PAAVAI ENGINEERING COLLEGE, NAMAKKAL – 637 018
(AUTONOMOUS)
B.E. MECHATRONICS ENGINEERING
CURRICULUM
REGULATIONS 2015

SEMESTER III

Course Code	Course Title	L	T	P	C
MA15301	Transforms and Boundary Value Problems	3	2	0	4
MT15301	Manufacturing Technology	3	0	0	3
MT15304	Fluid Mechanics and Machinery	3	0	0	3
MT15302	Digital Electronics	3	2	0	4
EE15305	Electrical Machines and Drives	3	0	0	3
MT15303	Kinematics of Machinery	3	2	0	4
MT15306	Fluid Mechanics and Machinery Laboratory	0	0	2	1
EE15306	Electrical Engineering Laboratory	0	0	4	2
MT15305	Computer Aided Machine Drawing	0	0	2	1
EN15301	Business English Course Laboratory	0	0	2	1

SEMESTER IV

Course Code	Course Title	L	T	P	C
MA15404	Numerical Methods	3	2	0	4
MT15401	Dynamics of Machinery	3	2	0	4
MT15402	Control System Engineering	3	0	0	3
MT15403	Mechanics of Solids	3	2	0	4
MT15404	Metrology and Computer Aided Inspection	3	0	0	3
EE15412	Microprocessors and Applications	3	0	0	3
EE15413	Microprocessors Laboratory	0	0	2	1
MT15405	Manufacturing Technology Laboratory	0	0	2	1
MT15406	Machine Dynamics Laboratory	0	0	2	1
MT15407	Technical Seminar	0	0	2	1

SEMESTER III

MA15301 TRANSFORMS AND BOUNDARY VALUE PROBLEMS 3 2 0 4

COURSE OBJECTIVES

- To introduce Fourier series analysis which are common for many engineering applications apart from solving boundary value problems.
- To acquaint the student with Fourier transform techniques used in wide variety of situations.
- To introduce the effective mathematical tools for the solutions of partial differential equations that model several physical processes
- To develop Z transform techniques for discrete time systems.

UNIT I FOURIER SERIES 15

Dirichlet's conditions – General Fourier series – Odd and even functions – Half range sine series – Half range cosine series – Gibb's Phenomenon – Complex form of Fourier Series – Parseval's identity – Harmonic Analysis.

UNIT II FOURIER TRANSFORMS 15

Fourier integral theorem (without proof) – Fourier transform pair – Sine and Cosine transforms – Properties – Transforms of simple functions – Convolution theorem – Parseval's identity.

UNIT III PARTIAL DIFFERENTIAL EQUATIONS 15

Formation of partial differential equations – Lagrange's linear equation – Solutions of standard types of first order partial differential equations - Linear partial differential equations of second and higher order with constant coefficients.

UNIT IV APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS 15

Solutions of one dimensional wave equation – One dimensional equation of heat conduction – Steady state solution of two-dimensional equation of heat conduction.

UNIT V Z - TRANSFORMS AND DIFFERENCE EQUATIONS 15

Z-transforms – Elementary properties – Inverse Z-transform – Convolution theorem – Formation of difference equations – Solution of difference equations using Z-transform.

TOTAL: 75 PERIODS

COURSE OUTCOMES

At the end of the course, the students would

- have gained a well-founded knowledge of fourier series, their different possible forms and the frequently needed practical harmonic analysis that an engineer may have to make from discrete data.

- have grasped the concept of expression of a function, under certain conditions, as a double integral leading to identification of transform pair and specialization on fourier transform pair, and their properties.
- have obtained capacity to formulate and identify certain boundary value problems encountered in engineering practices, decide on applicability of the fourier series method of solution, to solve them and to interpret the results.
- be capable of mathematically formulating certain practical problems in terms of partial differential equations, solve them and physically interpret the results.
- have learnt the basics of z – transform in its applicability to discretely varying functions, gained the skill to formulate certain problems in terms of difference equations and solve them using the Z – transform technique bringing out the elegance of the procedure involved.

TEXT BOOKS

1. Veerarajan T., "Transforms and Partial Differential Equations", Tata McGraw Hill Education Pvt. Ltd., New Delhi, Second reprint, 2012.
2. Narayanan S., ManickavasagamPillai.T.K and Ramanaiah.G "Advanced Mathematics for Engineering Students", Vol. II & III, S.Viswanathan Publishers Pvt Ltd. 1998.

REFERENCES

1. Larry C. Andrews, Bhimsen K. Shivamoggi, "Integral Transforms for Engineers", SPIE Optical Engineering press, Washington USA (1999).
2. Ramana.B.V., "Higher Engineering Mathematics", Tata Mc-GrawHill Publishing Company limited, New Delhi (2010).
3. Glyn James, "Advanced Modern Engineering Mathematics", 3rd Edition, Pearson Education (2007).
4. Erwin Kreyszig., "Advanced Engineering Mathematics" 10th edition, Wiley Publications.
5. Ray Wylie C and Barrett.L.C, "Advanced Engineering Mathematics", Tata McGraw Hill Education Pvt Ltd, Sixth Edition, New Delhi, 2012.
6. Datta K.B., "Mathematical Methods of Science and Engineering", Cengage Learning India Pvt Ltd, Delhi, 2013.

WEB LINKS

1. https://www.youtube.com/watch?v=coe-UA5ONI0
2. https://www.youtube.com/watch?v=gZNm7L96pfY
3. https://www.youtube.com/watch?v=4GHY8sRKPaU
4. http://172.16.100.200/NPTEL/displayweb.html?type1=111103021%2F35.pdf
5. http://172.16.100.200/NPTEL/displayweb.html?type1=111104031%2Flectures.pdf%23page%3D101.

MT15301 MANUFACTURING TECHNOLOGY 3 0 0 3

COURSE OBJECTIVES

- To understand the basics and working principle of various manufacturing processes
- To impart knowledge on both conventional and non-conventional machining processes
- To make familiar with modern manufacturing operations, including their capabilities, limitations, and how to design for lowest cost.
- To learn how to analyse products and be able to improve their manufacturability and Lower costs.
- To study the relationship between customer desires, functional requirements, Product materials, product design, and manufacturing process selection

UNIT I FOUNDRY TECHNOLOGY 9

Pattern and Core making: Pattern types, allowances, types of cores, core print - Moulding sand: types, properties, green sand moulding - Melting furnaces: Induction furnaces, CO2 process, Centrifugal Castings, Shell Casing, Investment Casting, Die casting, Defects in casting. Hot working and cold working

UNIT II FORMING – PROCESSES 9

Hot and Cold Working. Rolling: Introduction – Rolling Mills – Rolling Operations – Production of Seamless Tubing and Pipe. Forging: Introduction – Related Forging Operations – Drop forging. Extrusion and Drawing: Extrusion Practice – Hot, Cold, Impact and Hydrostatic extrusion. Sheet metal operations – Blanking, Punching and Piercing.

