations of LPP.

UNIT – III
Assignment Model: Algorithm for Solving Assignment Model, Hungarians Method for Solving Assignment Problem, Variations of Assignment Problem: Multiple Optimal Solutions, Maximization Case in Assignment Problem, Unbalanced Assignment Problem, Travelling Salesman Problem, Simplex Method for Solving Assignment Problem.
Transportation Problem: Mathematical Model of Transportation Problem, Methods for Finding Initial Feasible Solution: Northwest Corner Method, Least Cost Method, Vogels Approximation Method, Test of Optimality by Modi Method, Unbalanced Supply and Demand, Degeneracy and its Resolution.

UNIT – IV
Decision Theory: Introduction, Ingredients of Decision Problems. Decision-making under Uncertainty, Cost of Uncertainty Under Risk, Under Perfect Information, Decision Tree, Construction of Decision Tree.
Network Analysis: Network Diagram, PERT, CPM, Critical Path Determination, Project Completion Time, Project Crashing.

UNIT – V
Queuing Theory: Queuing Structure and Basic Component of a Queuing Model, Distributions in Queuing Model, Different Queuing Models with FCFS, Queue Discipline, Single and Multiple Service Station with Finite and Infinite Population. Game Theory, Suddle Point, Value of the Game.

TEXT BOOKS:
1.Mik Wisniewski, Dr Farhad Shafti, Quantitative Analysis for Decision Makers, Pearson, 7e, 2019.
2.Miguel Ángel Canela, Inés Alegre, Alberto Ibarra, Quantitative Methods for Management: A Practical Approach, Springer International Publishing, 1e, 2019.

REFERENCE BOOKS:
1.James E. Sallis, Geir Gripsrud, Ulf Henning Olsson, Ragnhild Silkoset, Research Methods and Data Analysis for Business Decisions: A Primer Using SPSS, Springer International Publishing, 1e, 2021.
2.R. Pannerselvam, Operations Research, Prentice Hall International, 3e, 2015.
3.N.V.S. Raju, Operations Research: Theory and Practice, CRC Press, 2020.
4.R. Pannerselvam, Operations Research, Prentice Hall International, 3e, 2015
5.J.K. Sharma, Operations Research: Theory Dand applications, MacMillian, 5e, 2013.

Course Outcomes: At the end of the course, students will be able to:
1. Understand the origin and application of operations research.
2. Learn about the Formulation of Linear Programming Problem for different areas.
3. appreciate the significance of variations of assignment problem, methods for finding Initial feasible solution.
4. Learn the aspects of Decision Theory and Network Analysis
5. Gain insights of the theoretical principles and practical applications of different queuing models.

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IV Year B. TECH - I- SEM   **L/T/P/C**
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(R22A0330) Tribology
(Professional Elective-III)

COURSE OBJECTIVES

1. To provide the knowledge and importance of Tribology in Design, friction, wear and lubrication aspects of machine components.
2. To select proper grade lubricant for specific application.
3. To understand the principles of lubrication, lubrication regimes, theories of hydrodynamic and the advanced lubrication techniques.
4. To introduce the concept of surface engineering and its importance in tribology.
5. To understand the behavior of Tribological components.

Unit-I

Introduction to tribology: Historical background, practical importance, and subsequent use in the field. Lubricants: Types and specific field of applications. Properties of lubricants- viscosity- its measurement- effect of temperature and pressure on viscosity- lubrication types- standard grades of lubricants, and selection of lubricants.

Unit-II

Friction and Wear: Friction theories - Surface contaminants - Frictional heating - Effect of sliding speed on friction. Classification of wear - Mechanisms of wear - Quantitative laws of wear - Wear resistance materials. Classification and mechanisms of wear- delamination theory- debris analysis- testing methods and standards- Related case studies.

Unit-III

Hydrodynamic journal bearings: Fundamentals of fluid formation – Reynold's equation; Hydrodynamic journal bearings – Sommer field number - performance parameters – optimum bearing with maximum load capacity – Friction – Heat generated and Heat dissipated. Hydrodynamic thrust bearings; Raimondi and Boyd solution for hydrodynamic thrust bearings - fixed tilting pads, single and multiple pad bearings - optimum condition with largest minimum film thickness.

Unit-IV

Hydrostatic Lubrication & Plane slider bearings: Introduction to hydrostatic lubrication, hydrostatic step bearings- load carrying capacity and oil flow through the hydrostatic step bearing- numerical examples. Pressure distribution- Load carrying capacity- coefficient of friction- frictional resistance in a fixed/pivoted shoe bearing- center of pressure- numerical examples.

Unit-V

Surface Topography: Surface characterization - Apparent and real area of contact - Derivation of average Reynolds equation for partially lubricated surface - Effect of surface roughness on journal bearings.

TEXTBOOKS:

1. "Introduction to Tribology", B. Bhushan, John Wiley & Sons, Inc., New York, 2002
2. "Engineering Tribology", PrasantaSahoo, PHI Learning Private Ltd, New Delhi, 2011.
3. "Engineering Tribology", J. A. Williams, Oxford Univ. Press, 2005.

REFERENCES:

1. "Introduction to Tribology in bearings", B. C. Majumdar, Wheeler Publishing.
2. "Tribology, Friction and Wear of Engineering Material", I. M.Hutchings, Edward Arnold, London, 1992.
3. "Engineering Tribology", G. W. Stachowiak and A. W. Batchelor, Butterworth Heinemann, 1992.
4. "Friction and Wear of Materials", Ernest Rabinowicz, John Wiley & sons, 1995.
5. "Basic Lubrication Theory", A. Cameron, Ellis Hardwoods Ltd., UK.

COURSE OUTCOMES: After studying this course, students will be able to:

1. Understand the fundamentals of tribology and associated parameters.

2. Apply concepts of tribology for the performance analysis and design of components experiencing relative motion.

3. Analyze the requirements and design hydrodynamic journal and plane slider bearings for a given application.

4. Select proper bearing materials and lubricants for a given tribological application.

5. Apply the principles of surface engineering for different applications of tribology.

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IV Year B. TECH - I- SEM   **L/T/P/C**
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(R22A0331) Industrial Engineering
(Professional Elective-III)

Course objectives:

1. Understand the philosophies of management gurus
2. Understand the various types of organization structures and their features, and Their advantages and disadvantages.
3. Learning various Industrial Engineering Practices like Operations Management techniques, work study, statistical quality control techniques, Job evaluation techniques and network analysis techniques.

