COURSE STRUCTURE AND DETAILED SYLLABUS

## **MECHANICAL ENGINEERING**

For B.TECH FOUR YEAR DEGREE PROGRAMME (Applicable for the batches admitted from 2020-2021)



VAAGDEVI COLLEGE OF ENGINEERING (Autonomous) Bollikunta, Warangal-506 005 Telangana State, India.

#### **R20** Regulations

## B.Tech- MECHANICAL ENGG VAAGDEVI COLLEGE OF ENGINEERING (AUTONOMOUS) MECHANICAL ENGINEERING

## **COURSE STRUCTURE**

(R20 Regulations applicable for the batches admitted from Academic Year 2020-2021)

S.NO	Course Code	Title of the Course	L	Т	Р	Credits
1	B20MA01	Linear Algebra and Calculus	3	1	0	4
2	B20CH01	Engineering Chemistry	3	1	0	4
3	B20ME02	Engineering Graphics	1	0	4	3
4	B20CS01	Programming for Problem Solving	4	0	0	4
5	B20EN02	English language and interactive Communication skills Lab	0	0	3	1.5
6	B20CS02	Programming for Problem Solving Lab	0	0	3	1.5
7	B20ME04	Engineering Workshop	0	0	2	1
8	B20MC01	Induction Programme	-	-	-	-
		Total	11	2	12	19

#### **I-SEMESTER**

#### **II-SEMESTER**

SI.NO	Course Code	Title of the Course	L	Т	Р	Credits
1	B20MA02	Differential equations and vector calculus	3	1	0	4
2	B20PH03	Engineering Physics	3	1	0	4
3	B20CE01	Engineering Mechanics	3	1	0	4
4	B20CS06	Introduction to Python Programming	1	0	2	2
5	B20EE01	Basic Electrical and Electronics Engineering	3	0	0	3
7	B20EE02	Basic Electrical and Electronics Engineering Lab	0	0	3	1.5
8	B20PH05	Physics Lab	0	0	3	1.5
9	B20MC03	NSS/NCC	0	0	2	0
		Total	13	3	10	20

#### B.Tech-MECHANICAL ENGG R20 Regulations VAAGDEVI COLLEGE OF ENGINEERING (AUTONOMOUS) MECHANICAL ENGINEERING

## **COURSE STRUCTURE**

(R20 Regulations applicable for the batches admitted from Academic Year 2020-2021)

Sl. No	Course Code	Title of the Course	L	Т	Р	Credits
1	B20ME07	Metallurgy and Material Science	3	0	0	3
2	B20ME08	Mechanics of Solids	3	0	0	3
3	B20ME09	Thermodynamics	3	0	0	3
4	B20ME10	Machine Drawing	2	0	2	3
5	B20CS26	Basics of Artificial Intelligence	2	0	0	2
6	B20EN01	English for Effective Communication	2	0	0	2
7	B20MC04	Human Values & Professional Ethics	2	0	0	0
8	B20ME11	Project Based Learning - 1	0	0	2	1
9	B20ME12	Mechanics of Solids Lab	0	0	3	1.5
10	B20ME13	Metallurgy Lab	0	0	3	1.5
		Total	17	00	10	20

#### **III-SEMESTER**

#### **IV-SEMESTER**

Sl. No	Course Code	Title of the Course	L	Т	Р	Credits
1	B20MA07	Probability and Statistics	3	1	0	4
2	B20ME14	Fluid Mechanics and Hydraulic Machinery	3	0	0	3
3	B20ME15	Thermal Engineering-I	3	0	0	3
4	B20ME16	Kinematics of Machines	3	0	0	3
5	B20ME17	Production Technology	3	0	0	3
6	B20ME18	Project Based Learning - 2	0	0	2	1
7	B20ME19	Fluid Mechanics and Hydraulic Machinery Lab	0	0	3	1.5
8	B20ME20	Production Technology Lab	0	0	3	1.5
9	B20ME21	Fuels & Lubricants Lab	0	0	2	1
		Total	15	01	10	21

## **R20 Regulations**

## B.Tech- MECHANICAL ENGG VAAGDEVI COLLEGE OF ENGINEERING (AUTONOMOUS) MECHANICAL ENGINEERING

#### **COURSE STRUCTURE**

(R20 Regulations applicable for the batches admitted from Academic Year 2020-2021)

SI. No.	Course Code	Title of the Course	L	Т	Р	Credits
1	B20ME22	Metrology & Machine Tools	3	0	0	3
2	B20ME23	Dynamics of Machinery	2	1	0	3
3	B20ME24	Design of Machine Members-I	3	0	0	3
4	B20ME25	Thermal Engineering-II	2	1	0	3
5	B20MB01	Managerial Economics & Financial Analysis	3	0	0	3
6	B20ME26	Project Based Learning -3	0	0	2	1
7	B20ME27	Thermal Engineering Lab	0	0	3	1.5
8	B20ME28	Metrology & Machine Tools Lab	0	0	3	1.5
		Total	13	02	08	19

#### **V-SEMESTER**

#### **VI-SEMESTER**

Sl. No.	Course Code	Title of the Course	L	Т	Р	Credits
1	B20ME29	Design of Machine Member – II	2	1	0	3
2	B20ME30	Heat & Mass Transfer	2	1	0	3
3	B20ME31	Project Based Learning -4	0	0	2	1
4		OPEN ELECTIVE-I	3	0	0	3
		<b>PROFESSIONAL ELECTIVE - I</b>				
5	B20ME32	Finite Element Methods	3	0	0	3
5	B20ME33	Mechatronics				
	B20ME34	Nano Technology				
		PROFESSIONAL ELECTIVE - II				3
6	B20ME35	Maintenance and Safety Engineering	2	0	0	
0	B20ME36	Mechanics of Composite Materials	5			
	B20ME37	Refrigeration and Air Conditioning				
		PROFESSIONAL ELECTIVE-III				
7	B20ME38	Unconventional Machining Processes	2	0	0	2
/	B20ME39	Design for Manufacture	5	0	0	5
	B20ME40	Power Plant Engineering				
8	B20ME41	Heat Transfer Lab	0	0	3	1.5
9	B20EN03	Advanced English Communications Skills Lab	0	0	3	1.5
10	B20MC07	Environmental Sciences	3	0	0	0
	•	Total	19	02	08	22

#### VAAGDEVI COLLEGE OF ENGINEERING (AUTONOMOUS) MECHANICAL ENGINEERING

#### **COURSE STRUCTURE**

(R20 Regulations applicable for the batches admitted from Academic Year 2020-2021)

Sl. No.	Course Code	Title of the Course	L	Т	Р	Credits
1	B20ME42	CAD/CAM	3	0	0	3
2	B20ME43	Instrumentation & Control Systems	3	0	0	3
3		<b>OPEN ELECTIVE-II</b>	3	0	0	3
		<b>PROFESSIONAL ELECTIVE-IV</b>				
1	B20ME44	Production Planning & Control	2	0	0	3
4	B20ME45	Robotics	5	0	U	
	B20ME46	Computational Fluid Dynamics				
		PR0FESSIONAL ELECTIVE-V			0	3
5	B20ME47	Additive Manufacturing	2	0		
5	B20ME48	Mechanical Vibrations	5	0		
	B20ME49	Automobile Engineering				
6	B20ME50	CAD/CAM Lab	0	0	3	1.5
7	B20ME51	Instrumentation & Control Systems Lab	0	0	3	1.5
8	B20ME52	Mini Project & Internship	0	0	0	2
9	B20ME53	Major Project Phase -I	0	0	8	4
		Total	15	00	14	24

#### **VII-SEMESTER**

#### (Applicable for the batches admitted from A.Y. 2020-2021 onwards)

#### VIII-SEMESTER

Sl. No.	Course Code	Title of the Course		L	Т	Р	Credits
1		<b>OPEN ELECTIVE-III</b>		3	0	0	3
		<b>PROFESSIONAL ELECTIVE-VI</b>					3
2	B20ME54	Plant Layout & Material Handling		2	0	0	
2	B20ME55	CNC Technologies		3	0		
	B20ME56	Jet Propulsion & Rocket Engineering					
3	B20ME57	Major Project Phase -II		0	0	16	08
4	B20ME58	Technical Seminar		0	0	2	1
			Total	06	00	16	15

#### **OPEN ELECTIVES OFFERED TO OTHER DEPARTMENTS**

Sl. No.	Course Code	Title of the Course	L	Т	Р	Credits
1	B20ME59	Non-Conventional Energy Sources	3	0	0	3
2	B20ME45	Robotics	3	0	0	3
3	B20ME33	Mechatronics	3	0	0	3

#### VAAGDEVI COLLEGE OF ENGINEERING (AUTONOMOUS) ELECTRICAL AND ELECTRONICS ENGINEERING

#### **COURSE STRUCTURE**

(R20 Regulations applicable for the batches admitted from Academic Year 2020-2021)

R20 B.Tech list of open electives. (Applicable form 2020-2021 admitted batch)

S.No.	Subject	Subject	L	Т	Р	Cre	Offered
1	B20CE55	Disaster Prenaredness & Planning Management	3	0	0		CIVIL
2	B20CE56	Environmental Management	3	0	0	3	CIVIL
3	B20CE57	Urban Planning	3	0	0	3	CIVIL
	B20EE57	Electrical Power Utilisation and Safety	3	0	0	3	FFF
5	B20EE55	Concents of Control systems	3	0	0	3	EEE
5	B20EE55	Panewable Energy Sources	3	0	0	3	EEE
0	D20LE50	Non Conventional Energy Sources	3	0	0	2	MECH
/	B20ME39	Non-Conventional Energy Sources	2	0	0	2	МЕСП
8	B20ME45	Kobotics	3	0	0	3	MECH
9	B20ME33	Niechatronics	3	0	0	3	MECH
10	B20EC37	Digital Image Processing	3	0	0	3	ECE
	B20EC46	Wireless and Mobile Communication	3	0	0	3	ECE
12	B20EC49	Sensor Networks	3	0	0	3	ECE
13	B20EC61	Biomedical Instrumentation	3	0	0	3	ECE
14	B20CS19	Data base Management Systems	3	0	0	3	CSE
15	B20CS12	Java Programming	3	0	0	3	CSE
16	B20CS55	Introduction to Network Security	3	0	0	3	CSE
17	B20CS56	Introduction to Cloud Computing	3	0	0	3	CSE
18	B20CS37	Internet of Things	3	0	0	3	CSE
19	B20CS04	Data Structures and Algorithms	3	0	0	3	CSE
20	B20AI03	Artificial Intelligence	3	0	0	3	CSE(AI&ML)
21	B20AI29	Introduction to Machine Learning	3	0	0	3	CSE(AI&ML)
22	B20AI30	Neural Networks	3	0	0	3	CSE(AI&ML)
23	B20AI31	Introduction to Cyber Security	3	0	0	3	CSE(AI&ML)
24	B20DS24	Introduction to Data science	3	0	0	3	CSE(DS)
25	B20DS25	Data Handling and Visualization	3	0	0	3	CSE(DS)
26	B20DS26	Introduction to Big Data	3	0	0	3	CSE(DS)
27	B20DS27	Introduction to Computer Forensics	3	0	0	3	CSE(DS)
28	B20MB02	Management Science	3	0	0	3	MBA
29	B20MB03	Entrepreneurship Development	3	0	0	3	MBA
30	B20MB06	Intellectual Property Rights	3	0	0	3	MBA

Note: Students should take open electives from the list of open electives offered by the other departments/branches only.

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#### LINEAR ALGEBRA AND CALCULUS

#### **B. TECH- I Semester**

L/T/P/C 3/1 /0 /4

Pre-requisites:

**Course Objectives:** Mathematical Knowledge at pre-university level Objectives To learn

- > Concept of rank of matrix and apply to know the consistency of system of linear equations.
- > To determine Eigen values, Eigen vectors of matrices.
- ➤ Analyse the nature of sequence and series.
- > Geometrical approach to the mean value theorems and their applications.
- > To find extreme value of function of two and three variables.

#### UNIT-I

#### Matrices

Types of Matrices: Symmetric, Skew-symmetric, Hermitian, Skew-Hermitian, orthogonal, Unitary matrices, Rank of a matrix by Echelon form and Normal form, System of linear equations: Solving system of Homogeneous and Non-Homogeneous equations.

#### UNIT-II

#### **Eigen Values and Eigen vectors**

Linear Transformation and Orthogonal Transformation: Eigen values and Eigen vectors and their properties: Diagonalization of a matrix; Cayley-Hamilton Theorem (without proof); finding inverse and power of a matrix by Cayley-Hamilton Theorem;

#### **UNIT-III**

#### **Sequences and Series**

Definitions, limit, Convergent, Divergent and Oscillatory sequences and Series.Comparison test, p-test, D-Alembert's ratio test; Cauchy's Integral test; Cauchy's nth root test. Alternating series: Leibnitz test, Absolute and Conditionally Convergence.

#### UNIT-IV

#### Calculus

Mean value theorems: Rolle's theorem, Lagrange's Mean value theorem with their Geometrical Interpretation and applications, Cauchy's Mean value Theorem. Taylor's Series. Definition of Improper Integral: Beta and Gamma functions and their applications.

#### **UNIT-V**

#### Multivariable calculus (Partial Differentiation and applications)

Definitions of Limit and continuity.Partial Differentiation; Total derivative; Jacobian; Functional dependence and independence, Maxima and Minima of functions of two and three variables using method of Lagrange's method of undetermined multipliers.

#### **COURSE OUTCOMES:**

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

**CO1:** Understand the principles of matrix to calculate the characteristics of system of linear equations using multiple methods.

CO2: Determine Eigen values, Eigenvectors of matrices.

CO3: Analyse the nature of sequence and series to identify the convergence.

**CO4:** Evaluate limits of single-variable functions graphically and computationally. Analyse improper integrals using Beta and Gamma functions.

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**CO5:** Calculate Partial derivatives, extreme of functions of multiple variables.

#### **Text Books**

- 1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 42nd Edition, 2012.
- 2. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John wiley& Sons, 2006.

#### References

- 1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
- 2. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
- 3. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.

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## **ENGINEERING CHEMISTRY**

## **B. TECH- I Semester**

L/T/P/C 3/1 /0 /4

#### Pre-requisites: Course Objectives:

- To bring adaptability to the concepts of chemistry and to acquire the required skills to become a perfect engineer.
- To impart the basic knowledge of surface chemistry and the phases present in the matter which makes the student to understand the technology based on them.
- To acquire the knowledge of electrochemical cells, different batteries, corrosion which are essential for the Engineers in industry water treatment which is essential for the Engineers in industry.
- To acquire the skills and knowledge to organic reactions and importance of polymers in engineering and everyday life.

#### **UNIT-I:**

#### **UNIT-I: Batteries & Corrosion**

Introduction to Electrochemical and Electrolytic cells, Galvanic cell, e.m.f, and Electro chemical seriesapplications. Batteries: primary cells-lithium cells. Secondary cells – Pb-acid storage cell, lithium-ion cells, Fuel cells-hydrogen-oxygen fuel cell. Methanol-oxygen fuel cell-advantages and applications.

**Corrosion:** Introduction, causes of corrosioin, types of corrosion-dry and wet corrosion-mechanism of electrochemical corrosion. Factors affecting on corrosion and corrosion control methods- cathodic protection(sacrificial anodic protection and impressive current cathodic protection) and surface coatings (anodic and cathodic), Methods of application of metal coatings-Hot dipping(galvanization and tinning) and electroplating of copper.

#### **UNIT-II:**

#### Water Technology

Introduction, types of hardness, units and Numerical problems. Estimation of hardness of water-EDTA method. Boiler troubles-scales and sludges. Treatment of Boiler feed water-Ion-exchange process. Desalination of brackish water-Reverse Osmosis. Domestic water treatment-specifications and steps involved in the treatment of potable water.

#### UNIT - III:

#### **Combustion and Fuels**

Combustion- chemistry of combustion, calorific value HCV and LCV its calculations.

Introduction and classifications, characters of good fuel, solid fuels proximate and ultimate analysis and their significance. Liquid fuels- petrolium –refining, cracking and knocking, octane no, cetane no, Bio-diesel – source and transeesterification, applications.

#### **UNIT-IV:**

#### Polymers

Polymers: Introduction to polymers, classification of polymers, types of polymerization, mechanism of free radical addition, ionic polymerization. Plastics: Properties of thermosetting (Bakelite, Nylon)) and thermoplastics (PE, PVC) resins. Conducting polymers - classification, mechanism of conduction in conducting polymers - poly acetylene and ploy aniline, applications.

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#### UNIT-II:

#### Phase rule and Surface Chemistry

Phase rule: Definition of terms, phase rule equation, phase diagrams: one component system – water system, two component system- Ag-Pb system, Iron-carbon phase diagram-cooling curves, annealing and case hardening.

Surface Chemistry: Adsorption-types of adsorption, adsorption isotherms- Freundlich adsorption isotherm, and Langmuir adsorption isotherm, applications of adsorption

#### **Course Outcomes:**

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

CO1: The knowledge of batteries and corrosion.

CO2: The knowledge of water treatment and

CO3: The knowledge of polymers and their uses.

CO4: The required knowledge of principles and concpts f phase rule and surface chemistry.

**CO5:** The knowledge of combustion and fuels.

#### Suggested reading:

- 1. Text book of Engineering Chemistry by Jain & Jain.
- 2. Text book of Engineering Chemistry, CENGAGE learning by Prasanta Rath, B. Ramadevi, Ch. Venkata Ramana Reddy & Subhendu Chakroborty.
- 3. University chemistry, by B. H. Mahan
- 4. (iv)Engineering Chemistry by Shashi Ch

#### B.Tech- MECHANICAL ENGG VAAGDEVI COLLEGE OF ENGINEERING (AUTONOMOUS)

## **ENGINEERING GRAPHICS**

## **B. TECH- I Semester**

L/T/P/C 1/0 /4 /3

## Pre-requisites:

#### **Course Objectives:**

- ➢ Use various engineering drawing instruments.
- Learn the basic convention of drawings, dimensioning, scales and conic sections like ellipse, parabola and parabola.
- > Learn projection of points, lines viewed in different positions.
- > Learn projections of plane surfaces and solids viewed in different positions.
- Gain knowledge of sections of solids and their usage in real time applications and conversion of orthographic projection to isometric projection vice-versa.

#### Unit – I

#### **Introduction to Engineering Drawing:**

Principles of Engineering Graphics and their significance, ISO and ANSI standards for coordinate dimensioning- usage of Drawing instruments, lettering

- a. Conic sections including the Rectangular Hyperbola (General method only);
- b. Roulettes-Cycloid, Epicycloid, Hypocycloid
- c. Involute
- d. Scales Plain, Diagonal and Vernier Scales.

#### Unit –II

Principles of Orthographic Projections in First Angle Projection- Conventions Projections of Points Projection of lines: Parallel, Perpendicular, inclined to one plane and inclined to both the planes.

#### Unit-III

Projection of planes: Plane parallel, perpendicular and inclined to one reference plane. Planes inclined to both the reference planes – Auxiliary Planes;

Projection of Regular Solids-Projection of regular solids, Cube, prisms, pyramids, tetrahedron, Cylinder and cone, axis inclined to one plane and both planes – Auxiliary Views Projections of Regular Solids.

#### Unit-IV

Sections and sectional views of right angular solid-Prism, Cylinder, Pyramid, Cone – Auxiliary Views; Development of surfaces of Right Regular Solids – Prism, Pyramid, Cylinder and Cone.

#### Unit-V

#### **Isometric Projections:**

Chapter-I Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes, Simple and compound Solids; Conversion of Isometric views to Orthographic views and Vice-versa, Conventions.

Chapter-II Overview of Computer Graphics: listing the computer technologies that impact on graphical communication, Demonstrating knowledge of the theory of CAD software -The Menu System, Toolbars Standard, Object Properties, Draw, Modify and Dimension.

#### **TEXT BOOKS**

- 1. Agrawal B & Agrawal C.M. (2012), Engineering Graphics, TMH Publications.
- 2. Bhatt N.D., Panchal V.M. & Ingke P.R., (2014), Engineering Drawing, Charotar Publishing House.

#### REFERENCES

- 1. Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers.
- 2. (Corresponding set of) CAD Software Theory and User Manuals.
- 3. Engineering Graphics. P I Varghese Tata McGraw Hill Education Pvt. Ltd.
- 4. Engineering Drawing P.J.Shan S.Chand Publishers.
- 5. Engineering Drawing Johle/Tata McGraw Hill Book Publishers.

#### **COURSE OUTCOMES:**

The students will be able to

- 1. Analyse the Projections of Points.
- 2. Understand the projections of solids.
- 3. Estimate the use of drawings, dimensioning, scales and conic sections
- 4. Modify the applications of this knowledge in computer graphics.
- 5. Compare the Conversion of Isometric views to Orthographic views

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## PROGRAMMING FOR PROBLEM SOLVING

## **B. TECH- I Semester**

L/T/P/C 4/0 /0 /4

Pre-requisites: Nil

## Course Objectives:

- > To provide the necessary knowledge on general engineering problem solving methodologies.
- To provide necessary foundations for step by step computer program development and to present the basic concepts in C programming language.
- > To prepare the students to write modular and readable C Programs.
- > The Course introduces the essential concepts like abstract data types, user defined data types.
- To analyze the performance of algorithms and how to use such knowledge for later processing with the help of files.
- > Aims to train the students to write working programs to solve problems.

#### UNIT -I

Introduction: Steps in Problem Solving, Algorithms, Flowcharts, Pseudo code, Types of Programming Languages, Introduction to C, History of C, Structure of a C Program.

Introduction to C Programming: The C Character Set, Identifiers and - Keywords, Data Types, Constants and Variables, Declarations, Expressions & Statements, Input / Output Statements (Formatted and Unformatted), Creating and Running a C program.

Operators and Expressions : Unary Operators, Arithmetic Operators, Relational and Logical Operators, Assignment Operators, Conditional operator, Bitwise Operators, special operators, Precedence & Associativity, Type Casting and Type Conversion.

#### UNIT – II

Control Statements: Branching Statements – if, if-else, else- if, nested-if. Switch statement. Un - conditional Branching Statement- goto. Looping Statements- while, do-while, for, nested loops. Break & Continue.

Functions : Introduction, Defining a Function, Types of Functions, Accessing a Function, Function Prototypes, Passing Arguments to a Function – call by value, Recursion.

Storage Classes: Automatic Variables, External (Global) Variables, Static Variables, Register.

#### UNIT – III

Arrays: Definition - Single Dimensional Arrays, Multi Dimensional Arrays, Declaration, Initialization, Reading & Writing elements in to an Array, Passing Arrays to Functions. Linear Search, Binary search, Bubble sort.

Strings: Declaration and Initialization of Strings, Reading and Writing a String, String Manipulation Functions, String as Array of Characters, Array of strings, Sorting of Strings.

Structures and Unions: User-Defined Data Types, Defining a Structure, Processing

Structure, Array of Structures, Nested Structures, Passing Structures To Functions. Unions. Typedef, Enumerated types - enum.

#### UNIT – IV

Pointers: Introduction, Pointer Declarations, Pointer to Pointer, Operations on Pointers -Pointer Arithmetic, Dynamic Memory Allocation – Malloc(), Calloc(), Realloc(), Free(). Pointers and Functions - call by Reference, Pointers and Arrays (one dimensional, two dimensional), Array of Pointers. Structures and Pointers, Self-Referential Structures.

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#### UNIT- V

File Handling: Introduction, Text Files and Binary Files, File Handling Functions-Opening and Closing a File, File Opening Modes, Reading and Writing a File. Random Access File Functions – fseek(), rewind(), ftell(). Command Line Arguments, C Preprocessor Directives.

#### **COURSE OUTCOMES:**

**CO-1:** Understanding how problems are posed and how they can be analyzed for obtaining solutions.

**CO-2**: Learning of sequencing, branching, looping and decision making statements to solve scientific and engineering problems.

CO-3: Implementing different operations on arrays and creating and using of functions to solve problems.

**CO-4:** Understanding and exploring the various methods of memory allocations.

**CO-5:** Ability to design and implement different types of file structures using standard methodology.

#### **TEXT BOOK:**

1. Byron Gottfried, "Programming with C". Third Edition(Schaum's Outlines) McGraw Hill.

#### **REFERENCE BOOKS:**

- 1. B.A. Forouzan and R.F. Gilberg ,"C Programming and Data Structures", Cengage Learning (3rd Edition)
- 2. Pradip Dey & Manas Ghosh, "Programming in C", 2nd Edition, Oxford University Press, 2013.
- 3. E. Balaguruswamy, "Programming in ANSI C", McGraw-Hill Education, 2008.

L/T/P/C 0/0 /3 /1.5

#### B.Tech- MECHANICAL ENGG VAAGDEVI COLLEGE OF ENGINEERING (AUTONOMOUS)

#### ENGLISH LANGUAGE AND INTERACTIVE COMMUNICATIONS SKILLS LAB

## **B. TECH- I Semester**

Pre-requisites: Nil

The *i*-English Skills Lab considers English as a skill and focuses on the production and practice of sounds of the language to familiarize the students with the use of English in everyday situations both in formal and informal contexts.

#### **Course Objectives**

- To facilitate computer-assisted multi-media instruction enabling individualized and independent language learning.
- To sensitize students to the nuances of English speech sounds, stress and intonation to use in day to day situations.
- To enable students to write simple texts with unity, brevity and coherence using apt vocabulary.
- To improve students' IT skills and research skills to search for needed information from the Internet and use it in e-mails.

#### **Course Outcomes**

After completing this course, students will be able to -

**CO1:** understand their strengths and weaknesses in English usage in formal and informal contexts.

CO2: use English comfortably in their individualized contexts.

CO3: use IT skills and research skills in English speaking and writing.

CO4: improve their vocabulary, pronunciation, receptive and expressive skills in English.

#### Learning and Teaching Approaches

The lab uses an integrated approach to language teaching that teaches all four language skills - listening, speaking, reading, and writing in natural settings. Both teachers and students are encouraged to respond through pair and group work with active learning strategies such as role play, debates, presentations, and brainstorming. Instructors and Students are encouraged to use online, print media and electronic media resources in conjunction with the course modules and make the best use of worksheets, quizzes, presentations, discussions, role plays and assignments.

This lab links learning approaches with assessment tasks to provide students with the opportunity to accept responsibility for their own learning. Even if students are unable to communicate fluently in English in the beginning of the course, instructors will use English as the language of instruction. Instead of switching to Telugu or other regional languages when there is a problem communicating to students, teachers are expected to use alternative strategies, such as slowing down, repetition, asking others to explain, using simpler vocabulary or using mind map diagr

#### Syllabus

# *i-English Skills Lab shall have four modules. Module 1: Part – 1 Individualized Speaking Skills*

- 1. I can introduce myself in English when meeting someone for the first time.
- 2. I can talk about familiar, everyday topics: my hobbies and interests.

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- 3. I can talk about familiar, everyday topics: my past experiences.
- 4. I can talk about familiar, everyday topics: my future plans, goals, and predictions.
- 5. I can talk about familiar, everyday topics: my college and stream.
- 6. I can talk about familiar, everyday topics: C-block, my subjects and teachers.
- 7. I can talk about familiar, everyday topics: regional, domestic, and international issues.
- 8. I can ask effective follow-up questions.
- 9. I can ask for and give opinions.
- 10. I can agree with someone politely.
- 11. I can disagree with someone politely.
- 12. I can talk about personal and ethical problems.
- 13. I can talk about solutions to personal and ethical problems.
- 14. I can answer questions from a passport officer.
- 15. I can make a hotel reservation on the telephone.
- 16. I can make a restaurant reservation on the telephone.
- 17. I can order food and drinks on phone / from a waiter at a restaurant.
- 18. I can ask a salesperson at a clothing store for assistance.
- 19. I can ask for directions when I am lost in a new place/city.
- 20. I can give directions to someone who is lost.

#### Part – 2. Towards Ideal English Pronunciation

Introduction to English speech sounds, stress, accent, rhythm and intonation with individualized practice.

#### Module 2: Writing Skills

- 1. I can write the name of my university, college, department, and engineering stream in English.
- 2. I can use Brainstorming and Clustering effectively.
- 3. I can write an introduction for an essay.
- 4. I can write body paragraphs for an essay.
- 5. I can write a conclusion for an essay.
- 6. I can use peer-feedback to rewrite parts of an essay.
- 7. I can rewrite an essay based on feedback received from a teacher.

#### Module 3: IT Skills

- 1. I can submit homework online using e-mail observing e-mail etiquette.
- 2. I can view homework feedback and complete follow-up online exercises using the suggested websites.

#### **Module 4: Research Skills**

- 1. I can identify a research question and develop survey questions individually.
- 2. I can identify a research question and develop survey questions as a member of a group.
- 3. I can conduct research by gathering survey data from others.
- 4. I can analyze results by ranking / tabulating survey data.
- 5. I can present survey findings individually to peers.
- 6. I can present survey findings as a member of a group to peers.

#### Minimum Requirement of infrastructural facilities for *i*-English Skills Lab:

The *i*-English Skills Lab needs to have space in the middle with movable chairs, tables for interaction and audio-visual aids with a Public-Address System, an LED TV and a projector.

The Lab has to accommodate 40 students with 40 systems, with one Master Console, LAN facility and English language learning software for self- study by students. The computer systems are to be networked with LAN to connect teachers with the students systems to transfer materials and to monitor student activities. High fidelity headphones with microphones are to be provided for students for individualized learning.

#### **B.Tech-** MECHANICAL ENGG

## The Academic Honesty Policy of BSH department for English Classes

The following will be considered violations of our academic honesty policy:

- 1. Copying answers from another student's exercise, quiz, etc. before or during class.
- 2. Showing your exercise, quiz, etc. to another student before or during class.
- 3. Using any form of 'cheat sheet' in performing an exercise, quiz, etc.
- 4. Taking copies of an exercise, quiz, etc. (including unused copies) outside of the classroom. (This includes taking pictures of the exercise, quiz, etc.)
- 5. Copying answers from another student's exercise, quiz, etc. while it is being administered.
- 6. Copying any portion of a homework exercise from another student.
- 7. Allowing any portion of your homework exercise to be copied by another student.
- 8. Copying (or closely paraphrasing) portions of a homework assignment from other sources (printed matter, the Internet, etc.) and presenting it as your own, regardless of whether you acknowledge the source. This includes using translation software to translate any portion of your submission into English.
- 9. Sharing Gmail User ID's or Passwords with another student.

Any of the above violations will result in a score of 0 for ALL exercises on that day.

#### **Distribution and Weightage of Marks**

Instructors use a variety of assessments in this course to assess learning. It is recommended that the lab work counts at least 50 per cent of students' final grades. Instructors advise the students for the assignments during the lab work that are to be graded. The remaining of the grades will be determined by mid-semester and end-semester examinations. The practical examinations for the lab practice shall be conducted as per the college norms prescribed for the core engineering practical sessions.

For the *i*-English Skills lab sessions, there shall be continuous evaluation during the year for 50 sessional marks and 50 end-semester examination marks. Of the 50 marks, 30 marks shall be awarded for day-to-day work and 20 marks to be awarded by conducting internal lab test(s). The end– semester examination shall be conducted by the teacher concerned, by inviting the external examiner. In case of the non-availability of the external examiner, other teacher of the same department can act as the external examiner.

#### **R20** Regulations

#### B.Tech- MECHANICAL ENGG VAAGDEVI COLLEGE OF ENGINEERING (AUTONOMOUS)

## PROGRAMMING FOR PROBLEM SOLVING LAB

#### **B. TECH- I Semester**

L/T/P/C 0/0 /3 /1.5

## Pre-requisites: Nil

## **Course Objectives:**

- > To provide the necessary knowledge on general engineering problem solving methodologies.
- To provide necessary foundations for step by step computer program development and to present the basic concepts in C programming language.
- > To prepare the students to write modular and readable C Programs.
- The Course introduces the essential concepts like abstract data types, user defined data types.
- > To analyze the performance of algorithms and how to use such knowledge for later processing with the help of files.
- > Aims to train the students to write working programs to solve problems.

## WEEK-1

Write a C program to find the areas of shapes like circle, square, rectangle and triangle

Write a C program to demonstrate Type Casting and Type Conversion.

WEEK-2

- 2.a) Write a C program to find the roots of a quadratic equation.
- 2.b) Write a C program to find greatest of any 3 numbers.
- 2.c) 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)

#### WEEK-3

Fibonacci sequence is defined as follows: the first and second terms insequence are 0 and 1.

Subsequent terms are found by adding the preceding two terms in the sequence. Write a C

program to generate the first n terms of the sequence.

A positive integer d is said to be a factor of another positive integer N if when N is divided by d, the remainder obtained is zero. For example, for number 12, thereare

6 factors 1, 2, 3, 4, 6, 12. Every positive integer k has at least two factors, 1 and the number k itself.Given two positive integers N and k, write a program to print the kth largest factor of N.

Input Format: The input is a comma-separated list of positive integer pairs (N, k).

#### **Output Format:**

The k<sup>th</sup> highest factor of N. If N does not have k factors, the output should be 1. **Constraints:** 

- 1<N<1000000000
- 1<k<600.

You can assume that N will have no prime factors which are larger than 13.

- Input: 12,3
- Output: 4

Write a C program to find the second largest number in a set of n numbers.

#### WEEK-4

Write a C program to generate Pascal's triangle.

Write a C program to find the LCM(Least Common Multiple) and GCD

(greatest common

divisor) of two given integers.

Write a C program to generate all the prime numbers between 1 and n, where n is a value

supplied by the user.

#### WEEK-5

Write a C program to find sum of series  $1+x^{1}+x^{2}+x^{3}+...+x^{n}$  using functions.

Write a C program to find factorial of a given number using Recursion. 5.c) Write a C program to demonstrate the use of Storage Classes

#### WEEK-6

Write a C program to find both the largest and smallest number in a list of integers.

N monkeys are invited to a party where they start dancing. They dance in a circular formation, very similar to a Gujarati Garba or a Drum Circle. The dance requires the monkeys to constantly change positions after every 1 second.

The change of position is not random & you, in the audience, observe a pattern. Monkeys are very disciplined & follow a specific pattern while dancing. Consider N = 6, and an array monkeys =  $\{3,6,5,4,1,2\}$ .

This array (1-indexed) is the dancing pattern. The value at monkeys[i], indicates the

new of position of the monkey who is standing at the ith position.

Given N & the array monkeys[], find the time after which all monkeys are in the initial positions for the 1st time.

#### Constraints

1<=t<=10 (test

cases)

1<=N<=10000 (Number of

#### monkeys) Input Format

First line contains single integer t, denoting the number of test

cases. Each test case is as follows -

Integer N denoting the number of monkeys.

Next line contains N integer denoting the dancing pattern array, monkeys[].

## Output

t lines,

Each line must contain a single integer T, where T is the minimum number of seconds after which all the monkeys are in their initial position

Write a C program to insert an element at a given position in an Array using functions.

#### B. Tech- MECHANICAL ENGG

#### WEEK-7

7. Write a C program to perform all of the following:

- a) Matrix Addition and subtraction
- b) Matrix Multiplication
- c) Find Transpose and test if a matrix is symmetric or not
- d) A traditional chess board consists of 8 rows and 8 columns. Write a program to count the number of safest places that a King can be positioned when 3

queens (ministers) are placed at different positions on the chess board.

#### WEEK-8

8.a) Write a C program to perform linear

search 8.b) Write a C program to perform

binary search

8.c) Write a C program to sort the elements using bubble

sort WEEK-9

Write a C program to insert a sub-string in to a given main string at a given position.

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#### B. Tech- MECHANICAL ENGG VAAGDEVI COLLEGE OF ENGINEERING (AUTONOMOUS)

## **ENGINEERING WORKSHOP**

## B. TECH- I Semester(Civil, Mechanical, EEE)

Pre-requisites: Nil

## **Course Objectives:**

- $\blacktriangleright$  Know the usage of various tools and their application in carpentry, tin smithy.
- Know the usage of various tools and their application in black smithy, foundry, welding and house wiring.
- > Make lap joint and dove tail joint in carpentry.
- > Make scoop, funnel and tray like items in tin smithy.
- ➤ Use one way, two-way switches, parallel and series connections in house wiring.
- ➤ Know the basics of welding.

## UNIT – I

**TRADES FOR EXERCISES:** (Any six trades from the following for Mechanical Engineering Branch & Any four trades for all other Branches with minimum of two exercises in each trade)

- 1. Carpentry
- 2. Fitting
- 3. Tin Smithy
- 4. Black Smithy
- 5. House wiring
- 6. Foundry
- 7. Plumbing
- 8. Soldering

#### UNIT – II

#### TRADES FOR DEMONSTRATION & EXPOSURE

- 1. Demonstration of Power tools & wiring
- 2. Welding.
- 3. Machine Shop

#### UNIT – III

IT WORKSHOP I: Computer hardware, identification of parts, Disassembly, Assembly of computer to working condition, simple diagnostic exercises. IT WORKSHOP II: Installation of operating system windows and Linux simple diagnostic exercises.

#### **TEXTBOOKS:**

- 1. Workshop Manual P.Kannaiah / K.L.Narayana/Scitech Publishers.
- 2. Workshop Manual Venkat Reddy/BS Publication / 6th Edition.

#### **COURSE OUTCOMÉS**:

The students will be able to

CO1: Know the fundamental knowledge of various trades and their usage in real time Applications.

CO2: Compare Foundry, Welding, Black smithy, Fitting, Machine shop and house wiring.

**CO3**: Understand the basis for analyzing power tools in construction and wood working, electrical engineering and mechanical engineering.

CO4: Apply basic concepts of computer hardware for assembly and disassembly.

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**R20** Regulations

L/T/P/C 0/0 /2 /1

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#### B.Tech- MECHANICAL ENGG VAAGDEVI COLLEGE OF ENGINEERING (AUTONOMOUS)

## **INDUCTION PROGRAMME**

## **B. TECH- I Semester**

L/T/P/C 0/0 /0 /0

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#### B. Tech- MECHANICAL ENGG R20 Regulations VAAGDEVI COLLEGE OF ENGINEERING (AUTONOMOUS)

## DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS

#### **B. TECH- II Semester**

L/T/P/C 3/1 /0 /4

Pre-requisites: Mathematical Knowledge at pre-university level Course Objectives:

To learn

- > Methods of solving the applications of differential equations.
- > To solve initial value problems using differential equations.
- > Evaluation of multiple integrations and their applications
- > The physical quantity involved in Engineering field related to vector field.
- > To apply fundamental theorems of vectors integrations in their applications.

#### **UNIT-I: First Order ODE**

Exact, Non-Exact, linear and Bernoulli's equations, Applications: Newton's law of cooling, Law of Natural growth and decay.

#### **UNIT-II: Ordinary Differential Equations of Higher Order**

Second order linear differential equations with constant coefficients: Non-Homogeneous terms of the type  $e^{ax}$ , sin ax, cos ax, polynomials in x,  $e^{ax}V(x)$ ; method of variation of parameters.

#### **UNIT-III: Multivariable Calculus (Integration)**

Evaluation of Double Integrals (Cartesian and polar coordinates), Change of order of integration (only Cartesian form); Evaluation of Triple Integrals: Change of variables (Cartesian to polar) for double.

#### **UNIT-IV: Vector Differentiation**

Vector point functions and scalar point functions. Gradient, Divergence and Curl.Directional derivatives, Tangent plane and normal line.Scalar potential functions. Solenoidal and Irrotational vectors.

#### **UNIT-V: Vector Integration**

Line, Surface and Volume Integrals. Theorems of Green, Gauss and Stokes (without proofs) and their applications.

#### **COURSE OUTCOMES:**

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

- CO1: Apply the fundamental concepts of ordinary differential equations toreal time problems.
- **CO2:** Find the complete solution of a non homogeneous differential equations and applying its concepts in solving physical problems of Engineering.
- CO3: Evaluate the multiple integrals in various coordinate systems.
- CO4: Apply the concepts of gradient, divergence and curl to formulate Engineering problems.
- CO5: Analyse line, surface and volume integrals using fundamental theorems.

#### **TEXT BOOKS**

- 1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 42<sup>nd</sup> Editions, 2012.
- 2. Erwin kreyszig, Advanced Engineering Mathematics, 9<sup>th</sup> Edition, John Wiley & Sons, 2006.

#### REFERENCES

- 1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9<sup>th</sup> Edition, Pearson, Reprint, 2002.
- 2. Paras Ram, Engineering Mathematics, 2<sup>nd</sup> Edition, CBS Publishers
- 3. S.L. Ross, Differential Equations, 3<sup>rd</sup> Ed., Wiley India, 1984.

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#### B. Tech- MECHANICAL ENGG VAAGDEVI COLLEGE OF ENGINEERING (AUTONOMOUS)

#### **ENGINEERING PHYSICS**

## **B. TECH- II Semester**

L/T/P/C 3/1 /0 /4

#### **Course Objectives:**

- The course aims at making students to understand the basic concepts of principles of Physics in a broader sense with a view to lay foundation for the various engineering courses.
- Students will be able to demonstrate competency and understanding of the concepts in Mechanics, Rigid body dynamics, ultrasonic, Lasers and semiconductor physics, a broad base of knowledge in Physics
- The main purpose of this course is to equip engineering undergraduates with anunderstanding of the scientific method, so that they may use the training beneficially in their higher pursuits
- > Hence Physics the foundation on which stands the elaborate structure of technology

#### Unit I: Lasers

Characteristics of lasers, absorption, spontaneous emission, stimulated emission. Einstein's theory of matter radiation interaction and A and B Coefficients; amplification of light by population inversion, Ruby laser, He-Ne laser, CO<sub>2</sub> laser, applications of lasers in science, Engineering and Medicine.