UNIT III MATERIAL – REMOVAL PROCESSES 9

Lathes and Lathe Operations, Drilling and Drilling Machines, Reaming and Reamers, Tapping and Tapes-Tool nomenclature, cutting speed, feed, machining Time calculations.

UNIT IV SPECIAL MACHINES 9

Milling Machines and Operations, Planning and Shaping, Broaching, Gear Hobbing and Shaping. Grinding Process – Abrasives – Finishing operations –lapping, Honing Powder coating.

UNIT V PRINCIPLES AND APPLICATIONS OF JOINING PROCESSES 9

Gas welding, Basic Arc Welding Processes, Thermit Welding, Electron – Beam Welding, Laser– Beam Welding, Ultrasonic Welding, Friction Welding, Electro slag, Resistance welding, Principles and application of Brazing and Soldering.

TOTAL: 45 PERIODS

COURSE OUTCOMES

On Completion of this course, the student will be able to

- understand the basics and working principle of various manufacturing processes
- understand both conventional and non-conventional machining processes
- gain awareness on automation used in manufacturing sectors
- learn the application of Joining Processes
- able to apply Milling Machines and Operations

TEXT BOOKS

1. Kalpakjian, S., "Manufacturing Engineering and Technology", Pearson education India,4th edition, 2001(ISBN 81 78081 571)
2. P. N. Rao, Manufacturing Technology - Vol I and II, Tata McGraw-Hill Publishing Company Limited, New Delhi, 2009.

REFERENCES

1. Hajra Choudhury, S.K., and Haqjra Choudhury, A.K., "Elements of Workshop Technology", Volume I and II, Media Promoters and Publishers Private Limited, Mumbai, 1997.
2. Paul Degarma E, Black J.T. and Ronald A. Kosher, eighth edition, Materials and Processes in Manufacturing Prentice – Hall of India, 1997.
3. Sharma P.C. A Textbook of Production Technology, S. Chand and Co., Ltd., 1999.
4. Kalpakjian, S., "Manufacturing Engineering and Technology", Pearson education India, 4th edition, 2001.

WEB LINKS

1. https://books.google.com/books?id=sT6jwN1LKTQC&printsec=frontcover&dq=Manufacturing+Technology&hl=en&sa=X&ei=NWUaVZfkNMyyogSG9YCACA&ved=0CDgQ6AEwAw#v=onepage&q=Manufacturing%20Technology&f=false
2. https://www.google.com/search?tbm=bks&hl=en&q=Manufacturing+Technology

MT15304 FLUID MECHANICS AND MACHINERY 3 0 0 3

COURSE OBJECTIVES

- To introduce the basic concepts of fluid mechanics for thorough understanding of the properties of fluids.
- To introduce the dynamics of fluids through the control volume approach.
- To understand the concepts of dimensionless parameters and its applications.
- To study the working principles of pumps and turbines, also their applications.
- To describe and learn the working of reciprocating and rotodynamic hydraulic machines

UNIT I INTRODUCTION 9

Units & Dimensions. Properties of fluids – Specific gravity, specific weight, viscosity, compressibility, vapour pressure and gas laws – capillarity and surface tension. Flow characteristics: concepts of system and control volume. Application of control volume to continuity equiation, energy equation, momentum equation and moment of momentum equation.

UNIT II FLOW THROUGH CIRCULAR CONDUITS 9

Laminar flow though circular conduits and circular annuli. Boundary layer concepts. Boundary layer thickness. Hydraulic and energy gradient. Darcy – Weisbachequaition. Friction factor and Moody diagram. Commercial pipes. Minor losses. Flow though pipes in series and in parallel.

UNIT III DIMENSIONAL ANALYSIS 9

Dimension and units: Buckingham's Π theorem. Discussion on dimensionless parameters. Models and similitude. Applications of dimensionless parameters.

UNIT IV ROTO DYNAMIC MACHINES 9

Homologus units. Specific speed. Elementary cascade theory. Theory of turbo machines. Euler's equation. Hydraulic efficiency. Velocity components at the entry and exit of the rotor. Velocity triangle for single stage radial flow and axial flow machines. Centrifugal pumps, turbines, performance curves for pumps and turbines.

UNIT V POSITIVE DISPLACEMENT MACHINES 9

Recriprocating pumps, Indicator diagrams, Work saved by air vessels. Rotary pumps. Classification. Working and performance curves.

TOTAL: 45 PERIODS

COURSE OUTCOMES

At the end of this course the student will be able to

- understand the fundamentals of fluid mechanics, including the basics of hydraulics, types of fluids-water, oils and its uses along with fluid properties.

- analyze fluid flow phenomena with the application of momentum and energy equation.
- perform dimensional analysis and to learn the several non-dimensional numbers with real time applications.
- acquire knowledge about the working principle of turbo machinery.
- learn the different types of pumps, fluid machineries and its working principles.

TEXT BOOKS

1. Streeter. V. L., and Wylie, E.B., Fluid Mechanics, McGraw Hill, 1983.
2. Rathakrishnan. E, Fluid Mechanics, Prentice Hall of India (II Ed.), 2007.

REFERENCES

1. Ramamritham. S, Fluid Mechanics, Hydraulics and Fluid Machines, DhanpatRai& Sons, Delhi, 1988.
2. Kumar. K.L., Engineering Fluid Mechanics (VII Ed.) Eurasia Publishing House (P) Ltd., New Delhi, 1995.
3. Bansal, R.K., Fluid Mechanics and Hydraulics Machines, Laxmi Publications (P) Ltd., New Delhi.
4. Grabel.W.P, Engineering Fluid Mechanics, Taylor Francis, Indian Reprint, 2011.
5. Modi P.N and Seth S.M, Hydraulics and Fluid Mechanics, Standard Book House, New Delhi 2004.

WEB LINKS

1. www.mechanical.in/fluid-mechanics-and-machinery
2. http://nptel.ac.in/courses/105101082/1

MT15303 KINEMATICS OF MACHINERY 3 2 0 4

COURSE OBJECTIVES

- To impart students with the knowledge about the basics of Mechanisms and understand the geometry of motion at any point in a link of a mechanism
- To facilitate students to understand the types of cam and follower, motion and profile drawing of cam
- To give awareness to students on the phenomenon of direction of rotation, speed and torque determination for simple, compound and planetary gear systems
- To understand the effects of friction in motion transmission and in machine components
- To analyse the motion resulting from a specified set of linkages in a mechanism.

UNIT I BASICS OF MECHANISMS 15

Terminology and Definitions – Degree of Freedom Mobility – Kutzbach criterion – Grashoff's law – Kinematic Inversions of 4 – bar chain and slider crank chains – Mechanical Advantage – Transmission angle – Description of common Mechanisms – Single, double and offset slider mechanisms – Quick return mechanisms Ratchets and escapements – Indexing Mechanisms – Rocking Mechanisms – Straight line generators – Design of Crank – rocker Mechanisms.