UNIT – I:

Introduction to Management: Entrepreneurship and organization – Nature and Importance of Management, Functions of Management, Taylor's Scientific Management Theory, Fayol's Principles of Management, Maslow's Theory of Human Needs, Douglas McGregor's Theory X and Theory Y, Herzberg's Two-Factor Theory of Motivation, Systems Approach to Management, Leadership Styles, Social responsibilities of Management

UNIT – II:

Designing Organizational Structures: Departmentalization and Decentralization, Types of Organization structures – Line organization, Line and staff organization, functional organization, Committee organization, matrix organization, Virtual Organization, Cellular Organization, team structure, boundary less organization, inverted pyramid structure, lean and flat organization structure and their merits, demerits and suitability.

UNIT – III:

Operations Management: Objectives- product design process- Process selection-Types of production system (Job, batch and Mass Production), Plant location-factors- Urban-Rural sites comparison- Types of Plant Layouts- Design of product layout- Line balancing (RPW method) Value analysis-Definition- types of values- Objectives- Phases of value analysis- Fast diagram

UNIT - IV:

Work Study: Introduction — definition — objectives — steps in work study — Method study — definition, objectives — steps of method study. Work Measurement — purpose — types of study — stop watch methods — steps — key rating — allowances — standard time calculations — work sampling.
Statistical Quality Control: variables-attributes, Shewart control charts for variables- chart, R chart, – Attributes-Defective-Defect- Charts for attributes-p-chart -c chart (simple Problems), Acceptance Sampling- Single sampling-Double sampling plans-OC curves.

UNIT – V:

Job Evaluation: Methods of job evaluation — simple routing objective systems — classification method factor comparison method, point method, benefits of job evaluation and limitations.
Project Management (PERT/CPM): Network Analysis, Programme Evaluation and Review Technique (PERT), Critical Path Method (CPM), Identifying critical path, Probability of Completing the project within given time, Project Cost Analysis, Project Crashing. (simple problems)

TEXT BOOKS:
1.Industrial Engineering and Management/O.P. Khanna/Khanna Publishers.
2.Industrial Engineering and Management Science/T.R. Banga and S.C. Sarma/Khanna Publishers.

REFERENCE BOOKS:
1.Motion and Time Study by Ralph M Barnes! John Willey & Sons Work Study by lLO.
2.Human factors in Engineering & Design/Ernest J McCormick /TMH.
3.Production & Operation Management /Paneer Selvam/PHI.
4.Industrial Engineering Management/NVS Raju/Cengage Learning.
5.Industrial Engineering Hand Book/Maynard.
6.Industrial Engineering Management I Ravi Shankar/Galgotia.

Course outcomes: At the end of the course, the student would be able to
apply principles of management
design the organization structure
apply techniques for plant location, design plant layout and value analysis
carry out work study to find the best method for doing the work and establish standard time for a given method
apply various quality control techniques and sampling plans
do job evaluation and network analysis.

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IV Year B. TECH - I- SEM   **L/T/P/C**
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(R22A0332) Production and Operations Management
(Professional Elective-IV)

COURSE OBJECTIVES:
1.To provide a comprehensive exposure to POM and its significance in Industries.
2.To understand different forecasting methods.
3.To analyze and apply techniques for scheduling.
4.To study the planning of resources required for a plant.
5.To learn the concept of stores management, stock control analysis and material handling techniques.

UNIT–I
Introduction: Overview of Production and Operations Management, Introduction, objectives, role and functions of Operations Management, Principles of Process planning and process design, Functions of Production Planning and Control, Production Cycle, Types of Production Systems - Job Shop, Assembly, Batch, Continuous and Project.

UNIT–II
Forecasting: Importance of forecasting, Types of forecasting, Objectives of forecasting, Importance, Process/Steps in forecasting, Advantages and Limitations, Factors affecting forecasting, Methods of forecasting.

UNIT–III
Facilities Management: Choice of site for location, Definition and objectives of Plant Layout
Scheduling: Aggregate planning, Master Production schedule (MPS), Scheduling in Job shop, Mass, Continuous and project type production, Concept of PERT & CPM, Introduction and Terminology of Line balancing.

UNIT–IV
Resource requirement planning: Introduction to Resource requirement planning, Concept of Just-In-Time (JIT), General overview of material requirement planning (MRP), definitions of terms used in material requirement planning, outputs and inputs of material requirement planning, Manufacturing resource planning (MRP II), Enterprise Resource planning- scope, Benefits, applications.

UNIT–V
Stores Management and materials handling: Stores management - nature of stores, store lay out, stock verification, classification and codification, safety stock Inventory Control – ABC analysis, VED analysis
Material handling: organization of material handling, factors affecting the selection of material handling equipment, types of material handling system, selection of handling system.

TEXT BOOKS:
1.Aswathappa K. and Sridhara Bhat, "Production and Operations Management", 2010, HPH.
2.Mahadevan. B, "Operations Management", 2010, Pearson Education.
3.Paneer Selvam - Production and Operations Management, PHI 2006

REFERENCE BOOKS:
1.Buffa E, Modern Production and Operations Management, John wiley 2007
2.Chary SN, Production and Operations Management, TMH,2009
3.Rama Murty-Production and Operations Management, New Age International,2005

COURSE OUTCOMES:

1.Understanding significance of POM, students able to illustrate production planning functions and manage manufacturing functions in a better way.

2.Analyzing different forecasting methods.

3.Applying techniques for scheduling.

4.Studying the planning of resources required for a plant.

5.Learning the concept of stores management, stock control analysis and material handling techniques.

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(R22A0333) Maintenance and Safety Engineering
(Professional Elective-IV)

Course Objectives
•To ensure the desired plant availability at an optimum cost within the safety prescription.
•Student able to know about the objectives of maintenance.
•To minimize the total cost of unavailability and resources.
•Explain the repair methods of beds and slide ways.
•Discuss various condition monitoring techniques.

UNIT-I
Introduction to the Development of Industrial Safety and Management: History and development of Industrial safety: Implementation of factories act, Safety and productivity, Safety organizations. Safety committees and structure, Role of management and role of Govt. in industrial safety.