#### Unit II: Physics of Semi-Conductor Opto-electronics:

Classification of materials in to conductors, semi- conductors and insulators, calculation of carrier concentration in intrinsic and extrinsic (N-type) semiconductors, Direct and indirect band gap semiconductors. Energy diagram of P-N diode, LED, Types of semiconductor photodetectors, working principles and characteristics of PIN diode, Solar Cell.

#### Unit III: Mechanics

Transformation of scalars and vectors under Rotation transformation; Forces in Nature; Newton's laws and its completeness in describing particle motion; Form invariance of Newton's Second Law; Solving Newton's equations of motion in polar coordinates.

#### Unit IV: Ultrasonics - Nondestructive testing (NDT) of materials

Introduction, Production of ultrasonic waves, Magnetostriction method, piezoelectric method, detection of ultrasonic waves, properties of ultrasonic weaves, Applications of ultrasonic: SONAR, cavitation, drilling, sonogram.

Ultrasonic transducer- ultrasonic flaw detector: Pulse echo system, transmission.

#### Unit V: Rigid body dynamics

Definition and motion of a rigid body in the plane; Rotation in the plane; Kinematics in a coordinate system rotating and translating in the plane; Angular momentum about a point of a rigid body in planar motion;

#### **COURSE OUTCOMES:**

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

CO1: Learns about transformation concepts in Mechancis

**CO2:** Gains knowledge on basics of rigid body dynamics and lasers which leads to new innovations and improvements

**CO3:** The knowledge of physics relevant to engineering is critical for converting ideas into technology.

**CO4:** An understanding of Physics also helps engineers understand the working and limitations of existing devices and techniques, which eventually leads to newinnovations and improvements.

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#### **TEXT BOOKS**

- 1. M N Avadhaulu, P G Kshirsagar, "A Text book of Engineering Physics", S Chand & Co., New Delhi 2011
- 2. V Rajendran, "Engineering Physics," Tata McGraw Hill Publishing Co Ltd, New Delhi 2012
- 3. P K Palani Swami, "Modern Engineering Physics", Siltech Publications
- 4. R K Gaur, S L Gupta, "Engineering Physics", Dhanpat Rai 2013

#### REFERENCES

- 1. D. S Mathur, "Properties of Matter", S Chand & Co., New Delhi 2012
- 2. R C Hibbeller. "Engineering Mechanics: Combined static and synamics", Prentice Hall, 2010
- 3. Vela Murali, "Engineering Mechanics", Oxford University Press 2010
- 4. A Nelson, "Engineering Mechanics: Statics and Dynamics", Tata McGraw Hill Publishing. Ltd New Delhi 2017

#### B. Tech- MECHANICAL ENGG VAAGDEVI COLLEGE OF ENGINEERING (AUTONOMOUS)

## **ENGINEERING MECHANICS**

## **B. TECH- II Semester**

L/T/P/C 3/1 /0 /4

## Pre – Requisites: None

#### **Course Objectives:**

- To know about the system of forces and their conditions for the equilibrium of particles and rigid bodies.
- To develop capacity to predict the effect of centroid and Moment of Inertia for carrying out the design functions of engineering.
- To gain knowledge by applying concepts and principles for engineering problems and also this course will be act as basics for core engineering study.

#### UNIT – I

**Introduction to Engineering Mechanics** – Basic Concepts - Resultants of Force System: Parallelogram law – Forces and components- Resultant of Coplanar Concurrent Forces – Components of Forces in Space – Moment of Force - Principle of moments – Coplanar Applications – Couples - Resultant of any Force System.

**Equilibrium of Force Systems:** Free Body Diagrams, Equations of Equilibrium-Equilibrium of Planar Systems- Equilibrium of Spatial Systems.

#### UNIT – II

**Friction:** Introduction – Theory of Friction – Angle of friction – Laws of Friction – Static and Dynamic Frictions – Motion of Bodies: Wedge, Screw, Screw-jack, and Differential Screw-jack.

#### 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.

**Moments of Inertia:** Definition – Polar Moment of Inertia –Radius of gyration- Transfer formula for moment of inertia - Moments of Inertia for Composite areas - Products of Inertia, Transfer Formula for Product of Inertia.

**Mass Moment of Inertia:** Moment of Inertia of Masses- Transfer Formula for Mass Moments of Inertia - Mass Moment of Inertia of composite bodies.

#### UNIT - IV

**Kinematics:** Motion of a particle – Rectilinear motion – motion curves – Rectangular components of curvilinear motion– Kinematics of Rigid Body - Types of rigid body motion - Angular motion - Fixed Axis Rotation

**Kinetics:** Translation - Analysis as a Particle and Analysis as a Rigid Body in Translation – Equations of plane motion - Angular motion - Fixed Axis Rotation – Rolling Bodies.

#### UNIT – V

**Work - Energy Method:** Work Energy Equations for Translation – Work Energy Applications to Particle Motion – Work Energy applied to Connected Systems - Work Energy applied to Fixed Axis Rotation and Plane Motion. Impulse and Momentum.

#### **COURSE OUTCOMES:**

The students will be able to

CO1: Understand the basic concepts of engineering mechanics and force Systems.

**CO2** : Calculate the friction developed in motion of bodies.

#### B. Tech- MECHANICAL ENGG

**CO3**: Calculate centroid and moment of inertia for simple and composite bodies. **CO4**: Apply the concepts of mechanics for solving problems of particles and rigid body motion **CO5** : Understand the Work Energy method for plane motion

#### **TEXT BOOKS:**

- 1. Timoshenko S, Young D.H, Rao J. V, Sukumar Pati Engineering Mechanics, 5th Edition, McGraw Hill Education, 2017
- 2. Ferdinand. L. Singer, Engineering Mechanics Statics and Dynamics, 3<sup>rd</sup> Edition, Harper International Edition, 1994.

#### **REFERENCES:**

- 1. Irving H. Shames, Engineering Mechanics, 1<sup>st</sup> Edition, Pearson, 2011
- YVD Rao, K. Govinda Rajulu, M. Manzoor Hussain, A Textbook of Engineering Mechanics, 1<sup>st</sup> Edition, Academic Publishing Company, 2016
- 3. M.V. Seshagiri Rao & D Rama Durgaiah, Engineering Mechanics, Universities Press, India, 2005
- 4. Tayal, A.K , Engineering Mechanics Statics and dynamics, 14<sup>th</sup> edition, Umesh Publication, Delhi, 2012.
- 5. K. L. Kumar, Vennu kumar, Engineering Mechanics,4<sup>th</sup> Edition,Tata McGraw-Hill Education (India) Pvt Limited, 2011
- 6. S. S. Bhavikatti, Fundamentals of Engineering Mechanics, 3<sup>rd</sup> Edition, New Academic Science, 2011

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**R20** Regulations

L/T/P/C 1/0 /2 /2

#### B. Tech- MECHANICAL ENGG VAAGDEVI COLLEGE OF ENGINEERING (AUTONOMOUS)

## INTRODUCTION TO PYTHON PROGRAMMING

## **B. TECH- II Semester**

Pre-requisites: None

## **Course Objectives:**

The purpose of the course is to make students

- To develop basic Python programs
- > To develop Python programs with conditional statements
- > To develop Python Programs with looping statements.
- > To develop Python functions and call them.
- > To get exposure to various problems solving approaches of computer science

#### Unit – I

Introduction to Python: What is Python?, What is Python Good For?, Python History, How does Python Execute a Program, Review of a Simple Program, Some of the Basic Commands. Statements, Input/Output Operations.

#### Unit – II

Keywords, Variables, Assigning values, Standard Data Types, Strings, Operands and operators. Understanding the Decision Control Structures: The if Statement, A Word on Indentation, The if ... else Statement, The if ... else Statement.

#### Unit – III

Loop Control Statements: The while Loop, The for Loop, Infinite Loops, Nested Loops. The break Statement, The continue Statement, The pass Statement, The assert Statement, The return Statement.

#### Unit – IV

Functions- Function Definition and Execution, Scoping, Arguments: Arguments are Objects, Argument Calling by Keywords, Default Arguments, Function Rules, Return Values.

#### Unit – V

Advanced Function Calling: The apply Statement, The map Statement, Indirect Function Calls, Anonymous Functions.

Modules: Importing a Module, Tricks for Importing Modules, Packages.

#### **Course Outcomes:**

CO1: Defining the fundamentals of writing Python scripts

CO2: Expressing the Core Python scripting elements such as variables and conditional control structures

**CO3:** Implement the Python scripting using looping statements.

CO4: Apply Python functions to facilitate code reuse

**CO5:** Extending how to work with modules and packages.

#### **Text Books:**

- 1. The Complete Reference-Python by Martin C. Brown, Mc Graw Hill
- 2. Python Bible- Complete Python Language Reference by Dave Brueck and Stephen Tanner **Reference Books:** 
  - 1. Python Programming for Beginners by Adam Stewart
  - 2. Python Essential Reference (3rd Edition) by David M. Beazleyf

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#### B.Tech- MECHANICAL ENGG VAAGDEVI COLLEGE OF ENGINEERING (AUTONOMOUS)

## **BASIC ELECTRICAL & ELECTRONICS ENGINEERING**

## **B. TECH- II Semester**

L/T/P/C 3/0 /0 /3

## Pre-requisites: None

#### **Course objectives:**

## In this course it is aimed to introduce

- > The basic concepts of electrical circuits which is the foundation for network theory
- > To understand about single phase AC circuits.
- > To understand functioning of different types of DC machines and transformers.
- > To understand the various operations of transistors and special purpose diodes
- > To learn basic concepts of diodes, Rectifiers and filters.

UNIT-I: Electrical Circuits: Circuits concept, R-L-C Parameters. Voltage and Current Source Transformation. V–I relationship for Passive elements, Kirchoff's Laws. sources. techniques series. parallel, star-delta Network reduction \_ series parallel, & star-delta transformations, Nodal Analysis, Mesh analysis with DC excitations. Network Theorems -Maximum Thevenin's. Norton's. Power Transfer. Superposition, Reciprocitv Theorems with DC excitation Calculation of Power (VI)

**UNIT-II**:Single Phase AC Circuits - R.M.S. and Average values, Form Factor, steady state analysis of series, Parallel and Series parallel Combinations of R, L and C with Sinusoidal excitation concept of reactance, Impedance, Susceptance and Admittance –Concept of Power Factor.

**UNIT-III:**Transformers and DC Machines:: D.C.Machines: Constructional features, Methods of Excitation, E.M.F. Equation and Applications, Torque development in D.C motor Characteristics of DC motors, losses, Efficiency, Speed control of DC Shunt motors Role of Transformers in the fields of engineering, Transformer principle, Ideal and Practical Transformers Equivalent circuit, Regulation and Efficiency.

**UNIT-IV:**P-N Junction Diode - Diode equation, V-I characteristic, Temperature dependence, Bipolar Junction Transistor (BJT) - Construction, Principle of Operation, CB,CE and CC configurations, Zener Diode, Zener diode characteristics, Use of Zener diode as simple regulator.

## UNIT-V:

Operational amplifier basics, op amp inverting and Non Inverting amplifier, Rectifiers and Filters - The P-N junction as a rectifier - A Half Wave Rectifier, Bridge Rectifier, Filters –Inductor Filters, Capacitor Filters.

## **COURSE OUTCOMES:**

#### After Completion of the course, the students will be able to

**CO1:** Analyze circuit theorems, mesh and nodal analysis, series and parallel networks, Electrical power. **CO2:** Gain knowledge on AC circuits, reactance, Impedance, Susceptance and Admittance and Power Factor

**CO3:** Learn the working principle of DC motors, Transformers

CO4: Study the characteristics of PN Junction diode and zener diode

CO5: Learn the basic of Amplifiers and Rectifiers.

## **TEXT BOOKS:**

- 1. Circuit Theory Analysis and Synthesis by A Chakrabarti, Dhanpat rai & co.
- 2. Basic Electrical Engineering, P Ramana, M. Suryakalavathi, G. T. Chandra Sekhar,1st Edition, S. Chand Technical Publications, 2018
- 3. Electronic Devices and Circuits, S. Salivahanan and N Suresh Kumar, 3rd Edition TMH, Revised 2019

#### **REFERENCES:**

- 1. Network Analysis by M.E Van Valkenburg, Pearson Publications 3<sup>rd</sup> Edition
- 2. Principles of electrical machines by V K Mehta, S Chand Publications
- 3. Electronics devices and circuits by I J NagrathPHI Publications

#### BASIC ELECTRICAL & ELECTRONICS ENGINEERING LAB mester L/T/P/C

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0/0 /3 /1.5

**B. TECH- II Semester** 

#### Pre-requisites: None

#### **Course objectives:**

- Impart a basic knowledge of electrical quantities such as current, voltage, power, energy and frequency to understand the impact of technology in a global and societal context.
- Provide working knowledge for the analysis of basic DC circuits used in electrical and electronic devices.
- > To explain the working principle, construction, applications of DC machines
- > Highlight the operation of diodes, transistors, rectifiers and filters.

#### List of Experiments

- 1. Verification of Kirchhoff's Laws.
- 2. Verification of Superposition and Reciprocity Theorems.
- 3. Verification of Thevenin's and Maximum Power transfer theorem.
- 4. Speed Control of DC Shunt Motor.
- 5. Swinburne's Test on DC shunt machine.
- 6. Brake test on DC shunt motor.
- 7. OC & SC tests on single phase transformer.
- 8. PN Junction Diode characteristics (Forward bias & Reverse bias).
- 9. Transistor CE Characteristics (Input and Output)
- 10. Rectifier with and without filters (Full wave & Half wave)

#### **COURSE OUTCOMES:**

#### After the course completion, the students are able to

- CO1: Learn to simplify complex electric and electronic circuits by applying the KVL and KCL laws
- CO2: Identify the optimal loading onmachines.
- CO3: Analyze the performance of DC machines
- CO4: Identify and analyze the performance and operation of semi conducting devices.

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#### B. Tech- MECHANICAL ENGG VAAGDEVI COLLEGE OF ENGINEERING (AUTONOMOUS)

#### PHYSICS LAB

#### **B. TECH- II Semester**

## Pre-requisites: None

#### **Objectives:**

- The purpose of doing experiments in the laboratory is not simply to verify a principle but also to explore the related phenomena and to find their applicability. The students are suggested to work in this direction and get benefit out of it.
- > To get practical knowledge which is related to the engineering course in the development of new technologies.
- > To impart fundamental knowledge in handling the equipments in Physics laboratory.

#### S.No

## Name of the Experiment

- 1 Torsional Pendulum- Determination of rigidity modulus of materials of a wire
- 2 Determination of energy gap of material of a p-n junction
- 3 Study of LED diode V-I and P-I characteristics
- 4 Study of LASER diode V-I and L-I characteristics
- 5 Bending losses of optical fibres and evaluation of numerical aperture of a given optical fibre
- 6 Study of decay charge & determination of time constant of RC circuit
- 7 Study of characteristics of Solar cell
- 8 Determination of wavelength of laser source- Diffraction grating
- 9 Determination of frequency of AC supply Sonometer
- 10 Determination of wavelength of monochromatic source using diffraction grating

#### **COURSE OUTCOMES:**

**CO1:** The laboratory course helps the student how to operate different equipments related to engineering. It also allows the student to develop experimental skills to design new experiments in engineering

**CO2:** The course enlightens the student about modern equipment like Solar cell, Optical fibres etc. **CO3:** With the exposure to these experiments, the student can compare the theory and correlate with experiment

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#### L/T/P/C 0/0 /3 /1.5

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#### B.Tech- MECHANICAL ENGG VAAGDEVI COLLEGE OF ENGINEERING (AUTONOMOUS)

## NSS/NCC

**B. TECH- II Semester** 

L/T/P/C 0/0 /2 /0

#### B.Tech- MECHANICAL ENGG VAAGDEVI COLLEGE OF ENGINEERING (AUTONOMOUS)

## METALLURGY AND MATERIAL SCIENCE

#### **B.Tech: III-Semester**

L /T/ P/C 3/ 0 / 0 /3

#### Pre-Requisites: None COURSE OBJECTIVES:

- > To understand the bond formation, grains and grain boundaries in crystalline metals
- Develop new materials using equilibrium diagram and lever rule applicable in calculating the liquid and solid percentage.
- > To apply heat treatment process to different materials to get required properties.
- > To Gain knowledge about advanced materials like composites and ceramics.
- > To know the selection of heat treatment processes for different materials.
- > To study the properties & applications of cast iron & steels.

#### UNIT – I

**Structure of Metals:** Bonds in Solids – Metallic bond - crystallization of metals, grain and grain boundaries, effect of grain boundaries on the properties of metal / alloys – determination of grain size.

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

#### UNIT –II

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

#### UNIT –III

**Cast Irons and Steels:** Structure and properties of White Cast iron, Malleable Cast iron, Grey cast iron, Spheroidal graphite cast iron, Alloy cast irons. Classification of steels, structure and properties of plain carbon steels, Low alloy steels, High alloy steels, tool and die steels.

#### UNIT – IV

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

**Non-ferrous Metals and Alloys:** Structure and properties of copper and its alloys, Aluminum and its alloys, Titanium and its alloys.

#### UNIT – V

**Ceramic materials:** Crystalline ceramics, glasses, cermets, abrasive materials, nonmaterial's – definition, properties and applications of the above.

**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 C - C composites.

#### **TEXT BOOKS:**

1. Introduction to Physical Metallurgy / Sidney H. Avener.

2. Material Science & Metallurgy / Kodgire

#### **REFERENCE BOOKS:**

## B.Tech- MECHANICAL ENGG

- 1. Science of Engineering Materials / Agarwal
- 2. Materials Science / Vijendra Singh
- 3. Elements of Material Science / V. Rahghavan
- 4. An introduction to Material Science / W.G.Vinas & H.L. Mancini
- 5. Material Science & Material / C.D.Yesudian & Harris Samuel
- 6. Engineering Materials and their Applications R. A Flinn and P K Trojan / Jaico Books.

#### **COURSE OUTCOMES:**

- The students will be able to
- CO1: Understand the bond formation, grains and grain boundaries in crystalline metals.
- CO2: Apply lever rule in calculating the liquid and solid percentage.
- CO3: Apply heat treatment processes to different materials to get required properties.
- CO4: Gain knowledge about advanced materials like composites & ceramics.
- CO5: Analyze the applications and the properties of cast irons and steels.

#### B.Tech- MECHANICAL ENGG VAAGDEVI COLLEGE OF ENGINEERING (AUTONOMOUS)

#### **MECHANICS OF SOLIDS**

#### **B.Tech: III-Semester**

L/T/P/C 3/0/0/3

#### Pre Requisites: ENGINEERING MECHANICS-I & II COURSE OBJECTIVES:

- ➢ Gain a fundamental understanding of the concepts of stress and strain by analysis of solids and structures.
- > Learn shear force & bending moment concept for different beams under different loads.
- > Learn bending stress & shear stress concept for different beams under different loads.
- Learn the concept of deflection & slope of the different beams.
- ▶ Learn the concept of stresses in thin & thick cylinders.

#### UNIT-I

**SIMPLE STRESSES AND STRAINS :** Elasticity and plasticity – Types of stresses and strains – Hooke's law – stress – strain diagram for mild steel – Working stress – Factor of safety – Lateral strain, Poisson's ratio and volumetric strain – Elastic modulus and the relationship between them – Bars of varying section – composite bars – Temperature stresses.

#### UNIT-II

**SHEAR FORCE AND BENDING MOMENT :** Definition of beam – Types of beams – Concept of shear force and bending moment – S.F and B.M diagrams for cantilever, simply supported and overhanging beams subjected to point loads , UDL, gradually varying loads and combination of these loads – Point of contra flexure – Relation between S.F., B.M and rate of loading at a section of a beam.

#### UNIT-III

**FLEXURAL STRESSES:** Theory of simple bending – Assumptions Derivation of bending equation: M/I=f/y=E/R, Neutral axis – Determination of bending stresses – section modulus of rectangular and circular sections (Solid and Hollow), I, T, Angle and Channel sections – Design of simple beam sections. SHEAR STRESSES: Derivation of formula – Shear stress distribution across various beam sections like rectangular, circular, triangular, I, T.

#### UNIT-IV

**TORSION OF CIRCULAR SHAFTS**: Theory of Pure Torsion- Derivation of Torsion equation:  $T/J=q/r=N\theta/L$ - Assumptions made in the theory of pure torsion- Torsional Moment of resistance – Polar Section modulus- Power transmitted by shafts- Combined bending , torsion and end thrust- Design of shafts according to theories of Failure.

THIN CYLINDERS : Thin seamless cylindrical shells – Derivation of formula for longitudinal and circumferential stresses – hoop, longitudinal and Volumetric strain – changes in diameter, length and volume of thin cylinders – Riveted boiler shells – Thin spherical shells.

THICK CYLINDERS – lame's equation – cylinders subjected to inside and outside pressures – compound cylinders.

#### UNIT-V

**DEFLECTION OF BEAMS** : Bending into a circular arc – slope, deflection and radius of curvature – Differential equation for the elastic line of a beam – Double integration Determination of slope and deflection for cantilever and simply supported beams subjected to point loads, - U.D.L. gradually varying load. Mohr's theorems – Moment Area method – application to simple cases including overhanging beams.
### B. Tech- MECHANICAL ENGG

### **TEXT BOOKS :**

- 1. Strength of Materials by Andrew Pytel and Ferdinond L. Singer Longman
- 2. Strength of Materials by Jondar : Galgotia Publications
- 3. Strength of Materials by Ramamrutham.

#### **REFERENCES :**

- 1. Strength of Materials by Bansal, Lakshmi Publications
- 2. Strength of Materials by S. Tumoshenko
- 3. Strength of Materials by R.S. Khurmi; S. Chand & Co. 2005

#### **COURSE OUTCOMES:**

The students will be able to

CO1: Understand the concepts of stress and strain in mechanics of solids and material properties.

**CO2:** Apply the fundamental concepts of shear force & bending moment for Cantilever beam, simply supported beam & overhanging beam with point loads, UDL, gradually varying loads & their combination.

CO3: Apply the fundamental concepts of Bending stresses & shear stresses for different Beams.

**CO4:** Apply the different methods to determine the deflection & slope of different beams like double integration method, Area moment method & Macaulay's method

**CO5:** Apply the Lame's equation to determine stresses in Thick cylinders and to understand the concept of torsion and its application to circular shafts.

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### THERMODYNAMICS

### **B.Tech: III-Semester**

L/T/P/C 3/0/0/3

# **Pre-Requisites:** None **COURSE OBJECTIVES:**

- To Understand basic concepts of thermodynamics like system, property, state, process, cycle and continuum.
- To Know the concept of quasi-static process, reversibility, causes of irreversibility and understand the concept of temperature through Zeroth law of thermodynamics.
- > To apply first law of thermodynamics for different thermal systems and understand the concept of entropy through second law of thermodynamics.
- > Understand the properties of pure substances and able to use mollier diagram and steam table.
- Quantify the behavior of perfect and real gases and able to calculate different properties of mixtures of perfect gases.
- > Analyze different power cycles and able to evaluate their performance parameters.

### UNIT I

Introduction: Basic Concepts: System, Control Volume, Surrounding, Boundaries, Universe, Types of Systems, Macroscopic and Microscopic viewpoints, Concept of Continuum, Thermodynamic Equilibrium, State, Property, Process, Exact & Inexact Differentials, Cycle – Reversibility – Quasi – static Process, Irreversible Process, Causes of Irreversibility – Energy in State and in Transition, Types, Displacement & Other forms of Work, Heat, Point and Path functions, Zeroth Law of Thermodynamics – Concept of Temperature – Principles of Thermometry – Reference Points – Const. Volume gas Thermometer – Scales of Temperature, Ideal Gas Scale

### UNIT II

PMM I - Joule's Experiments – First law of Thermodynamics – Corollaries – First law applied to a Process – applied to a flow system – Steady Flow Energy Equation.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 analysis, Thermodynamic scale of Temperature, 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

Pure Substances, P-V-T- surfaces, T-S and h-s diagrams, Mollier Charts, Phase Transformations – Triple point at critical state properties during change of phase, Dryness Fraction – Clausius – Clapeyron Equation Property tables. 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

### UNIT IV

Deviations from perfect Gas Model – Vander Waals Equation of State – Compressibility charts – variable specific Heats – Gas Tables

Mixtures of perfect Gases – Mole Fraction, Mass fraction Gravimetric and volumetric Analysis – Dalton's Law of partial pressure, Avogadro's Laws of additive volumes – Mole fraction, Volume fraction and partial

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pressure, Equivalent Gas const and Molecular Internal Energy, Enthalpy, specific Heats and Entropy of Mixture of perfect Gases and Vapour, Atmospheric air.

### UNIT – V

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

Brayton and Rankine cycles – Performance Evaluation – combined cycles.

#### **TEXT BOOKS:**

- 1. Engineering Thermodynamics / PK Nag /TMH, III Edition
- 2. Thermodynamics / C.P.Arora.

### **COURSE OUTCOMES:**

The students will be able to

**CO1:** Understand the basic thermodynamic principles and their applications

**CO2:** Apply the laws of thermodynamics for different thermal systems.

**CO3:** Use mollier diagram and steam tables to find the properties of pure substances.

CO4: Calculate different properties of perfect gases, real gases and mixtures of perfect.

**CO5:** Analyse different power cycles.

## MACHINE DRAWING

### **B.Tech: III-Semester**

L/T/P/C 2/0/2/ 3

Pre-Requisite: Engineering Graphics I&II

## Course Objectives:

- > Understand basics of drawing and represent any matter/object with the help of technical drawings.
- > Produce orthographic drawing of different machine parts & the section views.
- > Develop skill to produce assembly drawings.
- > Develop skill to produce detailed drawings of machine parts from assembly drawing.
- > Prepare and read the blueprint of drawings of machine parts.

## Machine Drawing Conventions:

Need for drawing conventions - introduction to ISI conventions

- 1. Conventional representation of materials, common machine elements and parts such as screws, nuts, bolts, keys, gears, webs, ribs.
- 2. Types of sections selection of section planes and drawing of sections and auxiliary sectional views. Parts not usually sectioned.
- 3. Types of Drawings working drawings for machine parts.
- 4. Conventional representation of electrical, electronic, hydraulic and pneumatic circuits.
- 5. Introduction and indication of the tolerances of form and position on drawings Types of surface roughness indication- surface roughness symbols obtainable from various manufacturing processes Heat treatment and surface treatment.

## **Drawing of Machine Elements:**

Understanding the applications of machine parts, Selection of Views, additional views for the following machine elements and parts with every drawing proportion.

- 6. Popular forms of Screw threads, bolts, nuts, stud bolts, tap bolts, set screws.
- 7. Keys, cottered joints and knuckle joint.
- 8. Riveted joints for plates
- 9. Welding Symbols & Welded joints, spigot and socket pipe joint.
- 10. Different types of Shaft Couplings including universal Coupling, Oldham Coupling etc.

## Assembly Drawings:

Drawings of assembled views for the part drawings of the following, using conventions and easy drawing proportions.

- 11. Steam engine parts stuffing boxes, cross heads, Eccentrics.
- 12. Machine tool parts: Tail stock, Tool Post, Machine Vices.
- 13. Other machine parts Screws jacks, Petrol engine connecting rod, Plummer block

## Part Drawings:

Drawings of parts from assembly drawings with indications of size, tolerances, roughness, form and position errors etc.

- 14. Steam engine parts stuffing boxes, cross heads, Eccentrics.
- 15. Machine tool parts Tail stock, Tool Post, Machine Vices.
- 16. Couplings Universal and Flange couplings.

**NOTE:** First angle projection to be adopted. The student should be able to provide working drawings of actual parts.

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#### **Text Book :**

1. Machine Drawing -K.L.Narayana/ Wiley Eastern.

#### **Reference Books :**

Machine Drawing – P.S.Gill.
 Machine Drawing – Junnarkar N.D./ Pearson Edu.

### **Course Outcomes:**

The students will be able to

CO1: Understand various conventions used in machine drawing

**CO2:** Identify the design and use of various machine components.

CO3: Interpret and make conclusions about a given drawing.

CO4: Prepare the assembly and part drawings for various machine components.

**CO5:** Apply the First angle projection to machine parts.

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### VAAGDEVI COLLEGE OF ENGINEERING (AUTONOMOUS)

### **BASICS OF ARTIFICIAL INTELLIGENCE**

#### **B.Tech: III-Semester**

**Pre-Requisites:** None

#### **COURSE OBJECTIVES:**

- > To learn the difference between optimal reasoning vs human like reasoning
- To understand the notions of state space representation, exhaustive search, heuristic search along with the time and space complexities
- > To learn different knowledge representation techniques
- > To understand the applications of AI: namely Game Playing.
- > To understand Theorem Proving, Expert Systems.
- > To learn Machine learning and Natural Language Processing.

#### UNIT 1:

Introduction- Foundation and history of AI, AI Problems and techniques, Problem spaces and searches, Blind search strategies; Breadth first, Depth first – Heuristic search techniques Hill climbing, Best first – A\* algorithm AO\* algorithm.

#### **UNIT 2:**

Introduction to Artificial Intelligence and Machine Learning, Linear Regression, Logistic Regression, Euclidean Distance metric and Mahalanobis distance metric, Eigen values, Eigen matrices.

#### **UNIT 3:**

Classification Problem, Naïve Bayesian Classifier, Support Vector Machines, Clustering Problem, Similarity measures.

### **UNIT 4:**

Knowledge representation issues – Predicate logic – logic programming – Sematic nets, Frames and inheritance, constraint propagation –Representing Knowledge using rules – Rules based deduction system.

#### **UNIT 5:**

Fuzzy Logic, Fuzzy Sets, Fuzzy Classification. Equivalence Relation and Equivalence Classes.

### **TEXT BOOK:**

- 1. The Elements of Statistical Learning Trevor Hastie, Robert Tibshirani and Jerome Friedman, Second Edition, Springer
- 2. Rich and Knight Artificial Intelligence

### **REFERENCE BOOKS:**

- 1. Prateek, J.: Artificial Intelligence with Python, pp. 14–16. Packt Publishing, Birmingham (2017).
- 2. Husain, Amir. The sentient machine: The coming age of artificial intelligence. Simon and Schuster, 2017.
- 3. Kaplan, Jerry. Artificial intelligence: What everyone needs to know. Oxford University Press, 2016.

### **COURSE OUTCOMES:**

- 1. Possess the ability to formulate an efficient problem space for a problem expressed in English.
- 2. Possess the ability to select a search algorithm for a problem.
- 3. Possess the characterization time and space complexities.
- 4. Possess the skill for representing knowledge using the appropriate technique

L/T/P/C 2/0/0/2

### B. Tech- MECHANICAL ENGG

- Possess the ability to apply AI techniques to solve problems of Game Playing,
  Possess the Expert Systems, Machine Learning and Natural Language Processing

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### B. Tech- MECHANICAL ENGG VAAGDEVI COLLEGE OF ENGINEERING (AUTONOMOUS)

## ENGLISH FOR EFFECTIVE COMMUNICATION

### **B.Tech: III-Semester**

L/T/P/C 2/0/0/2

### INTRODUCTION

In view of the growing importance of English as a tool for global communication and the consequent emphasis on training students to acquire language skills, the syllabus of English has been designed to develop linguistic, communicative and critical thinking competencies of Engineering students. In English classes, the focus should be on the skills development in the areas of vocabulary, grammar, reading and writing. The coursefollows an integrated approach to language teaching. Instructors and students are encouraged to use online, print media and electronic media resources in compliance with the course topics of the prescribed book and make the best use of worksheets, quizzes, presentations, discussions, role plays and assignments.

### **Course Objectives**

The course will enable the students to -

- understand types of reading for different purposes and practice a variety of texts inprint and electronic format.
- improve the language proficiency of students in English with an emphasis on vocabulary, grammar, reading and writing skills.
- motivate students to study academic subjects more effectively and critically using the theoretical and practical components of English.
- develop study skills and communication skills in formal and informal situations.

### **Course Outcomes**

After completing this course, students will be able to -

- CO1: Skim and scan the digital text to summarize it for future reference.
- **CO2:** Read the text tomake notes according to their needs.
- **CO3:** Use English language effectively in spoken and written forms.

CO4: Communicate confidently in various contexts and different cultures.

**CO5:** Acquire basic proficiency in English including reading and listening comprehension, writing and speaking skills.

### SYLLABUS

### Unit 1: Note Making Skills

- Listen to the audio textson current issues by English speakers and make notes based on the audio text.
- \* Readthe texts in printed format and make notes based on the text.
- Make notes for texts on scientific concepts.
- \* Read the excerpt, 'Inventors' and do the activities on skimming, scanning and information transfer.
- ✤ Vocabulary: Word formation prefixes and suffixes.
- Grammar: Contracted forms of verbs, tense and aspects.

### **Unit 2: Summarizing Skills**

- ♦ Watch the given videos on current issues and summarize the information.
- Read the given texts in electronic format to summarize the information.
- Summarize the given texts / videos on scientific concepts by English speakers.
- \* Read the excerpt, 'War' and do the activities on summarizing, and vocabulary building.
- ♦ Vocabulary: Homonyms, homophones and homographs.
- ✤ Grammar: Subject-verb agreement.

### **B.Tech-** MECHANICAL ENGG

### **Unit 3: Mind Mapping Skills**

- **\*** Use mind map techniques to read the text and infer the information using digital tools /through graphical representation.
- **\*** Read the excerpt, 'Aliens' and complete the activities on the reading passage.
- Vocabulary: One-word substitutes.
- ✤ Grammar: Articles.

### **Unit 4: Making Oral Presentations**

- Train the students to prepare the drafts for the technical events and present to the class.
- Produce visuals using various digital tools for making effective oral presentation.
- Prepare the visuals, audio and text materials based on the four major components.
- Read the excerpt, 'Genetics' and make an oral presentation.
- Vocabulary: Abbreviations and acronyms.
- ✤ Grammar: Common errors in tenses.

### **Unit5: Drafting Skills**

- ◆ Letter writing types– parts styles format appropriate language model letters.
- Prepare the script for compering for various college events.
- Read the excerpt, 'Sports' and write an essay on the most favourite sport.
- Vocabulary: Technical vocabulary.
- Grammar: Common errors in English.

### **Prescribed Textbook:**

*English for Technical Communication* by Sudarshana, N.P. and C. Savitha, Published by Cambridge University Press.

### **References:**

- 1. Swan, M. (2016). Practical English Usage. Oxford University Press.
- 2. Kumar, S and Lata, P. (2018). Communication Skills. Oxford University Press.
- 3. Wood, F.T. (2007). Remedial English Grammar. Macmillan.
- 4. Zinsser, William. (2001). On Writing Well. Harper Resource Book.
- 5. Hamp-Lyons, L. (2006). Study Writing. Cambridge University Press.

### Digital tools for mind mapping activities

- 1. https://www.mindomo.com/
- 2. https://www.mindmeister.com/
- 3. <u>https://www.ayoa.com/</u>
- 4. <u>https://coggle.it/</u>
- 5. https://www.popplet.com/

### Digital tools for the activities on oral presentation

- 1. <u>https://prezi.com/</u>
- 2. https://www.clearslide.com/product/presentations/
- 3. <u>https://wideo.co/</u>
- 4. https://slidebean.com/
- 5. <u>https://www.canva.com/</u>
- 6. https://docs.google.com/presentation/u/0/
- 7. https://www.powtoon.com/

## HUMAN VALUES & PROFESSIONAL ETHICS

### **B.Tech: III-Semester**

L/T/P/C 2/0/ 0/0

### **Objectives:**

- ➢ To help the students appreciate the essential complementary between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.
- 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.
- 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-1 Human Values:** Morals, values, ethics – integrity – work ethics – service learning – civic virtue – respect for others – living peacefully – Caring – sharing – honesty – courage – valuing time – cooperation – commitment – empathy – self-confidence – spirituality – character.

**Unit II Professional Ethics:** Profession and professionalism – Two models of professionalism – Professional etiquette – Three types of Ethics or morality Responsibility in Engineering standards – Engineering Ethics – Positive and Negative faces.

**Unit III Professional Responsibilities:** Ethical standards Vs Professional Conduct – Zero Tolerance for Culpable Mistakes – Hazards and Risks- Risk benefit analysis-congeniality, collegiality and loyalty. Respect for authority – conflicts of interest – occupational crime.

**Unit IV Professional Rights:** Professional rights and employee rights communicating risk and public policy – Whistle blowing – Collective bargaining. Professionals /engineers as managers, advisors, experts, witnesses and consultants – moral leadership-

**Unit V Ethics in global context:** Global issues in MNCs-Problems of bribery, extortion, and grease payments – Problem of nepotism, excessive gifts.

### **Prescribed Book:**

1. Aryasri, Human Values and Professional Ethics, Maruthi Publications.

### Suggested Books:

- 1. S B George, Human Values and Professional Ethics, Vikas Publishing.
- 2. KR Govindam & Saenthil Kumar Professional Ethics and Human Values, Anuradha Publications.
- 3. S K Chakraborthy & D Chakraborthy: *Human Values and Ethics*, Himalaya.
- 4. M. Govindarajan, S. Natarajan, & V.S. Senthilkumar: *Engineering Ethics (Includes Human Values)*, HI Learning Pvt. Ltd., New Delhi -110001.

### **COURSE OUTCOMES**

**CO1:** It ensures students sustained happiness through identifying the essentials of human values and skills.

CO2: It facilitates a correct understanding between profession and happiness.

**CO3:** It helps students understand practically the importance of trust, mutually satisfying human behavior and enriching interaction with nature.

**CO4:** Ability to develop appropriate technologies and management patterns to create harmony in professional and personal life.

### VAAGDEVI COLLEGE OF ENGINEERING (AUTONOMOUS)

### **MECHANICS OF SOLIDS LAB**

#### **B.Tech: III-Semester**

**Course Objectives:** 

- ▶ Understand the operations of UTM.
- > To understand the Effect of IMPACT Load.
- > To know the properties of various materials by testing methods.
- > To calculate the shear modulus by Torsion.
- > To know the stiffness of springs in various loadings.
- > To find the hardness of metals, Deflection of Beams.

#### **Experiments:**

- 1. Direct Tension Test.
- 2. Compression Test on Metals.
- 3. Bending Test.
- 4. Torsion Test.
- 5. Brinells Hardness Test
- 6. Rockwell Hardness Test.
- 7. Test on springs.
- 8. Impact test.
- 9. Compression test on cubes.
- 10. Deflection Test of Beams.

### **COURSE OUTCOMES:**

The students will be able to

- CO1: Perform material testing and analyze various material properties.
- CO2: Understand the Impact load effect on various Beams.
- CO3: Perform Hardness test to find hardness of components.
- CO4: Find the stiffness of springs with all parameters.
- CO5: Perform Deflection test on Beams and can analyze the Beams.

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### **METALLURGY LAB**

### **B.Tech: III-Semester**

**Course Objectives:** 

- To know the micro structural analysis of pure metals like Iron, Cu and AI.  $\geq$
- $\triangleright$ To know the micro structural analysis of Mild steels, low carbon steels, high carbon
- $\triangleright$ To know the micro structural analysis of Cast Irons.
- $\triangleright$ To know the hardness of the various materials with respect to heat treatment
- $\triangleright$ To know the properties of various materials by testing methods

## **Experiments:**

- 1. Preparation of various structure models (BCC,FCC,HCP)
- 2. Study of Iron-Iron Carbine Diagram and T-T-T Curves for understanding of classification of materials.
- 3. Preparation and study of the Micro Structure of pure metals like Iron, Cu and AL.
- 4. Preparation and study of the Microstructure of Mild Steels, medium carbon steels and high carbon steels.
- 5. Study of the Micro Structure of Cast Irons.
- 6. Study of the Micro Structures of Non-Ferrous alloys.
- 7. Study of the Micro structures of Heat treated steels.
- 8. Hardenability of steels by Jominy End Quench Test.
- 9. To find out the hardness of various treated and untreated steels.
- 10. Analysis & Understand the microstructures of Pure Metals, Steels, Non-Ferrous alloys & Heat Treated Steels.

## **COURSE OUTCOMES:**

The students will be able to

- **CO1:** Understand the Basic Crystal structures of various materials.
- CO2: Identify Grain and grain boundary, crystal structure of different materials.
- CO3: Study the microstructure of various materials.
- CO4: Analyze Metallurgical properties of various Metals and Non-Metals
- **CO5:** Analyze Metallurgical properties of ferrous and Nonferrous alloys.

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steels.

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### B.Tech- MECHANICAL ENGG VAAGDEVI COLLEGE OF ENGINEERING (AUTONOMOUS)

## PROBABILITY AND STATISTICS

## **B.Tech: IV-Semester**

## **Course Objectives:**

To learn

- 1. The ideas of probability and random variables and various discrete and continuous probability distributions and their properties
- 2. Find the application of discrete probability distributions.
- 3. Find the application of continuous probability distributions.
- 4. The basic ideas of statistics including measures of central tendency, correlation and regression.
- 5. To apply the tests in deriving the conclusions of the data.

**UNIT-I: Basic Probability:** Probability spaces, conditional probability, independent events and Bayes' theorem.Random variables: Discrete and continuous random variables, Expectation of Random Variables, Variance of random variables.

**UNIT-II: Discrete Probability distributions:** Binomial, Poisson, evaluation of statistical parameters for these distributions, Poisson approximation to the binomial distribution.

**UNIT-III: Continuous Random variable and Distributions:** Continuous random variables and their properties, distribution functions and densities, Uniform, exponential and Normal distributions, evaluation of statistical parameters for these distributions.