UNIT II KINEMATICS 15

Displacement, velocity and acceleration and analysis in simple mechanisms – Graphical Method velocity and acceleration polygons – Vector Approach, Computer applications in the kinematic analysis of simple mechanisms – Coincident points – Coriolis Acceleration.

UNIT III KINEMATICS OF CAM 15

Classifications – Displacement diagrams – parabolic Simple harmonic and Cycloidal motions – Layout of plate cam profiles – Derivatives of Follower motion – High speed cams – circular arc and tangent cams– Pressure angle and undercutting.

UNIT IV GEARS 15

Spur gear Terminology and definitions – Fundamental Law of toothed gearing and involute gearing – Inter changeable gears – gear tooth action - Contact ratio – Terminology – Interference and undercutting – Nonstandard gear teeth – Helical, Bevel, Worm, Rack and Pinion gears (Basics only) – Gear trains – Parallel axis gear trains – Epicyclic gear trains – Differentials

UNIT V FRICTION 15

Surface contacts – Sliding and Rolling friction – Friction drives – Friction in screw threads – Friction clutches – Belt and rope drives, Friction aspects in Brakes – Friction in vehicle propulsion and braking

TOTAL: 75 PERIODS

COURSE OUTCOMES

On Completion of this course, the student will be able to

- gain knowledge of basics of mechanisms and the geometry of motion at any point in a link of a mechanism
- construct the profile of cam for any given combination and condition
- understand the determination of speed and torque for simple, compound and planetary gear systems
- identify the effects of friction in motion transmission and in machine components
- learn about the Sliding and Rolling friction

TEXT BOOKS

1. Rattan S.S, "Theory of Machines", Tata McGraw – Hill Publishing Company Ltd., New Delhi,1998.
2. Shigley J.E and Uicker J.J, "Theory of Machines and Mechanisms", McGraw – Hill, Inc.1995.

REFERENCES

1. Thomas Bevan, "Theory of Machines", CBS Publishers and Distributors, 1984.
2. Ghosh A and A.K.Mallick, "Theory of Mechanisms and Machines", Affiliated East – West Pvt. Ltd., New Delhi, 1998.
3. Rao J.S and Dukkipati R.V, "Mechanism and Machine Theory", Wiley – Eastern Ltd., New Delhi, 1992.
4. John Hannah and Stephens R.C, "Mechanics of Machines", Viva Low – Prices Student Edition, 1999.
5. Khurmi, R.S., "Theory of Machines",14th Edition, S Chand Publications, 2005

WEB LINKS

1. www.asic-world.com/digital/tutorial.html
2. https://www.britannica.com/science/friction

EE15305 ELECTRICAL MACHINES AND DRIVES 3 0 0 3

(Common to Mechanical and Mechatronics)

COURSE OBJECTIVES

- To impart students with fundamentals of energy conversion, construction and principle of operation.
- To facilitate students to understand the characterization of electrical machines and various drives.
- To give awareness to concept of starting methods and speed control of electrical machines.
- To analyse the operation of solid state speed control of D.C. drives
- To understand the solid state speed control of A.C. drives

UNIT I DC MACHINES 9

DC Generator-Construction and Principle of operation, EMF Equation, types, OCC and External characteristics cures. DC Motors-Principle of operation, types, Characteristics – Starters - Braking methods.

UNIT II AC MACHINES 9

AC Generator-Construction and working principle - Three Phase Induction motors, Construction, types, principle of operation, characteristics and starting methods, Single phase induction motor- Construction and working principle of operation.

UNIT III FUNDAMENTALS OF ELECTRIC DRIVES 9

Basic Elements – Types of Electric Drives – factors influencing the choice of electrical drives – heating and cooling curves – loading conditions and classes of duty – Selection of power rating for drive motors - Load variation factors.

UNIT IV CONVENTIONAL AND SOLID STATE CONTROL OF DC DRIVES 9

Speed control of DC series and shunt motors – Armature and field control, Ward- Leonard control system – Solid state control using controlled rectifiers (Single phase Half & Full wave) and DC choppers – applications.

UNIT V CONVENTIONAL AND SOLID STATE CONTROL OF AC DRIVES 9

Speed control of three phase induction motor – Voltage control, voltage / frequency control, slip power recovery scheme – Inverters and AC voltage regulators – applications.

TOTAL: 45 PERIODS

COURSE OUTCOMES

On Completion of this course, the student will be able to

- select and utilize various dc machines.

- employ effective control techniques to electrical motors.
- understand the concept applied in Electric drives.
- able to apply solid state speed control of D.C. drives.
- select appropriate electrical drive for engineering applications.

TEXT BOOKS

1. Nagrath .I.J. & Kothari .D.P, "Electrical Machines", Tata McGraw-Hill, 2004.
2. VedamSubrahmaniam, "Electric Drives (concepts and applications)", Tata McGraw- Hill, 2001.
3. Pillai S.K., "A First course on Electrical Drives", New Age International Publishers, 2011.

REFERENCES

1. Theraja B.L and Theraja A.K., "A Text book of Electrical Technology", Volume – II, S,Chand& Co., 2007.
2. M.D.Singh, K.B.Khanchandani, "Power Electronics", Tata McGraw-Hill, 1998
3. R.Krishnan, "Electric Motor Drives – Modeling, Analysis and Control", Prentice-Hall of India Pvt. Ltd., 2003.
4. Bimal K Bose, "Modern Power Electronics and AC Drives", Prentice-Hall of India Pvt. Ltd., 2003.
5. Muhammad H. Rashid, "Power Electronics: Circuits, Devices and Applications", Pearson Education, 2004.

WEB LINKS

1. https://en.wikipedia.org/wiki/DC_motor
2. https://en.wikipedia.org/wiki/AC_motor
3. http://www.electrical4u.com/control-of-electrical-drives/
4. http://www.kbelectronics.com/Variable_Speed_DC_Drives.html

MT15302 DIGITAL ELECTRONICS 3 2 0 4

COURSE OBJECTIVES

- To understand the fundamentals of digital logic & minimization technique
- To impart students with various number systems and codes
- To introduce the methods for simplifying Boolean expressions
- To outline the formal procedures for the analysis and design of combinational circuits and sequential circuits
- To introduce the concept of memories and programmable logic devices.

UNIT I NUMBER SYSTEM, BOOLEAN LOGIC AND MINIMIZATION TECHNIQUES 15

Introduction to Number systems- Binary, Octal, Hexadecimal, BCD, Grey code, Excess 3 code - Binary arithmetic, 1's complements, 2's complements, and Code conversions. Boolean theorems, Boolean algebra – AND, OR, NOT, NAND & NOR operation, Sum of Product and Product of Sum forms. Minimization – K- Map, Don't care conditions - Five Variable K maps, Tabular Minimization Procedures.