UNIT-II
Accident Preventions and Protective Equipments: Personal protective equipment, Survey the plant for locations, Part of body to be protected, Education and training in safety, Prevention causes and cost of accident, Housekeeping, First aid, Firefighting equipment, Accident reporting, Investigations. Industrial psychology in accident prevention, Safety trials.

UNIT-III
Safety Acts: Features of Factory Act, Introduction of Explosive Act, Boiler Act, ESI Act, Workman's compensation Act, Industrial hygiene, Occupational safety, Diseases prevention, Ergonomics, Occupational diseases, stress, fatigue, health, safety and the physical environment, Engineering methods of controlling chemical hazards, safety and the physical environment, Control of industrial noise and protection against it, Code and regulations for worker safety and health.

UNIT-IV
Principles and Practices of Maintenance Planning: Basic Principles of maintenance planning – Objectives and principles of planned maintenance activity, Sound Maintenance systems – Reliability and machine availability, Equipment Life cycle, Measures for Maintenance Performance: Equipments breakdowns, Mean Time Between Failures and Repair, Factors of availability, Maintenance organization and economics.

UNIT-V
Maintenance Policies and Preventive Maintenance: Maintenance categories – Merits of each category – Preventive maintenance, Maintenance schedules: Repair cycle, Principles and methods of lubrication, Fault Tree Analysis, Total Productive Maintenance: Methodology and Implementation.

TEXT BOOKS:
1)Industrial Maintenance Management Srivastava, S.K. - S. Chand andCo.
2)Occupational Safety Management and Engineering Willie Hammer - PrenticeHall
3)Installation, Servicing and Maintenance Bhattacharya, S.N. - S. Chand andCo.

REFERENCE BOOKS:
1)Occupational Safety Management and Engineering Willie Hammer - PrenticeHall
2)Reliability, Maintenance and Safety Engineering by Dr.A.K.Guptha
3)A Textbook of Reliability and Maintenance Engineering byAlakeshManna

Course Outcomes:
- Describe the various categories of maintenance.
- Assemble, dismantle and align mechanisms in sequential order.
- Carry out plant maintenance using tribology, corrosion and preventive maintenance.
- Student gets the exposure of Maintenance Policies and Preventive Maintenance.
- Explain the repair methods of material handling equipments.

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(R22A0334) Automation and Control Engineering
(Professional Elective-IV)

Course Objectives:
The general objectives of the course are to enable the students to-
1. Understand the basics of automation and the need of Mechatronics systems.
2. Learn the constructions and working principle of different types of sensors and transducers.
3. Understand the constructions and working principle of different types of Actuators and drive systems.
4. To impart knowledge on the control elements.
5. To understand the different control schemes generally used to get best output.

UNIT – I
Introduction to automation: Types and strategies of automation, pneumatic and hydraulic components circuits, Mechanical Feeding and machine tool control to transfer the automation. Introduction to Mechatronics: Role of various engineering disciplines in Mechatronics, Mechatronics design elements, Scope of Mechatronics, Applications of Mechatronics.

UNIT – II
Sensors and Transducers: Sensors and transducers, performance terminology, displacement, position and proximity, velocity and motion, force, fluid pressure, liquid flow, liquid level, temperature, light sensors, selection of sensors.

UNIT – III
Actuators and drive systems: Mechanical, Electrical, Hydraulic drive systems, Characteristics of mechanical, Electrical, Hydraulic and pneumatic actuators and their limitations.

UNIT – IV
Control system components: Introduction, classification of control system- classification of control systems on the basis of control signal used, Adaptive control system, Process control systems

UNIT – V
Process control: Introduction, concept of process control, Automatic controllers- digital controller, Electronic controllers, Pneumatic controllers, P-I controller, PD controller, P-I-D controller, Hydraulic-controllers.

Text Books
1.Mechatronics, W.Bolton, Pearson Education, Asia. B. Tech (ME) R-20 Malla Reddy College of Engineering and Technology (MRCET)
2.Mechatronics, M.D. Singh and J.G. Joshi, PHI.

Reference Books
1.Mechatronics, D.A. Bradley, D. Dawson, N.C. Buru and A.J. Loader, Chapman Hall.
2.Microprocessor Architecture, Programming & Applications, S. Ramesh, Gaonkar, Wiley Eastern.
3.The Mechatronics Handbook with ISA– The Instrumentation, Systems, Automation, Robert H. Bishop. Ed.-in-chief., CRC Press.

Course Outcomes

1. The importance of automation in industries and Identification of key elements of   mechatronics system.
2. Identify different types of sensors and transducers required for specific applications.
3. Handle different types of controller like Electronic, Pneumatic and Hydraulic, Mechanical actuators and drives for specific applications.
4. Describe and analyze working principles of various types of motors, differences, characteristics and selection criteria, control methods.
5. Identify different types of process control required for specific.

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(R22A0335) Computational Fluid Dynamics
(Professional Elective-IV)

Pre-requisite: Heat Transfer and Fluid Mechanics

Course Objective: To apply the principles of Heat Transfer and Fluid Mechanics to formulate governing equations for physical problems and to solve those using different numerical techniques

UNIT - I:
Basic Aspects of the Governing Equations – Physical Boundary Conditions – Methods of solutions of Physical Problems – Need for Computational Fluid Dynamics – Different numerical/CFD techniques – FDM, FEM, FVM etc., - Main working principle - CFD as a research and design tool – Applications in various branches of Engineering
Mathematical behavior of Partial Differential Equations (Governing Equations): Classification of linear/ quasi linear PDE – Examples - Physical Processes: Wave Equations and Equations of Heat Transfer and Fluid Flow – Mathematical Behavior - General characteristics – Its significance in understanding the physical and numerical aspects of the PDE – One way and Two Way variables – Well posed problems – Initial and Boundary Conditions
Solution of Simultaneous Algebraic Equations: Direct Method – Gauss Elimination – LU Decomposition-Pivoting – Treatment of Banded Matrices – Thomas Algorithm Iterative Method: Gauss Seidel and Jordan Methods - Stability Criterion