**UNIT-IV: Applied Statistics:** Curve fitting by the method of least squares: Fitting of straight lines, second degree parabolas and more general curves, Correlation and regression, Rank correlation.

**UNIT-V: Testing of Hypothesis:** Test of significance: Large sample test for single proportion, difference of proportions, single mean, difference of means, Test for single mean, difference of means for small samples, test for ratio of variances for small samples.

## **COURSE OUTCOMES:**

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

- **CO1:** Use probability theory and deals with modelling uncertainty in order to evaluate the probability of real world events.
- **CO2:** Develop discrete probability distributions and its applications, and use these techniques to generate data from Binomial and Poisson Distributions.
- **CO3:** Use the techniques of continuous probability distributions to generate data from Normal Distributions.
- **CO4:** Perform correlation and regression analysis, in order to estimate the nature and the strength of the linear relationship between two variables.
- **CO5:** Construct confidence interval to estimates population parameters to test the hypothesis.

## TEXT BOOKS

- Probability and statistics for engineers and scientists, 9<sup>th</sup> Edition, Pearson Publications, Ronald E. Walpole, Raymond H. Myers, Sharon L. Myers, keying Ye.
- 2. Fundamentals of Mathematical Statistics, Sultan Chand & Sons Publications, S C Guptha and V.K. Kapoor.
- 3. T.K.V. Iyengar, Probability and Statistics, S. Chand, 2018.

L/T/P/C 3/1/0/4

### REFERENCES

- 1. Probability and Statistics for Engineers, 8<sup>th</sup> Edition, Miller and Freund's, Pearson Educations.
- 2. A First Course in Probability, 6th Ed., Pearson EducationIndia, 2002, S. Ross.

**R20** Regulations

### B.Tech- MECHANICAL ENGG VAAGDEVI COLLEGE OF ENGINEERING (AUTONOMOUS)

## FLUID MECHANICS & HYDRAULIC MACHINERY

### **B.Tech: IV-Semester**

L/T/P/C 3/0/0/3

#### Pre-Requisites: None COURSE OBJECTIVES:

- Understand the properties of fluids and flow characteristics. Determine pressure variation in a flowing fluid using Bernoulli's principle.
- Determine velocity and acceleration of a fluid at a point. Apply the different conservation equations of mass, momentum and energy to fluid flow problems.
- Apply basic fluid mechanics principles to the flow of viscous fluids in pipes and ducts. Calculate the head losses in simple pipes and channels.
- Describe the construction and working of turbines and pumps. Determine optimum speed for pump operation.
- > Determine radial and axial forces on impeller. Understand centrifugal pump impeller design.

### UNIT I

Fluid Statics: Dimensions and Units: physical properties of fluids-specific gravity, viscosity, and surface tension vapour 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 line, classification of flows steady & un steady, uniform & non uniform, laminar & turbulent, rotational & irrotational flows-equation of continuity for one dimensional flow and three dimensional flow.

### UNIT III

Fluid dynamics: Surface & body forces Euler's & Bernoulli's equations for flow along a stream line, momentum equation and its applications on force on pipe bend. Measurement of flow: Pitot tube, venture meter and orifice meter, flow nozzle.

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

### UNIT IV

Hydraulic Turbines & Turbo Machinery: Hydro dynamic force on jets on stationary and moving plate, inclined and curved vanes, jet striking centrally and at tip, velocity diagrams, work done and efficiency, flow over radial vanes.

Classification of turbines, heads and efficiencies, impulse and reaction turbines, Pelton wheel, Francis turbine, and Kaplan turbine-working proportions, work done, efficiencies, hydraulic design-draft tube theory-functions and efficiency.

### UNIT V

Performance of hydraulic turbines and pumps: Geometric similarity, unit and specific quantities, characteristic curves, governing of turbines, selection of type of turbines, cavitation, surge tank, water hammer.

Centrifugal pumps: Classification, working, work done-barometric head-losses and efficiencies specific speed-performance characteristic curves, NPSH.

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

### **TEXT BOOKS:**

- 1. Hydraulics, Fluid mechanics and hydraulic machinery by MODI and SETH
- 2. Fluid mechanics and hydraulic machines by Bansal

### **REFERENCES:**

- 1. Fluid mechanics and fluid power engineering by D.S.Kunar, Kotaria and sons.
- 2. Fluid mechanics and machinery by D. Rama Durgaiah, New age international.
- 3. Hydraulic machines by Banga and Sharma, Khanna publishers

### **COURSE OUTCOMES:**

The students will be able to

**CO1:** Apply mathematics and basic sciences and translates this knowledge to understand fluid flow principles and their applications.

CO2: Understand fundamental knowledge of the mechanics of fluid at rest and in motion.

CO3: Observe fluid phenomena by developing and using the principles, laws

CO4: Analyze fluid interactions with natural and constructed systems.

CO5: Associate fundamental knowledge & performance of different turbines & pumps.

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### THERMAL ENGINEERING-I

### **B.Tech: IV-Semester**

L/T/P/C 3/0/0/3

#### Pre-Requisite: THERMODYNAMICS COURSE OBJECTIVES:

- > Demonstrate the differences between air standard cycles and actual cycles.
- Understand the working principle of internal combustion engine and its components details, fuel injection carburetor.
- > Differentiate normal and abnormal combustion in spark ignition engines.
- > Know various stages of combustion in compression ignition engines, diesel knock.
- Solve problems on performance of engines, brake power, mechanical efficiency, and specific fuel consumption.
- > Understand constructional details and working principle of different types of compressors.

### UNIT – I

I.C. Engines:

Classification - Working principles of Four & Two stroke engine, SI & CI engines, Valve and Port Timing Diagrams, Air – Standard, air-fuel and actual cycles - Engine systems – Carburetor and Fuel Injection Systems for SI engines, Fuel injection systems for CI engines, Ignition, Cooling and Lubrication system, Fuel properties and Combustion Stoichiometry.

### UNIT – II

Normal Combustion and abnormal combustion in SI engines – Importance of flame speed and effect of engine variables – Abnormal combustion, pre-ignition and knocking in SI Engines – Fuel requirements and fuel rating, anti knock additives – combustion chamber – requirements, types of SI engines. Four stages of combustion in CI engines – Delay period and its importance – Effect of engine variables – Diesel Knock–Need for air movement, suction, compression and combustion induced turbulence in Diesel engine – open and divided combustion chambers and fuel injection–Diesel 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

Classification of compressors – Fans, blowers and compressors – positive displacement and dynamic types – reciprocating and rotary types. volumetric efficiency and effect of clearance volume, staged compression, under cooling, saving of work, minimum work condition for staged compression Rotary Compressor (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 efficiencypressure rise calculations – Polytropic efficiency.

### **TEXT BOOKS:**

- 1. I.C. Engines / V. Ganesan- TMH
- 2. Thermal Engineering / Rajput / Lakshmi Publications.
- 3. Thermal Engineering / P.K.Nag

### **REFERENCE BOOKS:**

- 1. IC Engines Mathur & Sharma Dhanpath Rai & Sons.
- 2. Engineering fundamentals of IC Engines Pulkrabek / Pearson /PHI
- 3. Thermal Engineering / Rudramoorthy TMH
- 4. Thermodynamics & Heat Engines / B. Yadav/ Central Book Depot., Allahabad
- 5. I.C. Engines / Heywood /McGrawHIll.
- 6. Thermal Engineering R.S. Khurmi & J.K.Gupta S.Chand

### **COURSE OUTCOMES:**

The students will be able to:

CO1: Understand the concept and working of two and four strokes I.C. engines.

**CO2:** Analyse the normal and abnormal condition for the combustion of SI and CI engines also the parameters which effect the combustion characteristics.

CO3: Able to calculate the performance of the engine with different parameters.

CO4: Get knowledge about compressors and their classifications.

**CO5:** Differentiate various compressor on the basis of their working and requirement and can use suitable one.

### **KINEMATICS OF MACHINES**

### **B.Tech: IV-Semester**

L/T/P/C 3/0/ 0/3

#### Pre-Requisite: Engineering Mechanics I & II COURSE OBJECTIVES:

- > To understand the concept of machines, mechanisms and related terminologies.
- > To understand the different steering gear mechanisms and power drives in automobile applications.
- To able to analyze a mechanism for displacement, velocity and acceleration at any point in a moving link.
- > To understand the profile of cams.
- > To understand the theory of gears, gear trains.

#### UNIT-I

**Mechanisms :** Elements or Links – Classification – Rigid Link, flexible and fluid link – Types of kinematics pairs – sliding, turning, rolling, screw and spherical pairs – lower and higher pairs – closed and open pairs – constrained motion – completely, partially or successfully and incompletely constrained

**Mechanism and Machines – Mobility of Mechanisms:** Grubler's criterion, classification of machines – kinematic chain – inversions of mechanism – inversions of quadric cycle chain, single and double slider crank chains. Mechanical advantage.

### UNIT-II

**Straight-line motion mechanisms:** Exact and approximate copied and generated types – Peaucellier - Hart - Scott Russel – Grasshopper – Watt -Tchebicheff's and Robert Mechanism – Pantograph.

Steering gears: Conditions for correct steering – Davis Steering gear, Ackerman's steering gear.

Hooke's Joint: Single and double Hooke's joint -velocity ratio - application - problems.

#### **UNIT-III**

**Kinematics:** Velocity and acceleration – Motion of link in machine – Determination of Velocity and acceleration – Graphical method – Application of relative velocity method.

**Plane motion of body:** Instantaneous center of rotation- centrodes and axodes – Three centers in line theorem – Graphical determination of instantaneous center, determination of angular velocity of points and links by instantaneous center method. Kliens construction - Coriolis acceleration - determination of Coriolis component of acceleration

**Analysis of Mechanisms:** Analysis of slider crank chain for displacement- velocity and acceleration of slider – Acceleration diagram for a given mechanism.

### **UNIT-IV**

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

### UNIT – V

**Higher pair:** Friction wheels and toothed gears – types – law of gearing, condition for constant velocity ratio for transmission of motion – velocity of sliding Forms of teeth, cycloidal and involutes profiles – phenomena of interferences – Methods of interference. Condition for minimum number of teeth to avoid interference – expressions for arc of contact and path of contact of Pinion & Gear and Pinion & Rack Arrangements–Introduction to Helical – Bevel and worm gearing

**Gear Trains:** Introduction – Types – Simple – compound and reverted gear trains – Epicyclic gear train. Methods of finding train value or velocity ratio of Epicyclic gear trains. Selection of gear box - Differential gear for an automobile.

### **TEXT BOOKS:**

- 1. Theory of Machines /S.S.Rattan Tata McGraw Hill Publishers.
- 2. Kinematics & Dynamics Of machinery/Norton/TMH

### **REFERENCE BOOKS:**

- 1. Theory of Machines / Thomas Bevan/CBS
- 2. Theory of Machines / Sadhu Singh / Pearson.
- 3. Theory of Machines / Shigley / Oxford
- 4. Mechanism and Machine Theory / JS Rao and RV Duggipati / New Age
- 5. Theory of Machines by / R.K. Bansal (Lakshmi Publications).

### **COURSE OUTCOMES:**

The students will be able to

**CO1:** Identify the basic mechanisms involved in machines.

- CO2: Develop familiarity with application of kinematics theories to real-world machines.
- CO3: Identify the basic relations between distance, time, velocity and acceleration.

CO4: Understand analytical linkage analysis, determine cam profiles

**CO5:** Analyze gear trains and gear profiles, speed regulation methods.

### **PRODUCTION TECHNOLOGY**

### **B.Tech: IV-Semester**

L/T/P/C 3/0/ 0/ 3

#### Pre-Requisites: None COURSE OBJECTIVES:

- > Student will be able to understand the principles of casting, welding processes.
- Student will be able to understand the principles of metal forming processes.
- The student will be able to understand the principles of various manufacturing processes and to apply them in producing industrial products economically.
- > Students will get the knowledge of Inert gas welding, TIG & MIG.
- Students will get the knowledge of advanced welding technologies like, friction welding, Induction welding.
- Students will able to understand the process of extrusion of metals Types, Applications

### UNIT – I

Casting : Steps involved in making a casting – Advantage of casting and its applications;

Patterns - Pattern making, Types, Materials used for patterns, pattern allowances and their construction; Properties of moulding sands. Methods of Melting - Crucible melting and cupola operation – Defects in castings, Casting processes – Types – Sand moulding, Centrifugal casting, die- casting, Investment casting, shell moulding; Principles of Gating – Requirements – Types of gates, Design of gating systems – Riser – Function, types of Riser and Riser design.

Solidification of casting – Solidification of pure metal – Nucleation and grain growth, casting design considerations

### UNIT – II

**Welding:** Classification – Types of welds and welded joints, Heat effected Zone, Welding Power Sources – V-I characteristics. Types of welding machines - Gas welding - Types, oxy-fuel gas cutting – standard time and cost calculations. Arc welding, forge welding, submerged arc welding, Resistance welding, Thermit welding, Melting efficiency.

### UNIT – III

**Recent Trends in Welding:** Inert Gas Welding \_ TIG Welding, MIG welding, Friction welding, friction stir welding, induction welding, electro slag welding, explosive welding, Laser welding. Soldering and Brazing. Welding defects – causes and remedies; destructive and non- destructive testing of welds.

### UNIT – IV

**Working Processes:** Hot working, cold working, strain hardening, recovery, recrystallization and grain growth. Rolling fundamentals – theory of rolling, types of Rolling mills and products. Forces in rolling and power requirements Stamping, forming and other cold working processes. Blanking and piercing – Bending and forming – Drawing and its types – wire drawing and Tube drawing – coining – Hot and cold spinning. Types of presses and press tools. Forces and power requirement in the above operations.

### UNIT – V

**Extrusion of Metals:** Basic extrusion process and its characteristics. Hot extrusion and cold extrusion – Forward extrusion and backward extrusion – Impact extrusion – Extruding equipment – Tube extrusion and pipe making, Hydrostatic extrusion. Forces in extrusion Forging Processes: Forging operations and principles – Tools – Forging methods – Smith forging, Drop Forging – Roll forging – Forging hammers: Rotary forging – forging defects – cold forging, swaging, Forces in forging operations.

### **TEXT BOOKS:**

1. Manufacturing Technology / P.N. Rao/TMH

### **REFERENCE BOOKS:**

- 1. Production Technology / R.K. Jain
- 2. Metal Casting / T.V Ramana Rao / New Age
- 3. Principles of Metal Castings / Rosenthal.
- 4. Welding Process / Parmar /
- 5. Production Technology /Sarma P C /
- 6. Manufacturing Engineering and Technology/Kalpakjin S/ Pearson Edu.

### **COURSE OUTCOMES:**

The students will be able to

**CO1:** Apply the knowledge of casting, welding joints and forces and power requirements in metal forming processes.

**CO2:** Relate the melting, solidification, pattern allowances, gating and riser design of mold cavity, aspects of casting.

CO3: Understand basic calculations of forces and power requirements in the metal forming operations.

**CO4:** Differentiate the application of welding using the arc welding, gas welding, resistance welding, soldering and brazing.

**CO5:** Survey the defects occurring in forging operation.

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### B. Tech- MECHANICAL ENGG

**R20** Regulations

#### VAAGDEVI COLLEGE OF ENGINEERING (AUTONOMOUS)

### FLUID MECHANICS & HYDRAULIC MACHINERY LAB

#### **B.Tech: IV-Semester**

L/T/P/C 0/0/3/1.5

#### Pre-Requisites: None COURSE OBJECTIVES:

- Calculate different parameters such as coefficient of friction, coefficient of discharge, coefficient of impact, power, efficiency etc. of various experiments.
- Determine pressure variation in a flowing fluid using Bernoulli's principle applications such as Venturimeter, orifice meter.
- > Apply basic fluid mechanics principles to the flow of water in pipes, pumps and turbines.
- Calculate the head losses and friction in pipes.
- > Test the performance of turbines and pumps.
- > Evaluate the forces and their impact of jet on flat and curved vanes.

#### **EXPERIMENTS:**

- 1. Calibration of Venturimeter & Orifice meter
- 2. Determination of Coefficient of discharge for a small orifice by a constant head method.
- 3. Determination of Coefficient of discharge for an external mouth piece by variable head method.
- 4. Determination of Coefficient of loss of head in a sudden contraction and friction factor.
- 5. Performance test on single stage centrifugal pump
- 6. Performance test on reciprocating pump
- 7. Impact of jet on vanes
- 8. Performance test on Pelton wheel.
- 9. Performance test on Francis Turbine
- 10. Performance test on Kaplan Turbine
- 11. Performance test on multi stage centrifugal pump
- 12. Drag and Lift Coefficients of an Aerofoil model.

NOTE: Any Ten of the above experiments are to be performed.

#### **COURSE OUTCOMES:**

The students will be able to

**CO1:** Apply knowledge of fluid mechanics and hydraulic machines and translates this knowledge for understanding fluid flow principles and their application to experiments.

**CO2:** Practical exposure by using components vacuum gauge, pressure gauge, manometers, pipes, motors, pumps & turbines.

**CO3:** Use comparison of theoretical values with the real parameters.

**CO4:** Know and understand the experimental analysis in turbines and pumps with parameters such as discharge, head of water, speed of brake drum.

### **B.Tech-** MECHANICAL ENGG

### VAAGDEVI COLLEGE OF ENGINEERING (AUTONOMOUS)

#### **PRODUCTION TECHNOLOGY LAB**

#### **B.Tech: IV-Semester**

L/T/P/C 0/0/3/1.5

## Pre-Requisites: None

**COURSE OBJECTIVES:** 

Students will be able to

- ➤ Know the experimental skills of various production processes.
- Learn casting process, welding process.
- ➤ Learn extrusion process.
- Learn the processing of plastics.
- ➤ Know the welding basics and concept of various process of welding.

### **EXPERIMENTS:**

#### **METAL CASTING LAB:**

- 1. Pattern Marking 1 Exercise
- 2. Study of Sand properties (Strength & Permeability)
- 3. Moulding 2 Exercises
- 4. Melting & Casting Demonstration

#### WELDING LAB:

- 1. Arc Welding:
  - a) Effect of polarity on welds strength & Heat affected zone
  - b) Effect of current on weld strength and Heat affected zone
- 2. Spot Welding Effect of current on weld strength.
- 3. Gas welding
- 4. TIG welding

#### **MECHANICAL PRESS WORKING:**

- 1) Blanking & Piercing operation & Study of simple Compound and progressive press tools.
- 2) Hydraulic Press: Deep Drawing and Extrusion Operations.
- 3) Bending and other operations.

#### **PROCESSING OF PLASTICS:**

1) Injection Moulding

2) Blow Moulding

#### **COURSE OUTCOMES:**

The students will be able to

**CO1:** Understand basic knowledge and concepts of various experiments.

CO2: Perform joining of materials (similar/dissimilar) using welding.

**CO3:** Analyze the concepts of extrusion and design of die.

CO4: Operate injection molding and blow molding machines.

### VAAGDEVI COLLEGE OF ENGINEERING (AUTONOMOUS)

### FUELS AND LUBRICANTS LAB

#### **B.Tech: IV-Semester**

L/T/P/C 0 /0/2/1

Pre-Requisites: None

#### **Course Objectives:**

- To know the flash point & fire point of liquid fuels like petrol & diesel.
- To know carbon percentage in liquid fuels.
- To know the Viscosity of different liquid lubricants.
- Learn the concept of Calorific value of Fuels.
- Learn the concept of depth of penetration for different lubricants.

#### **Experiments:**

- 1. Determination of Flash & Fire points of Liquid fuels / Lubricants using: Abels Apparatus
- 2. Determination of Flash & Fire points of Liquid fuels/ Lubricants using: Pensky Martens Apparatus
- 3. Carbon residue test: Liquid fuels
- 4. Determination of Viscosity of Liquid lubricants and Fuels using: Saybolt Viscometer
- 5. Determination of Viscosity of Liquid lubricants and Fuels using: Redwood Viscometer-I
- 6. Determination of Viscosity of Liquid lubricants and Fuels using: Redwood Viscometer-II
- 7. Determination of Calorific value of Gaseous Fuels using: Junkers Gas Calorimeter
- 8. Determination of Calorific value of Gaseous Fuels using: Bomb Calorimeter
- 9. Drop Point Penetration Apparatus for Grease
- 10. ASTM Distillation Test Apparatus

### **Course Outcomes:**

The students will be able to

CO1: Analyze the flash point & fire point of liquid fuels.

- CO2: Observe the carbon percentage for liquid fuels.
- CO3: Illustrate the viscosity of Liquid lubricants.
- CO4: Apply different methods to determine the calorific value of fuels.

CO5: Compare the depth of penetration for different lubricants.

### **METROLOGY AND MACHINE TOOLS**

#### B. Tech.: V-Semester

L/ T/ P/ C 3/ 0/ 0/ 3

#### Prerequisite – Nil COURSE OBJECTIVES:

- ➤To understand the basic principles of metrology this deals with the measuring instruments and the precision measurement techniques. Limits, fits, tolerances, linear, angular measurements Selective assembly, interchangeability.
- >To know the Measuring machines, and comparators for the application of mechanical engineering components, Machine tool alignment, Screw threads, and Surface texture variations.
- ➤To understand construction and working of various machine tools like lathe, milling, shaping and drilling, grinding, planning machines etc.
- >To demonstrate the knowledge of various cutting tool materials and will be able to select or design cutting tool material and tool geometries for the machining process and work material.
- ➤To select the optimum cutting parameters i.e. feed, cutting speed, depth of cut for particular machining process. They are also able to know the effective working of machines and surface quality of machines.

### UNIT – I

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

Limit Gauges: Taylor's principle, Design of GO and NO-GO gauges, Linear Measurement using Vernier Callipers, Micrometers ,Slip Gauges. Angular Measurements using Bevel protractor ,Sine bar and Angle Gauges.

### UNIT – II

Measurement of flatness using straight edges, surface plates, optical flat and auto collimator and Interferometer, Comparators.

Methods of measurement of surface finish and Surface Roughness, Talysurf.Screw thread measurement, Gear measurement.

### UNIT – III

**Metal cutting:** Introduction, elements of cutting process – Geometry of single point tools. Chip formation and types of chips. Engine lathe – Principle of working, types of lathe, specifications. Taper turning,– Lathe attachments. Capstan and Turret lathe – Single spindle and multi-spindle automatic lathes.

### UNIT – IV

**Drilling and Boring Machines:** Principles of working, specifications, types, operations performed; twist drill. Types of Boring machines and applications. Shaping, slotting and planing machines –Principles of working – machining time calculations.

### UNIT – V

**Milling machines:** Principles of working – Types of milling machines – Geometry of milling cutters methods of indexing. Grinding – theory of grinding – classification of grinding machines. Types of abrasives, bonds. Selection of a grinding wheel.

Lapping, honing and broaching machines, comparison and Constructional features, machining time calculations

Jigs and Fixtures: Principles of design of Jigs and fixtures and uses.

### **COURSE OUTCOMES:**

The students will be able to

- 1. Compare tabulated physical data that are useful to assembly of components, clearance, transition, interference fits.
- 2. Illustrate linear, angular measurement by using various micrometers, bevel protractor, auto collimator etc.
- 3. Apply cutting mechanics to metal machining based on cutting force and power consumption.
- 4. Operate lathe, milling machines, drill press, grinding machines, etc.
- 5. Evaluate mach inability of different materials using specific cutting forces and surface finish.

### **TEXTBOOKS:**

- 1. Metrology and Surface engineering by Mahajan & RK Jain / Khanna Publishers.
- 2. Engineering Metrology/I C Gupta / Dhanpath Rai.
- 3. Manufacturing Technology II", S. Chand.
- 4. Workshop Technology Vol II by B.S. Raghuvamsi, J K. Hazra choudary.

### **REFERENCE BOOKS:**

- 1. Connie Dotson, "Fundamentals of Dimensional Metrology", Thomson, 2003 6th Edition, ISBN-13: 9781133600923.
- 2. P.N.Rao, "Manufacturing Technology" Vol.2, Metal Cutting and Machine Tools, TMH, 2009, Ed.2, ISBN Number: 0074631802.

### **ONLINE RESOURCES:**

- 1. NPTEL Course: Metrology by Dr. K. Sadashivappa, IIT Madras. Link: https://nptel.ac.in/courses/112/106/112106179/#
- 2. NPTEL Course: Metal Cutting and Machine Tools by Prof. Asimava Roy, IIT Kharagpur. Link: https://nptel.ac.in/courses/112/105/112105233/

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### **DYNAMICS OF MACHINERY**

### B. Tech.: V-Semester

L/ T/ P/ C 2 /1/ 0/ 3

#### **Prerequisite – Engineering Mechanics**

#### **COURSE OBJECTIVES:**

- ➤ Analyze the motions of mechanisms, design mechanisms to obtain the desired motions, and analyze forces in machines & fundamentals of gyroscopic couple.
- $\succ$  Understand the friction in clutches.
- > Understand the turning moment diagrams and flywheels, working of governors.
- > Understand the balancing of rotary and reciprocating masses.
- > Understand the fundamentals in different vibrations.
- > Analyze the effect of vibration of machine parts under the operating conditions.

### UNIT – I

#### STATIC AND DYNAMIC FORCE ANALYSIS OF PLANAR MECHANISMS

Gyroscopic Introduction – Angular Motions – Gyroscopes – effect of precession – Conditions for equilibrium – Two, three and four force members – Inertia forces and D' Alembert's Principle – planar rotation about a fixed center.

### UNIT – II

### FRICTION

**Clutches**: Friction clutches – Single Disc or plate clutch, Multiple Disc Clutch, Cone Clutch, Centrifugal Clutch. Torque and power loss due to friction.

**Brakes and Dynamometers**: Analysis of Simple block brake – Internal expanding brakeband brake of vehicle. Dynamometers – absorption and transmission types. General description and methods of operation.

#### UNIT – III

#### TURNING MOMENT DIAGRAM AND FLY WHEELS

Turning moment – Inertia Torque, connecting rod angular velocity and acceleration, crank effort and torque diagrams – Fluctuation of energy – Fly wheels and their design.

**Governors**: Watt, Porter and Proell governors, spring loaded governors – HartNell and Hartung with auxiliary springs, Sensitiveness, isochronisms and hunting- effort and power of the governors.

### UNIT – IV

### BALANCING

Balancing of rotating masses Single and multiple – single and different planes. Balancing of Reciprocating Masses: Primary and Secondary balancing of reciprocating masses. Analytical and graphical methods – Unbalanced forces and couples – Balancing of "V", multi cylinder

in line and radial engines for primary and secondary balancing, locomotive balancing.

## UNIT – V

### VIBRATIONS

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

### **COURSE OUTCOMES:**

The students will be able to

- 1. Analyze the forces and torques in mechanisms and machines in operation. Know the function of governors, clutches and bearings.
- 2. Compute the frictional torque in clutches and braking torque in brakes.
- 3. Design the flywheel for different IC engines.
- 4. Evaluate the balancing masses in rotary and reciprocating balancing.
- 5. Calculate the frequencies of different vibrations.

### **TEXTBOOKS:**

- 1. Thomas Bevan, "Theory of Machines", Pearson Education India, 3<sup>rd</sup> Ed., 2010, ISBN Number: 978-81-317-2965-6
- 2. SS Ratan, "Theory of Machines", Mc Graw Hill, 3<sup>rd</sup> Ed. 2009, ISBN Number 9780070144774.

### **REFERENCE BOOKS:**

- P.L. Ballaney, "Theory of Machines and Mechanisms", Khanna Publishers, 3<sup>rd</sup> Ed., 2003, ISBN Number: 978-8174091222.
- 2. R.L. Norton, "Kinematics and Dynamics of Machinery", Mc. Graw Hill 1<sup>st</sup> Ed., ISBN Number: 978-0070144804
- 3. Uicker, Pennock and Shigley, "Theory of Machines and Mechanisms", Oxford, 1<sup>st</sup> Ed. ISBN Number: 978-007014480
- 4. R.S.Khurmi & J.K.Gupta, "Theory of Machines", Eurasia Publishing House 2012, ISBN Number: 978-8121925242.

### **ONLINE RESOURCES:**

- 1. NPTEL Course: Dynamics of Machines by Prof. Amitabha Ghosh, IIT Kanpur. Link: https://nptel.ac.in/courses/112/104/112104114/
- 2. NPTEL Course: Dynamics of Machines by Prof. K. Kurian Issac, IIT Bombay Link: https://nptel.ac.in/courses/112/101/112101096/

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### VAAGDEVI COLLEGE OF ENGINEERING (AUTONOMOUS)

#### **DESIGN OF MACHINE MEMBERS – I**

#### B. Tech.: V-Semester

L T P C 3 0 0 3

### Prerequisite – EM, MOS

#### **COURSE OBJECTIVES:**

- Use references that provide tabulated physical and mechanical data that are useful for mechanical design engineers.
- > Select the material and its properties for the optimum design of a component.
- > Understand the design principles of various machine members and able to apply the principles in designing new parts as per its functional requirements.
- ➤ Understand the theories of failures.
- > Apply theories of failures in defining the failure criteria of the part.
- > Design the various power drives suitable to transfer power requirements.

## UNIT – I

### INTRODUCTION

Definition, Types of design, General Considerations in the design – Design Procedure – Selection of Materials for design and manufacturing.

**Stresses in Machine Members:** Simple stresses – Combined stresses - stress strain relation – Various theories of failures – factor of safety – Design for strength and rigidity. 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 – Design for fluctuating stresses – Endurance limit – Estimation of Endurance strength – Goodman's line, Soderberg's line, Gerbers line.

#### UNIT – III

Design of fasteners Riveted joints – definition, types and design Failures in riveted joints, terminology used in riveted joints, lozenze joint, riveted joints with eccentric loads- Welded joints - definition, types and design – Bolted joints – Design of bolts with initial stresses – Design of joints under eccentric loading.

### UNIT – IV

Keys, cotters and knuckle joints: Design of keys-stresses in keys-cottered joints- spigot and socket, sleeve and cotter, jib and cotter joints-Knuckle joints.

### UNIT – V

### **Shafts and Shaft Couplings**

**Shafts:** Design of solid and hollow shafts for strength and rigidity – Design of shafts for combined bending and axial loads.

**Shaft Coupling:** Rigid couplings – Muff, Split muff and Flange couplings. Flexible couplings - Flange coupling (Modified) – One Case Study.

### **COURSE OUTCOMES:**

The students will be able to

- 1. Design a particular machine element and make use of standards parts and dimensions using design data book.
- 2. Design of shafts, shaft couplings like flange couplings, flexible couplings.
- 3. Determine the Stresses and deflections of bolded joints, keys, cotters, knuckle joints.
- 4. Determine the Stresses and deflections of helical springs.
- 5. Design of riveted, welded joint and screwed joints.

### **TEXTBOOKS:**

- 1. P.Kannaiah / Machine Design / Sci-Tech, 4<sup>th</sup> Ed. 2012, / ISBN-13: 978-81-8371-151-7.
- 2. Pandya and Shah / Machine Design / Charotar, 18<sup>th</sup> Ed., 2012, / ISBN, : 978-93-80358-51-2.

### **REFERENCE BOOKS:**

- 1. Schaum Series, "Machine deign", Mc.Graw Hill, ISBN-13: 9780070255951.
- 2. R.S.Kurmi, J.K.Gupta, "Machine design", S. Chand, 14<sup>th</sup> Ed., ISBn Number-13: 9788121925372.
- 3. S.Md.Jalaludeen, "Machine Design", Anuradha Publications, ISBN-13: 9788189638214.

### **ONLINE RESOURCES:**

- 1. NPTEL Course: Design of Machine Elements I by Prof. B. Maiti, IIT Kharagpur. Link: https://nptel.ac.in/courses/112/105/112105124/
- 2. NPTEL Course: Machine Design II by Prof. M. M. Mayuram, IIT Madras. Link: https://nptel.ac.in/courses/112/106/112106137/

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### VAAGDEVI COLLEGE OF ENGINEERING (AUTONOMOUS)

#### **THERMAL ENGINEERING – II**

#### B. Tech.: V-Semester

**Prerequisite – TD** 

#### **COURSE OBJECTIVES:**

- > Demonstrate the understanding of working principle of steam power plant.
- Understand the working principle of internal combustion engine and its components details, fuel injection carburetor, cooling and lubrication systems.
- > Differentiate the thermodynamic analysis of steam nozzles, turbines.
- > Know various stages of combustion in compression ignition engines, diesel knock.
- Solve problems on problems on performance of boilers, steam turbines, turbines.
- Understand constructional details and working principle of different types of compressors.

#### UNIT – I

#### **BASIC CONCEPTS**

Rankine Cycle – Schematic layout, Thermodynamic Analysis, Concept of Mean Temperature of Heat addition, Methods to improve cycle performance – Regeneration & reheating; Combustion: fuels and combustion, concepts of heat of reaction, adiabatic flame temperature, Stoichiometry, and Flue gas analysis.

## UNIT – II

### BOILERS

Classification – Working principles – with sketches including H.P. Boilers – Mountings and Accessories – working principles, boiler horse power, equivalent evaporation, efficiency and heat balance; Draught - classification – Height of chimney for given draught and discharge, condition for maximum discharge, efficiency of chimney – artificial draught, induced and forced.

#### UNIT – III

### STEAM NOZZLES AND CONDENSORS

Function of nozzle – applications – types, Flow through nozzles, thermodynamic analysis – assumptions – velocity of nozzle at exit - Ideal and actual expansion in nozzle, velocity coefficient, condition for maximum discharge, critical pressure ratio, criteria to decide nozzle shape; Super saturated flow, its effects, degree of super saturation and degree of under cooling - Wilson line.

Steam Condensers: Requirements of steam condensing plant – Classification of condensers – working principle of different types – vacuum efficiency and condenser efficiency – air leakage, sources and its affects, air pump, cooling water requirement.

### UNIT – IV

### **REACTION AND IMPULSE TURBINES**

Steam Turbines: Classification, Analysis of various types of steam turbines, Delaval, Curtis, Ratean, Condensing and Non Condensing Turbines.

Reaction Turbines: Mechanical details – principle of operation, thermodynamic analysis of a stage, degree of reaction – velocity diagram – Parson's reaction turbine – condition for maximum efficiency.

Impulse Turbines: Mechanical details – Velocity diagram – effect of friction – power developed, axial thrust, and blade or diagram efficiency – condition for maximum efficiency. Methods to reduce rotor speed – velocity compounding and pressure compounding, velocity and pressure variation along the flow – combined velocity diagram for a velocity compounded impulse turbine.

### UNIT – V

### 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, brief concepts about compressors, combustion chambers and turbines of Gas turbine plant.

Case Studies:

- 1. Case study on Thermal Failures like Boiler Failures.
- 2. Case study on "The Stanley Steamer Automobile"
- 3. Case study on "The Drinking Bird as a Heat Engine.

### **COURSE OUTCOMES:**

The students will be able to

- 1. Understand the basic concept behind the thermal power plant.
- 2. Get knowledge about working of boilers with their specification.
- 3. Analyze the importance of nozzle and condenser in steam power plant.
- 4. Identify the different types of steam turbines and use accordingly to the requirement.
- 5. Get the concepts of gas power plant with its different components.

### **TEXTBOOKS:**

- 1. R.K. Rajput, "Thermal Engineering", Laxmi Publications, 9<sup>th</sup> Ed. 2013, ISBN,: 978-93-81159-52-1.
- 2. Mahesh M Rathore, "Thermal Engineering", TMH, ISBN: 9780070681132.

### **REFERENCE BOOKS:**

- 1. R.Yadav, "Thermodynamics and Heat Engines", Central Book Dept, ISBN: 9788185444031.
- 2. P.Khajuria and S.P.Dubey, "Gas Turbines and Propulsive Systems", Dhanpatrai, ISBN: 9788189928483.
- 3. M.L.Mthur & Mehta, "Thermal Engineering", Jain Bros., ISBN : 8186321861.

### **ONLINE RESOURCES:**

- 1. NPTEL Course: Steam and Gas Power Systems by Prof. Ravi Kumar, IIT Roorkee. Link: https://nptel.ac.in/courses/112/107/112107216/
- 2. NPTEL Course: Steam Power Engineering by Prof. Vinak N. Kulkarni, IIT Guwahati. Link: https://nptel.ac.in/courses/112/103/112103277/

### VAAGDEVI COLLEGE OF ENGINEERING (AUTONOMOUS)

#### MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS B. Tech.: V-Semester L

#### **Prerequisite – Nil**

L T P C 3 0 0 3

#### **COURSE OBJECTIVES:**

To enable the student to understand and appreciate, with a practical insight, the importance of certain basic issues governing the business operations namely. Demand and supply, production function, cost analysis, markets form of business organizations, capital budgeting and financial accounting and financial analysis by using ratios.

#### UNIT – I

**Introduction to Managerial Economics:** Definition, Nature and Scope Managerial Economics Demand Analysis: Demand Determinants, Law of Demand and its exceptions, Definition, Types, Measurement and Significance of Elasticity of Demand. Demand Forecasting, Factors governing demand forecasting, methods of demand forecasting (survey methods, statistical methods, expert opinion method, test marketing, controlled experiments, judgmental approach to demand forecasting)

#### UNIT – II

**Production and Cost Analysis:** Production Function – Isoquants and Isocosts, MRTS, Least Cost Combination of Inputs, Production function, Laws of Returns, Internal and External Economies of Scale. Cost Analysis: Cost concepts, Opportunity cost, Fixed Vs. Variable costs, Explicit costs Vs.Implicit costs, Out of pocket costs vs. Imputed costs. Break-even Analysis (BEA)-Determination of Break-Even Point (simple problems)-Managerial Significance and limitations of BEA.

#### UNIT – III

**Introduction to Markets & Pricing strategies:** Market structures: Types of competition, Features of Perfect competition, Monopoly and Monopolistic Competition. Price-Output Determination in case of Perfect Competition and Monopoly. Pricing Strategies, Business & New Economic Environment: Characteristic features of Business, Features and evaluation of Sole Proprietorship, Partnership, Joint Stock Company, Public Enterprises and their types, Changing Business Environment in Post-liberalization scenario.

#### UNIT – IV

**Capital and Capital Budgeting:** Capital and its significance, Types of Capital, Estimation of Fixed and Working capital requirements, Methods and sources of raising finance, Nature and scope of capital budgeting, features of capital budgeting proposals, methods of Capital Budgeting: Payback Method, Accounting Rate of Return (ARR) and Net Present Value Method (simple problems)

### UNIT – V

**Introduction to Financial Accounting & Financial Analysis:** Double-Entry Book Keeping, Journal, Ledger, Trial Balance – Final Account (Trading Account, Profit and Loss Account and Balance Sheet with simple adjustments.) Computation, Analysis and Interpretation of Liquidity Ratios (Current Ration and quick ratio), Activity Ratios (Debt-Equity ratio, Interest Coverage ratio), and Profitability ratios (Gross Profit Ratio, Net Profit ratio, Operating Ratio, P/E Ratio and EPS).

### **COURSE OUTCOMES:**

The students will be able to

- 1. To study fundamental concepts in managerial economics and financial analysis including certain basic issues governing the business operations.
- 2. To learn the concepts of demand, elasticity of demand and demand forecasting and methods of demand forecasting.
- 3. To learn various issues involved in production decision analysis.
- 4. To gain the knowledge of Break Even Analysis and its importance in managerial decision making.
- 5. To learn different types of market environment under various types of competition.
- 6. To gain the knowledge of new economic environment in post liberalization scenario.
- 7. To know the concepts of capital budgeting and various methods of capital budgeting and its application in business decision making.

### **LEARNING OUTCOMES:**

- 1. Have an ability to understand the market dynamics namely, demand, demand forecasting, elasticity of demand, pricing methods and pricing in different market structures.
- 2. Gain an insight into how production function is carried out to achieve least cost combination of inputs and cost analysis.
- 3. Have an ability to understand the application of BEA in business decision making.
- 4. Have an ability to understand how capital budging decisions are carried out in business organization.
- 5. Have an ability to record the business transactions and following accounting process.
- 6. Have an ability to analyse and interpret the financial statements through ratio analysis.

### **TEXTBOOKS:**

- 1. Aryasri: Managerial Economics and Financial Analysis, 2/e, TMH, 2005.
- 2. Varshney & Maheswari: Managerial Economics, Sultan Chand, 2003.

### **REFERENCE BOOKS:**

- 1. Ambrish Gupta, Financial Accounting for Management, Pearson Education, New Delhi, 2004.
- 2. Shim & Siegel: Financial Accounting (Schaum's Outlines), 2/e TMH, 2004
- 3. Chary: Production and Operations Management, 3/e, TMH, 2004.
- 4. Domnick Salvatore: Managerial Economics In a Global Economy, 4<sup>th</sup> Edition, Thomson, 2003.
### **B.Tech-** MECHANICAL ENGG

- 5. Narayanaswamy: Financial Accounting-A Managerial Perspective, PHI, 2005.
- 6. Peterson & Lewis: Managerial Economics, 4<sup>th</sup> Edition, Pearson Education, 2004.
- 7. Raghunatha Reddy & Narasimhachary: Managerial Economics & Financial Analysis, Scitech, 2005.
- 8. S.N.Maheswari & S.K. Maheswarial, Financial Accounting, Vikas, 2005.
- 9. Truet and Truet: Managerial Economics: Analysis, Problems and Cases, Wiley, 2004.
- 10. Dwivedi: Managerial Economics, 6<sup>th</sup> Ed., Vikas, 2002.
- 11. Yogesh Maheswari: Managerial Economics, 2<sup>nd</sup> Ed., PHI, 2005

### **ONLINE RESOURCES:**

- 1. NPTEL Course: Managerial Economics by Dr. Trupti Mishra, IIT Bombay. Link: https://nptel.ac.in/courses/110/101/110101149/
- 2. NPTEL Course: Foundation Course in Managerial Economics by Prof. Barnali Nag, IIT Kharagpur.