UNIT II COMBINATIONAL CIRCUITS 15

Half and Full Adders - Half and Full Subtractors - Code Converters Encoder – Decoder - Multiplexer- Demultiplexer -Binary/ BCD adders, Subtractors - Carry look ahead adder – parity checker – parity generators- Magnitude Comparator.

UNIT III SEQUENTIAL CIRCUITS 15

General model of sequential circuits – Latch, Flip Flops– SR, D, JK and T, Level triggering, Edge triggering, Master slave configuration. Realization of one flip flop using other flip flop. Binary counters, Modulo–n counter- Decade - BCD counters. Ring counter, Johnson counter**.**

UNIT IV DESIGN OF SEQUENTIAL CIRCUITS 15

Classification of sequential circuits – Moore and Mealy - Design of Asynchronous counters- state diagram- State table –State minimization –State assignment- Register – shift registers - Universal shift register – Ring counters. Hazards: Static – Dynamic.

UNIT V MEMEORY, PROGRAMMABLE LOGIC DEVICES AND VHD 15

Memories - ROM, PROM, EPROM, Programmable Array Logic (PAL), Programmable Array Logic (PAL) - Implementation of combinational logic using PROM and PLA, PAL. Introduction

to VHDL -Behavioural, Data Flow and Structural Model - Operators – Data objects - Data types, Attributes - Test Benches –Simple **TOTAL: 75 PERIODS**

COURSE OUTCOMES

On Completion of this course, the student will be able to

- solve the fundamentals of digital logic with various number systems and codes by designing various combinational and sequential circuits
- design complex arithmetic and logic circuit and to evaluate its function realization using gates.
- acquire knowledge on the basics about synchronous and asynchronous circuits
- design the complex logic memories, programmable logic devices and test its functionality and timing
- understand the VHD programming language

TEXT BOOKS

1. Morris Mano M., "Digital Circuits and Logic Design", Prentice Hall of India, II Edition, 1996.
2. Ronald J. Tocci Neal S. Widmer and Gregory L. Moss, Digital Systems: Principles and Applications,
3. Prentice Hall of India, New Delhi, 2010.
4. ZainalabedinNavabhi, VHDL Analysis and Modeling of Digital Systems, McGraw-Hill, 1998.

REFERENCES

1. W.H. Gothmann, "Digital Electronics – Introduction Theory and Practice", PHI, 1992.
2. S. Salivahanan and S. Arivazhagan, "Digital Circuits and Design", 2nd Edition, Vikas Publishing House Pvt. Ltd, New Delhi, 2004.
3. W.H. Gothmann, "Digital Electronics – Introduction Theory and Practice", Prentice Hall of India Pvt. Ltd New Delhi, 1992.
4. R.R. Jain, "Modern digital electronics", Third edition, Tata McGraw – Hill, 3rd edition 2003.
5. Leach and Malvino, "Digital Principles of Electronics & Applications", Tata McGraw – Hill, 5th Edition, 2003.

WEB LINKS

1. https://en.wikipedia.org/wiki/Digital_electronics
2. http://www.electrical4u.com/digital-electronics/
3. http://www.asic-world.com/digital/tutorial.html

MT15306 FLUID MECHANICS AND MACHINERY LABORATORY 0 0 2 1

COURSE OBJECTIVES

- To reinforce and enhance the understanding of the fundamentals of fluid mechanics and hydraulic machines
- To introduce a variety of classical experimental and diagnostic techniques, and the principles behind these techniques
- To provide practice in making engineering judgements, estimates and assessing the reliability of the measurements and skills which are very important in all engineering disciplines
- To discuss and practise standard measurement techniques of fluid mechanics and their applications

UNIT I FLOW MEASUREMENT

Calibration of Flow Measuring instruments – Venturimeter, orifice meter, rotometer, Calibration of flows in open channels – weirs and notches. Estimation of friction factor in flow through pipes.

UNIT II PUMPS

Determination of performance characteristics of pumps – centrifugal pumps, submersible pumps, turbine pumps and positive displacement pumps – reciprocating and gear pumps.

UNIT III TURBINES

Determination of performance characteristics of turbines – reaction turbines and impulse turbines.

TOTAL: 30 PERIODS

COURSE OUTCOMES

On Completion of this course, the student will be able to

- understand the fundamentals of fluid mechanics and hydraulic machines
- have experimental knowledge on classical, experimental and diagnostic techniques
- estimate and assess the reliability of measurements which are very important in all engineering disciplines
- use rotometer, venturimeter and orifice meter to determine the fluid flow parameters.
- conduct experiments to assess the performances of various hydraulic machines.

REFERENCES

1. P. N. Modi and S. M. Seth, Hydraulics and Fluid Mechanics, Standard Book House, Delhi, 1991.
2. S. S. Rattan, A Text Book of Fluid Mechanics, Khanna Publishers, Delhi, 1994

EE15306 ELECTRICAL ENGINEERING LABORATORY 0 0 4 2

(Common to Mechanical and Mechatronics)

COURSE OBJECTIVES

- To expose the students to the basic operation of basic electronics, Electrical apparatus, electrical machines, and impact knowledge for them to develop experimental skills.
- To make the students conduct various experiments on D.C. machines and transformers and analyze their performance.
- To conduct the relevant experiments for determining the performance characteristics of AC machines.
- To expose the students to the operation of DC machines, Transformers, synchronous machines and induction motors and to give them experimental skills.

LIST OF EXPERIMENTS

1. Load test on DC shunt motor and DC Series motor.
2. Open circuit characteristics and load characteristics of DC shunt.
3. Speed Control of DC Shunt Motor (Armature and Field control)
4. Load test on single phase transformer.
5. OC & SC test on single phase transformer.
6. Load test on three phase alternator.
7. Swinburne's test.
8. Load test on three phase squirrel cage induction motor.
9. Speed control of three phase squirrel cage induction motor.
10. Load test on single phase induction motor.
11. Study of DC &AC Starters.

TOTAL: 60 PERIODS

COURSE OUTCOMES

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

- summarize the characteristics of dc motors under loaded and unloaded conditions.
- implement the various starting methods in ac motors.
- implement the speed control in dc shunt motor.
- predict the performance characteristics of AC motors.

MT15305 COMPUTER AIDED MACHINE DRAWING 0 0 2 1

COURSE OBJECTIVES

- To know the specifications and symbols of standard machine components used in machine drawing
- To expose the students to the concept of various tolerances and fits used for component design
- To understand and practice the drawings of machine components and simple assemblies using standard CAD packages
- To understand and create drawings manually or using any one CAD packages for standard machine components and assemblies with tolerance

LIST OF EXERCISES (Use 2D & 3D Software package)

1. Introduction to Machine Drawing - Dimensioning, Sectional views, Welding symbols, surface finish symbols.
2. Study of Limits, Fits and tolerances.
3. Free hand sketching of Machine Elements - Keys, Hexagonal and Square Head Bolts and Nuts, Conventional representation of Threads.
4. Converting given isometric view into orthographic views
5. Part and Assemble drawing of Universal coupling and Flange Coupling
6. Part and Assemble drawing of Bearings.
7. Part and Assemble drawing of Valves.
8. Part and Assemble drawing of Machine Elements – Tail Stock, Screw Jack and Connecting Rod Assembly.