UNIT - II:
Finite Difference Method: Basic aspects of Discretization – Finite Difference formulae for first order and second order terms – Solution of physical problems with Elliptic type of Governing Equations for different boundary conditions - Numerical treatment of 1D and 2D problems in heat conduction, beams etc., - Solutions –Treatment of Curve linear coordinates – Singularities – Finite Difference Discretization –Solution of 1D heat conduction problems in Heat conduction in curve linear coordinates

UNIT - III:
FDM: Solution of physical problems with Parabolic type of Governing Equations – Initial Condition – Explicit, implicit and semi implicit methods – Types of errors – Stability and Consistency – Von Neumann Stability criterion– Solution of simple physical problems in 1D and 2D – Transient Heat conduction problems- ADI scheme - Simple Hyperbolic type PDE - First order and Second order wave equations – Discretization using Explicit method - Stability criterion – Courant Number – CFL Condition - Its significance - Treatment of simple problems

UNIT - IV:
Finite Difference Solution of Unsteady Inviscid Flows: Lax – Wendroff Technique – Disadvantages – Maccormack's Technique
Fluid Flow Equations – Finite Difference Solutions of 2D Viscous Incompressible flow problems – Vorticity and Stream Function Formulation – Finite Difference treatment of Lid Driven Cavity Problem -
Application to Cylindrical Coordinates with example of flow over infinitely long cylinder and sphere – Obtaining Elliptic Equations

UNIT - V:
Finite Difference Applications in Fluid flow problems: Fundamentals of fluid Flow modeling using Burger's Equation – Discretization using FTCS method with respect to Upwind Scheme and Transport Property – Upwind Scheme and Artificial Viscosity
Solutions of Navier Stokes Equations for Incompressible Fluid Flows: Staggered Grid – Marker and Cell (MAC) Formulation – Numerical Stability Considerations – Pressure correction method - SIMPLE Algorithm

TEXT BOOKS:
1.Computational Fluid Dynamics: The basics with applications/ John D Anderson/McGraw Hill Publications
2.Numerical Heat Transfer and Fluid Flow/ S.V. Patankar/ Mc Graw Hill

REFERENCE BOOKS:
1.Computational Fluid Flow and Heat Transfer / K Muralidharan and T Sudarajan/ Narosa Publishers.
2.Computational Methods for Fluid Dynamics / Firziger & Peric/ Springer

Course Outcomes: At the end of the course, the student should be able to:
•Differentiate between different types of Partial Differential Equations and to know and understand appropriate numerical techniques.
•Solve the simple heat transfer and fluid flow problems using different numerical techniques, viz., FDM.
•Understand and to appreciate the need for validation of numerical solution.

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(R22A0390) Mechanical Measurements & Instrumentation lab and Computer Aided Engineering Laboratory

Course Objectives:
1.To prepare the students for successful career in industry and motivate for higher education.
2.To provide strong foundation in basic science and mathematics necessary to formulate, solve and analyze Control and Instrumentation problems
3.To provide strong foundation in circuit theory, control theory and signal processing concepts.
4.To introduce fundamentals of the analysis software, its features and applications.
5.To learn the basic element types in Finite Element analysis

LIST OF EXPERIMENTS:
 CYCLE-1
1.Calibration of Pressure Gauges
2.Study and calibration of LVDT transducer for displacement measurement.
3.Calibration of strain gauge for temperature measurement.
4.Calibration of thermocouple for temperature measurement.
5.Calibration of capacitive transducer for angular displacement.
6.Study and calibration of photo and magnetic speed pickups for the measurement of speed.
7.Calibration of resistance temperature detector for temperature measurement.
8.Study and calibration of McLeod gauge for low pressure

CYCLE-2
2-D stress analysis of bar
1.Plane stress analysis
2.Plain strain analysis
3. Beam analysis
4.Truss analysis 3-D analysis
5.Modal analysis
6.Buckling analysis Ansys, Abaqus

Course Outcomes:
1.At the end of the course, the student will be able to characterize and calibrate measuring devices.
2.Identify and analyze errors in measurement.
3.Analyze measured data using regression analysis.
4.Classify different types of truss and perform static analysis.
5.Perform static analysis on connecting rod with 3D elements.

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                                             -/-/6/3

(R22A0394) Project Phase-I

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IV Year B. TECH - II- SEM   **L/T/P/C**

4/-/-/4

(R22A0336) Innovation, Start-Up & Entrepreneurship

UNIT-I

Introduction: Meaning and Concept of Innovation, Levels of Innovation- Incremental Vs Radical Innovation- Inbound and Outbound Ideation- Open and Other Innovative Ideation Methods.

Entrepreneurship- Role-models of Entrepreneurship- Common Entrepreneurial characteristics, Role of Entrepreneurship in economic development- Entrepreneurship in the new millennium.

UNIT-II

The Entrepreneur and Mindset: Meaning – The skills required being an Entrepreneur and entrepreneurial decision process- Entrepreneurial stress - Challenges of start-ups- Entrepreneurial Motivation, Innovation, Imagination & Creativity.

UNIT-III

Business Planning and Fund Raising: Identifying, assessing and validation of the idea, Identifying the target segment and market share, creating an effective B-Plan, Market research, Financial, Market and Technical feasibility, Fund raising and valuation, Idea pitching.

UNIT-IV

Legal and Financial Aspects: Legal aspects: Permits, Registrations and compliances, Intellectual Property Rights, Contracts.

Financial aspects: Working capital management- Financial management and long-term investments, Capital structure and taxation, Brake even analysis.

UNIT-V

Contemporary Issues: Legal forms of entrepreneurial organizations- Debt, Equity, Angle and Venture Capital markets for Start-ups, Growth and Development stages- new venture finance- Initial Public Offer (IPO) Governmental initiatives to encourage startups - Business Incubations and its benefits- Protection of Intellectual Property.

TEXT BOOKS:

1. Kathleen R Allen, Launching New Ventures, An Entrepreneurial Approach, Cengage Learning, 2016 Anjan Raichaudhuri, Managing New Ventures Concepts and Cases, Prentice Hall International, 2010.
2. Innovation Management, C.S.G. Krishnamacharyulu, R. Lalitha, Himalaya Publishing House, 2010.
3. S. R. Bhowmik & M. Bhowmik, Entrepreneurship, New Age International, 2007.