Link: https://nptel.ac.in/courses/110/105/110105075/

3. NPTEL Course: Financial Accounting by Prof. Puran Singh, IIT Madras. Link: https://nptel.ac.in/courses/110/106/110106147/

**R20** Regulations

# VAAGDEVI COLLEGE OF ENGINEERING (AUTONOMOUS)

### **PROJECT BASED LEARNING - 3**

B. Tech.: V-Semester

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# THERMAL ENGINEERING LAB

B. Tech.: V-Semester

Prerequisite – TE - I

# **COURSE OBJECTIVES:**

- > Demonstrate the working principle of an IC engine.
- Conduct test on the engines to its performance parameters like Brake thermal efficiency, Brake specific fuel consumption, and Mechanical efficiency.
- > Estimate useful amount of heat energy and also various heat losses in the engine.
- Conduct tests on different engines like Petrol, Diesel, 4-stroke, Single cylinder and Multi cylinder engines.
- Know various loads to be applied on the engine like electric, mechanical and hydraulic loading.
- > Know the performance of a compressor unit.

# LIST OF EXPERIMENTS:

- 1. Single cylinder 4-stroke Diesel engine test Rig (Mechanical Loading).
- 2. 4-Stroke multi cylinder Petrol Engine test Rig.
- 3. Valve and Port timing Diagram Experiment.
- 4. 2-stage reciprocating Air Compressor
- 5. Study of Boiler models.
- 6. Assemble and Dissemble of Engine
- 7. Single cylinder 4-stroke Diesel engine test Rig (Electrical Loading)
- 8. Single cylinder 2-stroke Petrol engine test Rig
- 9. Variable compression ratio petrol engine Test Rig (DC dynamo meter loading)
- 10. Heat balance on SI and CI engines

# **COURSE OUTCOMES:**

The students will be able to

- 1. Identify various types of engines and their parts.
- 2. Understand the power of different engine and where they can be used.
- 3. Estimate the performance of different engine and analyze them.
- 4. Analyze engines to set better efficiencies by knowing Brake specific fuel consumption of the engines.

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LTPC

### **METROLOGY AND MACHINE TOOLS LAB**

B. Tech.: V-Semester

Prerequisite – Nil

#### **COURSE OBJECTIVES:**

- > Apply the principles of metrology with the measuring instruments i.e Vernier calipers, micrometer, bevel protractor, tool maker's microscope, sine bar etc.
- > Employ their knowledge to lathe, milling alignment tests with dial Gauges, spirit levels.
- > Operate lathe, milling machine, drilling, grinding, shaper, slotting machines.
- > Select cutting tool materials and tool geometries for different metals.
- > Perform turning, taper turning, thread cutting and knurling operations on lathe.

### LIST OF EXPERIMENTS:

#### (Perform any 10 experiments)

### METROLOGY LAB

- 1. Measurement of lengths, heights, diameters by Vernier calipers.
- 2. Thread Measurement by 2- wire and 3- wire method.
- 3. Use of gear teeth Vernier calipers and checking the chordal addendum and chordal height of spur gear.
- 4. Machine tool "alignment test on the lathe".
- 5. Tool makers' microscope and its application.
- 6. Angle and taper measurements by Bevel protractor, Sine bars, etc.
- 7. Measurement of different heights by using Vernier height gauge.

### MACHINE TOOLS LAB

- 1. Introduction of general-purpose machines Lathe, Drilling machine, Milling machine, Shaper.
- 2. Introduction of Planning machine, slotting machine, surface grinder and tool and cutter grinder.
- 3. Step turning and taper turning on lathe machine.
- 4. Thread cutting and knurling on lathe machine.
- 5. Drilling and tapping.
- 6. Shaping and planning.
- 7. Slotting.
- 8. Milling.
- 9. Cylindrical Surface Grinding.
- 10. Grinding of Tool angles.

# **COURSE OUTCOMES:**

The students will be able to

- 1. Use different types of measuring instruments
- 2. Perform different operations on Lathe machines.
- 3. This course provides fundamental knowledge and principles of machining to the operation of different marching processes on machine tools.
- 4. The course draws upon knowledge of metal cutting principles turnouts the lathes, milling, drilling, shaping, slotting, and grinding machines.

#### **DESIGN OF MACHINE MEMBERS – II**

**B. Tech.: VI-Semester** 

#### Prerequisite – EM, MOS

#### **COURSE OBJECTIVES:**

- > Select the material and its properties for the optimum design of a journal bearing.
- ▶ Understand the design of IC engine parts.
- > Design the belt drives and the pulleys for power transmission.
- > Design the various types of gears for power transmission.
- > Design the various power drives suitable to transfer power requirements.

#### UNIT – I

**Bearings:** Types of Journal bearings-basic modes of Lubrication – Bearing Modulus – full and partial bearings – Clearance ratio – Heat dissipation of bearings, bearing materials – journal bearing design. Ball and roller bearings – Static load – dynamic load – equivalent radial load – design and selection of ball & roller bearings.

#### UNIT – II

#### **DESIGN OF IC ENGINE PARTS:**

**Connecting Rod:** Thrust in connecting rod – stress due to whipping action on connecting rod ends – Cranks and Crank shafts. Pistons, Forces acting on piston – Construction, Design and proportions of piston.

#### UNIT – III

### POWER TRANSMISSION SYSTEMS AND PULLEYS:

Transmission of power by Belt and Rope drives, Transmission efficiencies, types of Belts, Ratio of tensions, initial tension and centrifugal tension – Ropes – pulleys for belt and rope drives-materials-chain drivers

#### UNIT – IV

**Gears:** Spur gears – load concentration factor – Dynamic load factor – analysis of spur gears – check for plastic deformation-check for dynamic and wear consideration.

**Helical and bevel gear drivers:** Helical and bevel gears – load concentration factor-Dynamic load factor-analysis of helical and bevel gears- check for plastic deformationcheck for dynamic and wear consideration.

**Design of worm gears:** Properties of worm gears – selection of materials – strength and wear rating of worm gears- force analysis-friction in worm gears.

### UNIT – V

**Design of Power Screws:** Design of Screw – design of nut – compound screw – differential screw – ball screw – possible failures and remedies.

### **COURSE OUTCOMES:**

The students will be able to

- 1. Design journal and roller bearings,
- 2. Design engine parts like connecting rod, crank pins, crank shafts, pistons, cylinder and cylinder liner.
- 3. Understand Power transmission system by belt drives and chain drives.
- 4. Understand the design of different gear.
- 5. Understand the design of different power screws.

### **TEXTBOOKS:**

- 1. P.Kannaiah, "Machine Design" Sci-Tech, 4<sup>th</sup> Ed. 2012, ISBN-13: 978-81-8371-151-7.
- 2. Pandya and Shah, "Machine Design", Charotar, 18<sup>th</sup> Ed. 2012, ISBN, : 978-93- 80358-51-2.
- 3. Design data book, PSG Data Book.

### **REFERENCE BOOKS:**

- 1. Schaum Series, "Machine deign", Mc.Graw Hill, 1<sup>st</sup> Edition, ISBN-13: 9780070255951.
- 2. R.S.Kurmi, J.K.Gupta, "Machine design", S. Chand, 14<sup>th</sup> Ed, ISBN Number-13: 9788121925372.
- S.Md.Jalaludeen, "Machine Design", Anuradha Publications, 14<sup>th</sup> Ed., ISBN-13: 97881896382

### **ONLINE RESOURCES:**

- 1. NPTEL Course: Design of Machine Elements I by Prof. B. Maiti, IIT Kharagpur. Link: https://nptel.ac.in/courses/112/105/112105124/
- 2. NPTEL Course: Machine Design II by Prof. M. M. Mayuram, IIT Madras. Link: https://nptel.ac.in/courses/112/106/112106137/

# HEAT & MASS TRANSFER

### B. Tech.: VI-Semester

L T P C 2 1 0 3

### Prerequisite – Nil

### **COURSE OBJECTIVES:**

- > To understand the basic differences between the modes of heat transfers conduction, connection and radiation.
- To know the basic laws like Fourier's law, Newton's law of cooling and Stefan Boltzmann law: Chart solutions of transient condition system.
- To understand the concept of hydrodynamic and thermal boundary layers. Heat transfer in phase change like boiling and condensation. Film wise and drop wise condensation.
- > To know various types of heat exchangers and heat transfer coefficients.
- > To know the concepts of log mean temperature difference and NTU methods for heat exchangers.
- To understand Radiation heat transfer, Planks law, Kirchhoff law, Stefan Boltzmann law, concept of shape factor, black body and emissivity.

### UNIT – I INTRODUCTION

Modes and mechanisms of heat transfer – Basic laws of heat transfer – General discussion about applications of heat transfer. Conduction Heat Transfer: Fourier rate equation – General heat conduction equation in Cartesian, cylindrical and Spherical coordinates.Simplification and forms of the field equation – steady, unsteady and periodic heat transfer – Initial and boundary conditions.

### UNIT – II

### **CONDUCTION HEAT TRANSFER**

**One Dimensional Steady State Conduction Heat Transfer:** Homogeneous slabs, hollow cylinders and spheres – overall heat transfer coefficient – electrical analogy – Critical radius of insulation. Variable and Thermal conductivity systems with heat sources or Heat generation.

Extended surface (fins) Heat Transfer – Long Fin, Fin with insulated tip and Short Fin, Application to error measurement of Temperature.

**One Dimensional Transient Conduction Heat Transfer:** Systems with negligible internal resistance – significance of Biot and Fourier Numbers – Chart solution of transient conduction systems. Concept of Functional Body.

### UNIT – III

### **CONVECTIVE HEAT TRANSFER**

Classification of systems based on causation of flow, condition of flow, configuration of flow and medium of flow – Dimensional analysis as a tool for experimental investigation – Buckingham Pi Theorem and method, application for developing semi – empirical non-dimensional correlation for convection heat transfer – Significance of non-dimensional numbers – Concepts of Continuity, Momentum and Energy Equations.

**Free Convection:** Development of Hydrodynamic and Thermal boundary layer along a vertical plate – Use of empirical relations for Vertical plates and Pipes.

### UNIT – IV

### FORCED CONVECTION - INTERNAL FLOWS

Concepts about Hydrodynamic and Thermal Entry Lengths – Division of internal flow based on this – Use of empirical relations of Horizontal Pipe Flow and annulus flow.

**Forced convection:** External Flows: Concepts about hydrodynamic and thermal boundary layer and use of empirical correlations for convective heat transfer – Flat plates and Cylinders.

**Heat Transfer with Phase Change:** Boiling: Pool boiling – Regimes Calculations on Nucleate boiling, Critical Heat Flux and Film boiling Condensation: Film wise and drop wise condensation – Nusselt's Theory of Condensation on a vertical plate – Film condensation on vertical and horizontal cylinders using empirical correlations

### UNIT – V

**Heat Exchangers:** Classification of heat exchangers – overall heat transfer Coefficient and fouling factor – Concepts of LMTD and NTU methods. Problems using LMTD and NTU methods.

**Radiation Heat Transfer:** Emission characteristics and laws of black, body radiation – Irradiation – total and monochromatic quantities – laws of Planck, Wien, Kirchhoff, Lambert, Stefan and Boltzmann – heat exchange between two black bodies – concepts of shape factor – Emissivity – heat exchange between grey bodies – radiation shields – electrical analogy for radiation network.

### **COURSE OUTCOMES:**

The students will be able to

- 1. Understand the basics of heat transfer with good knowledge of conduction , construction and radiation.
- 2. Identify the free convection and forced convection requirement for particular design.
- 3. Analyse the concept of heat convection and get better result from free convection.
- 4. To know the concept of hydrodynamics and thermal boundary in forced convection.
- 5. Design effective heat exchanger by considering concepts of radiation heat transfer along with conduction and convection.

### **TEXTBOOKS:**

- 1. R.C. SACHDEVA, "Fundamentals of Engineering Heat and Mass Transfer", New Age Publishers, 4<sup>th</sup> Ed. 2010, ISBN : 978-81-224-2785-1.
- 2. R.K. Rajput, "Heat and Mass Transfer", S. Chand & Company Ltd., 5<sup>th</sup> Edition, ISBN Number: 978-8121926171.

### **REFERENCE BOOKS:**

- 1. Yunus A.Cengel, "Heat Transfer: A Practical Approach", Tata McGraw Hill (P) Ltd., 4<sup>th</sup> Ed., ISBN 13: 9780073398129.
- F.P Incropera, "Fundamentals of Heat and Mass Transfer", John Wiley & Sons 6<sup>th</sup> Ed., ISBN-13: 978-0471457282.
- 3. HOLMAN, "Heat Transfer", TMH 10<sup>TH</sup> Ed., ISBN Number: 9780071069670.

### **ONLINE RESOURCES:**

- 1. NPTEL Course: Heat and Mass Transfer by Prof. S. P. Sukhatme, IIT Bombay. Link: https://nptel.ac.in/courses/112/101/112101097/
- 2. NPTEL Course: Heat and Mass Transfer by Prof. Pradip Dutta, IISc Banglore. Link: https://nptel.ac.in/courses/112/108/112108149/

# **PROJECT BASED LEARNING - 4**

B. Tech.: VI-Semester

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**R20** Regulations

### VAAGDEVI COLLEGE OF ENGINEERING (AUTONOMOUS)

**Open Elective - I** 

**B. Tech.: VI-Semester** 

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**Note:** Students should take open electives from the list of open electives offered by the other departments/branches only.

### FINITE ELEMENT METHODS (PROFESSIONAL ELECTIVE – I)

#### **B. Tech.: VI-Semester**

L T P C 3 0 0 3

### **Prerequisite – MOS**

#### **COURSE OBJECTIVES:**

- > To analyze various engineering objects by deserting them in to small elements.
- To analyze complicated objects and to find stresses, strains, deflection slopes under various load.
- > To understand potential energy, approach and boundary conditions.
- > To find out stiffness matrix of components to know various parameters objects.
- > To analyze two dimensional elements by using constant strain triangles methods.
- To analyze one dimensional heat transfer problems like fins and thin plates and to solve Eigen values of stepped bar and beams.

### UNIT – I

#### **INTRODUCTION TO FEM**

Basic concepts, historical back ground, application of FEM, general description, comparison of FEM with other methods. Basic equation of elasticity. Stress – Strain and strain – displacement relations for 2-D and 3-D. Rayleigh – Ritz method, weighted residual methods. **One Dimensional Problems:** Finite element modeling co-ordinates and shape functions. Finite element equations for an axial bar element in local coordinates using Potential energy approach – Finite element analysis of uniform, stepped and tapered bars subjected to mechanical loads – Assembly of Global stiffness matrix and load vector – Quadratic shape functions

### UNIT – II

Analysis of Trusses: Stiffness matrix for plane truss elements, Stress calculations and problems.

**Analysis of Beams:** Hermite shape functions – Element stiffness matrix – Load vector – simple Problems.

### UNIT – III 2-D PROBLEMS

Finite Element modeling of two dimensional stress analysis with Constant Strain Triangles (CST) and treatment of boundary conditions. Estimation of Load vector, stresses.

Finite element modeling of axi symmetric solids subjected to Axi symmetric loading with triangular elements.

Two dimensional 4 noded isoparametric elements and problems.

### $\mathbf{UNIT} - \mathbf{IV}$

### SCALAR FIELD PROBLEMS

Study state Heat transfer analysis: One dimensional analysis of Slab, fin and two dimensional analysis of thin plate- problems.

# UNIT – V

### **DYNAMIC ANALYSIS**

Dynamic equations – Lumped and consistent mass matrices – Evaluation of Eigen values and Eigen vectors – mode shapes for a stepped bar and beams.

### **COURSE OUTCOMES:**

The students will be able to

- 1. Student is able to analyze real time engineering objects and to present a well designed structures.
- 2. Student can analyze bars beams, shafts and array symmetric solids.
- 3. Student is able to understand and analyze the heat flow and know the temperature distribution at various points on the components.
- 4. Student can analyze any complicated structure by utilizing the computer software like ANSYS instead of analytical methods.
- 5. Estimate Load vector and stresses in 2D problems.

### **TEXTBOOKS:**

- 1. Tirupathi K.Chandrapatla and Ashok D.Belagundu, "Introduction to finite elements in engineering", Mc.Graw Hill, 4<sup>th</sup> Ed., Oct. 2011, 4<sup>th</sup> Ed., ISBN-13: 978- 0132162746.
- S.S.Rao, "The finite element methods in Engineering", Elsevier, 5<sup>th</sup> edition, 2012, ISBN-13: 978-1856176613.

### **REFERENCE BOOKS:**

- 1. J.N.Reddy, "An Introduction to Finite Element Methods", Mc.Grawhill, 2005, 3<sup>rd</sup> Ed. ISBN-13: 978-0072466850.
- 2. O.C. Zienkowitz, "The Finite Element Method in engineering science", McGrawhill, 2<sup>nd</sup> Ed., ISBN-13: 978-0070941380.
- 3. S.Md.Jalaludeen, "Introduction of Finite Element Analysis", Anuradha publications, ISBN-13: 9788184720983.

### **ONLINE RESOURCES:**

- 1. NPTEL Course: Finite Element Method by Prof. C.S. Upadhyay, IIT Kanpur. Link: https://nptel.ac.in/courses/112/104/112104115/
- 2. NPTEL Course: Finite Element Method by Prof. P.M. Dixit, IIT Roorkee. Link: https://nptel.ac.in/courses/112/104/112104116/
- 3. NPTEL Course: Introduction to Finite Element Method by Dr. R. Krishnakumar, IIT Madras.

Link: https://nptel.ac.in/courses/112/106/112106135/

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### VAAGDEVI COLLEGE OF ENGINEERING (AUTONOMOUS)

#### MECHATRONICS (PROFESSIONAL ELECTIVE – I)

#### **B. Tech.: VI-Semester**

Prerequisite – Nil

#### **COURSE OBJECTIVES:**

- ➤ Know the basic concepts of mechatronics.
- Know the various actuating systems like Hydraulic, pneumatic, mechanical and electrical actuating system.
- > Know about the micro processor and micro controllers.
- > Know about the system and interfacing and data acquisition.

#### UNIT – I

Mechatronics systems, elements, levels of mechatronics system, Mechatronics design system, measurement systems, control systems, microprocessor-based controllers, advantages and displacement, position, proximity, velocity, motion, force, acceleration, torque, fluid pressure, liquid flow, liquid level, temperature and light sensors.

#### UNIT – II

Solid state electronic devices, PN Junction diode, BJT, FET, DIA and TRIAC. Analog signal conditioning, amplifiers, filtering. Introduction to MEMS & typical applications.

#### UNIT – III

Hydraulic and pneumatic actuating systems, Fluid systems, Hydraulic and pneumatic systems, components, control valves, electro-pneumatic, hydro-pneumatic, electro-hydraulic servo systems: Mechanical actuating systems and electrical actuating systems.

#### UNIT – IV

Digital electronics and systems, digital logic control, micro processors and micro controllers, programming, process controllers, programmable logic controllers, PLCs versus computers, application of PLCs for control.

#### UNIT – V

System and interfacing and data acquisition, DAQS, SCADA, A to D and D to A conversions; Dynamic models and analogies, System response . Design of mechatronics systems & future trends.

# **COURSE OUTCOMES:**

The students will be able to

- 1. Use the control system; mechatronics design systems and measurement systems.
- 2. Work on various actuating systems.
- 3. Convert the signals from one form to another form.
- 4. Estimate the micro controllers and micro processors.
- 5. Develop the simple programming code for PLC's.

### **TEXTBOOKS:**

- 1. Mechatronics Integrated Mechanical Electronics Systems/KP Ramachandran &GK Vijaya Raghavan/WILEY india Edition/2008
- 2. Mechatronics Electronics control systems in Mechanical and Electrical Engineering/W Bolton/Pearson Education press/3<sup>rd</sup> edition,2005.

### **REFERENCE BOOKS:**

- 1. Mechatronics Source books by Newton C Braga, Thomson Publications, Chennai.
- 2. Mechatronics N.Shanmugam/ Anuradha Agencies Publishers.
- 3. Mechatronics System Design/Devdas shetty/Richard/Thomson.

### **ONLINE RESOURCES:**

- 1. NPTEL Course: Mechatronics by Prof. Pushparaj Mani Pathak, IIT Roorkee. Link: https://nptel.ac.in/courses/112/107/112107298/
- 2. NPTEL Course: Mechatronics and Manufacturing Automation by Dr. Shrikrishna N. Joshi, IIT Guwahati.

Link: https://nptel.ac.in/courses/112/103/112103174/

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### NANO TECHNOLOGY (PROFESSIONAL ELECTIVE – I)

#### B. Tech.: VI-Semester

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#### Prerequisite – Nil

#### **COURSE OBJECTIVES:**

- Understand the fundamentals of Nano theory, necessary background for applications in various industries.
- Learn the components of Nano materials in detail, and its working in different applications
- Understand the general scientific concepts required for technology, Apply the concepts in solving engineering problems,
- Explain scientifically the new developments in engineering and technology, and Get familiarized with the concepts, theories, and technological applications

#### UNIT – I

**Introduction to Nanotechnology:** Importance of nanoscale, Nanostructure types, electronic, magnetic, optical Properties of Nanomaterials, top-down and bottom – up approach to nanostructures.

**Quantum Mechanical phenomenon in Nanostructures:** Quantum confinement of electrons in semiconductor Nano structures, one dimensional confinement (Quantum Wires), two dimensional confinements (Quantum Wells), three dimensional confinements (Quantum dots).

### UNIT – II

**Carbon Nano Structures:** Carbon Nanotubes (CNTs), Fullerenes, C60, C80 and C240 Nanostructures, properties (mechanical, optical and electrical) and applications.

### UNIT – III

**Fabrication of Nanomaterials:** Physical Methods: Inert gas condensation, Arc discharge, RF plasma, plasma arc technique, lon sputtering, Laser ablation, Laser pyrolysis, Molecular beam eqitaxy, Chemical vapour deposition method.

**Nano Scale characterization techniques:** Scanning probe techniques (AFM, MFM, STM, SEM, TEM), XRD.

#### UNIT – IV

**Nanodevices and Nanomedicine:** Lab on chip for bioanalysis, Core/shell Nanoparticles in drug delivery systems (site specific and targeted drug delivery), cancer treatment, and bone tissue treatment.

**Nano and molecular electronics:** Resonant-Tunneling Structures, single electron tunneling, Single Electron transistors, coulomb blockade, glant magneto resistance, tunneling magneto resistance.

### UNIT – V

**Nanolithography and Nanomanipulation:** e-beam lithography and SEM based Nanolithography and Nanomanipulation, Ion beam lithography, oxidation and metallization Mask and its application. Deep UV lithography, X-ray based lithography.

### **COURSE OUTCOMES:**

The students will be able to

- 1. Understand the fundamentals of Nanotechnology
- 2. Know the different classes of nano materials
- 3. Impart basic knowledge on various synthesis and characterization techniques involved in Nanotechnology
- 4. Make the learner familiarize with nanotechnology potentialities.
- 5. Apply transfer interdisciplinary systems engineering approaches to the field of nanotechnology.

### **TEXTBOOKS:**

- 1. Charies.P.pode, introduction to nanotechnology, springer publications.
- 2. Springer Handbook of Nanotechnology-Bharat Bhusan.
- 3. Phani Kumar, principles of nanotechnology, scitech publications.

### **REFERENCE BOOKS:**

- 1. David Ferry "Transport in Nano structures" Cambridge University press 2000.
- 2. Nanobiotechnology; ed, C.M.Niemeyer, C.A. Mirkin.
- 3. Nanofabrication towards biomedical application: Techniques, tools, Application and impact-Ed. Challa S., S.R.Kumar, J.H.Carola.
- 4. Encyclopedia of Nanotechnology-Hari Singh Nalwa
- 5. Carbon Nanotubes: Properties and Applications- Michael J.O'Connell.
- 6. S.Dutta "Electron Transport in Mesoscopic systems" Cambridge University press.
- 7. H.Grabert and M.Devoret "Single charge Tunneling" Plenum press 1992.

### **ONLINE RESOURCES:**

1. NPTEL Course: Nanotechnology, Science and Applications by Dr. Prathap Haridoss, IIT Madras

Link: https://nptel.ac.in/courses/113/106/113106093/

### MAINTENANCE AND SAFETY ENGINEERING (PROFESSIONAL ELECTIVE – II)

#### B. Tech.: VI-Semester

Prerequisite – Nil

#### **COURSE OBJECTIVES:**

- Know the modern maintenance strategies
- Know the various types of maintenance like preventive, corrective and inventory control in maintenance.
- ▶ Know the quality maintenance processes.
- > Know the objective and importance of maintainability

#### UNIT – I

**Introduction:** Need for maintenance, facts and figures, modern maintenance strategy for the 21<sup>st</sup> century, engineering maintenance objectives and maintenance in equipment life cycle, terms and definitions.

Maintenance Management and control: Maintenance manual, maintenance, facility evaluation, functions of effective maintenance management, maintenance project control methods and maintenance management control indices.

#### UNIT – II

**Types of maintenance:** preventive maintenance, elements of preventative, maintenance program, establishing preventative maintenance program PM program evaluation and improvement, PM measures, PM models, corrective maintenance, corrective maintenance types, corrective maintenance steps and downtime components, corrective maintenance measures, corrective maintenance models.

**Inventory control in maintenance:** inventory control objectives and basic inventory decisions, ABC inventory control methods, inventory control models two bin inventory control and safety stock, spares determination factors spares calculation methods.

#### UNIT – III

**Quality and safety in maintenance:** needs for quality maintenance processes, maintenance work quality, use of quality control charts in maintenance work sampling, post maintenance testing, reasons for safety problems in maintenance, guidelines to improve safety in maintenance work, safety officer's role in maintenance work, protection of maintenance workers.

**Maintenance costing:** reasons for maintenance costing, maintenance budget preparation methods and steps, maintenance labor cost estimation, material cost estimation, equipment life cycle maintenance cost estimation, and maintenance cost estimation models.

### UNIT – IV

**Reliability, reliability centered maintenance, RCM:** Goals and principles, RCM process and Associated Questions, RCM program Components effectiveness measurement indicators, RCM benefits and reasons for its failures, reliability versus maintenance and reliability in support phase, bathtub hazard rate concept, reliability measures and formulas, reliability networks, reliability analysis techniques.

### UNIT – V

**Maintainability:** maintainability importance and objective, maintainability in systems, life cycle, and maintainability design characteristics, maintainability functions and measures, common maintainability design errors.

### **COURSE OUTCOMES:**

The students will be able to

- 1. Understand The maintenance in equipment life cycle.
- 2. Analyse The preventive and corrective measures in maintenance.
- 3. Estimate The inventory control in maintenance.
- 4. Classify The incosting and budget preparation
- 5. Compare the reliability measures, reliability networks and reliability analysis techniques.

#### **TEXTBOOKS:**

- 1. Reliability, Maintenance and Safety Engineering By Dr. A.K.Guptha/ Laxmi Publications
- 2. Industrial Safety Management by L.M.Deshmukh / TMH

#### **REFERENCE BOOKS:**

- 1. Maintenance Engineering & Management by R.C.Mishra/ PHI
- 2. Reliability Engineering by Elsayed/ Pearson
- 3. Engineering Maintenance A modern approach, B.S Dhallon, 2002, C.R.R Publishers.

### MECHANICS OF COMPOSITE MATERIALS (PROFESSIONAL ELECTIVE – II)

#### **B. Tech.: VI-Semester**

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#### Prerequisite – MOS, Metallurgy

#### **COURSE OBJECTIVES:**

- To make the basic understanding of linear elasticity with emphasis on the difference between isotropic and anisotropic material behavior
- to compute the elastic constants, elastic stiffness and compliance matrices using matrix algebra.
- ➤ to analyze a lamina for stress and strain tensors using Generalized Hooke's law
- ➤ to analyze a laminated plate in bending from classical laminate theory, and finding laminate properties from lamia
- Ability to predict the failure strength of a laminated composite plate using different failure theories.

#### UNIT – I

**Introduction to Composite Materials:** Introduction ,Classifications: Polymer Matrix Composites, Metal Matrix Composites, Ceramic Matrix Composites, Carbon–Carbon Composites, Fiber-Reinforced Composites and nature-made composites, and applications .

**Reinforcements:** Fibers- Glass, Silica, Kevlar, carbon, boron, silicon carbide, and born carbide fibers. Particulate composites, Polymer composites, Thermoplastics, Thermosetts, Metal matrix and ceramic composites.

#### UNIT – II

**Micro mechanical Analysis of a Lamina:** Introduction, Mass, Volume and Weight Fractions, Density and Void Content, Evaluation of Four Elastic Moduli, Strength of Materials Approach, Semi-Empirical Models, Elasticity Approach, Ultimate Strength of Unidirectional Lamina, Coefficients of Thermal Expansion, Coefficients of Moisture Expansion

#### UNIT – III

**Macro mechanical Analysis of a Lamina:** Introduction, Definitions Stress, Strain, Elastic Moduli, Strain Energy. Hooke's Law for Different Types of Materials, Hooke's Law for a Two-Dimensional Unidirectional Lamina, Plane Stress Assumption, Relationship of Compliance and Stiffness Matrix to Engineering Elastic Constants of a Lamina.

### UNIT – IV

**Macro mechanical Analysis of Laminates:** Introduction, Classical Laminate Theory, Stress– Strain Relations for a Laminate, Laminate Code, Special Cases of Laminate Stiffness's: Single Layered Configurations, Symmetric Laminates, Anti symmetric Laminates Un symmetric Laminates, Common Laminates In-Plane and Flexural Modulus.

### UNIT – V

**Failure Analysis of Laminates:** Introduction, Strength failure Theories: Maximum Stress Failure Theory, Maximum Stain Failure Theory, Tsai-Hill Failure Theory, Tsai-Wu Failure Theory, Failure Analysis and Design of Special Cases of Laminates, Applications, Failure Criterion for a Laminate.

### **COURSE OUTCOMES:**

The students will be able to

- 1. Highlight the appropriate use of composite materials in the industry
- 2. Understand the significance of replacing existing metal structures with composite materials whenever beneficial
- 3. Comprehend the complexity of design of composite materials and structures
- 4. Apply knowledge of mechanics of composite materials for analyzing advanced materials involved in current trends and research area
- 5. Apply the knowledge of composite materials for designing structures for aerospace applications and smart structures

### **TEXTBOOKS:**

- 1. R. M. Jones, Mechanics of Composite Materials, Mc Graw Hill Company, New York, 1975.
- 2. Engineering Mechanics of Composite Materials by Isaac and M Daniel, Oxford University Press, 1994.

### **REFERENCE BOOKS:**

- 1. B. D. Agarwal and L. J. Broutman, Analysis and performance of fibre Composites, Wiley-Interscience, New York, 1980.
- 2. Mechanics of Composite Materials, Second Edition (Mechanical Engineering), By Autar K. Kaw ,Publisher: CRC
- 3. L. R. Calcote, Analysis of Laminated Composite Structures, Van Nostrand Rainfold, New York, 1969.

### **ONLINE RESOURCES:**

1. NPTEL Course: Mechanics of Fibre Reinforced Polymer Composite Structures by Prof. Debabrata Chakraborty, IIT Guwahati.

Link: https://nptel.ac.in/courses/112/103/112103308/

2. NPTEL Course: Introduction to Composites by Prof. Nachiketa Tiwari, IIT Kanpur. Link: https://nptel.ac.in/courses/112/104/112104229/

### **REFRIGERATION & AIR CONDITIONING** (PROFESSIONAL ELECTIVE – II)

#### **B. Tech.: VI-Semester**

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#### Prerequisite – Nil

#### **COURSE OBJECTIVES:**

- > Understand the basics and the working principle of Air refrigeration system
- > Understand the working principle of vapour compression refrigeration system.
- > Understand the working principle of vapour absorption refrigeration system.
- Draw T-S, p-V and p-h diagrams and able to use psychometric chart in solving practical problems.
- > Know various Refrigeration & Air Conditioning equipments.
- Calculate various heat loads to design air conditioning system for comfort and industrial applications.

#### UNIT – I

#### INTRODUCTION TO REFRIGERATION

Necessity and applications – Unit of refrigeration and C.O.P. – Mechanical Refrigeration – Types of Ideal cycles of refrigeration.

Air Refrigeration: Bell Coleman cycle and Brayton Cycle, Open and Dense air systems – Actual air refrigeration system problems – Refrigeration needs of Air craft, different types of air conditioning systems in aircrafts.

#### UNIT – II

#### VAPOR COMPRESSION REFRIGERATION

Working principle and essential components of simple vapor 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 – numerical problems.

**Principles of Evaporators:** Classification – Working principles expansion devices – Types – Working principles.

**Refrigerants:** Desirable properties – classification refrigerants used – Nomenclature – Ozone Depletion – Global Warming.

#### UNIT – III

#### VAPOR ABSORPTION SYSTEM

Calculation of max COP – description and working of NH3 – water system and Li Br – water (Two shell & Four shell) System. Principle of operation Three Fluid absorptionsystem, salient features.

**Steam Jet Refrigeration System:** Working principles and Basic Components, Principle and operation of (i) Thermoelectric refrigerator (ii) Vortex tube or Hilsch tube.

### UNIT – IV

# INTRODUCTION TO AIR CONDITIONING

Specific humidity, relative humidity, degree of saturation, dry bulb temperature, wet bulb temperature.

Psychrometric Properties & Processes – Characterization of Sensible and latent heat loads – Need for Ventilation, consideration of infiltration – Load concepts of RSHF, GSHF – Problems, Concept of ESHF and ADP.

Requirements of human comfort and concept of effective temperature – Comfort chart – Comfort Air conditioning – Requirements of Industrial air conditioning, Air conditioning Load calculations.

### UNIT – V

# AIR CONDITIONING SYSTEMS

Classification of equipment, cooling, heating humidification and dehumidification, filters, grills and registers, fans and blowers, Heat pump – Heat sources – different heat pump circuits.

### **COURSE OUTCOMES:**

The students will be able to

- 1. Understand all the basic principles of refrigeration.
- 2. Prepare a model refrigeration system and designing various components according to the requirement.
- 3. Design an A.C. unit by calculating the heat loads.
- 4. Observe and analyze large capacity units like ice plants, cold storages and central A.C. units.
- 5. Know all Psychrometric properties and processes.

### **TEXTBOOKS:**

- 1. CP Arora, "Refrigeration and Air Conditioning", TMH, 2<sup>nd</sup> Edition, ISBN Number: 978-0074630105.
- 2. SC Arora & Domkundwar, "A Course in Refrigeration and Air conditioning", Dhanpatrai, ISBN : 9780000229663.

### **REFERENCE BOOKS:**

- 1. P.I. Bellaney, "Refrigeration and Air Conditioning", Jain Book Depot. 2<sup>nd</sup> Ed., ISBN Number: 817409136X.
- 2. R.S.Khurmi & J.K.Gupta, "Refrigeration and Air conditioning", S.Chand, Eurasia Publishing House (P) Ltd., 1<sup>st</sup> Edition, ISBN No. 9788121927819.

### **ONLINE RESOURCES:**

- 1. NPTEL Course: Refrigeration and Air Conditioning by Prof. Ravi Kumar, IIT Roorkee. Link: https://nptel.ac.in/courses/112/107/112107208/
- 2. NPTEL Course: Refrigeration and Air Conditioning by Prof. M. Ramgopal, IIT Kharagpur.

Link: https://nptel.ac.in/courses/112/105/112105128/

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### VAAGDEVI COLLEGE OF ENGINEERING (AUTONOMOUS)

### UNCONVENTIONAL MACHINING PROCESSES (PROFESSIONAL ELECTIVE – III)

#### B. Tech.: VI-Semester

#### Prerequisite – Nil

#### **COURSE OBJECTIVES:**

- To understand the difference between convention and unconventional machining process. To know the modern machining process and process selection for different materials.
- To know the Metal Removal Rate and surface finish of different materials using different process parameters.
- To know the electro chemical machining process, elements of ECM process, concentration, working of tool, chemistry of the process and tool design.
- > To know the economic aspects of the different unconventional machining process.
- To know the basic principle of electric discharge machining process, power circuits for EDM process tool design, surface finish, machining accuracy and characteristics of spark evaded surface wire process
- > To know the metallurgical effects of surface after machining process.

# UNIT – I

### INTRODUCTION

Need for Unconventional machining methods-Classification of Unconventional machining processes – considerations in process selection. Materials. Applications.

**Ultrasonic machining** – Elements of the process, mechanics of metal removal, constructional Details. process parameters, economic considerations, applications, limitations and recent developments.

### UNIT – II

**ABRASIVE JET MACHINING:** Abrasive jet machining, Water jet machining and abrasive water jet machining. Basic principles, equipments, process variables, mechanics of metal removal, performance Evaluation, applications and limitations.

**Electro** – **Chemical Processes** : Fundamentals of electro chemical machining, electrochemical grinding, electro chemical honing and deburring process, metal removal rate in ECM, Tool design, Surface finish and accuracy economic aspects of ECM – Simple problems for estimation of metal removal rate. Fundamentals of chemical machining, advantages and applications, maskants and etchants.

### UNIT – III

### THERMAL METAL REMOVAL PROCESSES

General Principle and applications of Electric Discharge Machining, Electric Discharge Grinding and electric discharge wire cutting processes – Power circuits for EDM, Mechanics

of metal removal in EDM, Process parameters, selection of tool electrode and dielectric fluids, methods surface finish and machining accuracy, characteristics of spark eroded surface and machine tool selection. Wire EDM, principle, applications.

### UNIT – IV

Theory of electron beam machining, comparison of thermal and non-thermal processes – General Principle and application of laser beam machining – thermal features, cutting speed and accuracy of cut.

### UNIT – V

### APPLICATION OF PLASMA FOR MACHINING

Metal removal mechanism, process parameters, accuracy and surface finish and other applications of plasma in manufacturing industries.

Magnetic abrasive finishing, Abrasive flow finishing, Electro stream drilling, shaped tube electrolytic machining.

### **COURSE OUTCOMES:**

The students will be able to

- 1. Understand selection of processes.
- 2. Design the components of Abrasive Jet machining process.
- 3. Observe surface properties after machining without destructing the material.
- 4. Select the material with respect to process.
- 5. Apply plasma for machining like Magnetic abrasive finishing, Abrasive flow finishing etc

### **TEXTBOOKS:**

- 1. Pandya P.C. and Shah H.S., "Modern Machining Process", TMH., 2008, 1<sup>st</sup> Edition, ISBN:9780070965539.
- V.K.Jain, "Advanced Manufacturing Process", Allied publishers, Edition: 2012, ISBN-13: 978-1439852903.

### **REFERENCE BOOKS:**

- Serope Kalpakjian and Steven R.Schmid, "Manufacturing Engineering and Technology", Pearson Publications, 5<sup>th</sup> Ed. 2009, ISBN: 0132272717.Bhattacharya A, "New Technology", The Institution of Engineers, India 1984.
- 2. C.Elanchezhian, B.Vijaya Ramnath and M.Vijayan, "Unconventional Machining Processes", Anuradha Publications, 2005, ISBN Number: 9788120319585.
- 3. Unconventional Machining Processes by Bhattacharya.

### **ONLINE RESOURCES:**

1. NPTEL Course: Advanced Machining Processes by Prof. Manas Das, IIT Guwahati. Link: https://nptel.ac.in/courses/112/103/112103202/

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### **DESIGN FOR MANUFACTURE** (PROFESSIONAL ELECTIVE – III)

#### B. Tech.: VI-Semester

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#### **Prerequisite – Machine Design**

#### **COURSE OBJECTIVES:**

- To understand various general design rules for manufacturing and criteria for material selection.
- > To study various machining processes and tolerance aspects in machining.
- > To know the design considerations for casting and welding processes.
- To understand the conceptual design factors to be considered in forging extrusion and sheet metal work.
- To study the general design guidelines for manual assembly and development of DFA Methodology.

### UNIT – I

**Introduction:** Design philosophy-Steps in Design process – General Design rules for Manufacturing – Basic principles of designing for economical production – Creativity in design.

**Materials:** Selection of Materials for design- Developments in Material Technology – Criteria for material section – Material selection interrelationship with process selection – process selection charts.

### UNIT – II

**Machining Processes:** Overview of various machining processes – general design rules for machining – Dimensional tolerance and surface roughness – Design for Machining ease – Redesigning of components for machining ease with suitable examples, General design recommendations for machined parts.

#### UNIT – III

**Metal Casting:** Appraisal of various casting processes, general design considerations for casting – casting tolerances – Use of Solidification Simulation in casting design – Product design rules for sand casting.

**Metal Joining:** Appraisal of various welding processes, Factors in design of weldments – General design guidelines – pre and post treatment of welds – Effects of thermal stresses in weld joints – Design of brazed joints.

#### UNIT – IV

**Forging**: factors of forging – Closed die forging design – parting lines of dies – Drop forging die design – General design recommendations of Extrusion, Sheet Metal Work

Design guidelines for Extuded sections – Design principles for Punching. Blanking, Bending, Deep Drawing-Keeler Goodman Forming Limit Diagram – Component Design for Blanking.

### UNIT – V

**Design for Assembly:** General design guidelines for Manual Assembly – Development of Systematic DFA Methodology – Assembly Efficiency – Classification System for Manual insertion and Fastening – Effect of part symmetry on handling time.