TOTAL: 30 PERIODS

COURSE OUTCOMES

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

- summarize the part and assemble drawing of machine elements – tail stock, screw jack and connecting rod assembly
- implement the various Part and Assemble drawing of Bearings

EN15301 BUSINESS ENGLISH COURSE LABORATORY 0 0 2 1

COURSE OBJECTIVES

- To develop the reading skills of the students and make them familiarized in skimming and scanning.
- To instil the communication concepts to enhance the students' conversational skills through various practice sessions and to familiarize them with a variety of business correspondence.
- To inculcate the receptive skills i.e. Listening and Reading and to make the students well versed in the Productive skills and to assist them in improving their vocabulary and comprehension of grammar.
- To expose the students to listening and speaking skills

UNIT I READING & VOCABULARY

Understanding short, real notices, messages - detailed comprehension of factual material- skimming & scanning skills - interpreting visual information - reading for detailed factual information - reading for gist and specific information - reading for grammatical accuracy and understanding of text structure - reading and information transfer.

UNIT II WRITING

Re-arranging appointments - asking for permission - giving instructions - apologizing and offering compensation - making or altering reservations - dealing with requests - giving information about a product.

UNIT III LISTENING

Listening to short telephonic conversation - Listening to short conversation or monologue - Listening to specific information - Listening to conversation- interview, discussion.

UNIT IV SPEAKING

Conversation between the interlocutor and the candidate - general interaction and social language - A mini presentation by each candidate on a business theme - organizing a larger unit of discourse - giving information and expressing opinions - two-way conversation between candidates followed by further prompting from the interlocutor- Expressing opinions- agreeing and disagreeing

TOTAL: 30 PERIODS

COURSE OUTCOMES

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

- enrich the vocabulary through reading and can develop their pronunciation skills.
- speak effectively in English on all occasions.
- prepare flawless reports and proposals.

TEXT BOOKS

1. Cambridge BEC Preliminary, Self-Study Edition, Cambridge University Press, New York, 2012.
2. Whitby, Norman. Business Benchmark, Pre-intermediate to intermediate, Business Preliminary, Shree MaitreyPrintech Pvt. Ltd., Noida, 2014.

REFERENCE

1. Raman, Meenakshi& Sangeetha Sharma. Technical Communication: Principles and Practice.
2. Oxford University Press, New Delhi. 2011.
3. Rizvi, Ashraf. M. Effective Technical Communication. Tata McGraw-Hill, New Delhi. 2005
4. Rutherford, Andrea. J Basic Communication Skills for Technology. Pearson, New Delhi. 2001.

WEB LINKS

1. http://www.cambridge.org/us/cambridgeenglish/catalog/cambridge-english-exams-ielts/business-benchmark
2. www.skillsyouneed.com/ips/active-listening.html

SEMESTER IV

MA15404 NUMERICAL METHODS 3 2 0 4

COURSE OBJECTIVES

- To analyze the solution for a large system of linear equations.
- To find the intermediate values when a series of data is given.
- To develop efficient algorithms for solving problems in science, engineering and technology.
- To solve the non-linear differential equations that cannot be solved by regular conventional method.
- To develop the accuracy of second order differential equation by finite difference method.

UNIT I SOLUTION OF EQUATIONS AND EIGEN VALUE PROBLEMS 15

Solution of equation –Iteration method: Newton Raphson method – Solution of linear system by Gaussian elimination and Gauss - Jordon method – Iterative method – Gauss-Seidel method – Inverse of a matrix by Gauss Jordon method – Eigenvalue of a matrix by power method.

UNIT II INTERPOLATION AND APPROXIMATION 15

Lagrangian Polynomials – Divided differences – Newton's Divided Difference, Hermite Interpolation Polynomial and Interpolating with a cubic spline – Newton's forward and backward difference formulas.

UNIT III NUMERICAL DIFFERENTIATION AND INTEGRATION 15

Differentiation using interpolation formulae –Numerical integration by trapezoidal and Simpson's 1/3– Romberg's method – Two and Three point Gaussian quadrature formulas – Double integrals using trapezoidal and Simpsons' rule.

UNIT IV INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS 15

Single step methods: Taylor series method – Modified Euler method for first order equation – Fourth order Runge – Kutta method for solving first and second order equations – Multistep methods: Milne's and Adam's predictor and corrector methods.

UNIT V BOUNDARY VALUE PROBLEMS IN ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS 15

Finite difference solution of second order ordinary differential equation – Finite difference solution of one dimensional heat equation by explicit and implicit methods – One dimensional wave equation and two dimensional Laplace and Poisson equations.

TOTAL: 75 PERIODS

COURSE OUTCOMES

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

- understand the basics of problem solving in linear equations.

- learn the methods on interpolation which will be useful in constructing approximate polynomial to represent the data is understood.
- acquire basic knowledge in developing computer programs.
- apply the concepts of initial value problem with more accuracy in the field of science and engineering field.
- acquire the computational procedure of the amount of heat emitted or transferred from an object.

TEXTBOOKS

1. Erwin Kreyszig., "Advanced Engineering Mathematics" 10th edition, Wiley Publications, 2010.
2. T. Veerarajan. and T. Ramachandran, "Numerical Methods with programming in C", 2nd ed., Tata McGraw-Hill, 2006.
3. Sankar Rao K " Numerical Methods for Scientists and Engineers –3rd Edition Prentice Hall of India Private, New Delhi, 2007.

REFERENCES

1. P. Kandasamy, K. Thilagavathy and K. Gunavathy, "Numerical Methods", S.Chand Co. Ltd., New Delhi, 2003.
2. Gerald C.F. and Wheatley, P.O., "Applied Numerical Analysis" 6th Edition, Pearson Education Asia, New Delhi, 2002.
3. M.K.Jain , S.R.K. Iyangar , R.K.Jain , "Numerical Methods For Scientific & Engineering Computation" , New Age International (P) Ltd , New Delhi , 2005.
4. M.B.K. Moorthy and P.Geetha, "Numerical Methods" , Tata McGraw Hill Publications company, New Delhi, 2011.
5. Balagurusamy, E., ―Numerical Methods‖, Tata McGraw-Hill Pub. Co. Ltd., New Delhi, 1999.