REFERENCE BOOKS

1. Stuart Read, Effectual Entrepreneurship, Routledge, 2013
2. Rajeev Roy, Entrepreneurship, 2e, Oxford publications, 2012.
3. Nandan .H, Fundamentals of Entrepreneurship, PHI, 2013

COURSE OUTCOMES:

1. Students will be able to understand a) Startup opportunities b) Legal and other requirements for new ventures c) Financial Issues of startups d) Sustainability and growth of startups e) Exit strategies
2. Students will be able to understand a) mindset of the entrepreneurs, b) identify ventures for launching, c) develop an idea on the legal framework and d) strategic perspectives in entrepreneurship.

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(R22A0337) Production Planning & control
(Professional Elective V)

Course Objectives: Understand the importance of Production planning & control. Learning way of carrying out various functions so as to produce right product, right quantity at right time with minimum cost.

Course Outcomes: At the end of the course, the student will be able to
•Understand production systems and their characteristics.
•Evaluate MRP and JIT systems against traditional inventory control systems.
•Describe and apply methods of line balancing and routing techniques..
•Apply various types of scheduling techniques to production systems.
•Apply dispatching and follow up techniques to the production control and management system.

UNIT – I:
Introduction: Definition – Objectives of Production Planning and Control – Functions of production planning and control - Types of production systems - Organization of production planning and control department.
Forecasting – Definition- uses of forecast- factors affecting the forecast- types of forecasting- their uses - general principle of forecasting. Forecasting techniques- quantitative and qualitative techniques. Measures of forecasting errors.

UNIT – II:
Inventory management – Functions of inventories – relevant inventory costs – ABC analysis – VED analysis – Basic EOQ model- Inventory control systems –continuous review systems and periodic review systems, MRP I, MRP II, ERP, JIT Systems - Basic Treatment only. Aggregate planning – Definition – aggregate-planning strategies – aggregate planning methods – transportation model.

UNIT – III:
Line Balancing: Terminology, Methods of Line Balancing, RPW method, Largest Candidate method and Heuristic method.
Routing– Definition – Routing procedure – Factors affecting routing procedure, Route Sheet.

UNIT – IV:
Scheduling –Definition – Scheduling Policies – types of scheduling methods – differences with loading – flow shop scheduling – job shop scheduling, line of balance (LOB) – objectives - steps involved.
UNIT – V:
Dispatching: Definition – activities of dispatcher – dispatching procedures – various forms used in dispatching.
Follow up: definition – types of follow up – expediting – definition – expediting procedures-Applications of computers in planning and control.

TEXT BOOKS:
1.Operations management/ Heizer/Pearson/13th Edition, 2019
2.Production and Operations Management / Ajay K Garg / Mc Graw Hill, 1st Edition, 2017

REFERENCE BOOKS:
1.Production Planning and Control- Text& cases/ SK Mukhopadhyaya /PHI, 2nd Edition, 2007.
2.Production Planning and Control- Jain & Jain – Khanna publications, 8th Edition, 1999.

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(R22A0338) Bio-Mass Engineering
(Professional Elective V)

COURSE OBJECTIVES:
This course will enable students to learn types of biomass, assessment techniques, biomass properties, thermo chemical, biological and chemical conversion, and power generation using bio mass.

COURSE OUTCOMES:
At the end of the course students are able to
1.Demonstrate different types of biomass, advantages and limitations of bio mass, sources of bio mass, properties of bio mass and biomass assessment techniques.
2.Explain thermo chemical conversion processes of biomass.
3.Describe various biological conversion processes of bio mass.
4.Discuss about chemical conversion processes of bio mass.
5.Explain concepts of power generation using biomass

UNIT – I
Introduction: Introduction: Types of biomass, advantages and dis advantages in use of bio mass as energy, sources of biomass, current biomass applications and trends, physical and thermal properties of biomass, techniques for biomass assessment.

UNIT – II
Thermo Chemical ReactionThermo chemical conversion: Combustion, gasification, pyrolysis, hydrothermal liquefaction, hydropyrolysis, torrefaction, choice of thermal process basedon biomass type and product requirement. Economics of thermo chemical conversion.

UNIT – III
Biological Conversion: Biodegradation and biodegradability of substrate - Biochemistry and process parameters of biomethanation - Biogas digester types - Digester design and biogas utilization. Biomethanation Process - Economics of biogas plant with their environmental and social impacts - Bioconversion of substrates into alcohol - Methanol & ethanol Production - Organic acids – Solvents - Amino acids - Antibiotics etc.

UNIT – IV
Chemical Conversion: Chemical Conversion: Hydrolysis & hydrogenation - Solvent extraction of hydrocarbons - Solvolysis of wood - Biocrude and biodiesel - Chemicals from biomass

UNIT – V
Utilisation of gasifier for electricity generation - Operation of spark ignition and compression ignition engine with woodgas – Methanol - ethanol & biogas - Biomass integrated gasification/combined cycles systems - Sustainable cofiring of biomass with coal - Biomass productivity - Energy plantation and power programme.

TEXT BOOKS
1.Sergio C. Caperda, Introduction to Biomass energy conversions, CRC Press, Taylor & Francis Group.
2.Erik Dahlquist, Technologies for converting Boimass to Useful energy, CRC Press, Taylor & Francis Group.

REFERENCE BOOKS
1.Biomass Conversion and Technology, C. Y. WereKo-Brobby and E. B. Hagan, John Wiley & Sons, 1996.
2.Biogas Systems: Principles and Applications, Mital K.M
3.Biomass Energy Systems, Venkata Ramana P and Srinivas S.N
4.Thermochemical Characterization of Biomass, Iyer PVR , M N E S

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(R22A0339) Mechatronics
(Professional Elective V)

Course Objectives
1. Understand key elements of Mechatronics system, representation into block diagram
2. Understand concept of transfer function, reduction and analysis
3. Understand principles of sensors, its characteristics, interfacing with DAQ microcontroller
4. Understand the concept of PLC system and its ladder programming, and significance of PLC systems in industrial application
5. Understand the system modeling and analysis in time domain and frequency domain.

UNIT - I

Introduction: Overview, History of mechatronics, Scope and significance of Mechatronics systems, elements of Mechatronic systems, Needs and benefits of Mechatronics in manufacturing.