### **COURSE OUTCOMES:**

The students will be able to

- 1. Classify the steps in design process
- 2. Understand the overview of various machining processes
- 3. Apply the factors in design of weldments
- 4. Analyze general design recommendations of extrusion
- 5. Compare the development of systematic DFA methodology

### **TEXTBOOKS:**

1. Product design for Manufacture and Assembly – Geoffrey Bothroyd, Peter Dewhurst and W.A Knight, CRC Press.

### **REFERENCE BOOKS:**

- 1. Product design and Manufacturing A.K Chitable and R.C Gupta. Prentice Hall of India, New Delhi, 2003.
- 2. Design and Manufacturing Surender Kumar & Goutham Sutradhar, Oxford & IBH Publishing Co. Pvt Ltd., New Delhi, 1998.
- 3. Product Design Kevin Otto and Kristin Wood. Pearson Education.

### **ONLINE RESOURCES:**

1. NPTEL Course: Design for Manufacture and Assembly (DFMA) by Abinash Kumar Swain, IIT Guwahati.

Link: https://nptel.ac.in/courses/107/103/107103012/

2. NPTEL Course: Design for Manufacturing by Prof. A. De, IIT Bombay. Link: https://nptel.ac.in/courses/112/101/112101005/

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### VAAGDEVI COLLEGE OF ENGINEERING (AUTONOMOUS)

### **POWER PLANT ENGINEERING** (PROFESSIONAL ELECTIVE – III)

#### B. Tech.: VI-Semester

Prerequisite – Nil

#### **COURSE OBJECTIVES:**

- Understand the sources of energy, nature and role of energy in India. To recognize and understand the different types of power plants, equipments and Layouts
- Understand the working principle of Steam power plant, equipment, Coal handling systems, ash handling systems.
- > Understand working principle of Diesel power plant and Gas Turbine power plant .
- > Know components of Hydro-Electric Power plant ,Typical Layouts, Types of Dams
- > Know various nuclear fuels, various types of Nuclear Reactors.
- Understand Power plant Economics, Load Curves, Effluents from various power plants, Environmental standards

#### 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 fed 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.

**Direct Energy Conversion:** Solar energy, fuel cells, Thermo electric and Thermo ionic, NHD generation.

### 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. Application of Hydro power plant, safety measures in Hydro power station, performance of water turbine, comparison of Hydro electric power plant and steam power plant.

### 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.

### **COURSE OUTCOMES:**

The students will be able to

- 1. Understand the different types of operation takes place in the power plant with its plant layout
- 2. Got knowledge about internal combustion power plants and their uses.
- 3. Explore the opportunities to improve the capacity and the efficiency of hydro electric power plant.
- 4. Understand the concept of nuclear power generation and find out the better way against radiation hazards.
- 5. Analyze the plant economics and the environmental considerations for the establishment of plant.

### **TEXTBOOKS:**

- 1. P.C.Sharma, "Power Plant Engineering", S.K.Kataria Publication, 2013, ISBN-13: 9788189757205.
- 2. Arora and S.Domkundwar, "A course in Power Plant Engineering", 2<sup>nd</sup> Edition TMH, ISBN: 9780070435995.

#### **REFERENCE BOOKS:**

- 1. Rajput, "A text book of Power Plant Engineering", Laxmi Publications, ISBN No.: 978-81-318-0255-7.
- 2. Ramalingam, "PowerPlant Engineering", SciTech Publishers, ISBN-13: 9788183710626.
- 3.P.K.Nag, "Power Plant Engineering": II Edition, TMH, ISBN Number: 978-0070648159.
- 4.Elanchezhian, "Power Plant Engineering", I.K. International Publications, ISBN-13: 978-8189866303.

#### **ONLINE RESOURCES:**

1. NPTEL Course: Power Plant Engineering by Prof. Ravi Kumar, IIT Roorkee. Link: https://nptel.ac.in/courses/112/107/112107291/

### HEAT TRANSFER LAB

#### **B. Tech.: VI-Semester**

Prerequisite – Nil

#### **COURSE OBJECTIVES:**

- > To know about various measuring instruments Thermocouples, Voltmeter, Ammeter, etc.
- > To demonstrate experimental principles.
- > To explain basic heat transfer principles.
- To determine thermal conductivity of various materials like magnesium oxide, brass rod, asbestos, saw dust.
- To perform experiments on Cartesian, cylindrical and spherical coordinate system experiments separately.
- > To determine the overall heat transfer coefficient in case composite walls and heat exchanger.
- > To know the efficiency, temperature distribution of a pin fin.
- > To understand a black body and know emissivity any other gray body.

#### LIST OF EXPERIMENTS: (Perform any TEN Experiments)

- 1. Composite Slab Apparatus Overall heat transfer co-efficient.
- 2. Heat transfer through lagged pipe.
- 3. Heat Transfer through a insulating powder.
- 4. Thermal Conductivity of given metal rod.
- 5. Heat transfer in pin-fin
- 6. Experiment on unsteady state Heat Conduction
- 7. Heat transfer in forced convection apparatus.
- 8. Heat transfer in natural convection
- 9. Parallel and counter flow heat exchanger.
- 10. Emissivity measurement apparatus.
- 11. Stefan Boltzmann Apparatus.
- 12. Critical Heat flux apparatus

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### **COURSE OUTCOMES:**

The students will be able to

- 1. Student is able to analyze and conduct the experiments to know the heat transfer and temperatures.
- 2. Student is able to interpret the experimental knowledge in the real life situation like in, electric iron, and refrigerator.
- 3. Student is able to possess the application knowledge of engine radiation, air condition chambers, solar collectors etc.
- 4. Student can design a heat transfer system to cool the given component to required temperature within the desired time.

### ADVANCED ENGLISH COMMUNICATION SKILLS LAB B. Tech.: VI-Semester

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Prerequisite: English Language and Interactive Communication Skills Lab

#### Introduction

The introduction of the Advanced English Communication Skills Lab is considered essential at  $3^{rd}$  year level. At this stage, the students need to prepare themselves for their careers which may require them to listen, speak, read, and write in English both for their professional and interpersonal communication in the globalised context.

The proposed lab should be a laboratory course to enable students to use 'good' English and perform the following:

- Gather ideas and information to organize ideas relevantly and coherently.
- Engage in debates.
- Participate in group discussions.
- Face interviews.
- Write project/research reports/technical reports.
- Make oral presentations.
- Write formal letters.
- Transfer information from non-verbal to verbal texts and vice-versa.
- Take part in social and professional communication.

#### **Course Objectives**

This Lab focuses on using multi-media instruction for language development to meet the following targets. By the end of the course the students will be able

- > To prepare the students for their placements by improving communication skills.
- To familiarize and train students with the types and elements of Résumé/ Curriculum Vitae.
- > To expose students to the concepts of report writing familiarize and train students to write technical reports.
- > To practice interview skills as an observer, an interviewer and/or an interviewee.

#### **Course Outcomes**

After completing this course, students will be able to:

CO1 Participate in group discussion to present their viewpoints briefly and effectively.

**CO2** Inculcate flair for writing and felicity in written expression in Résumé / Curriculum Vitae /

Reports.

CO3 Participate confidently with appropriate body language in interviews.

CO4 Enhance their team building skills and capabilities for effective decision making.

#### **Syllabus**

#### Module 1: Fundamentals of Interpersonal Communication

Listen to process information- give information, as part of a simple explanation – conversation starters: small talk-exposure to functional aspects of intonation- accent- tone-pauses for practice – compare information and ideas from multiple sources- converse with reasonable accuracy over a wide range of everyday topics.

- Lexical chunks for accuracy and fluency- factors influencing the fluency, Role play-deliver a five-minute formal / informal talk – greetings – respond to greetings – invite and offer – accept – decline – take leave- making a request-apology etc.
- Listening for gist- listening for details-Being an active listener: giving verbal and nonverbal feedback – Summarizing academic readings and lectures - conversational speech listening to and participating in conversation – persuasion.

#### Module 2: Effective Writing Skills

- Résumé Writing-Concept of Résumé Writing-Professional career objective-Resume-Curriculum vitae, Biodata: Difference-Format of Résumé and Types of Résumés -Tips to build a winning Résumé-Tips to write effective cover letter-Statement of Purpose-Letters of Recommendation.
- Report Writing-Elements of Report Writing- Significance, format, layout, and mechanismtypes of Reports-Newspaper Reports-Technical reports -Special Reports-Report in manuscript format.

### Module 3: Presentation Skills

Oral presentations - individual and group through JAMsessions/seminars/PPTs and Written presentations through posters/projects/reports.

#### **Module 4: Group Discussion**

Concept and process of Group Discussion-Importance of Group Discussion-Do's and Don'ts of Group Discussion-Group Discussion for placements-Practice on topics–Current affairs, Abstract topics, General awareness, Business and economy, Education and Social issues.

#### **Module 5: Interview Skills**

Interview Skills: Meaning and Purpose of an Interview-Types of interviews-telephonic interview, video conference-(n)etiquette; Interview preparation techniques-Dress code at an interview-Types of interview questions-FAQs in HR Interview.

# Minimum Requirement of infrastructural facilities for Advanced English Communication Skills Lab:

The Advanced English Communication Skills (AECS) Laboratory shall have the following infrastructural facilities to accommodate at least 35 students in the lab:

- Spacious room with appropriate acoustics
- Audio-visual aids
- LCD Projector
- Public Address system
- P IV Processor, Hard Disk 80 GB, RAM–512 MB Minimum, Speed 2.8 GHZ
- T. V, a digital stereo
- Headphones of High quality
- Forty movable chairs and Eight round tables to accommodate 5 students per each table

### **Prescribed Lab Manual:** A book titled **A Coursebook of Advanced Communication Skills Lab** published by Universities Press, Hyderabad.

Suggested Software: The software of the topics prescribed above are procured and used.

- Globarena
- Open source software
- Oxford Advanced Learner's Compass, 8<sup>th</sup>Edition
- DELTA's key to the Next Generation TOEFL Test: Advanced Skill Practice.
- Lingua TOEFL CBT Insider, by Dreamtech
- **TOEFL & GRE** (KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS)
- The following software from 'train2success.com'
  - > Positive Thinking
  - Interviewing Skills
  - > Telephone Skills
  - > Time Management
  - > Skill mate
  - > Presentation skills, Cambridge (with VCD)

# **Books Prescribed:**

- 1. **Technical Communication** by Meenakshi Raman & Sangeeta Sharma, Oxford University Press 2009.
- 2. English Language Communication : A Reader cum Lab Manual Dr A Ramakrishna Rao, Dr G Natanam& Prof SA Sankaranarayanan, Anuradha Publications, Chennai 2008.
- 3. Advanced Communication Skills Laboratory Manual by Sudha Rani, D, Pearson Education 2011.
- 4. **Technical Communication** by Paul V. Anderson. 2007. Cengage Learning pvt. Ltd. New Delhi.
- 5. **Business and Professional Communication:** Keys for Workplace Excellence. Kelly M. Quintanilla & Shawn T. Wahl. Sage South Asia Edition. Sage Publications. 2011.

# DISTRIBUTION AND WEIGHTAGE OF MARKS:

- The practical examinations for the Laboratory practice shall be conducted as per the University norms prescribed for the core engineering practical sessions.
- For the English Language lab sessions, there shall be continuous evaluation during the year for 30 sessional marks and 70 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 End Examination shall be conducted by the teacher concerned, by inviting the External Examiner from outside. In case of the non-availability of the External Examiner, other teacher of the same department can act as the External Examiner.

# Mini Project: As a part of Internal Evaluation

- Seminar/ Professional Presentation
- A Report on the same has to be prepared and presented.
- Teachers may use their discretion to choose topics relevant and suitable to the needs of students.
- Not more than two students to work on each mini project.
- Students may be assessed by their performance both in oral presentation and written report.

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## VAAGDEVI COLLEGE OF ENGINEERING (AUTONOMOUS)

#### **ENVIRONMENTAL SCIENCES**

#### **B. Tech.: VI-Semester**

Prerequisite – Nil

#### **COURSE OBJECTIVES:**

- > Understanding the importance of ecological balance for sustainable development.
- > Understanding the impacts of developmental activities and mitigation measures.
- > Understanding the environmental policies and regulations

## UNIT – I

## **ECOSYSTEMS:**

Definition, Scope, and Importance of ecosystem. Classification, structure, and function of an ecosystem, Food chains, food webs, and ecological pyramids. Flow of energy, Biogeochemical cycles, Bioaccumulation, Biomagnification, ecosystem value, services and carrying capacity, Field visits.

#### UNIT – II

#### NATURAL RESOURCES:

**Classification of Resources:** Living and Non-Living resources, **water resources:** use and over utilization of surface and ground water, floods and droughts, Dams: benefits and problems. **Mineral resources:** use and exploitation, environmental effects of extracting and using mineral resources, **Land resources:** Forest resources, **Energy resources:** growing energy needs, renewable and non renewable energy sources, use of alternate energy source, case studies.

#### UNIT – III

#### **BIODIVERSITY AND BIOTIC RESOURCES:**

Introduction, Definition, genetic, species and ecosystem diversity. Value of biodiversity; consumptive use, productive use, social, ethical, aesthetic and optional values. India as a mega diversity nation, Hot spots of biodiversity. Field visit. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts; conservation of biodiversity: In-Situ and Ex-situ conservation. National Biodiversity act.

#### UNIT – IV

#### **ENVIRONMENTAL POLLUTION AND CONTROL TECHNOLOGIES:**

Environmental Pollution: Classification of pollution, Air Pollution: Primary and secondary pollutants, Automobile and Industrial pollution, Ambient air quality standards. Water pollution: Sources and types of pollution, drinking water. Soil Pollution: Sources and types, Impacts of modern agriculture, degradation of soil. Noise Pollution: Sources and Health hazards, standards, Solid waste: Municipal Solid Waste management, composition

and characteristics of e-Waste and its management. **Pollution control technologies:** Wastewater Treatment methods: Primary, secondary and Tertiary. Overview of air pollution control technologies, Concepts of bioremediation. **Global Environmental Issues and Global Efforts:** Climate change and impacts on human environment. Ozone depletion and Ozone depleting substances (ODS). Deforestation and desertification. International conventions / Protocols: Earth summit, Kyoto protocol, and Montréal Protocol. NAPCC-GoI Initiatives.

# UNIT – V

# **ENVIRONMENTAL POLICY, LEGISLATION & EIA:**

Environmental Protection act, Legal aspects Air Act- 1981, Water Act, Forest Act, Wild life Act, Municipal solid waste management and handling rules, biomedical waste management and handling rules. EIA: EIA structure, methods of baseline data acquisition. Overview on Impacts of air, water, biological and Socio-economical aspects. Strategies for risk assessment, Concepts of Environmental Management Plan (EMP). **Towards Sustainable Future:** Concept of Sustainable Development Goals, Population and its explosion, Crazy Consumerism, Environmental Education, Urban Sprawl, Human health, Environmental Ethics, Concept of Green Building, Ecological Foot Print, Life Cycle assessment (LCA), Low carbon life style.

## **COURSE OUTCOMES:**

The students will be able to

- 1. Recall previously learned ecosystem and find how the biodiversity changes went in the environment.
- 2. Demonstrate outlines of types of pollutions and related to day-to-day life.
- 3. Apply models of food chains and energy flow models to solve the identified parameters.
- 4. Classify the types of pollutants and distinguish the functions of sustainable development that take part in the environment.
- 5. Design the experiments with BOD, COD, OD and to estimate the micro organisms which cause contamination and can propose solutions.

## **TEXTBOOKS:**

- 1 Textbook of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission.
- 2 Environmental Studies by R. Rajagopalan, Oxford University Press.

## **REFERENCE BOOKS:**

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

# B. Tech- MECHANICAL ENGG

- 5. Text book of Environmental Science and Technology Dr. M. Anji Reddy 2007, BSPublications.
- 6. Introduction to Environmental Science by Y. Anjaneyulu, BS. Publications.

## **ONLINE RESOURCES:**

1. NPTEL Course: Environment and Development by Prof. Ngamjahao Kipgen, IIT Guwahati.

Link: https://nptel.ac.in/courses/109/103/109103186/

## CAD/CAM

#### **B. Tech.: VII-Semester**

Prerequisite – Nil

#### **COURSE OBJECTIVES:**

- To know the computers in industrial manufacturing and use of hardware and software components in CAD/CAM systems.
- To analyze the difference between 2D & 3D transformations in computer graphics applications.
- > To construct the database models and geometric modeling features. To know the drafting and modeling systems used in CAD/CAM. Solid modeling features and applications.
- ➤ To distinguish between NC (Numerical Control), CNC & DNC in CAD/CAM.
- > To know about the group technology approaches for manufacturing industries.
- ➤ To analyze the QC (Quality Control) and CAQC (Computer Aided Quality Control) functions

## UNIT – I

## COMPUTERS IN INDUSTRIAL MANUFACTURING

**Introduction:** Computer configuration for CAD Applications, Computer Peripherals for CAD, Product cycle, CAD/CAM Hardware, Basic structure, CPU, Memory types, input devices, display devices, hard copy devices, storage devices.

**Computer Graphics:** Virtual reality, Hidden lines, Hidden surfaces, Z-buffer, Pointers, Area sub-division, Scan line algorithm. , database structure for graphics, modeling, transformation of geometry, 3D transformations, mathematics of projections, clipping.

## UNIT – II

## **GEOMETRIC MODELING**

Requirements, geometric models, geometric construction models, curve representation methods-Hermite Cubic spline, Bezier curve, B-spline

Surface representation methods-Plane Surface, Surface of Revolution, tabulated cylinder. Solid modeling-Boundary representation, Constructive solid geometry

**Drafting and Modeling Systems:** Basic geometric commands, layers, display control commands, editing, dimensioning.

## UNIT – III

## NUMERICAL CONTROL

NC, NC modes, NC elements, NC machine tools, structure of CNC machine tools, features of Machining center, turning center, CNC Part Programming: fundamentals, manual part programming methods, computer aided part programming.

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# UNIT – IV

**Group Technology:** Part family, coding and classification, production flow analysis, advantages and limitations.

**Computer Aided Quality Control**: Terminology in quality control, the computer in QC, contact inspection methods, noncontact inspection methods-optical, noncontact inspection methods- Non-optical, computer aided testing, integration of CAQC with CAD/CAM.

## UNIT – V

**COMPUTER AIDED PROCESS PLANNING:** Retrieval CAPP, Generative CAPP, Hybrid system.

**Case Studies-** Web Integrated Manufacturing, JIT production control by Kanban, Toyota integrated product development, Indian Manufacturing Scenario.

## **COURSE OUTCOMES:**

The students will be able to

- 1. Observe the various input and output devices used in CAD/CAM systems.
- 2. Understand 2D and 3D transformations problems .
- 3. Write the programs for different models by using NC part programming.
- 4. Analyze the Group Technology (GT)
- 5. Differentiate CAQC (Computer Aided Quality Control) and CIM (Computer Integrated Manufacturing) systems.

## **TEXTBOOKS:**

- 1. A Zimmers & P.Groover, "CAD/AM", PE/PHI, 1<sup>st</sup> Ed., ISBN Number: 978-8177584165.
- 2. Ibrahim Zeid, "CAD/CAM Theory and Practice", TMH, 2<sup>nd</sup> Ed., ISBN Number: 978-0070151345.

# **REFERENCE BOOKS:**

- 1. Lalit Narayan, "Computer Aided Design and Manufacturing", PHI, ISBN: 978-81- 203-3342-0.
- Radhakrishnan and Subramanian, "CAD/CAM/CIM", New Age, 3<sup>rd</sup> Ed., 2007, ISBN-13: 9788122412482.

# **ONLINE RESOURCES:**

- 1. NPTEL Course: Computer Aided Design and Manufacturing by Prof. Anoop, IIT Delhi. Link: https://nptel.ac.in/courses/112/102/112102101/
- 2. NPTEL Course: Computer Aided Design and Manufacturing I by Prof. Anoop, IIT Delhi. Link: https://nptel.ac.in/courses/112/102/112102102/
- 3. NPTEL Course: Computer Aided Design and Manufacturing II by Prof. Anoop, IIT Delhi.

Link: https://nptel.ac.in/courses/112/102/112102103/

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## VAAGDEVI COLLEGE OF ENGINEERING (AUTONOMOUS)

#### INSTRUMENTATION AND CONTROL SYSTEMS B. Tech.: VII-Semester

**Prerequisite – Nil** 

#### **COURSE OBJECTIVES:**

- To know the measurement systems, performance characteristics, errors classification and elimination.
- > To analyze the concepts of displacement, temperature, pressure measurement, calibration procedures and their applications.
- > To know about the measurements of level, flow, speed, acceleration and vibration.
- ➤ To understand the concepts of stress strain, humidity, force, torque and power measurement devices. to know the elements of control systems with block diagrams and their applications in temperature control, numerical control and servo control.

#### UNIT – I

Definition- Basic principles of measurement- Measurement – Measurement systems, generalized configuration and function descriptions of measuring instruments- examples. Static and Dynamic performance characteristics- sources of error, Classification and elimination of error.

#### UNIT – II

**Measurement of Displacement:** Theory and construction of various transducers to measure displacement – Piezo electric, Inductive, capacitance, resistance ionization and photo electric transducers, Calibration procedures.

**Measurement of Temperatures:** Classification – Ranges – Various principles of measurements – Expansion, Electrical Resistance – Thermistor – Thermo couple – Pyrometers – Temperature indicators.

**Measurement of Pressure:** Units- classification – different principles used. Manometers, Piston, Bourdon pressure gauge, Bellows- Diaphragm gauges. Low pressure measurement - Thermal conductivity gauges – ionization pressure gauges, McLeod pressure gauge.

#### UNIT – III

**Measurement of Level:** Direct method – Indirect methods – capacitative, ultrasonic, magnetic, cryogenic fuel level indicators- Bubbler level indicators.

**Flow Measurement:** Rotameter, magnetic, Ultrasonic, Turbine flow meter, Hot – wire 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 – Principles of Seismic instruments – Vibrometer and accelerometer using this principle.

## UNIT – IV

**Stress Stain 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, Absorption psychrometer, Dew point meter.

Measurement of Force, Torque and Power: Elastic force meters, load cells, Torsion meters, Dynamometers.

## UNIT – V

**Elements of Control Systems:** Introduction, Importance – Classification – Open and closed systems Servomechanisms, transfer Function - Examples with block diagrams – Temperature, speed and position control systems.

## **COURSE OUTCOMES:**

The students will be able to

- 1. Gain knowledge on various parts of machine and IC engine. Understand the design construction of machine parts.
- 2. To gain knowledge of functioning of parts such as connecting rod, eccentric etc.
- 3. To understand how heat and electricity arecombined in calibrating thermoelectric devices, especially resistance temperature detector, thermo couple.
- 4. To measure the displacement using LVDT transducer. To gain knowledge on flow measurement using rotameter.
- 5. Classify Open and closed systems Servomechanisms.

# **TEXTBOOKS:**

- 1. Measurement systems: Applications & Design/ D.S. Kumar/ Anuradha Agencies.
- 2. Instrumentation, measurement & analysis / B. C. Nakra & K.K. Choudhary/THM.

# **REFERENCE BOOKS:**

- 1. Principles of industrial Instrumentation and Control systems/ Chennakesava R Alavala/ Cengage Learning.
- 2. Instrumentation and control systems / S. Bhaskar/ Anuradha agencies.
- 3. Experimental Methods for Engineers/ Holman/ McGraw Hill.
- 4. Mechanical and Industrial Measurements/ R.K. Jain/ Khanna Publishers.
- 5. Mechanical Measurements / Sirohi and Radhakrishna / New Age.
- 6. Instrumentation & Mech. Measurements/ A.K.Tayal / Galgotia Publications.

# **ONLINE RESOURCES:**

- 1. NPTEL Course: Industrial Instrumentation by Prof. Alok Barua, IIT Kharagpur. Link: https://nptel.ac.in/courses/108/105/108105064/
- 2. NPTEL Course: Industrial Instrumentation by Prof. V. Jayashankar, IIT Madras. Link: https://nptel.ac.in/courses/108/106/108106074/#

## **Open Elective - II**

**B. Tech.: VII-Semester** 

LTPC 3003

Note: Students should take open electives from the list of open electives offered by the other departments/branches only.

## PRODUCTION PLANNING & CONTROL (PROFESSIONAL ELECTIVE – IV)

#### **B. Tech.: VII-Semester**

L T P C 3 0 0 3

#### Prerequisite – Nil

#### **COURSE OBJECTIVES:**

- Ensure efficient utilization of production facilities and to coordinate the production activities of different departments.
- Maintain adequate but not excessive stock of raw materials; work in process and of finished goods to meet production requirements.
- > Plan delivery schedules at the most economical level.
- > Establishing targets and checking it against performance.
- Provide alternative production strategies in case of emergencies. Have better control over stocks of raw material, Work in process and finished goods.
- > Ensure production of right product in right quality at the right time

## UNIT – I INTRODUCTION

Definitions – Objectives of Production Planning and Control – Functions of production planning and control – Elements of production control - Types of production - Organization of production planning and control, Internal organizations department.

**Forecasting:** Definition- importance of forecasting - factors affecting the forecast- types of forecasting and their uses-demand patterns - general principles of forecasting techniquesquantitative techniques- 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, ERP, and 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, and RPW method-Largest Candidate rule method. Routing – Definition – Routing procedure – Factors affecting routing procedure, Route Sheet.

# UNIT – IV

# SCHEDULING

Definition – Scheduling Policies – types of scheduling methods – difference 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.

## **COURSE OUTCOMES:**

The students will be able to

- 1. Design and plan an economical production system.
- 2. Learn about effective utilization of plant resources
- 3. Provide alternate production strategies
- 4. Guide shop floor people for manufacturing products of required quantity.
- 5. Define dispatcher and its procedures.

## **TEXTBOOKS:**

- 1. Samuel Elion, Elements of Production Planning and Control", ISBN-13: 9788185027098.
- 2. R.K.Jain, "Production planning and Control", Khanna publishers.

# **REFERENCE BOOKS:**

- 1. Ravi Shankar, "Industrial Engineering and management", Galgotia Publishers, 2<sup>nd</sup> Edition, ISBN Number: 978-8175156050.
- Panner Selvam, "Production Operation Management", PHI Publishers, 2<sup>nd</sup> Edition, ISBN, 8120327675, 9788120327672.
- 3. Moore, "Production Control", ISBN 13: 9780070429215.
- 4. Joseph S. Martinich, "Production and Operations Management", John Willey & Sons, 1<sup>st</sup> Edition, ISBN-13: 978-0471546320.

# **ONLINE RESOURCES:**

1. NPTEL Course: Principles of Industrial Engineering by Prof. D K Dwivedi, IIT Roorkee.Link: https://nptel.ac.in/courses/112/107/112107292/

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## **ROBOTICS** (PROFESSIONAL ELECTIVE – IV)

#### **B. Tech.: VII-Semester**

L T P C 3 0 0 3

## Prerequisite – KOM

#### **COURSE OBJECTIVES:**

- Students will be able to understand the concepts of robotics classification by coordinate system and control system.
- Students will be able to determine the degrees of freedom, end effectors, electric hydraulic and pneumatic devices.
- > Students will possess the concepts of homogeneous transformations.
- > Student will understand the Jacobean problems, Newton Euler transmations.
- Students will know about the actuators and feedback components, resolvers, encoders velocity sensors.
- > Students will be able to know the applications of robots in manufacturing.

#### UNIT – I INTRODUCTIO

INTRODUCTION

Automation and Robotics – An over view of Robotics – classification by coordinate system and control systems – Components of Industrial Robotics: Degrees of freedom – End effectors: Types of grippers: Mechanical, Magnetic, Vacuum cup – General considerations on gripper selection and design.

# UNIT – II

## **MOTION ANALYSIS**

Basic rotation matrices – Composite rotation matrices – Euler Angles – Equivalent Angle and Axis – Homogeneous transformation – Problems.

**Manipulator Kinematics:** D.H.Notation– Joint coordinates and world coordinates – Forward and inverse kinematics – problems.

**Differential Kinematics:** Differential kinematics of planar and spherical manipulators – Jacobians – Problems.

# UNIT – III

#### **ROBOT DYNAMICS**

Lagrange – Euler formulations – Newton – Euler formulations – Problems on planar two link manipulators.

## UNIT – IV

## TRAJECTORY PLANNING

Joint space scheme – cubic polynomial fit – Avoidance of obstacles – Types of motion – Slew motion – Joint interpolated motion – straight line motion – problems.

## UNIT – V

## **ROBOT ACTUATORS AND FED BACK COMPONENTS**

Actuators: Pneumatic and Hydraulic actuators. Electric Actuators: DC servo motors – stepper motors. Feedback components: position sensors – potentiometers, resolvers and encoders – Velocity sensors – Tactile sensors.

Robot Application in Manufacturing: Material handling – Assembly and Inspection.

## **COURSE OUTCOMES:**

The students will be able to

- 1. Apply the knowledge of robotics in real time human life applications.
- 2. Analyze the concept of CAD/CAM and automation to the robotics.
- 3. Compare knowledge of robot applications in manufacturing like, material handling, loading and unloading etc.
- 4. Experiment the robotics to the spot and continuous arc welding and spray painting.
- 5. Relate the Robot Application in Manufacturing.

## **TEXTBOOKS:**

- 1. Groover M P, "Industrial Robotics", Pearson Edu., 2012 1<sup>st</sup> Edition, ISBN Number: 0070265097, 9780070265097, 978-0070265097.
- JJ Craig, "Introduction to Robotic Mechanics and Control", Pearson, 2008 3<sup>rd</sup> edition. ISBN-13: 978-0201543612

## **REFERENCE BOOKS:**

- 1. Fu K S, "Robotics", McGraw Hill, 1<sup>st</sup> Ed., 2008, ISBN 13: 9780070226258.
- 2. Richard D.Klafter, "Robotic Engineering", Prentice Hall, 1<sup>st</sup> Ed., 1989, ISBN-13: 9780137820535.

## **ONLINE RESOURCES:**

- 1. NPTEL Course: Introduction to Robotics by Dr. Balaraman Ravindran, IIT Madras. Link: https://nptel.ac.in/courses/107/106/107106090/
- 2. NPTEL Course: Introduction to Robotics by Prof. Ashish Dutta, IIT Kanpur. Link: https://nptel.ac.in/courses/112/104/112104298/
- 3. http://www.robogrok.com/index.html

## COMPUTATIONAL FLUID DYNAMICS (PROFESSIONAL ELECTIVE – IV)

#### **B. Tech.: VII-Semester**

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#### Prerequisite - Differential equations and vector calculus, HT, FEM

#### **COURSE OBJECTIVES:**

- > Describe the physical significance of each term of the governing equations for CFD.
- ➤ Use a commercial CFD package to solve practical CFD problems effectively.
- > Develop finite difference and finite volume discredited forms of the CFD equations.
- > Construct computer code to solve the Euler and Navier Stokes Eqns.
- > Create and demonstrate verification strategies for evaluating CFD code.
- > Understand different algorithms of different models.

# UNIT – I

#### **INTRODUCTION**

Computational Fluid Dynamics as a Research and Design Tool, Applications of Computational Fluid Dynamics.

**Governing Equations of Fluid Dynamics:** Introduction, Control Volume, Substantial Derivative, Divergence of Velocity, Continuity Equation, Momentum Equation and Energy Equation.

#### UNIT – II

## MATHEMATICAL BEHAVIOUR OF PARTIAL DIFFERENTIAL EQUATIONS

Introduction, Classification of Quasi-Linear Partial Differential Equations, Eigen Value Method, Elliptic Equations, Parabolic Equations and Hyperbolic Equations.

#### UNIT – III

#### **BASICS ASPECTS OF DISCRETIZATION**

Introduction, Introduction of Finite Differences, Difference Equations, Explicit and Implicit Approaches, Errors and Stability Analysis, Convergence criteria and Grid Generation. **Incompressible Fluid Flow:** Introduction, Implicit Crank-Nicholson Technique, Pressure Correction Method, Computation of Boundary Layer Flow.

## UNIT – IV

#### HEAT TRANSFER

Finite Difference Applications in Heat conduction and Convention – Heat Conduction: Steady heat conduction, in a rectangular geometry, Transient heat conduction, Finite difference application in Convective heat transfer.

# UNIT – V

## FINITE VOLUME METHOD

Finite volume formulations for diffusion equation, convection diffusion equation. Solution algorithm for pressure velocity coupling in steady flows. Use of Staggered grids SIMPLE Algorithm and Introduction to Turbulence and Turbulence models.

## **COURSE OUTCOMES:**

The students will be able to

- 1. Describe Governing equations of CFD.
- 2. Analyze problems with Euler and Navier Stokes Eqns.
- 3. Evaluate CFD codes.
- 4. Analyze different models with different algorithms.
- 5. Understand Finite volume formulations for diffusion equation.

## **TEXTBOOKS:**

- 1. John D.Anderson, "Computational Fluid Dynamics: Basics with applications", McGraw Hill 1<sup>st</sup> Ed., ISBN-13: 978-0070016859.
- 2. Tapan K.Sengupta, "Fundamentals of Computational Fluid Dynamics", University Press, ISBN: 9788173714788.

## **REFERENCE BOOKS:**

- 1. SuhasV.Patankar, "Numerical Heat Transfer and Fluid Flow", Butter-Worth Publishers, Hemisphere Publishing Company, New York 1<sup>st</sup> Ed., ISBN Number: 978-0891165224.
- 2. Muralidhar K, "Computational Fluid Flow and Heat Transfer", Narosa Publishing House 2<sup>nd</sup> Ed., ISBN No.: 9781842651728.

# **ONLINE RESOURCES:**

1. NPTEL Course: Foundation of Computational Fluid Dynamics by Dr.S.Vengadesan, IIT Madras.

Link: https://nptel.ac.in/courses/112/106/112106186/

2. NPTEL Course: Computational Fluid Dynamics by Dr. K. M. Singh, IIT Roorkee. Link: https://nptel.ac.in/courses/112/107/112107079/

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# ADDITIVE MANUFACTURING (PROFESSIONAL ELECTIVE – V)

#### **B. Tech.: VII-Semester**

Prerequisite – Nil

#### **COURSE OBJECTIVES:**

- To understand the fundamental concepts of Additive Manufacturing (i.e. Rapid Prototyping) and 3-D printing, its advantages and limitations.
- Classify various types of Additive Manufacturing Processes and know their working principle, advantages, limitations etc.
- > To have a holistic view of various applications of these technologies in relevant fields such as mechanical, Bio-medical, Aerospace, electronics etc.

#### UNIT – I

**Introduction:** Prototyping fundamentals, Historical development, Fundamentals of Rapid Prototyping, Advantages and Limitations of Rapid Prototyping, Commonly used Terms, Classification of RP process, Rapid Prototyping Process Chain: Fundamental Automated Processes.

#### UNIT – II

**Liquid-based Rapid Prototyping Systems:** Stereo lithography Apparatus (SLA): Models and Specifications, Process, working principle, photopolymers, photo polymerization, layering technology, laser and laser scanning, Applications, Advantages and Disadvantages, Case studies.

**Solid ground curing (SGC):** Models and specifications, Process, working principle, Applications, Advantages and Disadvantages, Case studies.

**Solid-based Rapid Prototyping Systems:** Laminated Object Manufacturing (LOM): Models and specifications, Process, working principle, Applications, Advantages and Disadvantages, Case studies.

**Fused Deposition Modeling (FDM):** Models and specifications, Process, working principle, Applications, Advantages and Disadvantages, Case studies.

#### UNIT – III

**Powder Based Rapid Prototyping Systems:** Selective laser sintering (SLS): Models and specifications, Process, working principle, Applications, Advantages and Disadvantages, Case studies.

**Three-dimensional Printing (3DP):** Models and specifications, Process, working principle, Applications, Advantages and Disadvantages, Case studies.

**Rapid Tooling:** Introduction to Rapid Tooling (RT), Conventional Tooling Vs RT, Need for RT. Rapid Tooling Classification; Indirect Rapid Tooling Methods: Spray Metal Deposition,

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# **B.Tech-** MECHANICAL ENGG

RTV Epoxy Tools, Ceramic tools, Investment Casting, Spin Casting, Die casting, Sand Casting, 3D Keltool process.

**Direct Rapid Tooling:** Direct AIM, LOM Tools, DTM Rapid Tool Process, EOS Direct Tool Process and Direct Metal Tooling using 3DP

## UNIT – IV

**Rapid Prototyping Data Formats:** STL Format, STL File Problems, Consequence of Building Valid and Invalid Tessellated Models, STL file Repairs: Generic Solution, Other Translators, Newly Proposed Formats.

**Rapid Prototyping Softwares:** Features of various RP softwares like Magics, Mimics, Solid View, View Expert, 3 D View, Velocity 2, Rhino, STL View 3 Data Expert and 3 D doctor.

## UNIT – V

**RP Applications:** Application - Material Relationship, Application in Design, Application in Engineering, Analysis and Planning, Aerospace Industry, Automotive Industry, Jewelry Industry, Coin Industry, GIS application, Arts and Architecture. RP Medical and **Bioengineering Applications:** Planning and simulation of complex surgery, Customized Implants & Prosthesis, Design and Production of Medical Devices, Forensic Science and Anthropology, Visualization of Biomolecules.

## **COURSE OUTCOMES:**

The students will be able to

- 1. Describe various CAD issues for 3D printing and rapid prototyping and related operations for STL model manipulation.
- 2. Formulate and solve typical problems on reverse engineering for surface reconstruction from physical prototype models through digitizing and spline-based surface fitting.
- 3. Formulate and solve typical problems on reverse engineering for surface reconstruction from digitized mesh models through topological modeling and subdivision surface fitting.
- 4. Explain and summarize the principles and key characteristics of additive manufacturing technologies and commonly used 3D printing and additive manufacturing systems.
- 5. Explain and summarize typical rapid tooling processes for quick batch production of plastic and metal parts.

## **TEXTBOOKS:**

- 1. 3d Printing and Additive Manufacturing: Principles And Applications/Chua C.K., Leong K.F. and LIM C.S/World Scientific Publications
- 2. Additive Manufacturing Technologies/ I. Gibson I D. W. Rosen I B. Stucker/ Springer

# **REFERENCE BOOKS:**

- 1. Terry Wohlers, Wholers Report 2000, Wohlers Associates
- 2. Rapid Prototyping and Manufacturing /PaulF.Jacobs/ASME
- 3. Rapid Manufacturing /D.T. Pham and S.S. Dimov /Springer

## **ONLINE RESOURCES:**

1. NPTEL Course: Fundamentals of Additive Manufacturing Technologies by Prof. Sajan Kapil, IIT Guwahati.

Link: https://nptel.ac.in/courses/112/103/112103306/

2. NPTEL Course: Rapid manufacturing by Dr. Amandeep Singh, IIT Kanpur.

Link: https://nptel.ac.in/courses/112/104/112104265/

# MECHANICAL VIBRATIONS (PROFESSIONAL ELECTIVE – V)

#### **B. Tech.: VII-Semester**

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#### Prerequisite – DOM

#### **COURSE OBJECTIVES:**

- Fully understand and appreciate the importance of vibrations in mechanical design of machine parts
- > Understand free and forced (harmonic, periodic vibrations)
- Solve for the motion and the natural frequency of freely vibrating damped and undamped motion.
- Know about free and forced vibrations with damping of linear systems with one and two degrees of freedom.

## UNIT – I

**Single Degree of Freedom System:** Undamped and damped free vibration; 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- undamped and damped free and forced vibrations; undamped 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 model analysis; Method of matrix inversion; Torsional vibrations of multi-rotor systems and geared systems; Discrete-Time systems.

#### UNIT – IV

**Frequency Domain Vibration Analysis:** Over view, machine-train monitoring parameters-Data base development-vibration data acquisition-trending analysis-failure-node analysissignature analysis-root cause analysis.

#### UNIT – V

**Numerical Methods:** Raleigh's stodola's Matrix iteration, Rayleigh-Ritz Method and Holzer's methods.

# **COURSE OUTCOMES:**

The students will be able to

- 1. Students acquire the ability to format mathematical models of problems in vibrations
- 2. Students will have an abiliy to obtain the complete solution for the motion of vibrator systems (damped & undamped subjected to non periodic forcing functions)
- 3. Students will be able to obtain design parameters and indicate methods of solutions for complicated vibratory problems.
- 4. Students will be able to solve the vibrations probems for multi degrees of freedom.
- 5. Students will be able to obtain numerical solutions in vibrations problems.

# **TEXTBOOKS:**

- 1. Mechanical Vibrations/Groover/Nem chand and Bros.
- 2. Elements of Vibration Analysis/Meirovitch/TMH,2001.

## **REFERENCE BOOKS:**

- 1. Mechanical Vibrations/Vp Singh/Danapathi Rai & Sons.
- 2. Mechanical Vibrations/SS Rao/Pearson,2009/4<sup>th</sup>Edition.
- 3. Mechanical Vibrations/Debabrata Nag/Wiley.
- 4. Vibration problems in Engineering/S.P.Timoshenko.
- 5. Mechanical vibrations and sound engineering/A.G.Ambekar/PHI.
- 6. Theory and Practice of Mechanical Vibrations/JS Rao & K.Gupta/ New Age intl. Publishers/Ravised 2nd Edition.