WEB LINKS

1. https://www.youtube.com/watch?v=QTQ8bO1F-Dg
2. https://www.youtube.com/watch?v=AT7Olelic8U
3. https://www.youtube.com/watch?v=TH06N7Q7FJw

MT15401 DYNAMICS OF MACHINERY 3 2 0 4

COURSE OBJECTIVES

- To impart the knowledge about the static and dynamic force analysis on various parts of reciprocating engine
- To understand the function of flywheel and to construct the various turning moment diagram
- To give awareness to the knowledge about balancing of various parts for different engine
- To expose the effects of vibration in various beams under different load conditions and the basic concepts of governor and gyroscopes

UNIT I FORCE ANALYSIS 15

Rigid Body dynamics in general plane motion – Equations of motion- Dynamic force analysis – Inertia force and Inertia torque – D. Alemberts principle – The principle of superposition –Dynamic Analysis in Reciprocating Engines – Gas Forces – Equivalent masses – Bearing loads – Crank shaft Torque – Turning moment diagrams – Fly wheels.

UNIT II BALANCING 15

Static and dynamic balancing – Balancing of rotating masses – Balancing a single cylinder Engine Balancing Multi – cylinder Engines – Partial balancing in locomotive Engines – Balancing linkages.

UNIT III FREE VIBRATION 15

Basic features of vibratory systems – Degrees of freedom – Single degree a freedom – Free vibration – Equations of motion – natural frequency – Types of Damping – Damped vibration critical speeds of simple shaft – Torsional systems; Natural frequency of two and three rotor systems

UNIT IV FORCED VIBRATION 15

Response to periodic forcing – Harmonic Forcing – Forcing caused by unbalance – Support motion – Force transmissibility and amplitude transmissibility vibration isolation.

UNIT V MECHANISM FOR CONTROL 15

Governors – Types – Centrifugal governors – Gravity controlled and spring controlled centrifugal governors – Characteristics – Effect of friction – Controlling Force - Other governor mechanisms. Gyroscopes – Gyroscopic forces and Torques – Gyroscopic stabilization - Gyroscopic effects in Automobiles, ships and airplanes.

TOTAL: 75 PERIODS

COURSE OUTCOMES

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

- carry out static and dynamic force analysis on various parts of reciprocating engine
- construct turning moment diagram of flywheel
- perform balancing of various parts for different engine
- know the basic concepts of governor and gyroscopes
- acquire knowledge on the Mechanism for Control of Centrifugal governors

TEXT BOOK

1. S. S. Rattan, Theory of Machines, Tata McGraw-Hill Publishing Company Ltd, New Delhi, 2011.

REFERENCES

1. Thomas Bevan, "Theory of Machines", CBS Publishers and distributors, 1984.
2. Ghosh A. and Mallick A.K., "Theory of Mechanisms and Machines", Affiliated East- West Press Pvt. Ltd., New Delhi, 1988.
3. Shigley J.E. and Uicker J.J., "Theory of Machines and Mechanisms ", McGraw – Hill, Inc., 1995.
4. Rao J.S. and Dukkipati R.V., "Mechanism of Machine Theory", Wiley – Eastern Limited, New Delhi, 1992.
5. John Hannah and Stephens R.C., "Mechanics of Machines", Viva low – Priced Student Edition, 1999.
6. Sadhu Singh "Theory of a Machines", Pearson Education, 2002.

WEB LINKS

1. http://nptel.ac.in/courses/112104114/
2. http://freevideolectures.com/Course/2364/Dynamics-of-Machines

MT15402 CONTROL SYSTEMS ENGINEERING 3 0 0 3

COURSE OBJECTIVES

- To describe feedback control and basic components of control systems
- To understand the various time domain and frequency domain tools for analysis and design of linear control systems
- To study the methods to analyze the stability of systems using root locus technique
- To describe the methods of designing compensators and applications of control systems
- To provide sound knowledge in the basic concepts of linear control theory and design of control system.

UNIT I BASIC CONCEPTS AND SYSTEM REPRESENTATION 9

Basic elements in control systems – Open and closed loop systems with example –Mathematical model of Translational, Rotational & Electrical systems – Transfer function – Block diagram reduction techniques – Signal flow graph.

UNIT II TIME RESPONSE ANALYSIS 9

Introduction – Time domain specifications – Types of test inputs I and II order system response– Steady state error – Error coefficients – Generalized error series – P, PI, PD, PID Controlled characteristics.

UNIT III FREQUENCY RESPONSE ANALYSIS AND DESIGN 9

Introduction – Frequency domain specifications – Bode plots and polar plots – Constant M and N circles and Nichols chart – Correlation between frequency domain and time domain specifications.

UNIT IV STABILITY OF CONTROL SYSTEMS 9

Characteristics equation – Location of roots in s-plane for stability – Routh Hurwitz criterion –Root locus construction – Gain margin and phase margin – Nyquist stability criterion.

UNIT V COMPENSATION DESGIN & APPLICATIONS OF CONTROL SYSTEMS 9

Realization of basis compensation – Lag, Lead and Lag – lead networks – Compensator design using Bode plots. Stepper motors- AC & DC Servo Motor-Hydraulic Controller-Pneumatic Controller - Overview of Distributed control system and PLC.

TOTAL: 45 PERIODS

COURSE OUTCOMES

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

- Possess knowledge on feedback control and basic components of control systems
- understanding various time domain and frequency domain tools for analysis and design of linear control systems
- conduct analysis to know the stability of systems from transfer function forms and to define the methods of designing compensators
- know the application areas of control system.
- acquire knowledge on Compensation Design

TEXTBOOK

1. I.J. Nagrath and M. Gopal, *Control System Engineering*, New Age International Publisher, New Delhi, 2011.

REFERENCES

1. Katsuhiko Ogata, "Modern Control Engineering", 4th Edition, Pearson Education 2003.
2. I.J.Nagrath& M. Gopal, "Control Systems Engineering", New Age International Publishers, 2003.
3. B.C.Kuo, "Automatic control systems", Prentice Hall of India ltd, New Delhi 1995.
4. Dorf R.C. and Bishop R.H., "Modern Control systems", Addison – Wesley, 1995 (MATLAB reference).
5. Leonard N.E. and William Levine, "Using MATLAB to Analyze and Design Control Systems,"

WEB LINKS

1. http://nptel.ac.in/courses/108101037/1
2. https://en.wikipedia.org/wiki/Control_engineering

MT15403 MECHANICS OF SOLIDS 3 2 0 4

COURSE OBJECTIVES

- To develop the theoretical basis about the stress, strain and elastic modulus
- To understand the concepts in various components with sound mathematical principles and to enable students to systematically solve engineering problems regardless of difficulty
- To familiarize with finding shear force, bending moment, deflection and slopes in various types of beams with different load conditions
- To understand the concept of confidence and competence in solving problems related to the machine components like shafts, columns, springs and purposes
- To provide sound knowledge in the basic concept in Torsion in Shafts and Springs

UNIT I STRESS, STRAIN AND DEFORMATION OF SOLIDS 15

Properties of mild steel, cast iron, aluminum alloys, copper alloys and magnesium alloys - Mechanical properties of Materials - Simple stress and strain - Stresses and strains due to axial force - Hooke's law - Factor of safety -Poisson's ratio - Elastic constants and their relationship Stress-Strain Curve for Ductile and Brittle Materials.