Sensors: Classification of sensors basic working principles, displacement sensor – linear and rotary potentiometers, LVDT and RVDT, incremental and absolute encoders, Proximity and range sensors – Eddy current sensor, ultrasonic sensor, laser interferometer transducer, hall Effect sensor, inductive Proximity switch, Light sensors – Photodiodes, Phototransistors, Flow Sensors – ultrasonic Sensor, Laser Doppler Anemometer, Tactile Sensors – PVDF tactile sensor, micro-switch and reed switch, Piezoelectric sensors, Vision Sensor.

UNIT - II

Actuators: Electrical Actuators: Solenoids, relays, diodes, thyristors, triacs, BJT, FET, DC motor, Servo Motor, BLDC Motor, AC Motor, Stepper Motor, Hydraulic & pneumatic devices – Power supplies, valves, Cylinder sequencing, Design of hydraulic & pneumatic circuits. Piezo Electric Actuators, Shape memory alloys.

UNIT - III

Basic System models & Analysis: Modeling of one & two degrees of freedom Mechanical, Electrical, fluid and thermal systems, block diagram representations of these systems. Dynamic Responses of System: Transfer function, modeling dynamic systems, first order systems, second order systems.

UNIT - IV

Digital Electronics: Number systems, BCD codes and arithmetic, Gray codes, self-complimenting codes, Error detection and correction principles. Boolean functions using Karnaugh Map, Design of combinational circuits, design of arithmetic circuits, Design of code converters, encoders and decoders. Signal Conditioning: Operational amplifiers, inverting amplifier, differential amplifier, Protection, comparator, filters, multiplexer, Pulse width modulation counters, decoders. Data acquisition – Quantizing theory, Analog to digital conversion, digital to analog conversion.
Controllers: Classification of Control systems, Feedback, Closed loop and open loop systems PLC

UNIT - V

Programming: PLC Principles of operation, PLC sizes, PLC hardware components, I/O section Analog I/O section, Analog I/O modules, digital I/O modules, CPU processor memory, module programming, Ladder Programming, ladder diagrams, Timers, Internal relays and counters, data handling, analogue input and output. Application on real time industrial automation systems.
Advanced Applications in Mechatronics: Sensors for condition monitoring, mechatronic control in

automated manufacturing, Artificial intelligence in Mechatronics, micro sensors in mechatronics, Application of Washing machine as mechatronic device.

TEXT BOOKS:

1.W. Boton, "Mechatronics", 5th edition, Adison Wesley Longman ltd, 2010.

2.Mechatronics system design by Devdas Shetty and Richard A. Kolk, P.W.S. Publishing company, 2001.

3.Alciatore David G & Histand Michael B, "Introduction to Mechatronics and Measurement systems", 4th edition, Tata McGraw Hill, 2006

Course Outcomes:

1. Identification of key elements of mechatronics system and its representation in terms of block diagram
2. Understanding the concept of signal processing and use of interfacing systems such as ADC, DAC, digital
3. Interfacing of Sensors, Actuators using appropriate DAQ micro-controller
4. Time and Frequency domain analysis of system model (for control application)
5. PID control implementation on real time systems

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(R22A0340) Energy conservation and Management
(Professional Elective V)

Course Objectives:
•To understand the principles of energy conservation
•To understand thermal insulation & refractors.
•To know waste heat recovery systems.
•To gain knowledge about engineering economics.
•To impart knowledge Energy management programs.

UNIT-I
Energy Conservation: Rules for efficient energy conservation – technologies for energy conservation –outline of waste heat and material reclamation, load management, alternate energy sources, and energy storage.

UNIT-II
Thermal Insulation & Refractors: Heat loss through un-insulated surfaces, effects of insulation on current carrying wires – economic thickness of insulation – critical radius of insulation – properties of thermal insulators – classification of insulation materials – classification of refractors – properties of refractors – criteria for good refractory material – applications of insulating & refractory materials.

UNIT-III
Waste Heat Recovery Systems: Guideline to identify waste heat – feasibility study of waste heat – shell and tube heat exchanger – thermal wheel – heat pipe heat exchanger – heat pump – waste heat boilers – incinerators.
Heat Recovery Systems & Heat Exchanger Networks: Liquid to liquid heat exchangers – gas to liquid heat recovery systems, regenerators, recuperators, rotating regenerators – miscellaneous heat recovery methods – selection of materials for heat exchangers – combined radiation and convective heat exchanger, U tube heat exchanger, tube heat exchanger, fluidized bed heat exchanger – economizer.

UNIT-IV
Engineering Economics: Managerial objectives, steps in planning – efficiency of organization- capital budgeting – classification of costs – interest – types – nominal and effective interest rates – discrete and continuous compounding – discounting - time value of money – cash flow diagrams – present worth factor, capital recovery factor, equal annual payments – equivalent between cash flows. ENERGY AUDITING: A definition – objectives – level of responsibility – control of energy – uses of energy – check lists – energy conservation schemes – energy index – cost index – pie charts – sankey diagrams
– load profiles – types of energy audits – questionnaire – energy audit of industries – general energy audit – detailed energy audit – energy saving potential.

UNIT-V
Project Management
Method of investment appraisal – rate of return method, pay back method, net present value method (NPV) – adoption of the methods in energy conservation campaign – types of projects — propose of project management – classification – role and qualities of project manager – types of budgets - budget committee – budgeting.

Energy Management Programs: Necessary steps of energy management programme – concepts of energy management – general principles of energy management – energy management in manufacturing and process industries – qualities and functions of energy managers – duties of energy manager - language of energy manager – checklist for top management.

TEXT BOOKS:
1.Waste heat recovery systems -D.A. Reay/Pergmon Press.
2.Energy Management -W.R. Murphy & G. Mickay, Butterworths

REFERENCE BOOKS:
1.Energy Conservation -P.W.O' Callaghan, Pargamon Press 1981.
2.Engineering Heat Audits -C.P. Gupta & Rajendra Prakash, Nechand & Bros.
3.Hand book of energy audits -Albert Thumann, The F.Airmont Press Inc., Atlanta Georgia, 1979.
4.Energy Management Principles -Craig B. Smithm, Pergarmon Press.