## **ONLINE RESOURCES:**

- 1. NPTEL Course: Introduction to Mechanical Vibration by Prof. Anil Kumar, IIT Roorkee. Link: https://nptel.ac.in/courses/112/107/112107212/
- 2. NPTEL Course: Mechanical Vibrations by Prof. S.K. Dwivedy, IIT Guwahati. Link: https://nptel.ac.in/courses/112/103/112103112/

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# VAAGDEVI COLLEGE OF ENGINEERING (AUTONOMOUS)

# AUTOMOBILE ENGINEERING (PROFESSIONAL ELECTIVE – V)

#### **B. Tech.: VII-Semester**

Prerequisite – TE - I

#### **COURSE OBJECTIVES:**

- Understand the fundamentals of automobile theory, necessary background for intelligent diagnosis, maintenance and repair of different type of modern automobiles.
- Learn the components of automobile in detail, power transmission, engine construction and working, lubrication system.
- > Get the idea of emissions that will be released from the automobile
- > Understand different types of fuel systems, cooling and ignition systems.
- ► Understand different steering gear mechanisms
- Gain knowledge of different systems of an automobile like electrical, transmission, suspension and breaking systems.

## UNIT – I INTRODUCTION

Components of four wheeler automobile – chassis and body – power unit – power transmission – rear wheel drive, front wheel drive, 4 wheel drive – types of automobile engines, engine construction – engine lubrication, splash and pressure lubrication systems, oil filters, oil pumps – crank case ventilation – engine service, reboring, decarburization, Nitriding of crank shaft..

**Emission from Automobiles :** Pollution standards, National and international – Pollution Control – Techniques – Noise Pollution & control.

Multi point fuel injection for SI engines, CRDI – solar photo – voltaic, hydrogen, bio mass, alcohals, LPG, CNG, Liquid fuels and gaseous fuels, merits and demerits.

## UNIT – II FUEL

## **SYSTEM**

**S.I. Engine:** Fuel supply systems, Mechanical and electrical fuel pumps – carburetor – types – air filters – petrol injection.

**C.I. Engines:** Requirements of diesel injection systems, types of injection systems, fuel pump, nozzle, Alternative fuels for Automobiles-injection, Classification, Properties, Hybrid vehicles, injection timing, testing of fuel pumps.

## UNIT – III

**Cooling System:** Cooling Requirements, Air Cooling, Liquid Cooling and Forced Circulation cooling System – Radiators – Types – Cooling Fan - water pump, thermostat, evaporative cooling – pressure sealed cooling – antifreeze solutions.

# **B.Tech-** MECHANICAL ENGG

**Ignition System:** Function of an ignition system, battery ignition system, constructional features of storage battery, auto transformer, contact breaker points, condenser and spark plug – Magneto coil ignition system, electronic ignition system using contact breaker, electronic ignition using contact triggers – spark advance and retard mechanism.

#### UNIT – IV

**Electrical System:** Charging circuit, generator, current – voltage regulator – starting system, bendix drive mechanism, solenoid switch, lighting systems, Horn, wiper, fuel gauge – oil pressure gauge, engine temperature indicator etc.

**Transmission System:** Clutches, principle, types, cone clutch, single plate clutch, multi plate clutch, magnetic and centrifugal clutches, fluid fly wheel – Gear boxes, types, sliding mesh, constant mesh, synchro mesh gear boxes, epicyclic gear box, over drive torque converter. Propeller shaft – Hatch – Kiss drive, Torque tube drive universal joint, differential rear axles – types – wheels and tyres.

#### UNIT – V

**Steering System:** Steering geometry – camber, castor, king pin rake, combined angle toe in, center point steering. Types of steering mechanism – Ackerman steering mechanism, Davis steering mechanism, steering gears – types, steering linkages.

**Suspension System:** Objects of suspension systems – rigid axle suspension system, torsion bar, shock absorber, Independent suspension system.

**Braking System:** Mechanical brake system, Hydraulic brake system, Master cylinder, wheel cylinder, tandem master cylinder, Requirement of brake fluid, Pneumatic and vacuum brakes.

## **COURSE OUTCOMES:**

The students will be able to

- 1. Understand the various parts used in automotive pollution standards.
- 2. Understand different types of fuel injection system and pump system.
- 3. Analyze the cooling systems & ignition systems used in case of an automobile.
- 4. Understand the power transmission in automobile gearbox and clutch system.
- 5. Understand various transmission systems, steering systems and suspension and breaking systems.

#### **TEXTBOOKS:**

- 1. Kirpal Singh, "Automobile Engineering", Vol. 1 & Vol. 2, Standard Publishers Distribution 12<sup>th</sup> Edition, ISBN Numbers: 9788180141713, 9788180141775.
- K.M Gupta, "Automobile Engineering", Vol. 1 & Vol. 2, Umesh publication, 1<sup>st</sup> Edition, 2013, ISBN Numbers: <u>9788188114220</u>.

## **REFERENCE BOOKS:**

- 1. Heitner, "Automotive Mechanics", 2<sup>nd</sup> Ed., CBS Publishers & Distributors, ISBN-13: 978-8123908915.
- 2. P. RamiReddy, "Alternative fuels of Automobiles", Frontline publications.

# **ONLINE RESOURCES:**

1. NPTEL Course: Fundamentals of Automotive Systems by Prof. C.S.Shankar Ram, IIT Madras.

Link: https://nptel.ac.in/courses/107/106/107106088/

## CAD/CAM LAB

#### **B. Tech.: VII-Semester**

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# Prerequisite – MOS, MD

#### **COURSE OBJECTIVES:**

- > To know the part drawings for various components.
- > To draw the part modeling using AutoCAD software package.
- > To determine the deflection and stresses in 2D and 3D trusses and beams
- > To develop different modeling components using CREO
- > To develop the NC program for CNC milling and turning operations
- > To get the idea of post processors used in NC machines.

## LIST OF EXPERIMENTS:

- **1. Drafting (CADD):** Development of part drawings for various components in the form of orthographic and isometric. Representation of Dimensioning and tolerances scanning and plotting. Study of script.
- **2. Part Modeling (CAD):** Generation of various 3D Models through protrusion, revolve, shell sweep. Creation of various features. Study of parent child relation. Feature based and Boolean based modeling surface and Assembly Modeling.

#### 3. Analysis (CAE):

- a) Determination of deflection and stresses in 2D and 3D trusses and beams.
- b) Determination of deflections component and principal and von-misses stresses in plane stress, plane strain and axisymmetric components.
- c) Determination of stresses in 3D and shell structures
- d) Estimation of natural frequencies and mode shapes Harmonic response of 2D beam.
- e) Steady state heat transfer Analysis of plane and Axisymmetric components.

## 4. Manufacturing (CAM):

- a) Development of process sheets for various components based on tooling machines.
- b) Development of manufacturing and tool management systems.
- c) Study of various post processors used in NC Machines
- d) Development of NC code for free form and sculptured surfaces using CAM packages.
- e) Machining of simple components on NC lathe and Mill by transferring NC code from a CAM package.

# **COURSE OUTCOMES:**

The students will be able to

- 1. Draw the part drawings which are utilized in real time applications.
- 2. Understand the different types of stress analysis, load calculations by using ANSYS software.
- 3. Analyze 2D and 3D part drawings using AutoCAD, CREO software packages.
- 4. Develop and understand the NC part program generation by using CUTVIEWER packages.

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# VAAGDEVI COLLEGE OF ENGINEERING (AUTONOMOUS)

#### INSTRUMENTATION AND CONTROL SYSTEMS LAB B. Tech.: VII-Semester

**Prerequisite – Nil** 

#### **COURSE OBJECTIVES:**

- > To gain knowledge about Pressure Gauges.
- > To know different types of temperature measurements devices.
- > To understand the Function of LVDT transducer.

#### LIST OF EXPERIMENTS: (Perform any 10 experiments)

- 1. Calibration of Pressure Gauges.
- 2. Calibration of transducer for temperature measurements.
- 3. Study and Calibration of LVDT transducer for displacement measurement.
- 4. Calibration of strain gauge for temperature measurement.
- 5. Calibration of thermo couple for temperature measurements.
- 6. Calibration of capacitive transducer for angular displacement.
- 7. Study and calibration of Photo and magnetic speed pickup for the measurement of speed.
- 8. Calibration of resistance temperature detector for temperature measurement.
- 9. Study and calibration of a Rota meter for flow measurement.
- 10. Study and use of a Seismic pickup for the measurement of vibration amplitude of an engine bed at various loads.
- 11. Study and Calibration of McLeod gauge for low pressure.

#### **COURSE OUTCOMES:**

The students will be able to

- 1. Identify the different pressure gauges
- 2. Understand the different types of temperature measurements.
- 3. Analyze the calibration of capacitive transducer for angular displacement
- 4. Evaluate seismic pickup for the measurement of vibration amplitude

# **MINI PROJECT & INTERNSHIP**

**B. Tech.: VII-Semester** 

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# **MAJOR PROJECT PHASE - I**

**B. Tech.: VII-Semester** 

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## **Open Elective - III**

**B. Tech.: VIII-Semester** 

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**Note:** Students should take open electives from the list of open electives offered by the other departments/branches only.

**R20** Regulations

# VAAGDEVI COLLEGE OF ENGINEERING (AUTONOMOUS)

## PLANT LAYOUT & MATERIAL HANDLING (PROFESSIONAL ELECTIVE – VI)

#### **B. Tech.: VIII-Semester**

Prerequisite – Nil

#### **COURSE OBJECTIVES:**

- Understand the various types of plant layouts
- > Design the plant layout for different type of industries
- > Understand the importance of material handling in the overall production cost
- > Know how to avoid the bottlenecks in material handling systems.
- > Know the various safety measures to be taken in material handling systems
- > Know how to design miscellaneous equipments.

#### UNIT – I

Introduction-Classification of Layout, Advantages and Limitations of different layouts, Layout design procedures.

Process Layout and Product Layout: Selection, specification, Implementation and follow up, comparison of product and process layout. Overview of the plant layout.

#### UNIT – II

Heuristics for plant layout-ALDEP, CORELAP, CRAFT, Group Layout, Fixed position layout – Quadratic assignment model. Branch and bound method.

#### UNIT – III

Introduction, Material handling systems and its objectives ,material Handling principles, Classification of Material Handling equipment, Relationship of material handling to plant layout.

#### UNIT – IV

Importance of Material Handling Systems: Selection of material handling system. Material Handling methods- path, Equipment and function-oriented systems.

#### UNIT – V

Methods to minimize cost of material handling-Maintenance of Material Handling equipments, Safety in handling Ergonomics of material handling equipment. Design of material handling systems, Miscellaneous equipments.

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# **COURSE OUTCOMES:**

The students will be able to

- 1. Get the knowledge of various types of material handling systems.
- 2. Understand applications of different types of plant layouts.
- 3. Get the knowledge of applications of ergonomics in material handling
- 4. Get the knowledge of designing of cost-effective ,6material handling systems.
- 5. Understand merits of different types of plant layouts.

## **TEXTBOOKS:**

- 1. PB Mahapatra, "Operations Management", PHI, 2<sup>nd</sup> Ed. 2010, ISBN 13: 9788120339262.
- 2. Dr.KC Arora & Shinde, "Aspects of Material handling", Lakshmi Publications, 2007, s ISBN-13: 9789381159262.

## **ONLINE RESOURCES:**

- 1. NPTEL Course: Operations Management by Dr. Inderdeep Singh, IIT Roorkee. Link: https://nptel.ac.in/courses/112/107/112107238/
- 2. NPTEL Course: Industrial Engineering by Dr. Inderdeep Singh, IIT Roorkee. Link: https://nptel.ac.in/courses/112/107/112107142/

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## CNC TECHNOLOGIES (PROFESSIONAL ELECTIVE – VI)

#### **B. Tech.: VIII-Semester**

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#### Prerequisite – CAD/CAM

#### **COURSE OBJECTIVES:**

- > Understand basic features of NC and CNC Machines and their Design Considerations.
- > To study various system devices hardware and software interpolations.
- > To Know various tooling systems used in CNC Machines.
- Understand both Manual and Computer Aided Programming for Generating Various Contours.
- To study about the DNC systems and Adaptive Control used for various machining process.

#### UNIT – I

Features of NC Machines, Fundamentals of numerical control, advantage of NC systems, classification of NC systems, point to point, NC and CNC, incremental and absolute, open and closed loop systems, Features of NC Machine Tools, design consideration of NC machine tool, methods of improving machine accuracy.

#### UNIT – II

**CNC Machines Elements:** Machine Structure-Guide ways-feed drives-spindles-spindle bearings. System Devices: Drives, feedback devices, counting devices.

**Interpolators for manufacturing systems:** DDA integrator, DDA hardware interpolators, CNC software interpolators.

#### UNIT – III

**Tooling for CNC Machines:** Interchangeable tooling system, preset and qualified tools, coolant fed tooling system, modular fixturing, quick change tooling system, automatic head changers.

#### UNIT – IV

**NC Part Programming:** Manual programming – Basic concepts, Point contour programming, canned cycles, parametric programming.

**Computer-Aided Programming:** General information, APT programming, Examples APT programming problems (2D machining only). NC programming on CAD/CAM systems, the design and implementation of post processors. Introduction to CAD/CAM software, Automatic Tool Path generation.

# UNIT – V

**DNC Systems and Adaptive Control:** Introduction, type of DNC systems, advantages and disadvantages of DNC adaptive control with optimization, Adaptive control with constraints, Adaptive control of machining processes like turning, grinding

## **COURSE OUTCOMES:**

The students will be able to

- 1. Understand the basic procedures and concepts of programming, set up and operation of a CNC Machining Center.
- 2. Identify and understand the basic programming codes.
- 3. Create geometry and tool paths from the specifications on a blueprint for simple parts using Master cam programming software.
- 4. Identify and define the functions of the CNC machine control.
- 5. Analyze the CNC machining center for manufacturing simple parts.

## **TEXTBOOKS:**

- 1. Computer Control of Manufacturing Systems- Yoram Koren, Tata Mc Grw Hill, 2009.
- 2. Computer Aided Manufacturing-Elancheqhian, Sunder Selvan and Shanmuga Sunder, University Science Press, Second Edition.

## **ONLINE RESOURCES:**

- 1. NPTEL Course: Computer Numerical Control (CNC) of Machine Tools and Processes by Prof. Asimava Roy Choudhury, IIT Kharagpur.
- Link: https://nptel.ac.in/courses/112/105/112105211/
- 2. NPTEL Course: Mechatronics and Manufacturing Automation by Dr. Shrikrishna N. Joshi, IIT Guwahati.

Link: https://nptel.ac.in/courses/112/103/112103174/

## JET PROPULSION & ROCKET ENGINEERING (PROFESSIONAL ELECTIVE – VI)

#### **B. Tech.: VIII-Semester**

L T P C 3 0 0 3

#### Prerequisite – TE - II

#### **COURSE OBJECTIVES:**

- > Explain the characteristics & performance of aerospace propulsion systems.
- Model newly conceived racket or air breathing propulsion systems and estimate their Performance and behavior.
- > Carry out preliminary designs of rocket to meet specified requirements.
- > Carry testing and instrumentation for cryogenics like nuclear and plasma and propulsion

#### UNIT – I

#### **ELEMENTS OF GAS TURBINE THEORY**

Thermodynamic cycles, Open closed and semi-closed – parameters of performances – cycle modifications for improvement of performances.

#### JET PROPULSION

Historical sketch – reaction principle – essential features of propulsion devices – Thermal engines, Classification of – Energy flow thrust, thrust power and propulsion efficiency – Need for thermal jet engines and applications.

#### UNIT – II

#### **TURBOPROP AND TURBOJET-I**

Thermodynamics Cycles, plant layout essential components, principles of operation performance evaluation

#### **TURBOPROP AND TURBOJET-II**

Thrust, Augmentation and thrust reversal – contrasting with piston engine propeller plant.

## UNIT – III

#### RAMJET

Thermodynamic cycle, plant layout, essential components – principle of operation - performance evaluation – comparison among atmospheric thermal jet engines – serque jet and pulse jet, elementary treatment.

#### **ROCKET ENGINES**

Need for, applications – Basic principles of operations and parameters of performance classification, solid and liquid propellant rocket engines advantage, domains of application – Propellants – comparison of propulsion system.

## $\mathbf{UNIT} - \mathbf{IV}$

## **ROCKET TECHNOLOGY I**

Flight mechanics, application thrust profiles, acceleration – staging of rockets, need for - feed systems, injectors and expansion nozzles – rocket heat transfer and ablative cooling.

#### UNIT – V

# **ROCKET TECHNOLOGY II**

Testing & Instrumentation – Need for cryogenics – advanced propulsion systems, elementary treatment of electrical, nuclear and plasma arc propulsion.

## **COURSE OUTCOMES:**

The students will be able to

- 1. Compare the characteristics & performance of aerospace propulsion systems.
- 2. Estimate their Performance and behavior of ramjets.
- 3. Analyze preliminary designs of rocket to meet specified requirements.
- 4. Identify testing and instrumentation methods for cryogenics like nuclear and plasma and propulsion
- 5. Understand the fundamentals of turbojet, ramjet and their performance evaluation.

## **TEXTBOOKS:**

- 1. Gas Dynamics and Space Propulsion by M.C. Ramasamy, Ph.D
- 2. Gas Turbines Propulsive systems by P.R. Khajuria, S.P Dubey.

## **REFERENCE BOOKS:**

- 1. Gas turbines V Ganesan
- 2. Gas turbines / Cohen, Rogers & Sarvana. Mutloo / Addision
- 3. Rocket propulsion Sutton

## **ONLINE RESOURCES:**

- 1. NPTEL Course: Jet and Rocket Propultion by Dr. A. Kushari, IIT Kanpur. Link: https://nptel.ac.in/courses/101/104/101104019/
- 2. NPTEL Course: Gas Dynamics and Propulsion by Prof. V. Babu, IIT Madras. Link: https://nptel.ac.in/courses/112/106/112106166/

**B.Tech-** MECHANICAL ENGG

**R20** Regulations

# VAAGDEVI COLLEGE OF ENGINEERING (AUTONOMOUS)

#### **MAJOR PROJECT PHASE - II**

**B. Tech.: VIII-Semester** 

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## VAAGDEVI COLLEGE OF ENGINEERING (AUTONOMOUS)

## **TECHNICAL SEMINAR**

**B. Tech.: VIII-Semester** 

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# NON-CONVENTIONAL ENERGY SOURCES (OPEN ELECTIVE OFFERED TO OTHER DEPARTMENTS)

L T P C 3 0 0 3

### Prerequisite – Nil

### **COURSE OBJECTIVES:**

- Introduce to the technology of renewable sources of energy
- > Learn about the solar radiation, its applications and radiation measuring instruments
- > Learn about the various types of geothermal resources and its applications
- Study the biomass energy resources, bio-mass systems.
- Learn the methods of energy extraction from the wind and oceans learn to the technology of direct energy conversion methods

### UNIT – I

## **PRINCIPLES OF SOLAR RADIATION:**

Role and potential of new and renewable source, the solar energy option, Environmental impact of solar power, physics of the sun, the solar constant, extraterrestrial and terrestrial solar radiation, solar radiation on titled surface, instruments for measuring solar radiation and sun shine, solar radiation data.

### UNIT – II

## **SOLAR ENERGY COLLECTION:**

Flat plate and concentrating collectors, classification of concentrating collectors, orientation and thermal analysis, advanced collectors.

### SOLAR ENERGY STORAGE AND APPLICATIONS:

Different methods, Sensible, latent heat and stratified storage, solar ponds. Solar Applications- solar heating/cooling technique, solar distillation and drying, photovoltaic energy conversion.

## UNIT – III

**WIND ENERGY:** Sources and potentials, horizontal and vertical axis windmills, performance characteristics, Betz criteria.

**BIO-MASS:** Principles of Bio-Conversion, Anaerobic/aerobic digestion, types of Biogas digesters, gas yield, combustion characteristics of bio-gas, utilization for cooking, I.C. Engine operation and economic aspects.

### UNIT – IV

**GEOTHERMAL ENERGY:** Resources, types of wells, methods of harnessing the energy, Potential in India.

## B. Tech-MECHANICAL ENGG

**OCEAN ENERGY:** OTEC, Principles utilization, setting of OTEC plants, thermodynamic cycles. Tidal and wave energy: Potential and conversion techniques, mini-hydel power plants, and their economics.

## UNIT – V

**DIRECT ENERGY CONVERSION:** Need for DEC, Carnot cycle, limitations and principles of DEC. Thermoelectric generators, see beck, pettier and joule Thomson effects, Figure of merit, materials, applications, MHD generators, principles, dissociation and ionization, hall effect, magnetic flux, MHD accelerator, MHD Engine, power generation systems, electron gas dynamic conversion, economic aspects. Fuel cells, principles, faraday's law's, thermodynamic aspects, selection of fuels and operating conditions.

## **COURSE OUTCOMES:**

The students will be able to

- 1. Apply the technology to capture the energy from the renewable sources like sun, Wind, ocean, biomass, geothermal.
- 2. Use different renewable energy sources to produce electrical power minimize the use of conventional energy sources to produce electrical energy
- 3. Identify the fact that the conventional energy resources are depleted
- 4. Understand direct energy conversion
- 5. Learn different methods in solar energy system.

## **TEXTBOOKS:**

- 1. Non-Conventional Energy Sources /G.D. Rai
- 2. Renewable Energy Technologies /Ramesh & Kumar /Narosa

## **REFERENCE BOOKS:**

- 1. Renewable energy resources/ Tiwari and Ghosal/ Narosa.
- 2. Non-Conventional Energy / Ashok V Desai /Wiley Eastern.
- 3. Non-Conventional Energy Systems / K Mittal /Wheeler
- 4. Solar Energy /Sukhame

## **ONLINE RESOURCES:**

- 1. NPTEL Course: Non-Conventional Energy Resources by Dr. Prathap Haridoss, IIT Madras.
- Link: https://nptel.ac.in/courses/121/106/121106014/
- 2. NPTEL Course: Non-Conventional Energy Systems by Prof. L. Umanand, IISc Bangalore.

Link: https://nptel.ac.in/courses/108/108/108108078/

## **ROBOTICS** (OPEN ELECTIVE OFFERED TO OTHER DEPARTMENTS)

L T P C 3 0 0 3

### Prerequisite – Nil

### **COURSE OBJECTIVES:**

- Students will be able to understand the concepts of robotics classification by coordinate system and control system.
- Students will be able to determine the degrees of freedom, end effectors, electric hydraulic and pneumatic devices.
- > Students will possess the concepts of homogeneous transformations.
- Student will understand the Jacobean problems, Newton Euler transmations.
- Students will know about the actuators and feedback components, resolvers, encoders velocity sensors.
- > Students will be able to know the applications of robots in manufacturing.

# UNIT – I

### **INTRODUCTION**

Automation and Robotics – An over view of Robotics – classification by coordinate system and control systems – Components of Industrial Robotics: Degrees of freedom – End effectors: Types of grippers: Mechanical, Magnetic, Vacuum cup – General considerations on gripper selection and design.

## UNIT – II

## **MOTION ANALYSIS**

Basic rotation matrices – Composite rotation matrices – Euler Angles – Equivalent Angle and Axis – Homogeneous transformation – Problems.

**Manipulator Kinematics:** D.H.Notation– Joint coordinates and world coordinates – Forward and inverse kinematics – problems.

**Differential Kinematics:** Differential kinematics of planar and spherical manipulators – Jacobians – Problems.

### UNIT – III ROBOT DYNAMICS

Lagrange – Euler formulations – Newton – Euler formulations – Problems on planar two link manipulators.

## $\mathbf{UNIT} - \mathbf{IV}$

## TRAJECTORY PLANNING

Joint space scheme – cubic polynomial fit – Avoidance of obstacles – Types of motion – Slew motion – Joint interpolated motion – straight line motion – problems.

## UNIT – V

## **ROBOT ACTUATORS AND FED BACK COMPONENTS**

Actuators: Pneumatic and Hydraulic actuators. Electric Actuators: DC servo motors – stepper motors. Feedback components: position sensors – potentiometers, resolvers and encoders – Velocity sensors – Tactile sensors.

Robot Application in Manufacturing: Material handling – Assembly and Inspection.

## **COURSE OUTCOMES:**

The students will be able to

- 1. Apply the knowledge of robotics in real time human life applications.
- 2. Analyse the concept of CAD/CAM and automation to the robotics.
- 3. Compare knowledge of robot applications in manufacturing like, material handling, loading and unloading etc.
- 4. Experiment the robotics to the spot and continuous arc welding and spray painting.
- 5. Relate the Robot Application in Manufacturing.

## **TEXTBOOKS:**

- 1. Groover M P, "Industrial Robotics", Pearson Edu., 2012 1<sup>st</sup> Edition, ISBN Number: 0070265097, 9780070265097, 978-0070265097.
- JJ Craig, "Introduction to Robotic Mechanics and Control", Pearson, 2008 3<sup>rd</sup> edition. ISBN-13: 978-0201543612

## **REFERENCE BOOKS:**

- 1. Fu K S, "Robotics", McGraw Hill, 1<sup>st</sup> Ed., 2008, ISBN 13: 9780070226258.
- 2. Richard D.Klafter, "Robotic Engineering", Prentice Hall, 1<sup>st</sup> Ed., 1989, ISBN-13: 9780137820535.

## **ONLINE RESOURCES:**

- 1. NPTEL Course: Introduction to Robotics by Dr. Balaraman Ravindran, IIT Madras. Link: https://nptel.ac.in/courses/107/106/107106090/
- 2. NPTEL Course: Introduction to Robotics by Prof. Ashish Dutta, IIT Kanpur. Link: https://nptel.ac.in/courses/112/104/112104298/
- 3. http://www.robogrok.com/index.html

L T P C 3 0 0 3

## VAAGDEVI COLLEGE OF ENGINEERING (AUTONOMOUS)

### MECHATRONICS (OPEN ELECTIVE OFFERED TO OTHER DEPARTMENTS)

### **Prerequisite – Nil**

### **COURSE OBJECTIVES:**

- > Know the basic concepts of mechatronics.
- Know the various actuating systems like Hydraulic, pneumatic, mechanical and electrical actuating system.
- > Know about the micro processor and micro controllers.
- > Know about the system and interfacing and data acquisition.

### UNIT – I

Mechatronics systems, elements, levels of mechatronics system, Mechatronics design system, measurement systems, control systems, microprocessor-based controllers, advantages and displacement, position, proximity, velocity, motion, force, acceleration, torque, fluid pressure, liquid flow, liquid level, temperature and light sensors.

### UNIT – II

Solid state electronic devices, PN Junction diode, BJT, FET, DIA and TRIAC. Analog signal conditioning, amplifiers, filtering. Introduction to MEMS & typical applications.

### UNIT – III

Hydraulic and pneumatic actuating systems, Fluid systems, Hydraulic and pneumatic systems, components, control valves, electro-pneumatic, hydro-pneumatic, electro-hydraulic servo systems: Mechanical actuating systems and electrical actuating systems.

### UNIT – IV

Digital electronics and systems, digital logic control, micro processors and micro controllers, programming, process controllers, programmable logic controllers, PLCs versus computers, application of PLCs for control.

#### UNIT – V

System and interfacing and data acquisition, DAQS, SCADA, A to D and D to A conversions; Dynamic models and analogies, System response . Design of mechatronics systems & future trends.

## **COURSE OUTCOMES:**

The students will be able to

- 1. Use the control system, mechatronics design systems and measurement systems.
- 2. Work on various actuating systems.
- 3. Convert the signals from one form to another form.
- 4. Estimate the micro controllers and micro processors.
- 5. Develop the simple programming code for PLC's.

## **TEXTBOOKS:**

- 1. Mechatronics Integrated Mechanical Electronics Systems/KP Ramachandran &GKVijaya Raghavan/WILEY india Edition/2008
- 2. Mechatronics Electronics control systems in Mechanical and Electrical Engineering/W Bolton/Pearson Education press/3<sup>rd</sup> edition,2005.

### **REFERENCE BOOKS:**

- 1. Mechatronics Source books by Newton C Braga, Thomson Publications, Chennai.
- 2. Mechatronics N.Shanmugam/ Anuradha Agencies Publishers.
- 3. Mechatronics System Design/Devdas shetty/Richard/Thomson.

## **ONLINE RESOURCES:**

- 1. NPTEL Course: Mechatronics by Prof. Pushparaj Mani Pathak, IIT Roorkee.Link: https://nptel.ac.in/courses/112/107/112107298/
- 2. NPTEL Course: Mechatronics and Manufacturing Automation by Dr. Shrikrishna N.Joshi, IIT Guwahati.

Link: https://nptel.ac.in/courses/112/103/112103174/

### DISASTER PREPAREDNESS & PLANNING MANAGEMENT (OPEN ELECTIVE – CIVIL ENGINEERING)

### B.Tech – EEE, MECH, ECE, CSE, CSE(AI&ML) & CSE(Data Science)

L/T/P/C 3/ 0/ 0/ 3

Pre-Requisites-No prerequisites are needed for enrolling into the course

### **Course Objectives:**

- > To Know about the state of art of disaster management in world
- > To Study the various natural disasters and its mitigation measures
- > To understand human induced Hazards and its case studies
- To impart knowledge on remote sensing and GIS
- > To expose students to various technologies used for disaster mitigation and management.

### **UNIT – I : Introduction**

Hazard, vulnerability and risk, Types of disasters, Disaster management cycle, role of civil engineers in disaster management, Progress of disaster management in world, vulnerability profile of India, Disaster management act, Disaster management in India

### **UNIT – II : Natural Disasters**

Hydro - meteorological based disasters – Tropical cyclones, floods, drought and desertification zones, Geographical based disasters – Earthquake, Tsunamis, Landslides and avalanches – Causes, Types, effects and Mitigation measures, coastal zone management

### UNIT - III : Human induced hazards

Human induced hazards: chemical industrial hazards, major power breakdowns, traffic accidents, etc. Case studies

### UNIT - IV: Remote sensing and GIS for Disaster Management

Introduction to remote sensing and GIS, its applications in disaster mitigation and management, case studies

### **UNIT - V: Disaster Management**

Risk assessment and hazard mapping -mitigation and management options - warning and forecasting

### **Course Outcomes**

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

- CO 1: Attain knowledge on various types, stages, phases in disaster management
- CO 2: Recognize various types of natural disaster, Mitigation and Management Systems
- CO 3: Know the different types of manmade disasters and its effects
- CO 4: Explain Remote sensing technology and GIS in disaster mitigation and management.
- CO 5: Know the concepts of risk, warning and forecasting methods in disaster management

### **TEXT BOOKS:**

- 1. Pradeep Sahni, "Disaster Risk Reduction in South Asia", Prentice Hall, First Edition, 2003
- 2. Singh B.K., "Handbook of Disaster Management: Techniques & Guidelines", Rajat Publication, 2008
- 3. Ghosh G.K., "Disaster Management", APH Publishing Corporation, First Edition, 2011

## **REFERENCE BOOKS:**

- 1. Rajib, S and Krishna Murthy, R.R. "Disaster Management Global Challenges andLocal Solutions", Universities Press, First Edition, 2012
- 2. Navele, P & Raja, C.K., "Earth and Atmospheric Disasters Management, Natural and Manmade", B.S. Publications, First Edition, 2019
- 3. Tushar Battacharya., "Disaster Science and Management", Tata McGraw Hill Company, 2012

### **Online Resources:**

- 1. https://nptel.ac.in/courses/105/104/105104183/
- 2. https://nptel.ac.in/courses/124/107/124107010/

### ENVIRONMENTAL MANAGEMENT (OPEN ELECTIVE – CIVIL ENGINEERING)

### B.Tech – EEE, MECH, ECE, CSE, CSE(AI&ML) & CSE(Data Science)

L/T/P/C 3/ 0/ 0/ 3

Pre Requisites - No prerequisites are needed for enrolling into the course

## **Course Objectives:**

- > To introduce the environmental management policies and legal aspects in India
- > To study the various steps involved in Environment management system standard
- > To understand the importance of Environmental Impact Assessment
- > To know about the environment management plan
- > To know about the Environmental management techniques and control measure

### **UNIT – I : Introduction to Environmental Management**

Scope and nature of Environment Management - its need and brief discussion on the ethical, legal and financial reasons for Environment Management, the framework and approach to develop Environment management system, Policies and legal aspect in India

### UNIT - II : Environment management system (EMS) standard

Guideline to implement effective Environment management system, core element of EMS, EMS standard: ISO 14000, its evolution, principle and specification, benefit of EMS. Planning and its implementation, Comparison of other standards with ISO 14000

### **UNIT – III : Environmental Impact Assessment**

EIA definition, its need and principle, scoping, screening and the baseline condition, different methodologies, Impact identification and decision making, EIA case studies in India

### **UNIT - IV : Environment management plan**

Planning and identification of baseline condition and impact, monitoring and evaluation of risk, mitigation plan, legislation and environmental audit, disaster management plan, Life cycle assessment and risk analysis

### UNIT - V : Environmental management techniques and control measure

Environmental monitoring, modelling and risk assessment, Implementation of sustainable design, control measure for different environment pollution such as air pollution, water pollution, soil and noise pollution

### **Course Outcomes:**

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

CO1 : Comprehend the need for Environmental Management

- CO2 : Identify the attributes of Environment Management system and standards
- **CO3** : Apply different methodologies for impact assessment
- CO4 : To understand the various Environment management plan
- CO5: Identify the techniques and control measures for Environment management

### **TEXT BOOKS:**

## B. Tech-MECHANICAL ENGG

- 1. John Pallister ., Environmental Management, Oxford University Press, 2<sup>nd</sup> Edition, 2017
- 2. Ajith Sankar., Environmental Management, Oxford University Press, First Edition, 2015
- 3. Krishnamoorthy Bala., Environmental Management, PHI Learning, 3<sup>rd</sup> Edition, 2017

## **REFERENCE BOOKS:**

- 1. V Murali Krishna, Valli Manickam., Environmental Management, ELSEVIER, 1<sup>st</sup>Edition, 2017
- 2. Jacob Thomas ., Environmental Management, Pearson Education India.1st Edition,2014
- 3. <u>M.C. Dash</u>., Concepts of Environmental Management for Sustainable Development, Dreamtech Press &Wiley, First Edition, 2019

# **Online Resources:**

1. https://nptel.ac.in/courses/120/108/120108004/

## URBAN PLANNING (OPEN ELECTIVE – CIVIL ENGINEERING)

## B.Tech – EEE, MECH, ECE, CSE, CSE(AI&ML) & CSE(Data Science)

L/T/P/C 3/ 0/ 0/ 3

Pre Requisites -No prerequisites are needed for enrolling into the course

## **Course Objectives:**

- > To introduce the history of town planning and its importance
- > To study the various steps involved in urban planning and its methods
- > To know the importance of housing development
- > To understand the importance of public transport and non-motorized transport.
- > To introduce the concept of smart cities in India

### **UNIT – I : Introduction**

History of Town Planning - Definitions and Objectives of Planning - Examples of planned and unplanned cities - Retrofitting medieval towns and existing cities - Healthy city planning

### **UNIT – II : Basic Planning Methods**

Base map preparation - survey techniques - Analytical methods - region classification -

Demographic methods - population forecasting - Introduction of Remote sensing, GIS and GPS in urban planning context - Regional planning

### **UNIT – III : Housing Development**

Policies and schemes - Housing typologies - Housing for the poor and elderly - Housing finance options – under privileged population management - Planning and management of local streets, water supply and storm water drainage - municipal solid waste management systems - new possibilities for recycling.

## **UNIT – IV : Transport and Mobility**

Costs of congestion - Public and Para-transit modes (taxis and autos) - Feeder systems for the use of public transport - non-motorized transport facilities - cycling and walking infrastructure - Integrated public transport

### **UNIT - V: Smart Cities**

Smart city developments across the world - Specific priorities for Smart Cities in India – Leveraging recent technologies in enhancing urban living: internet of things (IoT) - Recreation - Renewable energy - green corridors, green space and green buildings - Safety and security of urban population.

## **Course Outcomes:**

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

CO1 : Describe the importance of proper urban planning for a healthy city

- CO2 : Apply basic methods for urban planning
- **CO3** : Describe housing development schemes
- **CO4** : Design public transport and non-motorized transport facilities for a city
- CO5: Describe smart city developments in India and abroad and its various elements

## **TEXT BOOK:**

- 1. Peter Hall, Mark Tewdwr-Jones, Urban and Regional Planning. Taylor & Francis, 6<sup>th</sup> Edition, 2019
- 2. Joy Sen., Sustainable Urban Planning. The Energy and Resources Institute, New Delhi, 2013 Edition, 2013
- 3. Rao M. P., Urban Planning Theory And Practice, CBS Publishers, Revised Edition, 2019

## **REFERENCE BOOKS:**

- 1. Peter Hall, Cities of Tomorrow: An Intellectual History of Urban Planning and Design Since 1880, Wiley-Blackwell, 4<sup>th</sup> Edition, 2014
- 2. Randall Crane and Rachel Weber, The Oxford Handbook of Urban Planning. Oxford University Press, 2012
- 3. Amiya Kumar Das., Urban Planning in India, Rawat Pubns, First Edition 2007

## **Online Resources:**

1. https://nptel.ac.in/courses/124/107/124107158/

### ELECTRICAL POWER UTILISATION AND SAFETY (OPEN ELECTIVE – ELECTRICAL AND ELECTRONICS ENGINEERING)

## B.Tech –CIVIL, MECH, ECE, CSE, CSE(AI&ML) & CSE(Data Science) L/T/P/C

3/0/0/3

# Prerequisites: None

## **Course Objectives:**

- > To provide information of importance various parameters in electrical system.
- To analyze and design illumination scheme, electrification, earthing system and protection system for anapplication.

## Unit-I:

**Electric Heating and Welding** Advantages of electric heating, resistance heating, types of furnaces, induction heating, types of induction furnaces, dielectric heating, types of welding- arc and resistance

## Unit-II:

**IlluminationScheme** Basic terms used in illumination scheme, Electric lamps, Recommended levels of illumination, types of lighting schemes, design of lighting schemes, factory lighting, street lighting, flood lighting

## Unit-III:

**Electrical Installation, Estimating andCosting** Types of loads, Load assessment, Electrical supply systems, wiring systems, Permissible voltage drops and conductor size calculations, Estimating and costing for residential and commercial service connections (single phase and three phase)

## Unit-IV:

**Power Factor** Effects of power factor, causes of low power factor, disadvantages of low power factor, methods of improving power factor, most economical power factor.

## Unit-V:

**Electrical Safety, Earthing System and Protective Devices** Electrical shock mechanisms, factors influencing the electric shock, body current thresholds (tolerable body current limit), thevenin's concepts and accidental equivalent circuits (step and touch potentials), protection against electric shock, purpose of earthing, IS rules for earthing of electrical installations, factors governing the resistance of earth electrode, methods of earthing, measurement of earth resistance, methods of reducing earth resistance, fuse, miniature circuit breakers (MCB) and earth leakage circuit breakers (ELCB).

## **Text Books:**

1. E. Openshaw Taylor, Utilisation of Electrical Energy, Universities Press.

- 2. H. Partab, Art and Science of Utilisation of Electrical Energy, Dhanpat Rai & Co.
- 3. J. B. Gupta, Utilization of Electric Power and Electric Traction, S. K. Kataria & Sons, New Delhi.
- 4. G. C. Garg, Utilization of Electric Power and Electric Traction, Khanna Publishers, Delhi.

5. R. K. Rajput, Utilisation of Electrical Power, Laxmi Publications (P) Ltd., New Delhi.

## **References:**

1. N. V. Suyranarayana, Utilisation of Electric Power Including Electric Drives and Electric Traction, NewAge Publishers, New Delhi.

2. J. B. Gupta, A Course in Electrical Installation Estimating and Costing, S. K. Kataria & Sons, NewDelhi.

3. Dr. J. G. Jamnani, Elements of Electrical Design, Mahajan Publishing House

## **B.** Tech-MECHANICAL ENGG

### **Course outcomes:**

On successful completion of this course, students are able to: CO1:Know about the electric heating and welding CO2:Gain the knowledge on illumination system. CO3: Understand the electrical installation, estimation and costing. CO4:Understand the importance of power factor. CO5:Gain the knowledge on safety and protection.

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## **CONCEPTS OF CONTROL SYSTEMS** (OPEN ELECTIVE – ELECTRICAL AND ELECTRONICS ENGINEERING)

## B.Tech –CIVIL, MECH, ECE, CSE, CSE(AI&ML) & CSE(Data Science) L/T/P/C

3/0/0/3

# Prerequisites: None

## **Course Objectives:**

- > To understand the different ways of system representations such as Transfer functionrepresentation and state space representations and to assess the system dynamic response.
- To assess the system performance using time domain analysis and methods for improving it.

## Unit-I:

**Basic concepts of control system:** Terminology - plant, process, system, disturbances, controlled variable, manipulated variable etc., Block diagram of basic control system, application areas with examples. Classifications of control systems, Concept of superposition for linear systems with examples.

## Unit-II:

**Mathematical modelling of systems:** Translational and rotational mechanical systems, electrical systems, Force voltage and force current analogy, Position servo mechanism. Block diagram and signal flow graph representation of physical systems along with rules, properties, comparison and limitation, Mason's gain formula.

## Unit-III:

**Time response analysis:** Standard test signals along with examples of their usage, steady state errors for step, ramp and parabolic inputs, analysis of first and second order systems, Transient response specifications with numerical examples, Basic control actions and two position, proportional, PI, PID and rate feedback controllers, Limitations of time domain analysis.

## Unit-IV:

**Frequency response analysis:** Need of frequency response analysis, Sinusoidal response of linear system, methods used in frequency response, Frequency domain specifications.

## Unit-V:

**Stability:** Concept of stability, types of stability, Routh's stability criterion, special cases with numerical examples, stability of closed loop system, concept of root locus, open loop and closed loop transfer poles, step by step procedure for root loci, numerical examples.