UNIT II ANALYSIS OF STRESSES IN TWO DIMENSIONS 15

State of stresses at a point - Normal and tangential stresses on inclined planes - Principal planes and stresses – Plane of maximum shear stress - Mohr's circle for biaxial stresses. Behavior of thick wall pressure vessels

UNIT III BEAMS 15

Types of beams: Supports and Loads - Theory of simple bending - Stresses in beams: bending and shear stress - Stress variation along the length and section of the beam, Slope and Deflection of beams: Double integration for Cantilever and simply supported beams Section modulus

UNIT IV COLUMNS 15

Columns - Buckling of long columns due to axial load - Equivalent length of a column - Euler's and Rankine's formulae for columns of different end conditions Deflection in overhanging beams

UNIT V TORSION IN SHAFTS AND SPRINGS 15

Analysis of torsion of circular bars - Shear stress distribution - Bars of Solid and hollow circular section – Compound shafts.

TOTAL: 75 PERIODS

COURSE OUTCOMES

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

- compute stress, strain and elastic moduli under given loading
- construct shear force and bending moment diagrams of standard beams
- demonstrate deflection and slopes in various types of beams with different load conditions
- solve problems related to the machine components like shafts, columns, springs and purposes
- know the application areas of springs

TEXTBOOKS

1. R. K. Bansal, A text book of Strength of Materials, Laxmi Publications (P) Limited, New Delhi, 2010.
2. Egor P. Popov, Engineering Mechanics of Solids, Prentice Hall of India Learning. Ltd., New Delhi, 2010.

REFERENCES

1. R.K.Rajput, Engineering Materials, S. Chand and Company Ltd, New Delhi, 2007.
2. P. Purushothama Raj and V. Ramasamy, Strength of Materials, Pearson Education, India, 2013.
3. S. Rattan, Strength of Materials, Tata McGraw-Hill Publishing Company Limited, New Delhi, 2011.
4. B. K. Sarkar, Strength of Materials, Tata McGraw-Hill Publishing Company Limited, New Delhi, 2008.
5. Irring H. Shames and James M. Pitarresi, Introduction to Solid Mechanics, Prentice Hall of India Learning. Ltd., New Delhi, 2009.
6. R. Subramaniam, Strength of Materials, Oxford University Press, New Delhi 2012.

WEB LINKS

1. www.engineersedge.com/strength_of_materials.html
2. www.me.mtu.edu/~mavable/MoM2nd.htm

MT15404 METROLOGY AND COMPUTER AIDED INSPECTION 3 0 0 3

COURSE OBJECTIVES

- To understand the concept of Metrology
- To learn about Metrology instruments and application for various measurements
- To introduce concept of computer applications in Metrology.
- To enhance the principles of various Inspection, Instruments and Methodology
- To enhance knowledge in the area of non-contact inspection

UNIT I BASIC CONCEPTS AND COMPARATORS 9

Basic concept – Legal metrology – Precision – Accuracy – Types of errors – standards of measurement – traceability – interchangeability and selective assembly, gauge blocks, limit gauges – tailor's principle of gauge design. Comparators: Mechanical, Electronic, optical and Pneumatic – Automatic gauging.

UNIT II ANGULAR MEASUREMENT AND SURFACE FINISH MEASUREMENT 9

Angular measurement: sine bar – Autocollimator, optical projectors: profile projectors –toolmakers microscope, measurement of surface finish: Terminology – roughness – waviness –analysis of surface finish – stylus probe instrument –Talysurf.

UNIT III SCREW THREAD AND GEAR METROLOGY 9

Screw thread metrology: errors in thread – pitch error – drunkenness – measurement of various elements thread – two and three wire method – best wire size – Thread gauges – floating carriage micrometer. Measurement of gears – Terminology – measurement of various elements of gear – tooth thickness – constant chord and base tangent method – Parkinson Gear Tester.

UNIT IV LASER METROLOGY 9

Laser Metrology: LASER interferometer – constructional features, sources of error, measurement of positional error, straightness and flatness of machine tools – LASER Alignment Telescope – LASER Micrometer – LASER Triangulation technique – in process and on line measurement.

UNIT V ADVANCES IN METROLOGY 9

Coordinate measuring machine (CMM): Constructional features – types, applications, Applications of Image Processing in measurement – computer aided inspection. Introduction to machine vision system.

TOTAL: 45 PERIODS

COURSE OUTCOMES

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

- demonstrate different measurement technologies and to make use of them in Industrial Components

- compute angular measurement and surface finish measurement
- acquire knowledge on screw thread metrology
- carry out laser metrology
- demonstrate Coordinate measuring machine

TEXT BOOKS

1. Jain R.K. “Engineering Metrology”, Khanna Publishers, 2005.
2. Gupta. I.C., “Engineering Metrology”, Dhanpatrai Publications, 2005.

REFERENCES

1. Connie Dotson, et al., “Fundamentals of Dimensional Metrology”, Thomas Asia, Singapore, First print, 2003.
2. Doeblin E.O., “measurement system applications and design” First Edition, 1990.
3. Groover M.P., “Automation, production system and computer integrated manufacturing “, Prentice – Hall, New Delhi, 2003.

WEB LINKS

1. http://nptel.ac.in/courses/112102103//Module%20G/Module%20G(2)/p2.htm
2. https://en.wikipedia.org/wiki/Computer-aided_inspection

EE15412 MICROPROCESSORS AND APPLICATIONS 3 0 0 3

COURSE OBJECTIVES

- To study the architecture of 8085.
- To understand the addressing modes and instruction set of 8085.
- To impart knowledge of commonly used peripheral devices.
- To gain the knowledge of interrupt controller / interfacing ICs.
- To cognizant the applications of microprocessor

UNIT I INTRODUCTION 9

Organization of Micro Computers – Organization of 8085: Architecture, Internal Register Organization and Pin Configuration – Instruction Set of 8085 – addressing modes – instruction and machine cycles with states and timing diagram.

UNIT II MEMORY AND I/O DEVICES 9

Need for Interfacing – Memory Interfacing: address space partitioning – address map – Address decoding –Bus contention. I/O Interfacing: Data transfer schemes – programmed Synchronous and asynchronous – Interrupt driven Transfer – Multiple devices and multiple interrupt levels – enabling disabling and masking of interrupts.DMA transfer: Cycle stealing – Burst mode – Multiple DMA devices – DMA transfer in 8085 systems – serial data transfer.