Course Outcomes: At the end of the course, student will be able to
•Understand the basic concept of energy conservation and its role in energy management.
•Focus on thermal Insulation & refractors, classification and applications.
•Discuss the energy conservation opportunities in the energy intensive industries by waste heat recovery system.
•Analyze the quantum of electrical energy that can be saved by the use of energy efficient lighting systems and energy audit parameters.
•Understand concept of Project management and energy management Programs

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(R22A0341) Turbo Machinery
(Professional Elective VI)

Pre-requisites: Thermal Engineering, Heat Transfer

Course Objectives:

•To provide the knowledge of basic principles, governing equations and applications of turbo machinery.

•To explain construction and working principle and evaluate the performance characteristics of Turbo Machines

UNIT – I

Introduction to Turbomachinery: Classification of turbo-machines, second law of thermodynamics applied to turbine and compressors work, nozzle, diffuser work, fluid equation, continuity, Euler's, Bernoulli's, equation and its applications, expansion and compression process, reheat factor, preheat factor

UNIT – II

Fundamental Concepts of Axial and Radial Machines: Euler's equation of energy transfer, vane congruent flow, influence of relative circulation, thickness of vanes, number of vanes on velocity triangles, slip factor, Stodola, Stanitz and Balje's slip factor, suction pressure and net positive suction head, phenomena of cavitation in pumps, concept of specific speed, shape number, axial, radial and mixed flow machines, similarity laws.

UNIT – III

Gas Dynamics: Fundamental thermodynamic concepts, isentropic conditions, mach numbers, and area, Velocity relations, Dynamic Pressure, Normal shock relation for perfect gas. Supersonic flow, oblique shock waves. Normal shock recoveries, detached shocks, Aerofoil theory.

Centrifugal compressor: Types, Velocity triangles and efficiencies, Blade passage design, Diffuser and pressure recovery. Slip factor, Stanitz and Stodolas formula's, Effect of inlet mach numbers, Pre whirl, Performance

UNIT – IV

Axial Flow Compressors: Flow Analysis, Work, and velocity triangles, Efficiencies, Thermodynamic analysis. Stage pressure rise, Degree of reaction, Stage Loading, General design, Effect of velocity, Incidence, Performance

Cascade Analysis: Geometrical and terminology. Blade force, Efficiencies, Losses, Free end force, Vortex Blades.

UNIT – V

Axial Flow Gas Turbines: Work done. Velocity triangle and efficiencies, Thermodynamic flow analysis, Degree of reaction, Zweifels relation, Design cascade analysis, Soderberg, Hawthrone, Ainley, Correlations, Secondary flow, Free vortex blade, Blade angles for variable degree of reaction. Actuator disc, Theory, Stress in blades, Blade assembling, Material and cooling of blades, Performances, Matching of compressors and turbines, off design performance.

TEXT BOOKS:
1.Principles of Turbo Machines/DG Shepherd / Macmillan
2.Turbines, Pumps, Compressors/Yahya/ Mc Graw Hill

REFERENCE BOOKS:
1.A Treatise on Turbo machines / G. Gopal Krishnan and D. Prithviraj/ SciTech
2.Gas Turbine Theory/ Saravanamuttoo/ Pearson.
3.Turbo Machines/ A Valan Arasu/ Vikas Publishing House Pvt. Ltd.

Course Outcomes: At the end of the course, student will be able to:
•Apply thermodynamics and kinematics principles to turbo machines
•Understand mechanisms behind working of Turbines, compressors.
•Understand the thermodynamic and flow analysis for turbines and compressors
•Analyze the performance of turbo machines.

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(R22A0342) Composite Materials
(Professional Elective VI)

Course objectives

•Develop understanding of the structure of ceramic materials on multiple length scales.
•Develop knowledge of point defect generation in ceramic materials, and their impact on transport properties.
•To describe key processing techniques for producing metal, ceramic-, and polymer-matrix composites.
•To demonstrate the relationship among synthesis, processing, and properties in composite materials.

UNIT – I

Introduction: Definition, Classification of Composite materials based on structure, based on matrix, Advantages of composites, Applications of composites, Functional requirements of reinforcement and matrix.

UNIT – II

Types of reinforcements and their properties: Fibers: Carbon, Boron, Glass, Aramid, Al2O3, SiC, Nature and manufacture of glass, carbon and aramid fibres, Comparison of fibres. Role of interfaces: Wettability and Bonding, The interface in Composites, Interactions and Types of bonding at the Interface, Tests for measuring Interfacial strength.

UNIT – III

Fabrication of Polymeric Matrix Composites, Structure and properties of Polymeric Matrix Composites, Interface in Polymeric Matrix Composites, Applications; Fabrication of Ceramic Matrix Composites, Properties of Ceramic Matrix Composites, Interface in Ceramic Matrix Composites, Toughness of Ceramic Matrix Composites Applications of Ceramic Matrix Composites.

UNIT – IV

Fabrication of Metal Matrix Composites: Solid state fabrication, Liquid state fabrication and In-situ fabrication techniques; Interface in Metal Matrix Composites: Mechanical bonding, Chemical bonding and Interfaces in In-situ Composites; Discontinuously reinforced Metal Matrix Composites, Properties and Applications. Fabrication of Carbon fiber composites, properties, interface and applications.

UNIT – V

Micromechanics of Composites: Density, Mechanical Properties: Prediction of Elastic constants, Micro mechanical approach, Halpin-Tsai equations, Transverse stresses; Thermal properties: Hydrothermal stresses and Mechanics of Load transfer from matrix to fiber.

TEXTS BOOKS

1.Composite Materials – Science & Engineering, K.K. Chawla, Springer-Verlag, New York, 1987.
2.An Introduction to Composite Materials, Hull, Cambridge, 2nd Edt. 1997.

REFERENCE BOOKS

1.Composites, Engineered Materials Handbook, Vol. 1, ASM International, Ohio, 1988.

2.Structure and Properties of Composites, Materials Science and Technology, Vol. 13, VCH, Weinheim, Germany, 1993.

3.Composite Materials: Engineering and Science, F.L. Matthews and R.D. Rawlings, Chapman & Hall, London, 1994.

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

•Understand the crystal structures of a wide range of ceramic materials and glasses.

•explain how common fibers are produced and how the properties of the fibers are related to the internal structure.

•select matrices for composite materials in different applications.

•describe key processing methods for fabricating composites.