## **Text Books:**

1. Katsuhiko Ogata, Modern control theory, Pearson Education International, Fifth edition.

2. Norman S Nise, Control system engineering, John Wiley & Sons, Inc., Sixth edition

3. Richard C. Dorf, Robert H Bishop, Modern control systems, Pearson Education International, Twelfth edition.

## B. Tech-MECHANICAL ENGG R20 Regulations

References:

1. Farid Golnaraghi, Benjamin C Kuo, Automatic control systems, John Wiley & Sons, Inc., Nineth edition

2. J.Nagrath and M.Gopal,Control System Engineering, New Age International Publishers,5th Edition, 2007

## **Course Outcomes:**

On successful completion of this course, students are able to:

**CO1:** Understand the basic concept control systems.

CO2: Know the mathematical model of the systems.

**CO3:**Estimate the time domain specifications and steady state error.

**CO4:**Know the frequency response analysis.

**CO5:**Understand concept of stability.

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### **RENEWABLE ENERGY SOURCES** (OPEN ELECTIVE – ELECTRICAL AND ELECTRONICS ENGINEERING)

# B.Tech –CIVIL, MECH, ECE, CSE, CSE(AI&ML) & CSE(Data Science) L/T/P/C

3/0/0/3

## Prerequisites: None

## **Course Objectives:**

- > To introduce to the technology of renewable sources of energy.
- > To learn about the solar radiation, its applications and radiation measuring instruments.
- > To study the Geothermal biomass energy resources, biomass systems.
- > To learn the methods of energy extraction from the wind and oceans.

### Unit-I:

**Global and National Energy Scenario**: Over view of conventional & renewable energy sources, need, potential &development of renewable energy sources, types of renewable energy systems, Future of Energy Use, Global and Indian Energy scenario, Energy for sustainable development, renewable electricity and key elements, Global climate change, CO2 reduction potential of renewable energy- concept of Hybrid systems

### Unit–II:

**Solar Energy:** Solar energy system, Solar Radiation, Availability, Measurement and Estimation, Solar Thermal Conversion Devices and Storage, Solar-Electrical Power Generation, general Solar Photo Voltaic (SVP) system, Different configurations, SPV system components and their characteristics, Stand-Alone and Grid Connected SPV systems, other Miscellaneous Applications of Solar Energy.

## Unit-III:

**Wind Energy:** Wind Energy Conversion, Potential, Nature of the wind, Wind Data and Energy Estimation, Site selection, Types of wind turbines, Wind farms, Wind Generation and Control., classification of wind, characteristics, offshore wind energy – Hybrid systems, wind energy potential and installation in India

### Unit -IV:

**Hydel and Tidal Power Systems:** Basic working principle, Classification of hydel systems: Large, small, micro – measurement of head and flow – Energy equation – Types of turbines – Numerical problems. Tidal power – Basics – Kinetic energy equation – Numerical problems – Wave power – Basics – Kinetic energy equation.

## Unit- V:

**Bio-Mass, Geothermal& Ocean Energy:** Principles of Bio-Conversion, Anaerobic/aerobic digestion, types of Bio-gas digesters, gas yield, combustion characteristics of bio-gas, utilization for cooking, I. C. Engine operation and economic aspects. Geothermal Energy: Resources, types of wells, methods of harnessing the energy, potential in India. Ocean Energy: OTEC, Principles utilization, setting of OTEC plants, thermodynamic cycles.

## **Text Books:**

1. Godfrey Boyle, Renewable Energy, Oxford university, press, 3rd edition, 2013.

2. Ahmed and Zobaa, Ramesh C Bansal, Handbook of renewable technology World scientific, Singapore.

3. Ramesh & Kumar, Renewable Energy Technologies, Narosa.

4. Chetong Singh Solanki, Renewable energy technologies – A practical guide for beginners –, PHI.

## **References:**

1. B.H. Khan, Non-conventional energy source TMH-2nd edition.

2. Karlsson, Kenneth Bernard; Skytte, Klaus Morthorst, Integrated energy systems modeling, DTU International Energy Report 2015.

### **Course outcomes:**

On successful completion of this course, students are able to:

**CO1:**Know about the global and national energy scenario.

CO2:Understand the concept of solar energy.

CO3:Know the basics of wind energy.

**CO4:**Differentiate the hydel and tidal power plants.

**CO5:** Explore the bio-mass, geothermal and ocean energy.

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### NON-CONVENTIONAL ENERGY SOURCES (OPEN ELECTIVE – MECHANICAL ENGINEERING)

## B.Tech –CIVIL, EEE, ECE, CSE, CSE(AI&ML) & CSE(Data Science)

L/T/P/C 3/ 0/ 0/ 3

### Prerequisite – Nil COURSE OBJECTIVES:

- Introduce to the technology of renewable sources of energy
- > Learn about the solar radiation, its applications and radiation measuring instruments
- > Learn about the various types of geothermal resources and its applications
- Study the biomass energy resources, bio-mass systems.
- Learn the methods of energy extraction from the wind and oceans learn to the technology of direct energy conversion methods

## UNIT – I

## **PRINCIPLES OF SOLAR RADIATION:**

Role and potential of new and renewable source, the solar energy option, Environmental impact of solar power, physics of the sun, the solar constant, extraterrestrial and terrestrial solar radiation, solar radiation on titled surface, instruments for measuring solar radiation and sun shine, solar radiation data.

## UNIT – II

## SOLAR ENERGY COLLECTION:

Flat plate and concentrating collectors, classification of concentrating collectors, orientation and thermal analysis, advanced collectors.

## SOLAR ENERGY STORAGE AND APPLICATIONS:

Different methods, Sensible, latent heat and stratified storage, solar ponds. Solar Applications- solar heating/cooling technique, solar distillation and drying, photovoltaic energy conversion.

## UNIT – III

**WIND ENERGY:** Sources and potentials, horizontal and vertical axis windmills, performance characteristics, Betz criteria.

**BIO-MASS:** Principles of Bio-Conversion, Anaerobic/aerobic digestion, types of Biogas digesters, gas yield, combustion characteristics of bio-gas, utilization for cooking, I.C. Engine operation and economic aspects.

### UNIT – IV

**GEOTHERMAL ENERGY:** Resources, types of wells, methods of harnessing the energy, Potential in India.

**OCEAN ENERGY:** OTEC, Principles utilization, setting of OTEC plants, thermodynamic cycles. Tidal and wave energy: Potential and conversion techniques, mini-hydel power plants, and their economics.

## UNIT – V

**DIRECT ENERGY CONVERSION:** Need for DEC, Carnot cycle, limitations and principles of DEC. Thermoelectric generators, see beck, pettier and joule Thomson effects, Figure of merit, materials, applications, MHD generators, principles, dissociation and ionization, hall effect, magnetic flux, MHD accelerator, MHD Engine, power generation systems, electron gas dynamic conversion, economic aspects. Fuel cells, principles, faraday's law's, thermodynamic aspects, selection of fuels and operating conditions.

## **COURSE OUTCOMES:**

The students will be able to

- **CO1** Apply the technology to capture the energy from the renewable sources like sun, Wind, ocean, biomass, geothermal.
- **CO2** Use different renewable energy sources to produce electrical power minimize the use of conventional energy sources to produce electrical energy
- CO3 Identify the fact that the conventional energy resources are depleted
- CO4 Understand direct energy conversion
- CO5 Learn different methods in solar energy system.

### **TEXTBOOKS:**

- 3. Non-Conventional Energy Sources /G.D. Rai
- 4. Renewable Energy Technologies /Ramesh & Kumar /Narosa

### **REFERENCE BOOKS:**

- 5. Renewable energy resources/ Tiwari and Ghosal/ Narosa.
- 6. Non-Conventional Energy / Ashok V Desai /Wiley Eastern.
- 7. Non-Conventional Energy Systems / K Mittal /Wheeler
- 8. Solar Energy /Sukhame

## **ONLINE RESOURCES:**

3. NPTEL Course: Non-Conventional Energy Resources by Dr. Prathap Haridoss, IIT Madras.

Link: https://nptel.ac.in/courses/121/106/121106014/

4. NPTEL Course: Non-Conventional Energy Systems by Prof. L. Umanand, IISc Bangalore.

Link: https://nptel.ac.in/courses/108/108/108108078/

### **ROBOTICS** (OPEN ELECTIVE – MECHANICAL ENGINEERING)

B.Tech –CIVIL, EEE, ECE, CSE, CSE(AI&ML) & CSE(Data Science)

L/T/P/C 3/ 0/ 0/ 3

# Prerequisite – Nil

# **COURSE OBJECTIVES:**

- Students will be able to understand the concepts of robotics classification by coordinate system and control system.
- Students will be able to determine the degrees of freedom, end effectors, electric hydraulic and pneumatic devices.
- > Students will possess the concepts of homogeneous transformations.
- > Student will understand the Jacobean problems, Newton Euler transmations.
- Students will know about the actuators and feedback components, resolvers, encoders velocity sensors.
- > Students will be able to know the applications of robots in manufacturing.

### UNIT – I INTRODUCTION

Automation and Robotics – An over view of Robotics – classification by coordinate system and control systems – Components of Industrial Robotics: Degrees of freedom – End effectors: Types of grippers: Mechanical, Magnetic, Vacuum cup – General considerations on gripper selection and design.

## UNIT – II

## **MOTION ANALYSIS**

Basic rotation matrices – Composite rotation matrices – Euler Angles – Equivalent Angle and Axis – Homogeneous transformation – Problems.

**Manipulator Kinematics:** D.H.Notation– Joint coordinates and world coordinates – Forward and inverse kinematics – problems.

**Differential Kinematics:** Differential kinematics of planar and spherical manipulators – Jacobians – Problems.

## UNIT – III

## **ROBOT DYNAMICS**

Lagrange – Euler formulations – Newton – Euler formulations – Problems on planar two link manipulators.

## UNIT – IV

### **TRAJECTORY PLANNING**

Joint space scheme – cubic polynomial fit – Avoidance of obstacles – Types of motion – Slew motion – Joint interpolated motion – straight line motion – problems.

### UNIT – V

## **ROBOT ACTUATORS AND FED BACK COMPONENTS**

Actuators: Pneumatic and Hydraulic actuators. Electric Actuators: DC servo motors – stepper motors. Feedback components: position sensors – potentiometers, resolvers and encoders – Velocity sensors – Tactile sensors.

## Robot Application in Manufacturing: Material handling – Assembly and Inspection.

# **COURSE OUTCOMES:**

The students will be able to

- **CO1** Apply the knowledge of robotics in real time human life applications.
- CO2 Analyse the concept of CAD/CAM and automation to the robotics.
- **CO3** Compare knowledge of robot applications in manufacturing like, material handling, loading and unloading etc.
- CO4 Experiment the robotics to the spot and continuous arc welding and spray painting.
- CO5 Relate the Robot Application in Manufacturing.

## **TEXTBOOKS:**

- 3. Groover M P, "Industrial Robotics", Pearson Edu., 2012 1<sup>st</sup> Edition, ISBN Number: 0070265097, 9780070265097, 978-0070265097.
- 4. JJ Craig, "Introduction to Robotic Mechanics and Control", Pearson, 2008 3<sup>rd</sup> edition. ISBN-13: 978-0201543612

## **REFERENCE BOOKS:**

- 3. Fu K S, "Robotics", McGraw Hill, 1<sup>st</sup> Ed., 2008, ISBN 13: 9780070226258.
- 4. Richard D.Klafter, "Robotic Engineering", Prentice Hall, 1<sup>st</sup> Ed., 1989, ISBN-13: 9780137820535.

## **ONLINE RESOURCES:**

- 4. NPTEL Course: Introduction to Robotics by Dr. Balaraman Ravindran, IIT Madras. Link: https://nptel.ac.in/courses/107/106/107106090/
- 5. NPTEL Course: Introduction to Robotics by Prof. Ashish Dutta, IIT Kanpur. Link: https://nptel.ac.in/courses/112/104/112104298/
- 6. http://www.robogrok.com/index.html

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### MECHATRONICS (OPEN ELECTIVE – MECHANICAL ENGINEERING)

## B.Tech –CIVIL, EEE, ECE, CSE, CSE(AI&ML) & CSE(Data Science)

L/T/P/C 3/ 0/ 0/ 3

### Prerequisite – Nil COURSE OBJECTIVES:

- > Know the basic concepts of mechatronics.
- Know the various actuating systems like Hydraulic, pneumatic, mechanical and electrical actuating system.
- > Know about the micro processor and micro controllers.
- > Know about the system and interfacing and data acquisition.

## UNIT – I

Mechatronics systems, elements, levels of mechatronics system, Mechatronics design system, measurement systems, control systems, microprocessor-based controllers, advantages and displacement, position, proximity, velocity, motion, force, acceleration, torque, fluid pressure, liquid flow, liquid level, temperature and light sensors.

## UNIT – II

Solid state electronic devices, PN Junction diode, BJT, FET, DIA and TRIAC. Analog signal conditioning, amplifiers, filtering. Introduction to MEMS & typical applications.

## UNIT – III

Hydraulic and pneumatic actuating systems, Fluid systems, Hydraulic and pneumatic systems, components, control valves, electro-pneumatic, hydro-pneumatic, electro-hydraulic servo systems: Mechanical actuating systems and electrical actuating systems.

## UNIT – IV

Digital electronics and systems, digital logic control, micro processors and micro controllers, programming, process controllers, programmable logic controllers, PLCs versus computers, application of PLCs for control.

## UNIT – V

System and interfacing and data acquisition, DAQS, SCADA, A to D and D to A conversions; Dynamic models and analogies, System response. Design of mechatronics systems & future trends.

## **COURSE OUTCOMES:**

The students will be able to

CO1 Use the control system, mechatronics design systems and measurement systems.

**CO2** Work on various actuating systems.

CO3 Convert the signals from one form to another form.

CO4 Estimate the micro controllers and micro processors.

CO5 Develop the simple programming code for PLC's.

## **TEXTBOOKS:**

- 3. Mechatronics Integrated Mechanical Electronics Systems/KP Ramachandran &GKVijaya Raghavan/WILEY india Edition/2008
- 4. Mechatronics Electronics control systems in Mechanical and Electrical Engineering/W Bolton/Pearson Education press/3<sup>rd</sup> edition,2005.

## **REFERENCE BOOKS:**

- 4. Mechatronics Source books by Newton C Braga, Thomson Publications, Chennai.
- 5. Mechatronics N.Shanmugam/ Anuradha Agencies Publishers.
- 6. Mechatronics System Design/Devdas shetty/Richard/Thomson.

## **ONLINE RESOURCES:**

- 3. NPTEL Course: Mechatronics by Prof. Pushparaj Mani Pathak, IIT Roorkee.Link: https://nptel.ac.in/courses/112/107/112107298/
- 4. NPTEL Course: Mechatronics and Manufacturing Automation by Dr. Shrikrishna N.Joshi, IIT Guwahati.

Link: https://nptel.ac.in/courses/112/103/112103174/

# VAAGDEVI COLLEGE OF ENGINEERING (AUTONOMOUS)

### DIGITAL IMAGE PROCESSING (OPEN ELECTIVE – ELECTRONICS & COMMUNICATION ENGINEERING)

## B.Tech –CIVIL, EEE, MECH, CSE, CSE(AI&ML) & CSE(Data Science) L/T/P/C

3/0/0/3

# Pre Requisites: None

## **Course Objectives**

- > To familiarize the students with digital image fundamentals.
- > To get exposed to simple image enhancement techniques in Spatial and Frequency domain.
- > To learn concepts of degradation function and restoration techniques.
- > To study the image segmentation and representation techniques.
- > To Understand the concepts of image compression techniques.

## UNIT- I

**Digital Image Fundamentals & Image Transforms**: Digital Image Fundamentals, Sampling and Quantization, Relationship between Pixels,

**Image Transforms**: 2-D FFT, Properties, Walsh Transform, Hadamard Transform, Discrete Cosine Transform, Haar Transform, Slant Transform, Hotelling Transform.

## UNIT -II

**Image Enhancement (Spatial Domain)**: Introduction, Image Enhancement in Spatial Domain: Enhancement through Point Operation, Types of Point Operation, Histogram Manipulation, Linear and Non — Linear Gray Level Transformation, Spatial domain filtering.

**Image Enhancement (Frequency Domain):** Low Pass (Smoothing) filters, High Pass (Sharpening) filters and Homomorphism filtering.

## UNIT -III

**Image Restoration:** Degradation Model, Algebraic Approach to Restoration, Inverse Filtering, Least Mean Square Filters, Constrained Least Squares Restoration, Interactive Restoration.

## UNIT-IV

**Image Segmentation**: Detection of Discontinuities, Edge Linking And Boundary Detection, Thresholding, Region based Segmentation.

**Morphological Image Processing:** Dilation and Erosion operations, Opening and Closing operations, Hit or Miss Transformation.

## UNIT-V

**Image Compression:** Redundancies and their Removal Methods, Fidelity Criteria, Image Compression Models, Huffman and Arithmetic Coding, Error Free Compression, Lossy and Lossless Predictive Coding, Transform Based Compression, JPEG 2000 Standards.

## **Text Books**

- 1. Digital Image Processing Rafael C. Gonzalez, Richard E. Woods, 3rd Edition, Pearson, 2008
- 2. Fundamentals of Digital Image Processing A.K.Jain, PHI, 1989

## **Reference Books**

1. Digital Image Processing using MATLAB — Rafael C. Gonzalez, Richard E Woods and Steven L.Eddings, 2nd Edition, TMH, 2010.

2. Digital Image Processing- S Jayaraman, S Esakkirajan, T Veerakumar- TMH, 2010.

3. Digital Image Processing with MATLAB & Labview — Vipula Singh, Elsevier.

## **Course Outcomes**

After completion of this course students will be able to

CO1 Gain the knowledge of digital image fundamentals and image transforms.

CO2 Understand image enhancement in spatial and frequency domain.

**CO3** Understand the different methods to restore an image.

CO4 Analyze image segmentation techniques and morphological image processing.

CO5 Analyze the different image compression techniques.

# VAAGDEVI COLLEGE OF ENGINEERING (AUTONOMOUS)

### WIRELESS AND MOBILE COMMUNICATION (OPEN ELECTIVE – ELECTRONICS & COMMUNICATION ENGINEERING)

## B.Tech –CIVIL, EEE, MECH, CSE, CSE(AI&ML) & CSE(Data Science) L/T/P/C

3/0/0/3

# Pre Requisites: None

## **Course Objectives**

- To provide the student with an understanding of the Cellular concept, Frequency reuse, Hand-off strategies.
- > To enable the student to analyze and understand wireless and mobile cellular communication systems over a stochastic fading channel
- > Toprovide the student with an understanding of Co-channel and Non-Co-channel interference
- To give the student an understanding of cell coverage for signal and traffic, diversity techniques and mobile antennas.
- To give the student an understanding of frequency management, Channel assignment and types of hand off.

## UNIT - I

**Introduction to Cellular Mobile Radio Systems:** Limitations of Conventional Mobile Telephone Systems, Basic Cellular Mobile System, First, Second, Third and Fourth Generation Cellular Wireless Systems, Uniqueness of Mobile Radio Environment- Fading, Coherence Bandwidth, Delay Spread, Doppler Spread and Coherence Time. Fundamentals of Cellular Radio System Design: Concept of Frequency Reuse, Co-Channel Interference, Co-Channel Interference Reduction Factor, Desired C/I From a Normal Case in a Omni Directional Antenna System, Trunking and Grade of Service, ImprovingCoverageandCapacityinCellularSystems-CellSplitting,Sectoring,MicrocellZoneConcept.

## UNIT - II

**Co-Channel Interference**: Measurement Of Real Time Co-Channel Interference, Design of Antenna System, Diversity Techniques-Space Diversity, Polarization Diversity, Frequency Diversity, Time Diversity, Directional Diversity. Non-Co-Channel Interference: Adjacent Channel Interference, Near End Far End Interference, Cross Talk, Effects on Coverage and Interference by Power Decrease, Antenna Height Decrease, Effects of Cell Site Components.

## UNIT - III

**Cell Coverage for Signal and Traffic**: Signal Reflections in Flat and Hilly Terrain, Effect of Human Made Structures, Phase Difference Between Direct and Reflected Paths, Constant Standard Deviation, Straight Line Path Loss Slope, General Formula for Mobile Propagation Over water and Flat Open Area, Near and Long Distance Propagation, Path Loss From a Point to Point Prediction Model in Different Conditions, Merits of Lee Model. Cell Site and Mobile Antennas: Space Diversity Antennas, Umbrella Pattern Antennas.

## UNIT - IV

**Frequency Management and Channel Assignment:** Numbering and Grouping, Access and Paging Channels, Channel Assignments to Cell Sites and Mobile Units, Channel Sharing and Borrowing, Sectorization, Overlaid Cells, Non Fixed Channel Assignment.

## UNIT - V

Handoffs and Dropped Calls: Handoff Initiation, Types of Handoff, Delaying Handoff, Advantages of Handoff, Power Difference Handoff, Forced Handoff, Mobile Assisted and Soft Handoff, inter system

Handoff, Introduction to Dropped Call Rates and their Evaluation.

## **Text Books**

- 1. MobileCellularTelecommunications—W.C.Y.Lee,McGrawHill,2ndEdn.,1989.
- 2. Wireless Communications Theodore. S. Rapport, Pearson Education, 2nd Edn., 2002.
- 3. Mobile Cellular Communication Gottapu sashibhushana Rao, Pearson, 2012.

## **Reference Books**

- 1. PrinciplesofMobileCommunications—GordonL.Stuber,SpringerInternational,2ndEdn.,2001.
- 2. Modern Wireless Communications-Simon Haykin, Michael Moher, Pearson Education, 2005.
- 3. Wireless Communications Theory and Techniques, Asrar U. H .Sheikh, Springer, 2004.
- 4. Wireless Communications and Networking, Vijay Garg, Elsevier Publications, 2007.
- 5. Wireless Communications Andrea Goldsmith, Cambridge University Press, 2005.

## **Course Outcomes**

By the end of the course, the student will be able to

- **CO1** Estimate the impairments due to multi path fading channel.
- CO2 Explain an Importance of the fundamental techniques to overcome the different fading effects.
- CO3 Distinguish the co-channel and Non co-channel interference.
- CO4 Inspect cell coverage for signal and traffic, diversity techniques and mobile antennas.
- **CO5** Relate and explain the functioning of frequency management, Channel assignment and types of handoff.

### SENSOR NETWORKS (OPEN ELECTIVE – ELECTRONICS & COMMUNICATION ENGINEERING)

## B.Tech –CIVIL, EEE, MECH, CSE, CSE(AI&ML) & CSE(Data Science) L/T/P/C

3/0/0/3

## **Pre-requisites:** None

## **Course Objectives:**

- > To introduce the various types of sensor & networks in wireless
- > To explore the analysis of various sensors & networks

## UNIT-I

**OVERVIEWOFWIRELESSSENSORNETWORKS:**ChallengesforWirelessSensorNetworks,EnablingT echnologiesForWireless Sensor Networks.

## UNIT-II

**ARCHITECTURES:**Single-NodeArchitecture-HardwareComponents,EnergyConsumption of Sensor Nodes , Operating Systems and Execution Environments, Network Architecture - Sensor Network Scenarios, Gateway Concepts.

## UNIT-III

**NETWORKING SENSORS:** Physical Layer and Transceiver Design Considerations, MAC Protocols for Wireless Sensor Networks, Low Duty Cycle Protocols And Wakeup Concepts -S-MAC, The Mediation Device Protocol, Wakeup Radio Concepts, Address and Name Management, Assignment of MAC Addresses.

## UNIT-IV

**INFRASTRUCTURE ESTABLISHMENT:** Topology Control , Clustering, Time Synchronization, Localization and Positioning.

## UNIT-V

**SENSOR NETWORK PLATFORMS AND TOOLS:** Sensor Node Hardware – Berkeley Motes, Programming Challenges, Node-levels of twareplatforms, Node-level Simulators.

## TEXTBOOKS

- 1. HolgerKarl&AndreasWillig,"ProtocolsAndArchitecturesforWirelessSensorNetworks", John Wiley,2005.
- 2. Feng Zhao &Leonidas J. Guibas, -Wireless Sensor Networks- An Information Processing Approach", Elsevier, 2007.

## REFERENCES

- 1. Kazem Sohraby, Daniel Minoli, &Taieb Znati, -Wireless Sensor Networks-Technology, Protocols, And Applications John Wiley, 2007.
- 2. AnnaHac, -Wireless Sensor Network Designsl, John Wiley, 2003.

## **Course Outcomes**

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

- CO1 Understand the overview of sensor & networks.
- CO2 Explore the various architectures of sensors & network
- CO3 Uunderstand the various protocols in sensor networks.
- CO4 Identify the infrastructure and establishment of sensor networks.
- CO5 Explore various sensor network platforms and tools.

# VAAGDEVI COLLEGE OF ENGINEERING (AUTONOMOUS)

### **BIOMEDICAL INSTRUMENTATION** (OPEN ELECTIVE – ELECTRONICS & COMMUNICATION ENGINEERING)

B.Tech –CIVIL, EEE, MECH, CSE, CSE(AI&ML) & CSE(Data Science) L/T/P/C

3/0/0/3

## Pre Requisites: None

## **Course Objectives**

The following are the course objectives

- > To study bioamplifier, biosignals and measurement of physiological parameters.
- > To know about different bioelectrodes and activities of heart.
- > To understand therapeutic and cardic instrumentation.
- > To study EEG and EMG machines, recordings and interpretations.

### UNIT-I

**Components of Medical Instrumentation System:** Bloamplifier, Static and Dynamic Characteristics of Medical Instruments, Biosignals and Characteristics, Problems encountered with Measurements from Human beings. Organization of Cell, Derivation of Nernst equation for Membrane Resting Potential Generation and Propagation of Action Potential, Conduction through Nerve to Neuromuscular Junction.

## UNIT -II

**Bio Electrodes**: Biopotential Electrodes-External Electrodes, Internal Electrodes, Biochemical Electrodes. Mechanical Function, Electrical Conduction System of the Heart, Cardiac Cycle, Relation between Electrical and Mechanical Activities of the Heart.

## UNIT -III

**Cardiac Instrumentation**: Blood Pressure and Blood Flow Measurement, Specification of ECG Machine, Einthoven Triangle, Standard 12-Lead Configurations, Interpretation of ECG waveform with respect to Electro Mechanical Activity of the Heart.

## UNIT -IV

**Therapeutic Equipment:** Pacemaker, Defibrillator, Shortwave Diathermy, Hemodialysis Machine. Respiratory Instrumentation: Mechanism of Respiration, Spirometry, Pnemuotachograph Ventilators.

### UNIT -V

**Neuro-Muscular Instrumentation**: Specification of EEG and EMG Machines, Electrode Placement for EEG and EMG Recording, Interpretation of EEG and EMG.

### **Text Books**

- 1. Biomedical Instrumentation and Measurements by Leslie Cromwell, F.J. Weibell, E.A. Pfeiffer, PHI.
- 2. Medical Instrumentation, Application and Design by John G. Webster, John Wiley.

### **Reference Books**

- 1. Principles of Applied Biomedical Instrumentation by L.A. Geoddes and L.E. Baker, John Wiley and Sons.
- 2. Hand-book of Biomedical Instrumentation by R.S. Khandpur, McGraw-Hill, 2003.
- 3. Biomedical Telemetry by Mackay, Stuart R., John Wiley.

## **Course Outcomes**

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

- **CO1** Understand the functions of bio amplifiers, characteristics of medical instruments and bio signals.
- **CO2** Discuss the various internal, external Bio electrodes and relations between electrical and mechanical activities of heart.

**CO3** Compare various concepts of Cardiac Instrumentation and gain the knowledge about **CO4** Analyze the Therapeutic Equipment and their operation.

CO5 Acquires knowledge about neuro-muscular Instrumentation like ECG EMG and EEG.

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**R20** Regulations

# VAAGDEVI COLLEGE OF ENGINEERING (AUTONOMOUS)

### DATABASE MANAGEMENT SYSTEMS (OPEN ELECTIVE – COMPUTER SCIENCE & ENGINEERING)

### B.Tech –CIVIL, EEE, MECH, ECE, CSE(AI&ML) & CSE(Data Science)

L/T/P/C 3/ 0/ 0/ 3

## Pre-requisites: Data Structures, Mathematics-I

## **Course Objectives**:

This Course provides an emphasis on how to organize, maintain and retrieve information efficiently and effectively from a Database and it presents an introduction to data base management systems (DBMS) and relational data model. Also the course introduces the concepts of transactions and transaction processing and the issues and techniques relating to concurrency and recovery in multi-user database environments.

### **UNIT-I:** Introduction

Database system Applications - Database System versus File Systems - View of Data– Instances and schema - Data Models - Database Languages -DDL-DML - Database Users and Administrator –Transaction Management - Database System Structure-Application Architectures – History of Database Systems.

### UNIT- II: Database Design and ER model

Basic concepts - Entity sets and Relationship Sets – Constraints - Keys - Design Issues - Entity-Relationship Diagram- Weak Entity Sets - Extended E-R Features - Designing of an E-R Database Schema-Reduction of an E-R Schema to Tables.

### **UNIT-III: Relational Model**

Introduction to the Relational Model – Structure of Relational Databases - Relational Algebra – Relational Calculus – Domain relational Calculus, Tuple Relational Calculus - Integrity and Security – Domain Constraints, Referential Integrity Constraints-Triggers-security and Authorization – SQL- Basic Structure, Set operations, Aggregate Operations – Null values- Nested Sub queries – Views – Modification of Database-Joined relations, Case Statement, NVL Function, Conversion Functions.

## **UNIT- IV: Informal Design guidelines for Relation Schema**

Functional Dependencies– Normal Forms based on Primary Keys-Decomposition–Desirable properties of Decomposition – First Normal Form, Second Normal Form–Third Normal Form- Boyce- Codd Normal Form - Multivalued Dependency- Fourth Normal Form- Fifth Normal Form-Transactions-Transaction Concept- Transaction state- Implementation of atomicity and Durability- Concurrent Executions – Serializability, Recoverability-Implementation of Isolation.

## **UNIT-V: Concurrency Control**

Lock Based Protocols, Dead Lock Handling, Multiple Granularity, Time-stamp Based Protocols, Validation Based Protocols.

**Recovery System**: Failure Classification, Storage Structure, Recovery and Atomicity, Log Based recovery, Shadow Paging, Recovery with concurrent transactions.

**Storage and File Structure** - File Organization – Organization of records in file - Data Dictionary Storage – Indexing and Hashing – Basic Concepts, Ordered Indices, B+ Tree Index files, B- tree index files – Static Hashing – Dynamic Hashing – Comparison of Indexing and Hashing.

### **Course Outcomes:**

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

CO-1: Perceive the fundamental concepts of database management.

## **R20** Regulations

**CO-2:** Analyze database models & Entity Relationship models and to draw the E-R diagram for the given case study.

- CO-3: Apply relational Database Theory, and be able to write relational algebra expressions for queries.
- **CO-4:** Apply Normalization Process to construct the database and explain Basic Issues of Transaction processing.
- **CO-5:** Compare the basic Database storage structures and access techniques: File Organization indexing methods including B- Tree and Hashing.

## **TEXT BOOKS:**

- 1. Database System Concepts, Silberschatz, Korth, sixth Edition, McGraw hill.
- 2. Database Systems, Ramez Elmasri Shamkant B. Navathe Pearson Education, 6<sup>th</sup> edition

## **REFERENCE BOOKS:**

- 1. Database Management Systems, Raghu ramakrishnan, Johannes Gehrke, TATA Mc Graw Hill
- 2. Data base Systems design, Implementation, and Management, Peter Rob & Carlos Coronel 7th Edition.
- 3. Database Systems , The Complete Book, Hector Garcia-Molina, Jeffrey D.Ullman, Jennifer Widom.
- 4. An Introduction to Database Systems, C.J. Date ,Eighth edition

**R20** Regulations

# VAAGDEVI COLLEGE OF ENGINEERING (AUTONOMOUS)

## JAVA PROGRAMMING (OPEN ELECTIVE – COMPUTER SCIENCE & ENGINEERING)

## B.Tech –CIVIL, EEE, MECH, ECE, CSE(AI&ML) & CSE(Data Science)

L/T/P/C 3/ 0/ 0/ 3

Pre-Requisites: Programming for Problem Solving

## **Course Objectives:**

- This course introduces computer programming using the JAVA programming language with objectoriented programming principles.
- > The use of Java in a variety of technologies and on different platforms.
- > To understand fundamentals of object-oriented programming in Java which includes defining classes, invoking methods, using class libraries.
- ➢ Using API to solve real world problems.

## UNIT-I

**OOP Concepts:** OOP Features, OOP Concepts-Data Abstraction, Encapsulation, Inheritance, Polymorphism, Classes and Objects, Procedural and Object Oriented Programming paradigms.

**Java Programming:** History of Java, Data Types, Variables, Constants, Scope and Life Time of Variable, Operators, Type Conversion and Casting, Conditional Statements, Iterative statements, Break and Continue statements, Access Controls, Arrays, Methods and Constructors, Static variables and Static methods, This reference, Overloading methods, Garbage collection, Nested Classes, and Inner Classes.

## UNIT-II

**Inheritance:** Inheritance - types of Inheritance, Member access rules, Method Overriding, Super keyword, Preventing Inheritance: Final classes and methods.

Interfaces: Abstract class, defining an Interface, Abstract Vs Interface, implementing and extending Interface.

## UNIT-III

Packages- Defining, creating and accessing a Package, and importing Packages.

**Exception Handling-** Exception Handling, Types of Exceptions. Usage of try, catch, throw, throws and finally, re-throwing exceptions, and User defined Exceptions.

## UNIT-IV

**Multi Threading-** Creating Thread, Life cycle of Thread, Thread priorities, Synchronization of Threads, Inter-Thread Communication, and Producer Consumer Problem.

**Collection Framework in Java-** Overview of Java Collection Frame work, Generics, Commonly used Collection Classes and Interfaces-Array List, Vector, Hash Table, Stack, Enumeration, Iterator, String Tokenizer, Random, Scanner, Calendar, and Properties.

## UNIT-V

**GUI Programming with Java-** AWT class Hierarchy, Introduction to Swing, Swing vs. AWT, Containers-JFrame, JApplet, and JPanel, Swing components- JButton, JLabel, JTextField, and JTextArea. Layout manager and its types.

**Event Handling-** Events, Event classes, Event Listeners, Delegation event model, Examples: handling a button click, and handling mouse and keyboard events.

Applet: Create an Applet, Life Cycle of an Applet, and passing parameters to Applet.

## **Course Outcomes:**

- CO-1: Understand the use of OOP concepts and solve real world problems using OOP techniques.
- **CO-2:** Solve the inter-disciplinary applications using the concept of inheritance.
- **CO-3:** Develop robust and faster applications by applying different exception handling mechanisms.
- **CO-4:** Understand the multithreading concepts and develop efficient applications.
- CO-5: Design GUI based applications and develops applets for web applications.

## **TEXT BOOK:**

1. Java The Complete Reference, 8th Edition. herbert schildt. Indian edition.

## **REFERENCE BOOKS:**

- 1. Java for Programmers, P.J. Dietel and H.M Dietel, Pearson Education (OR) JAVA: How to Program P.J. Dietel and H.M. Dietel, PHI.
- 2. Object Oriented Programming through Java, P. Radha Krishna, University Press.
- 3. Thinking in Java, Bruce Ecel, Pearson Education
- 4. Programming in Java, S. Malhotra and S. Choudary, Oxford Univ. Press.

### INTRODUCTION TO NETWORK SECURITY (OPEN ELECTIVE – COMPUTER SCIENCE & ENGINEERING)

### B.Tech –CIVIL, EEE, MECH, ECE, CSE(AI&ML) & CSE(Data Science) L/T/P/C

3/0/0/3

### Pre requisites: Data Communications and Computer Networks. Course Objectives:

- To explain the objectives of information security and importance and application of each of confidentiality, integrity, authentication and availability. Understand various cryptography concepts and techniques.
- > To illustrate various symmetric key and asymmetric key cryptographic algorithms.
- > To define the basic requirements of message authentication, hashing algorithms.
- > To describe E-Mail Security with PGP, S/MIME.
- > To discuss the requirements of SET, understand intrusion detection and Firewalls.

## UNIT – I

**Security Concepts:** Introduction, Types of Security attacks, Security services, Security Mechanisms, A model for Network Security, **Cryptography Concepts and Techniques:** Introduction, plain text and cipher text, substitution techniques, transposition techniques, encryption and decryption, symmetric and asymmetric key cryptography, Steganography.

## UNIT – II

**Symmetric key Ciphers:** Block Cipher principles, Feistel Cipher Structure, DES algorithm, AES algorithm, Multiple Encryption and Triple DES, Block cipher operation, Stream ciphers, RC4. **Asymmetric key Ciphers:** Principles of public key cryptosystems, RSA algorithm, Diffie- Hellman Key Exchange.

## UNIT – III

**Cryptographic Hash Functions:** Message Authentication, Secure Hash Algorithm(SHA-512). **Message authentication codes:** Authentication requirements, HMAC, Digital signatures.

## UNIT – IV

**E-Mail Security:** Pretty Good Privacy-Notations, PGP Operation-Authentication and Confidentiality, Cryptographic Keys and Key Rings, Message Transmission and Reception. **S/MIME-**S/MIME Functionality, Messages, Certificate Processing, Certification Authorities

## UNIT – V

**Web Security:** Requirements, Secure Electronic Transaction (SET), Intruders, Firewall Design principles, Trusted Systems, Intrusion Detection Systems(Online Chapters and Appendices: Chapter 22, Chapter 23).

### **Course Outcomes:**

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

CO-1: Identifies various types of vulnerabilities, attacks, mechanisms and security services.

- CO-2: Compare and contrast symmetric and asymmetric encryption algorithms.
- **CO-3:** Implementation of message authentication, hashing algorithms.

**CO-4:** Explore E-Mail security, S/MIME Functionality.

CO-5: Develop intrusion detection system and designing of various types of firewalls.
#### **TEXT BOOK:**

1. Cryptography and Network Security - Principles and Practice: William Stallings, Pearson Education, 6th Edition

#### **REFERENCE BOOKS:**

1. Cryptography and Network Security: C K Shyamala, N Harini, Dr T R Padmanabhan, Wiley India, 1st

Edition.

- 2. Cryptography and Network Security :Forouzan Mukhopadhyay, Mc Graw Hill, 3<sup>rd</sup> Edition
- 3. Information Security, Principles, and Practice: Mark Stamp, Wiley India.
- 4. Principles of Computer Security: WM. Arthur Conklin, Greg White, TMH
- 5. Introduction to Network Security: Neal Krawetz, CENGAGE Learning

6. Network Security and Cryptography: Bernard Menezes, CENGAGE Learning

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#### INTRODUCTION TO CLOUD COMPUTING (OPEN ELECTIVE – COMPUTER SCIENCE & ENGINEERING)

#### B.Tech –CIVIL, EEE, MECH, ECE, CSE(AI&ML) & CSE(Data Science)

#### L/T/P/C 3/ 0/ 0/ 3

# **Prerequisites:**

- 1. A course on "Computer Networks"
- 2. A course on "Operating Systems"
- 3. A course on "Distributed Systems"

# **Course Objectives:**

- > This course provides an insight into cloud computing
- Topics covered include- distributed system models, different cloud service models, serviceoriented architectures, cloud programming and software environments, resource management.

# UNIT-I

Computing Paradigms: High-Performance Computing, Parallel Computing, Distributed Computing, Cluster Computing, Grid Computing, Cloud Computing, Bio computing, Mobile Computing, Quantum Computing, Optical Computing, Nano computing.

# UNIT-II

Cloud Computing Fundamentals: Motivation for Cloud Computing, The Need for Cloud Computing, Defining Cloud Computing, Definition of Cloud computing, Cloud Computing Is a Service, Cloud Computing Is a Platform, Principles of Cloud computing, Five Essential Characteristics, Four Cloud Deployment Models

#### **UNIT-III**

Cloud Computing Architecture and Management: Cloud architecture, Layer, Anatomy of the Cloud, Network Connectivity in Cloud Computing, Applications, on the Cloud, Managing the Cloud, Managing the Cloud Infrastructure Managing the Cloud application, Migrating Application to Cloud, Phases of Cloud Migration Approaches for Cloud Migration.

# UNIT-IV

Cloud Service Models: Infrastructure as a Service, Characteristics of IaaS. Suitability of IaaS, Pros and Cons of IaaS, Summary of IaaS Providers, Platform as a Service, Characteristics of PaaS, Suitability of PaaS, Pros and Cons of PaaS, Summary of PaaS Providers, Software as a Service, Characteristics of SaaS, Suitability of SaaS, Pros and Cons of SaaS, Summary of SaaS Providers, Other Cloud Service Models.

#### UNIT-V

Cloud Service Providers: EMC, EMC IT, Captiva Cloud Toolkit, Google, Cloud Platform, Cloud Storage, Google Cloud Connect, Google Cloud Print, Google App Engine, Amazon Web Services, Amazon Elastic Compute Cloud, Amazon Simple Storage Service, Amazon Simple Queue, service, Microsoft, Windows Azure, Microsoft Assessment and Planning Toolkit, SharePoint, IBM, Cloud Models, IBM Smart Cloud, SAP Labs, SAP HANA Cloud Platform, Virtualization Services Provided by SAP, Sales force, Sales Cloud, Service Cloud: Knowledge as a Service, Rack space, VMware, Manjrasoft, Aneka Platform

# **Course Outcomes:**

**CO-1:** Ability to understand various service delivery models of a cloud computing architecture. **CO-2:** Ability to understand the ways in which the cloud can be programmed and deployed.