UNIT III INTERFACING DEVICES 9

Programmable peripheral device – programmable interval timer (8253) – Programmable communication interface (USART) – Programmable interrupt controller – Programmable DMA Controller (8257), programmable peripheral interface (8255)

UNIT IV DESIGN USING PERIPHERAL DEVICES 9

Interfacing A/D and D/A converters – Matrix Keyboard design using 8255 using 8085 programs. Designing real time clock, detecting power failure, detecting presence of objects using 8253 -Design of Keyboard and display interfacing using 8279

UNIT V MICROPROCESSOR APPLICATIONS 9

Temperature monitoring system – Automotive applications – Closed loop process control –Stepper motor control.

TOTAL: 45 PERIODS

COURSE OUTCOMES

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

- understand the architecture of 8085, instruction set and addressing modes of 8085 and illustrate with simple programs.

- get knowledge about commonly used peripheral / interfacing ics.
- analyse the concepts of i/o interfacing, execution.
- design microprocessor based systems using peripheral devices.
- device selection and the applications of microprocessor.

TEXT BOOK

1. Ramesh Goankar, "Microprocessor Architecture, Programming and Applications with 8085",
2. Penram International, 2009.
3. Umashankar B.S., Udaya Kumar K, "The 8085 Microprocessor: Architecture, Programming and Interfacing", Publisher: Pearson Education, 2008.
4. R.Theagarajan, S.Dhanasekaran, S.Dhanapal, "Microprocessors and its applications", New Age International, 2004

REFERENCES

1. V. Douglas Hall, "Microprocessors and Interfacing Programming and Hardware", Tata McGraw - Hill Publishing Company Ltd., 2002.
2. K. Ray and K. M. Bhurchandi, "Advanced Microprocessor and Peripherals – Architecture, Programming and Interfacing", Tata McGraw - Hill Publishing Company Ltd., 2006.
3. Aditya P. Mathur, "Introduction to Microprocessor", Tata McGraw-Hill Publishing Company Ltd., 2003.
4. Rafiquzzaman M., "Microprocessors Theory and Applications: Intel and Motorola", Prentice Hall, 2003.
5. Krishnakant "Microprocessors and Microcontrollers Architecture Programming and System Design", 8085- 8086- 8051- 8096", PHI, 2007

WEB LINKS

1. https://en.wikipedia.org/wiki/Microcontroller
2. http://www.zseries.in/embedded%20lab/8085%20microprocessor/other%20applications.
3. http://www.nptel.ac.in/courses/Webcourse-

EE15413 MICROPROCESSOR LABORATORY 0 0 2 1

COURSE OBJECTIVES

- To able to write program using arithmetic operations of microprocessors.
- To understand various IC interfacing with 8085.
- To experimentally understand the operation of Intel 8085 microprocessor
- To know about the Sorting of number series and Code conversion
- To learn the Arithmetic and geometrical series, A/D and D/A conversions.

LIST OF EXPERIMENTS

I. Programming

1. Addition and subtraction of two 8 bit numbers.
2. Addition and subtraction of two 16 bit numbers.
3. Decimal addition and subtraction of two 8 bit numbers
4. To arrange a series of numbers in ascending order.
5. To arrange a series of numbers in descending order
6. To find the largest and smallest number in given array.
7. Multiplication and Division of 8 bit numbers
8. Decimal to hexadecimal conversion and hexadecimal number to decimal number conversion.

II. Interfacing

1. Analog to digital conversion.
2. Digital to analog conversion.
3. Stepper motor controller.
4. Temperature controller.

TOTAL: 30 PERIODS

COURSE OUTCOMES

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

- write the assembly level programming in 8085 microprocessors.
- interfacing stepper motor, adc, dac and temperature controller with 8085 microprocessors.

MT15405 MANUFACTURING TECHNOLOGY LABORATORY 0 0 2 1

COURSE OBJECTIVES

- To impart knowledge and skill in the field of conventional machine tools used in the industries
- To supplement the theory, course on machining processes
- To demonstrate and to study of the following machines.
- To understand the machine capabilities and processes completely

LIST OF EXPERIMENTS

UNIT I LATHE PRACTICE

a. Plain Turning
b. Taper Turning
c. Thread Cutting

Estimation of machining time for the above turning processes.

UNIT II DRILLING PRACTICE

a. Drilling
b. Tapping
c. Reaming.

UNIT III Milling

a. Surface Milling.
b. Gear Cutting.
c. Contour Milling.

UNIT IV Planning and Shaping

a. Cutting Key Ways.
b. Dove tail machining.

TOTAL: 30 PERIODS

COURSE OUTCOMES

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

- Get the experience of common conventional machine tools used in the industries
- correlate the theory course on machining processes

MT15406 MACHINE DYNAMICS LABORATORY 0 0 2 1

COURSE OBJECTIVES

- To explain the various practical aspects of instrumentation with emphasis on mechanical domain.
- To introduce the various types of governor, cam, balancing of rotating masses and to determine the M.I. of various systems.
- To explain the concept of mechanical measurement and various methods used for measuring the variables.
- To know about the single and multi-degree freedom suspension systems.
- To understand the concept of Vibrating system spring mass

LIST OF EXPERIMENTS

1. Governor – Determination of sensitivity, effort, etc. for watt, porter, proell, Hartnell governors.
2. Cam – Study of jump phenomenon and drawing profile of the cam.
3. Motorized Gyroscope – Verification of law's – Determination of gyroscopic couple.
4. Whirling of shaft – Determination of critical speed of shaft with concentrated loads.
5. Balancing of reciprocating masses.
6. Balancing of rotating masses.
7. Determination of Moment of inertia by oscillation method for connecting rod and flywheel.
8. Vibrating system spring mass – system – Determination of damping co – efficient of single degree of freedom system.
9. Determination of influence co – efficient for multi degree freedom suspension system.
10. Determination of transmissibility ratio – vibrating table.
11. Determination of torsional natural frequency of single and Double Rotor systems. - Undamped and Damped Natural frequencies.
12. Transverse vibration of Free-Free beam – with and without concentrated masses.

TOTAL: 30 PERIODS

COURSE OUTCOMES

- On the completion of the course, students will be able to acquire knowledge about various types of governors and cams

MT15407 TECHNICAL SEMINAR 0 0 2 1

COURSE OBJECTIVE

During the seminar session, each student is exposed to prepare and present a topic on engineering/technology, for duration of about 8 to 10 minutes. In a session of three periods per week, 15 students are expected to present the seminar. A faculty guide is to be allotted and he/she will guide and monitor the progress of the student and maintain attendance also. Students are motivated to use various teaching aids such as overhead projectors, power point presentation and demonstrative models. This will enable them to gain confidence in facing the placement interviews.

TOTAL: 30 PERIODS

COURSE OUTCOMES

On the completion of the course,

Students will be encouraged to use various teaching aids such as overhead projectors, power point presentation and demonstrative models. This will enable them to gain confidence in facing the placement interviews.