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(R22A0343) Power Plant Engineering
(Professional Elective VI)

Course Objectives: The goal of this course is to be aware of the design of conventional and alternative power-generation plants. The learning objectives include
•Analysis and preliminary design of the major systems of conventional fossil-fuel steam-cycle power plants.
•A working knowledge of the basic design principles of nuclear, gas turbine, combined cycle, hydro, wind, geothermal, solar, and alternate power plants.
•Awareness of the economic, environmental, and regulatory issues related to power generation.

UNIT – I

Introduction to the Sources of Energy – Resources and Development of Power in India.
Steam Power Plant: Plant Layout, Working of different Circuits, Fuel and handling equipments, types of coals, coal handling, choice of handling equipment, coal storage, Ash handling systems.
Combustion Process: Properties of coal – overfeed and underfeed fuel beds, traveling grate stokers, spreader stokers, retort stokers, pulverized fuel burning system and its components, combustion needs and draught system, cyclone furnace, design and construction, Dust collectors, cooling towers and heat rejection. Corrosion and feed water treatment.

UNIT – II

Internal Combustion Engine Plant: Diesel Power Plant: Introduction – IC Engines, types, construction– Plant layout with auxiliaries – fuel supply system, air starting equipment, lubrication and cooling system – super charging.
Gas Turbine Plant: Introduction – classification - construction – Layout with auxiliaries – Principles of working of closed and open cycle gas turbines. Combined Cycle Power Plants and comparison.

UNIT – III

Hydro Electric Power Plant: Water power – Hydrological cycle / flow measurement – drainage area characteristics – Hydrographs – storage and Pondage – classification of dams and spill ways.
Hydro Projects and Plant: Classification – Typical layouts – plant auxiliaries – plant operation pumped storage plants.

UNIT – IV

Nuclear Power Station: Nuclear fuel – breeding and fertile materials – Nuclear reactor – reactor operation. Types of Reactors: Pressurized water reactor, Boiling water reactor, sodium-graphite reactor, fast Breeder Reactor, Homogeneous Reactor, Gas cooled Reactor, Radiation hazards and shielding – radioactive waste disposal.

UNIT – V

Power Plant Economics and Environmental Considerations: Capital cost, investment of fixed charges, operating costs, general arrangement of power distribution, Load curves, load duration curve. Definitions of connected load, Maximum demand, demand factor, average load, load factor, diversity factor – related exercises. Effluents from power plants and Impact on environment – pollutants and pollution standards – Methods of Pollution control.

TEXT BOOKS
1.Power Plant Engineering/ P. K. Nag / Mc Graw Hill
2.Power Plant Engineering / Hegde / Pearson.

REFERENCES BOOKS
1.Power Plant Engineering / Gupta / PHI
2.Power Plant Engineering / A K Raja / New age.

Course Outcomes: At the end of the course students will be able to:
•Understand the concept of Rankine cycle.
•Understand working of boilers including water tube, fire tube and high-pressure boilers and determine efficiencies.
•Analyze the flow of steam through nozzles.
•Evaluate the performance of condensers and steam turbines.
•Evaluate the performance of gas turbines.

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

IV Year B. TECH - II- SEM　　　　　　　　　　　　　　**L/T/P/C**
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(R22A0344) Total Quality Management
(Professional Elective VI)

Course Objectives:

•Develop an understanding of the necessary information and skills needed to manage, control and improve quality practices in the organizations through TQM philosophy.

•To understands customer and supplier relationship and Bench marketing.

•Apply TQM in traditional organizations.

•Analysis of quality in cost and management.

•To understand various ISO around the world.

UNIT – I

Introduction: The concept of TQM, Quality and Business performance, attitude and involvement of top management, communication, culture and management systems. Management of Process Quality: Definition of quality, Quality Control, a brief history, Product Inspection vs, Process Control, Statistical Quality Control, Control Charts and Acceptance Sampling.

UNIT – II

Customer Focus and Satisfaction: Process Vs. Customer, internal customer conflict, quality focus, Customer Satisfaction, role of Marketing and Sales, Buyer – Supplier relationships. Bench Marketing: Evolution of Bench Marketing, meaning of Bench marketing, benefits of bench marketing, the bench marketing process, pitfalls of bench marketing.

UNIT– III

Organizing for TQM: The systems approach, organizing for quality implementation, making the transition from a traditional to a TQM organizing, Quality Circles. Productivity, Quality and Reengineering: The leverage of Productivity and Quality, Management systems Vs. Technology, Measuring Productivity, Improving Productivity Re-engineering.

UNIT – IV

The Cost of Quality: Definition of the Cost of Quality, Quality Costs, Measuring Quality Costs, use of Quality Cost Information, Accounting Systems and Quality Management.

UNIT – V

ISO9000: Universal Standards of Quality: ISO around the world, The ISO9000 ANSI/ASQCQ-90. Series Standards, benefits of ISO9000 certification, the third-party audit, Documentation ISO9000 and services, the cost of certification implementing the system.

TEXT BOOKS

1.Total Quality Management: Text, cases and Readings, Third Edition - Joel E. Ross.

2.Beyond TQM - Robert L. Flood.

REFERENCE BOOKS

1. Statistical Quality Control – Eugene Grant, Richard McGraw-Hill, 2017.
2. Total Quality Management, Besterfiled D. H., Pearson Education Asia – 2015-4th Edition
3. The Management and Control of Quality, Evans J. R, and Lindsay W. M., Southwestern (Thomson Learning), Fifth Edition.

Course Outcomes: After completion of the course the student will be able to
- Understand the concept of TQM and various control charts
- To analyze the relationship between customer and supplier
- Implement TQM in an organization
- To evaluate the cost of quality
- Understand the third-party audit and documentation of various ISO audits

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IV Year B. TECH - II- SEM   **L/T/P/C**

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(R22A0395) Project Phase-II

COURSE OBJECTIVES

1. To survey selected topics addressing issues of science in society today.
2. To familiarize with scientific literature.
3. To collect information on each topic.
4. To assimilate, synthesize and integrate information.
5. To organize the information on each topic into an analysis.

COURSE OUTCOMES

1. Identify and compare technical and practical issues related to the area of program specialization.
2. Outline annotated bibliography of research demonstrating scholarly skills.
3. Prepare a well-organized report employing elements of technical writing and critical thinking.
4. Demonstrate the ability to describe, interpret and analyse technical issues and develop competence in presenting.
5. To effectively communicate by making an oral presentation before an evaluation committee.