**CO-3:** Understanding Cloud Computing Architecture and Management

**CO-4:** Understanding cloud service Models.

**CO-5:** Understanding cloud service providers.

# **TEXT BOOK:**

1. Essentials of cloud Computing: K. Chandrasekhran, CRC press, 2014

# **REFERENCE BOOKS:**

- 1. Cloud Computing: Principles and Paradigms by Rajkumar Buyya, James Broberg and Andrzej M. Goscinski, Wiley, 2011.
- 2. Distributed and Cloud Computing, Kai Hwang, Geoffery C. Fox, Jack J. Dongarra, Elsevier, 2012.
- 3. Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance, Tim Mather, Subra Kumaraswamy, Shahed Latif, O'Reilly, SPD, rp 2011.

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# VAAGDEVI COLLEGE OF ENGINEERING (AUTONOMOUS)

#### INTERNET OF THINGS (IoT) (OPEN ELECTIVE – COMPUTER SCIENCE & ENGINEERING)

#### B.Tech –CIVIL, EEE, MECH, ECE, CSE(AI&ML) & CSE(Data Science) L/T/P/C

3/0/0/3

**Pre-requisites:** Basic Programming Knowledge, Communications Protocols **Course Objectives:** 

- > To introduce the terminology, technology and its applications
- > To introduce the concept of M2M (machine to machine) with necessary protocols
- > To introduce the Python Scripting Language which is used in many IoT devices
- > To introduce the Raspberry PI platform, that is widely used in IoT applications
- > To introduce the implementation of web based services on IoT devices

#### UNIT I

Introduction to Internet of Things –Definition and Characteristics of IoT, Physical Design of IoT – IoT Protocols, IoT communication models, IoT Communication APIs, IoT enabled Technologies – Wireless Sensor Networks, Cloud Computing, Big data Analytics, Communication Protocols, Embedded Systems, IoT Levels and Templates, Domain Specific IoTs – Home, City, Environment, Energy, Retail, Logistics, Agriculture, Industry, health and Lifestyle.

# UNIT II

IoT and M2M – Introduction to M2M, Difference between M2M and IoT, Software Defined Networks, Network Function Virtualization, differences between SDN and NFV for IoT, Basics of IoT System Management with SNMP, NETCONF, NETOPEER.

# UNIT IV

IoT Physical Devices and Endpoints - Introduction to Raspberry PI-Interfaces (serial, SPI, I2C) Programming – Python programs with Raspberry PI with focus of interfacing external gadgets, controlling output, reading input from gpio pins.

#### UNIT V

IoT Physical Servers and Cloud Offerings – Introduction to Cloud Storage models and communication APIs Web servers – Web server for IoT, Cloud for IoT, Python web application framework, Designing a RESTful web API.

#### **Course Outcomes:**

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

**CO-1:** Interpret the vision of IoT from global context.

CO-2: Perceive building blocks of Internet of Things and its characteristics.

CO-3: Learn the basic concepts of Python. Implement the python programming using Raspberry.

**CO-4:** Perceive the application areas of IoT. Realize the revolution of Internet in Mobile Devices, Cloud & Sensor Networks

**CO-5:** Determine the Market perspective of IoT. Develop Python web applications and cloud servers for IoT.

#### **TEXT BOOKS:**

1. Internet of Things - A Hands-on Approach, Arshdeep Bahga and Vijay Madisetti, Universities Press, 2015, ISBN: 9788173719547

2. Getting Started with Raspberry Pi, Matt Richardson & Shawn Wallace, O'Reilly (SPD), 2014, ISBN: 9789350239759

# **REFERENCE BOOK:**

1. Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, StamatisKarnouskos, David Boyle, "From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence", 1 st Edition, Academic Press, 2014.

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#### DATA STRUCTURES AND ALGORITHMS (OPEN ELECTIVE – COMPUTER SCIENCE & ENGINEERING)

#### B.Tech –CIVIL, EEE, MECH, ECE, CSE(AI&ML) & CSE(Data Science)

L/T/P/C 3/ 0/ 0/ 3

**Prerequisites:** A course on "Programming for Problem Solving". **Course Objectives:** 

- > Exploring basic data structures such as stack sand queues.
- > Introduce a variety of data structures such as hash tables, search trees, heaps, graphs.

# UNIT -I

**Basic Concepts:** Algorithm specification- Introduction, Performance analysis and Performance measurement. Arrays: The Abstract data type, Sparsematrices- Introduction, Sparse matrix representation, Transposing a matrix.

**Stacks and Queues** : StackAbstractDataType,Stackoperations,QueueAbstractDataType,Queue operations.Evaluationofexpressions-Expressions,Postfixnotations,Infixtopostfix.

#### UNIT -II

Linked Lists: Singly linked lists and chains, Representing chains, Linked stacks and Queues, Doubly linked lists, Circular lists.

**Trees:** Introduction, Binary trees- The abstract data type, Properties of binary trees, Binary tree representations, Binary tree traversals- Inorder traversal, Preorder traversal, Post order traversal. **Binary search trees:** Definition, Searching a binary search tree, Insertion into a binary search tree, Deletion from a binary search tree, Joining and Splitting binary search trees, Height of a binary search tree.

#### UNIT-III

**Heaps:** Priority Queues, Definition of MAX heap, insertion into a MAX Heaps, Deletion from MAX Heaps.

**Efficient Binary Search Trees**: Optimal binary search trees, AVL trees, rotations of AVL trees. Multiway Search Trees: M-way search trees, B-trees.

#### UNIT -IV

**Hashing:** Introduction, Hash functions, Collision resolution Techniques - Hash tableoverflow, Extendible hashing.

**Graphs:** The Graph Abstract Data Type- Introduction, Definition, Graph representations, Elementary graph operations-Depth first search, Breadth first search.

#### UNIT -V

**Sorting**-Types of sorting, Insertion sort, Selection sort, Quick sort, Merge sort, Heapsort, External sorting-K-way merge sort, Comparison of all sorting methods.

#### **Course Outcomes:**

CO-1: Define the basic techniques of algorithm analysis

**CO-2:** Examine the linear and non linear data structures.

**CO-3:** Develop Priority Queues and Balanced Trees.

**CO-4:** Understand Hashing Techniques and Graph applications.

**CO-5:** Apply suitable algorithms for sorting Technique.

#### **TEXT BOOK:**

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1. Fundamentals of Data Structures in C, 2<sup>nd</sup> Edition, E. Horowitz, S. Sahni and Susan Anderson Freed, Universities Press.

# **REFERENCE BOOKS:**

- 1. Data Structures: A PseudocodeApproachwithC,2<sup>nd</sup>Edition, R.F. Gilberg and B.A.Forouz and Cengage Learning.
- 2. Data Structures using C–A.S.T anenbaum, Y.Langsam, and M.J. Augenstein, PHI/ Pearson Education.

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# VAAGDEVI COLLEGE OF ENGINEERING (AUTONOMOUS)

#### ARTIFICIAL INTELLIGENCE (OPEN ELECTIVE – CSE (ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING))

#### B.Tech –CIVIL, EEE, MECH, ECE, CSE & CSE(Data Science)

L/T/P/C 3/ 0/ 0/ 3

# Pre-Requisites: None

# **Course Objectives:**

- > To learn the difference between optimal reasoning vs human like reasoning
- > To understand the notions of state space representation, exhaustive search, heuristic search along with the time and space complexities
- > To learn different knowledge representation techniques
- > To understand the applications of AI: namely Game Playing.
- > To understand Theorem Proving, Expert Systems.

# UNIT - I

Introduction: AI problems, Agents and Environments, Structure of Agents, Problem Solving Agents Basic Search Strategies: Problem Spaces, Uninformed Search (Breadth-First, Depth-First Search, Depth-first with Iterative Deepening), Heuristic Search (Hill Climbing, Generic Best-First, A\*), Constraint Satisfaction (Backtracking, Local Search)

# UNIT - II

Advanced Search: Constructing Search Trees, Stochastic Search, A\* Search Implementation, Minimax Search, Alpha-Beta Pruning Basic Knowledge Representation and Reasoning: Propositional Logic, First-Order Logic, Forward Chaining and Backward Chaining, Introduction to Probabilistic Reasoning, Bayes Theorem

# UNIT - III

Advanced Knowledge Representation and Reasoning: Knowledge Representation Issues, Nonmonotonic Reasoning, Other Knowledge Representation Schemes Reasoning Under Uncertainty: Basic probability, Acting Under Uncertainty, Bayes' Rule, Representing Knowledge in an Uncertain Domain, Bayesian Networks

# UNIT - IV

Learning: What Is Learning? Rote Learning, Learning by Taking Advice, Learning in Problem Solving, Learning from Examples, Winston's Learning Program, Decision Trees.

#### UNIT - V

Expert Systems: Representing and Using Domain Knowledge, Shell, Explanation, Knowledge Acquisition.

#### **Course Outcomes:**

- **CO-1:** Possess the ability to formulate an efficient problem space for a problem expressed in English.
- CO-2: Possess the ability to select a search algorithm for a problem.
- CO-3: Possess the skill for representing knowledge using the appropriate technique
- **CO-4:** Possess the ability to apply AI techniques to solve problems of Game Playing,

CO-5: Possess the Expert Systems, Machine Learning and Natural Language Processing

#### **TEXT BOOK:**

1. Russell, S. and Norvig, P, Artificial Intelligence: A Modern Approach, Third Edition, PrenticeHall, 2010.

# **REFERENCE BOOKS:**

- 1. Artificial Intelligence, Elaine Rich, Kevin Knight, Shivasankar B. Nair, The McGraw Hill publications, Third Edition, 2009.
- 2. George F. Luger, Artificial Intelligence: Structures and Strategies for Complex Problem Solving, Pearson Education, 6th ed., 2009.

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# VAAGDEVI COLLEGE OF ENGINEERING (AUTONOMOUS)

#### INTRODUCTION TO MACHINE LEARNING (OPEN ELECTIVE – CSE (ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING))

# B.Tech –CIVIL, EEE, MECH, ECE, CSE & CSE(Data Science)

L/T/P/C 3/ 0/ 0/ 3

Pre-requisites: Programming for Problem solving,

#### **Course Objectives:**

- > To be able to formulate machine learning problems corresponding to different applications.
- > To understand a range of machine learning algorithms along with their strengths and weaknesses
- > To understand the basic theory underlying machine learning.
- > To be able to apply machine learning algorithms to solve problems of moderate complexity.
- > To be able to read current research papers and understands the issues raised by current research.

#### UNIT-I

The ingredients of machine learning, Tasks: the problems that can be solved with machine learning, Models: the output of machine learning, Features, the workhorses of machine learning. (Text Book 1- page no: 1-80)

#### UNIT- II

Binary classification and related tasks: Classification, Scoring and ranking Beyond binary classification: Handling more than two classes, Regression, Unsupervised and descriptive learning. (Text Book 1- page no: 81-127)

#### UNIT-III

Intoduction of Concept Learning, Models: Decision trees, Ranking and probability estimation trees, Tree learning as variance reduction. (Text Book 1- page no: 129-156)

#### **UNIT-IV**

Rule models: Learning ordered rule lists, Learning unordered rule sets, The Perceptron: a heuristic learning algorithm for linear classifiers. (Text Book 1- page no: 194-218, 262-297).

#### UNIT- V

Support vector machines, Probabilistic models: The normal distribution and its geometric interpretations, Probabilistic models for categorical

Course Outcomes: After the completion of this course the students should be able to :

**CO-1:** Explain the theory underlying machine learning.

**CO-2:** Learn beyond binary classification.

CO-3: Recognize and implement various genetic algorithms.

**CO-4:** Construct algorithms to learn tree, to learn linear, non-linear models and Probabilistic models. **CO-5:** Able to analyze the data.

#### **TEXT BOOKS:**

1. Machine Learning: The art and science of algorithms that make sense of data, Peter Flach, Cambridge. 2. The R Book. Second Edition. Michael J. Crawley. 3. Machine Learning, Tom M. Mitchell, MGH.

#### **REFERENCE BOOKS:**

- 1. Understanding Machine Learning: From Theory to Algorithms, Shai Shalev-Shwartz, Shai BenDavid, Cambridge.
- 2. Machine Learning in Action, Peter Harington, 2012, Cengage.

#### NEURAL NETWORKS (OPEN ELECTIVE – CSE(ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING))

#### B.Tech –CIVIL, EEE, MECH, ECE, CSE & CSE(Data Science)

L/T/P/C 3/ 0/ 0/ 3

# Pre requisites: None

# **Course Objectives:**

- To understand the biological neural network and to model equivalent neuron models.
- To understand the architecture, learning algorithm and issues of various feed forward and feedback neural networks.

# UNIT – I

**Introduction:** A Neural Network, Human Brain, Models of a Neuron, Neural Networks viewed as Directed Graphs, Network Architectures, Knowledge Representation, Artificial Intelligence and Neural Networks Learning Process: Error Correction Learning,

#### UNIT – II

Memory Based Learning, Hebbian Learning, Competitive, Boltzmann Learning, Credit Assignment Problem, Memory, Adaption, Statistical Nature of the Learning Process **Single Layer Perceptron :** Adaptive Filtering Problem, Unconstrained Organization Techniques, Linear Least Square Filters, Least Mean Square Algorithm, Learning Curves, Learning Rate Annealing Techniques,

#### UNIT-III

Perceptron –Convergence Theorem, Relation Between Perceptron and Bayes Classifier for a Gaussian Environment Multilayer Perceptron: Back Propagation Algorithm XOR Problem, Heuristics, Output Representation and Decision Rule, Computer Experiment, Feature Detection.

#### **UNIT-IV**

Back Propagation Algorithm XOR Problem, Heuristics, Output Representation and Decision Rule, Computer Experiment, Feature Detection.

#### UNIT-V

Back Propagation and Differentiation, Hessian Matrix, Generalization, Cross Validation, Network Pruning Techniques, Virtues, and Limitations of Back Propagation Learning, Accelerated Convergence, Supervised Learning

#### **Course Outcomes:**

By completing this course the student will be able to:

CO-1: Describe different neural networks of various architectures

**CO-2:** Understand the feed forward and feed backward.

**CO-3:** Design the training of neural networks.

**CO-4:** Learn various learning rules.

**CO-5:** Develop the testing of neural networks and do the perform analysis of these networks for various pattern recognition application.

#### **TEXT BOOKS:**

1. Neural Networks a Comprehensive Foundations, Simon Haykin, PHI edition.

# **REFERENCE BOOKS:**

- 1. Artificial Neural Networks B. Yegnanarayana Prentice Hall of India P Ltd 2005
- 2. Neural Networks in Computer Intelligance, Li Min Fu TMH 2003
- 3. Neural Networks -James A Freeman David M S Kapura Pearson Education 2004.
- 4. Introduction to Artificial Neural Systems Jacek M. Zurada, JAICO Publishing House Ed. 2006.

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# VAAGDEVI COLLEGE OF ENGINEERING (AUTONOMOUS)

#### INTRODUCTION TO CYBER SECURITY (OPEN ELECTIVE – CSE (ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING))

#### B.Tech –CIVIL, EEE, MECH, ECE, CSE & CSE(Data Science)

L/T/P/C 3/ 0/ 0/ 3

#### Prerequisites: Basic Computer knowledge.

# **Course Objectives:**

- > To introduce the methodologies and framework of ethical hacking for enhancing the security.
- > To learn about cybercrimes and how they areplanned.
- > To learn the vulnerabilities of mobile and wireless devices.
- > To learn about the cyber-Law and legalperspectives.

#### UNIT – I

Introduction to Cybercrime: Introduction, Cybercrime and Information Security, Who are Cybercriminals, Classifications of Cybercrimes, Cyber-crime: The legal Perspectives and Indian Perspective, Cybercrime and the Indian ITA 2000, A Global Perspective on Cybercrimes. (Text Book-1 : Page no : 1 - 39)

# UNIT – II

Cryptography: Introduction Cryptography, Steganography, Objectives of Cryptography: Confidentiality, Integrity, Authenticity, Non-repudiation, Accountability, Types of Attacks: Passive Attacks, Active Attacks, Introduction to Symmetric key cryptography, Asymmetric Key Cryptography, Hashing. (Text Book-2)

#### UNIT – III

Cyber Offenses: How Criminals Plan Them: Introduction, How Criminals plan the Attacks, Social Engineering, Cyber stalking, Cyber café and Cybercrimes, Botnets: The Fuel for Cybercrime, Attack Vector.(Text Book-1 : Page no : 45 – 78)

# UNIT – IV

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. (Text Book-1 : Page no : 81-119)

# UNIT – V

Tools and Methods Used in Cybercrime: Introduction, Proxy Servers and Anonymizers, Phishing, Password Cracking, Key loggers and Spywares, Virus and Worms, Trojan Horse and Backdoors, Steganography, DoS and DdoS attacks, SQL Injection, Buffer Overflow.(Text Book-1 : Page no :125-170)

#### **Course Outcomes:**

CO-1: After the completion of this course, the students should be able to

- CO-2: Outline key terms and concepts in cyber law, intellectual property and cybercrimes.
- **CO-3:** Understand basic cryptography and stenography.
- CO-4: Explore the vulnerabilities, threats and cybercrimes posed by criminals.
- **CO-5:** Identify various security challenges phased by mobile devices and identify various types of tools and methods used in cybercrime, develops the secure counter methods to maintain security protection.

#### **TEXT BOOKS:**

- 3. .Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Nina Godbole and Sunil Belapure, Wiley INDIA.
- Cryptography and Network Security Principles and Practice: William Stallings, Pearson Education, 6<sup>th</sup> Edition

# **REFERENCE BOOKS:**

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

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# VAAGDEVI COLLEGE OF ENGINEERING (AUTONOMOUS)

#### INTRODUCTION TO DATA SCIENCE (OPEN ELECTIVE – CSE (DATA SCIENCE))

#### B.Tech –CIVIL, EEE, MECH, ECE, CSE & CSE(AI&ML)

L/T/P/C 3/ 0/ 0/ 3

#### Pre-requisites: Basics of Computer science and Mathematics Course Objectives:

- > To understand the basic concepts of Data Science
- > To learn data pre processing and techniques for data analytics
- > Understand the statistical concepts for data science.

#### **UNIT-I:**

Introduction: What Is Data Science? How Does Data Science Relate to Other Fields? Data Science and Statistics, Computer Science, Engineering, and Business Analytics. Data Science, Social Science, and Computational Social Science, The Relationship between Data Science and Information Science, Information vs. Data, Skills for Data Science, Tools for Data Science, Issues of Ethics, Bias, and Privacy in Data Science.(TB1)

#### UNIT-II:

Data: Introduction, Data Types, Structured Data, Unstructured Data, Challenges with Unstructured Data, Data Collections, Open Data, Social Media Data, Multimodal Data, Data Storage and Presentation, Data Pre-processing, Data Cleaning, Data Integration, Data Transformation , Data Reduction, Data Discretization.(TB1)

#### **UNIT-III:**

Techniques: Introduction, Data Analysis and Data Analytics, Descriptive Analysis, Variables, Frequency Distribution, Measures of Centrality, Dispersion of a Distribution, Diagnostic Analytics, Correlations, Predictive Analytics, Prescriptive Analytics, Exploratory Analysis, Mechanistic Analysis, Regression.(TB1)

#### UNIT-IV:

Statistical Data Analysis: Role of statistics in data science, Kinds of statistics, Descriptive statistics, Inferential statistics, Probability theory, Random variables, Independence, Four perspectives on probability, Bayesian probability, Probability distribution .(TB2)

#### UNIT-V:

Machine Learning for Data Science: Overview of machine learning, Supervised machine learning, Regression methods, Classification methods, KNN classification, Decision tree classification, Naive Bayes classification, Unsupervised machine learning, Clustering methods, K-means, Principle Component Analysis (PCA), Association Analysis, Apriori algorithm, FP-Growth Analysis. (TB2)

Course Outcomes: After completing this course the students will be able to

CO1: Understand the basic concepts of Data Science.

CO2: Learn about types of data and data pre processing.

CO3: Understand the techniques for data analytics.

CO4: Learn the statistical fundamentals related to Data Science.

CO5: Understand the concepts of Machine Learning for Data Science.

#### **TEXT BOOK**

- 1. Chirag Shah, A Hands-On Introduction To Data Science, Cambridge University Press.
- 2. Data Science Fundamentals and Practical Approaches. Dr. Gypsy Nandi, Dr. Rupa Kumar Sharma.

#### **REFERENCE BOOKS**

1. Doing Data Science, Straight Talk from The Frontline. Cathy O'Neil and Rachel Schutt, O'Reilly, 2014.

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# VAAGDEVI COLLEGE OF ENGINEERING (AUTONOMOUS)

#### DATA HANDLING AND VISUALIZATION (OPEN ELECTIVE – CSE (DATA SCIENCE))

#### B.Tech –CIVIL, EEE, MECH, ECE, CSE & CSE(AI&ML)

L/T/P/C 3/ 0/ 0/ 3

# Pre-requisites: Fundamentals of Data Science Course Objectives:

- Understand basics of Data Visualization
- Learn about visualization of distributions.

#### UNIT-I:

Introduction to Visualization: Visualizing Data-Mapping Data onto Aesthetics, Aesthetics and Types of Data, Scales Map Data Values onto Aesthetics, Coordinate Systems and Axes- Cartesian Coordinates, Nonlinear Axes, Coordinate Systems with Curved Axes, Colour Scales-Colour as a Tool to Distinguish, Colour to Represent Data Values ,Colour as a Tool to Highlight.

#### **UNIT-II:**

Directory of Visualizations- Amounts, Distributions, Proportions, x–y relationships, Geospatial Data. Visualizing Distributions: Visualizing Amounts-Bar Plots, Grouped and Stacked Bars, Dot Plots and Heatmaps, Visualizing Distributions: Histograms and Density Plots- Visualizing a Single Distribution, Visualizing Multiple Distributions at the Same Time.

#### **UNIT-III:**

Visualizing Proportions-A Case for Pie Charts, A Case for Side-by-Side Bars, A Case for Stacked Bars and Stacked Densities, Visualizing Proportions Separately as Parts of the Total ,Visualizing Nested Proportions-Nested Proportions Gone Wrong, Mosaic Plots and Treemaps, Nested Pies ,Parallel Sets.

#### **UNIT-IV:**

Visualizing Associations Among Two or More Quantitative Variables-Scatterplots, Correlograms, Dimension Reduction, Paired Data. Visualizing Time Series and Other Functions of an Independent Variable-Individual Time Series, Multiple Time Series and Dose–Response Curves, Time Series of Two or More Response Variables

#### UNIT-V:

Visualizing Trends-Smoothing, Showing Trends with a Defined Functional Form, Detrending and Time-Series Decomposition, Visualizing Geospatial Data-Projections, Layers, Choropleth Mapping, Cartograms, Visualizing Uncertainty-Framing Probabilities as Frequencies, Visualizing the Uncertainty of Point Estimates, Visualizing the Uncertainty of Curve Fits, Hypothetical Outcome Plots.

Course Outcomes: After completing this course the students will be able to

CO1: Understand the fundamentals of Data Visualization.

CO2: Learn the concepts of Visualizing Distributions

CO3: Understand how to Visualizing Proportions and Nested Proportions

CO4: Learn the concepts of Visualizing Associations and Time series data.

CO5: Understand the different Visualizing Trends

#### **TEXT BOOK**

1. Claus Wilke, "Fundamentals of Data Visualization: A Primer on Making Informative and Compelling Figures", 1st edition, O'Reilly Media Inc, 2019.

#### **REFERENCE BOOKS**

- 1. Tony Fischetti, Brett Lantz, R: Data Analysis and Visualization, O'Reilly ,2016
- 2. Ossama Embarak, Data Analysis and Visualization Using Python: Analyze Data to Create Visualizations for BI Systems, Apress, 2018

#### INTRODUCTION TO BIG DATA (OPEN ELECTIVE – CSE (DATA SCIENCE))

#### B.Tech –CIVIL, EEE, MECH, ECE, CSE & CSE(AI&ML)

L/T/P/C 3/ 0/ 0/ 3

#### **Pre-requisites:** DBMS

#### **Course Objectives:**

- > To understand the basic concepts of Big Data
- > To learn distributed computing and big data analytics
- > Understand the fundamentals of Hadoop and Map Reduce.

#### UNIT-I:

Grasping the Fundamentals of Big Data: The Evolution of Data management, Understanding the Waves of Managing Data. Defining big data, Building a Successful Big Data Management Architecture, The Big Data Journey. Examining Big Data Types, Defining Structured Data, Defining Unstructured Data, Putting Big Data Together.(TB1)

#### **UNIT-II:**

Types of Digital Data: Classification of Digital Data: Structured data, Semi-structured data and Unstructured. Introduction to Big Data: Characteristics of Data, Evolution of Big Data, Definition of Big Data, Challenges with Big Data, What is Big Data?, Why Big Data?, Traditional Business Intelligence (BI) versus Big Data, A Typical Data Warehouse Environment, A Typical Hadoop Environment, What is New Today?, What is Changing in the Realms of Big Data? (TB2)

#### **UNIT-III:**

A Brief History of Distributed Computing, Giving thanks to DARPA, Understanding the Basics of Distributed Computing. Big Data Technology Components: Exploring the Big Data Stack, Big Data Analytics, Big Data Applications. Cloud and Big Data: Defining the Cloud in the Context of Big Data, Understanding Cloud Deployment and Delivery Models, Making Use of the Cloud for Big Data, Providers in the Big Data Cloud Market.(TB1)

#### **UNIT-IV:**

Introduction to Hadoop: Features and advantages and versions of Hadoop. Hadoop Ecosystems and distributions. Hadoop versus SQL. Introducing Hadoop, RDBMS versus Hadoop, Distributed Computing Challenges, History of Hadoop, Hadoop Overview, HDFS (Hadoop Distributed File System), Processing Data with Hadoop, Managing Resources and Applications with Hadoop YARN (Yet Another Resource Negotiator), Interacting with Hadoop Ecosystem: PIG, HIVE & HBase. (TB2)

#### UNIT-V:

MapReduce Fundamentals: Tracing the Origins of MapReduce, Understanding the map Function, Adding the reduce Function, Putting map and reduce Together, Optimizing MapReduce Tasks. Integrating Big Data with the Traditional Data Warehouse, Big Data Analysis and the Data Warehouse, Changing the Role of the Data Warehouse.(TB1)

#### Course Outcomes: After completing this course the students will be able to

CO1: Understand the importance of Big Data.

- CO2: Learn about the types of data and Big Data Analytics.
- CO3: Understand the Big Data technology components and applications.
- CO4: Learn the basics of Hadoop Eco system.
- CO5: Understand the map reduce fundamentals.

#### **TEXT BOOK**

- 1. Big Data for Dummies, Judith Hurwitz, Alan Nugent, Dr. Fern Halper, and Marcia Kaufman, Wiley
- 2. Big Data and Analytics, Seema Acharya, Subhasinin Chellappan, Wiley publications.

#### **REFERENCE BOOKS**

1. Big Data, Black BookTM, DreamTech Press, 2015 Edition.

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#### **INTRODUCTION TO COMPUTER FORENSICS** (OPEN ELECTIVE – CSE (DATA SCIENCE))

#### B.Tech –CIVIL, EEE, MECH, ECE, CSE & CSE(AI&ML)

L/T/P/C 3/ 0/ 0/ 3

**Pre-requisites:** Fundamentals of Computers **Course Objectives:** 

- > Understand the fundamentals of computer forensics.
- > Learn about the different computer forensics systems and data collection methods.
- Understand Computer Forensics Analysis.

#### **UNIT-I:**

Computer Forensics Fundamentals: Introduction to Computer Forensics, Use of Computer Forensics in Law Enforcement, Computer Forensics Assistance to Human Resources/ Employment Proceedings, Computer Forensics Services, Benefits of Professional Forensics Methodology, Steps Taken by Computer Forensics Specialists. Types of Computer Forensics Technology: Types of Military Computer Forensic Technology and Business Computer Forensic Technology. Specialized Forensics Technology, Encryption Methods and vulnerabilities, Protecting Data from Being Compromised.

#### **UNIT-II:**

Types of Computer Forensics Systems: Internet Security Systems, Intrusion Detection Systems, Firewall Security Systems, Storage Area Network Security Systems, Network Disaster Recovery Systems, Public Key Infrastructure Systems, Wireless Network Security Systems, Instant Messaging (IM) Security Systems, Net Privacy Systems, Identity management Security Systems, Identity Theft, Biometric Security Systems, Homeland Security Systems.

#### **UNIT-III:**

Computer Forensics Evidence and Capture: Data Recovery Defined, Data Back-up and Recovery, The Role of Back-up in Data Recovery, The Data-Recovery Solution. Evidence Collection and Data Seizure: Why Collect Evidence? Collection Options, Obstacles, Types of Evidence, The Rules of Evidence ,Volatile Evidence, General Procedure, Collection and Archiving, Methods of Collection, Artifacts, Collection Steps.

#### **UNIT-IV:**

Duplication and Preservation of Digital Evidence: Preserving the Digital Crime Scene, Computer Evidence Processing Steps, Legal Aspects of Collecting and Preserving, Computer Forensic Evidence. Computer Image Verification and Authentication: Special Needs of Evidential Authentication, Practical Consideration, Practical Implementation.

#### UNIT-V:

Computer Forensics Analysis: Discovery of Electronic Evidence, Electronic Document Discovery: A Powerful New Litigation Tool, Identification of Data: Timekeeping, Forensic Identification and Analysis of Technical Surveillance Devices. Reconstructing Past Events: How to Become a Digital Detective, Useable File Formats, Unusable File Formats, Converting Files.

Course Outcomes: After completing this course the students will be able to

CO1: Understand the definition of computer forensics fundamentals.

CO2. Describe the types of computer forensics technology. Analyze various computer forensics systems.

CO3. Illustrate the methods for data recovery, evidence collection and data seizure.

**CO4**. Summarize duplication and preservation of digital evidence. Evaluate the effectiveness of available digital forensics tools.

**CO5**. Employ fundamental computer theory in the context of computer forensics practices **Text Books:** 

1. Computer Forensics, Computer Crime Investigation by John R. Vacca, Firewall Media, New Delhi.

#### **Reference Books:**

- 1. Real Digital Forensics by Keith J. Jones, Richard Bejtiich, Curtis W. Rose, Addison- Wesley Pearson Education
- 2. Computer Forensics and Investigations by Nelson, Phillips Enfinger, Steuart, CENGAGE Learning.
- 3. Forensic Compiling, A Tractitioneris Guide by Tony Sammes and Brian Jenkinson, Springer International edition.

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# MANAGEMENT SCIENCE (OPEN ELECTIVE – MBA)

#### B.Tech – CIVIL, EEE, MECH, ECE, CSE, CSE(AI&ML) & CSE(Data Science)

L/T/P/C 3/ 0/ 0/ 3

# Pre-requisites: None

# **Course Objectives:**

This course is intended to familiarize the students with the framework for the managers and leaders available for understanding and making decisions relating to issues related organizational structure, production operations, marketing, human resource management, product management and strategy.

#### UNIT - I:

**Introduction to Management and Organization:** Concepts of Management and organizationnature, importance and Functions of Management, Systems Approach to Management - Taylor's Scientific Management Theory- Fayal's Principles of Management- Maslow's theory of Hierarchy of Human Needs- Douglas McGregor's Theory X and Theory Y - Hertzberg Two Factor Theory of Motivation - Leadership Styles, Social responsibilities of Management, Designing Organizational Structures: Basic concepts related to Organization - Departmentation and Decentralization, Types and Evaluation of mechanistic and organic structures of organization and suitability.

#### UNIT - II:

**Operations and Marketing Management:** Principles and Types of Plant Layout-Methods of Production(Job, batch and Mass Production), Work Study - Basic procedure involved in Method Study and Work Measurement - Business Process Reengineering(BPR) - Statistical Quality Control: control charts for Variables and Attributes (simple Problems) and Acceptance Sampling, TQM, Six Sigma, Deming's contribution to quality, Objectives of Inventory control, EOQ, ABC Analysis, Purchase Procedure, Stores Management and Store Records - JIT System, Supply Chain Management, Functions of Marketing, Marketing Mix, and Marketing Strategies based on Product Life Cycle, Channels of distribution.

#### UNIT - III:

**Human Resources Management (HRM):** Concepts of HRM, HRD and Personnel Management and Industrial Relations (PMIR), HRM vs PMIR, Basic functions of HR Manager: Manpower planning, Recruitment, Selection, Training and Development, Placement, Wage and Salary Administration, Promotion, Transfer, Separation, Performance Appraisal, Grievance Handling and Welfare Administration, Job Evaluation and Merit Rating - Capability Maturity Model (CMM) Levels - Performance Management System.

#### UNIT - IV:

**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).

#### UNIT - V:

**Strategic Management and Contemporary Strategic Issues:** Mission, Goals, Objectives, Policy, Strategy, Programmes, Elements of Corporate Planning Process, Environmental Scanning, Value Chain Analysis, SWOT Analysis, Steps in Strategy Formulation and Implementation, Generic Strategy alternatives. Bench Marking and Balanced Score Card as Contemporary Business Strategies.

#### **TEXT BOOKS:**

- 1. Stoner, Freeman, Gilbert, Management, 6th Ed, Pearson Education, New Delhi, 2004.
- 2. P. Vijay Kumar, N. Appa Rao and Ashnab, Chnalill, Cengage Learning India, 2012.

#### **REFERENCE BOOKS:**

- 1. Kotler Philip and Keller Kevin Lane: Marketing Management, Pearson, 2012.
- 2. Koontz and Weihrich: Essentials of Management, McGraw Hill, 2012.
- 3. Thomas N. Duening and John M. Ivancevich Management Principles and Guidelines, Biztantra, 2012.
- 4. Kanishka Bedi, Production and Operations Management, Oxford Uiversity Press, 2012.
- 5. Samuel C. Certo: Modern Management, 2012.
- 6. Schermerhorn, Capling, Poole and Wiesner: Management, Wiley, 2012.
- 7. Parnell: Strategic Management, Cengage, 2012.
- 8. Lawrence R Jauch, R. Gupta and William F. Clueck: Business Policy and Stragtegic Management Science, McGraw Hill, 2012.

#### **Course Outcomes:**

**CO1** Outline the fundamentals of management and contributions to management.

- **CO2** Define the social Responsibilities of an organization towards stakeholders and build the suitable organization structure and to identify factors influencing plant location and layout decisions.
- **CO3** Know importance of materials management, evaluate quality of products using SQC techniques and Identify the basic concepts of marketing mix and Human Resource concepts.
- **CO4** Know how PERT and CPM different and to construct network by proper planning organizing an managing the efforts to accomplish a successful project.
- **CO5** Appraise all contemporary management practices and analyze how these contemporary management practices one applicable in modern business and service organizations.

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#### B. Tech- MECHANICAL ENGG VAAGDEVI COLLEGE OF ENGINEERING (AUTONOMOUS)

# ENTREPRENEURSHIP DEVELOPMENT (OPEN ELECTIVE – MBA)

#### B.Tech – CIVIL, EEE, MECH, ECE, CSE, CSE(AI&ML) & CSE(Data Science)

L/T/P/C 3/ 0/ 0/ 3

#### Pre-requisites: None

**Course Objective:** The objective of the course is to make students understand the nature of entrepreneurship, and to motivate the student to start his/her own enterprise. The objective of the course is to enlighten with the fragrance of Corporate Good Governance and Business Ethics, so that they would become the best entrepreneurs / managers of the corporate world.

#### Unit – I

Nature of Entrepreneurship; Characteristics – Qualities and skills of an Entrepreneur – Functions of entrepreneur – Entrepreneur scenario in India and Abroad. Forms of Entrepreneurship: Small Business – Importance in Indian Economy – Types of ownership – Sole trading – Partnership – Joint stock company and other forms. First – Mover disadvantages, Risk Reduction strategies, Market scope strategy, Imitation strategies and Managing Newness

#### Unit – II

Aspects of Promotion: Generation of new entry opportunity, SWOT Analysis, Technological Competitiveness, legal regulatory systems, patents and trademarks, Intellectual Property Rights-Project Planning and Feasibility Studies- Major steps in product development. Financial Aspects: Sources of raising Capital, Debt-Equity, Financing by Commercial Banks, Government Grants and Subsidies, Entrepreneurship Promotion Schemes of Department of Industries (DIC), KVIC, SIDBI, NABARD, NSIC, APSFC, IFCI and IDBI. New Financial Instruments.

#### Unit - III

**Introduction to Business Ethics:** Necessity for Business Ethics-Need for Ethical guideline –Salient Issues in Ethics and Commerce- Ethics as a Luxury – Earlier attempts at Ethics in Industry – Justification for Ethics – Effect of Migration of National Character – Shadow Economy – Basic Principles in Ethics – Corporate Climate and corporate climate audits – Political Issues – Nature and theory of Ethics – The Naturalistic fallacy - G.E.Moore's Philosophy.

#### Unit – IV

**Understanding Corporate Governance:** Corporate Governance- Capitalism at crossroads – Historical perspective of Corporate Governance – Issues of Corporate Governance – Theoretical basis of Corporate Governance – Corporate Governance mechanisms – Indian Model of Governance – Good Corporate Governance – Corporate Governance committees – OECD Principles – Indian Committee and guidelines – The confederation of Indian Industry's initiative. Corporate Governance Models, Corporate Social Responsibility.

#### Unit – V

**Corporate Social Responsibility:** System Concept of Business Society – SocialResponsibility – Social Responsibility tools – approaches to Ethics – Corporate Social Accountability - Business in a Social World – Ethics and Social Responsibility – professional ethics – Ethics of practicing company secretaries- Ethical investing.

#### **Text Books:**

- 1. Robert D Hisrich, Michael P Peters, Dean A Shepherd: Entrepreneurship, TMH, 2009
- 2. Vasanth Desai: Entrepreneurship, HPH, 2009
- 3. C.S.V.Murthy: Business Ethics & Corporate Governance, Himalaya, 2009.

# Department of MECHANICAL ENGG

## **References:**

- 1. Bholanath Dutta: Entrepreneurship Text and Cases, Excel, 2009
- 2. David Martin: Corporate Governance, Viva, 2009
- 3. H. Nandan: Fundamentals of Entrepreneurship, PHI, 2009.
- 4. Barringer: Entrepreneurship, Pearson, 2009.
- 5. Ronald D Francis & Mukti Mishra: Business Ethics, TMH, 2009
- 6. RK Mishra, Gitarani: Corporate Governance, Excel, 2009
- 7. A.C.Frenando: Corporate Governance, Pearson, 2006
- 8. V.Balachandran &V.Chandrasekaran: Corporate Governance & Social Responsibility, PHI, 2009
- 9. A.C.Fernando: Business Ethics, Pearson, 2009
- 10. Laura P Hartman & Abha Chatterjee: Business Ethics, TMH, 2009
- 11. Tripat Kaur: Values and Ethics in Management, 2/e, Paragon International,2009.

#### **Course Outcomes:**

CO1 Explain characteristics, Qualities, Skills and Functions of Entrepreneur.

- CO2 Demonstrates Entrepreneur Scenario in India and abroad.
- CO3 Summarizes necessity for business ethics and ethical guidelines in business.
- CO4 Interprets about Government Grants and subsides and Entrepreneurship promotion schemes.
- CO5 Prioritizes corporate social responsibility and professional ethics by company secretaries.

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#### B. Tech- MECHANICAL ENGG VAAGDEVI COLLEGE OF ENGINEERING (AUTONOMOUS)

# INTELLECTUAL PROPERTY RIGHTS (OPEN ELECTIVE – MBA)

# B.Tech – CIVIL, EEE, MECH, ECE, CSE, CSE(AI&ML) & CSE(Data Science)

L/T/P/C 3/ 0/ 0/ 3

# Pre-requisites: None

# **Course Objectives:**

In the interest of the national economic growth the innovations and improvements are to be owed and used for the production and distribution process. The Students of technology willnbe benefited by knowing the process of obtaining recognition of their innovations. This course will enable them to know the legal process of registering the innovation.

# UNIT – I

**INTRODUCTION TO INTELLECTUAL PROPERTY:** Introduction, types of intellectual property, International organizations, agencies and treaties, importance of intellectual property rights.

# UNIT – II

**TRADE MARKS**: Purpose and function of trademarks, acquisition of trade mark rights, protectable matter, selecting and evaluating trade mark, trade marks registration processes.

# UNIT – III

**LAW OF COPY RIGHTS**: Fundamental of copy right law, originally of material, rights of reproduction, rights of perform the work publicity, copy right ownership issues, copy right registration, notice of copy right, international copy right law.

LAW OF PATENTS: Foundation of patent law, patent searching process ownership rights and transfer.

# UNIT- IV

**TRADE SECRETS:** Trade secrete law, determination of trade secrete status, liability for misappropriations oftrade secrets, protection for submission trade secrete litigation.

# UNIT-V

**NEW DEVELOPMENT OF INTELLECTUAL PROPERTY**: New developments in trade mark law: Copyright law, patent law, intellectual property audits.

# **TEXT BOOOKS & REFERENCES:**

- 1. Intellectual property rights, Deborah, E. Bouchux, cengage learing
- 2. Intellectual property right Unleashing the knowledge economy, prabuddhaganguli, Tate Mc Graw Hill Publishing company ltd.

# **Course Outcomes:**

CO1 Outline the increasing importance of Intellectual Property Rights

- **CO2** Utilize post registration procedures and trade mark registration process
- **CO3** Explain the copyright principles and rights
- CO4 Prioritize the law of patents and patent ownership
- **CO5** Develop the trade secret and maintenance