M.D. UNIVERSITY, ROHTAK

(NAAC Accredited 'A+' Grade)

SCHEME OF STUDIES AND EXAMINATION
B.TECH (Robotics and Automation Engineering)
SEMESTER 5th AND 6th
Scheme effective from 2023-24

COURSE CODE AND DEFINITIONS:

Course Code	Definitions
L	Lecture
T	Tutorial
P	Practical
BSC	Basic Science Courses
ESC	Engineering Science Courses
HSMC	Humanities and Social Sciences including Management courses
PCC	Professional Core Courses
LC	Laboratory Courses
MC	Mandatory Courses
PT	Practical Training
S	Seminar
TH	Theory
Pr	Practical

General Notes:

1. Mandatory courses are non credit courses in which students will be required passing marks in internal assessments.
2. Students will be allowed to use non programmable scientific calculator. However, sharing of calculator will not be permitted in the examination.
3. Students will be permitted to opt for any elective course run by the department. However, the department shall offer those electives for which they have expertise. The choice of the students for any elective shall not be binding for the department to offer, if the department does not have expertise. To run the elective course a minimum of 1/3rd students of the class should opt for it.

Scheme of Studies and Examination

B.TECH (Robotics and Automation Engineering) – 5th Semester

w.e.f. 2023-24

S. N.	Course Code	Course Title	Hours per week			Total Contact hrs/week	Credit	Examination Schedule (Marks)				Duration of Exam (Hours)
			L	T	P			Internal Assessment	External Examination	Practical	Total	
1	PCC-ME-301G	Computer Aided Design & Manufacturing	3	0	0	0	3	25	75		100	3
2	PCC- RA-303G	Industrial Automation & Robotics	3	1	0	3	3	25	75		100	3
3	ESC-CSE-205G	Digital Electronics	3	0	0	3	3	25	75		100	3
4	PCC- ME-307G	Kinematics of Machine	3	0	0	3	3	25	75		100	3
5	PCC-CSE-203G	Data Structures & Algorithms	3	0	0	3	3	25	75		100	3
6	**OEC/HSMC-I**	Refer List -I	2	0	0	2	2	25	75		100	3
7	LC-ME-311G	Computer Aided Design & Manufacturing Lab	0	0	2	2	1	25		25	50	3
8	LC-CSE-211G	Digital Electronics Lab	0	0	2	2	1	25		25	50	3
9	LC-ME-315G	Kinematics of Machine Lab	0	0	2	2	1	25		25	50	3
10	LC-CSE-213G	Data Structures & Algorithms LAB Using C	0	0	2	2	1	25		25	50	3
11	PT-RA-319G	Practical Training-I	0	0	2	2	0					3
12	MC-315G	Essence of Indian Traditional knowledge										
	TOTAL						**21**	**250**	**450**	**100**	**800**	

Note 1. The evaluation of Practical Training-I will be based on seminar, viva-voce, report submitted by the students. According to performance, the students are awarded grades A, B, C, F. A student who is awarded 'F' grade is required to repeat Practical Training.

Note 2. The evaluation of 'Essence of Indian Traditional Knowledge (MC-315G) be based on grades i.e. A,B,C & F. The student who is awarded 'F"' grade is required to repeat the subject.

Excellent: A; Good : B; Satisfactory: C; Not Satisfactory: F.

OPEN ELECTIVE COURSES (OEC)/ HUMANITIES AND SOCIAL SCIENCES INCLUDING MANAGEMENT COURSES (HSMC)-LIST-I

LIST-I (Semester -V) (Choose any one from the following list.)

S. No.	Code	Name of Course	No. of Contact Hours	Credits
1.	HSMC-01G	Economics For Engineers	2	2
2.	HSMC-03G	Finance and Accounting	2	2
3.	OEC –RA-301G	Air and Noise Pollution and Control	2	2
4.	OEC –RA-303G	Installation Testing & Maintenance of Electrical Equipments	2	2
5.	OEC –RA-305G	Microprocessor and Interfacing	2	2

Note: Students have to select any one subject from the above list of courses.

Scheme of Studies and Examination

B.TECH (Robotics and Automation engineering) – 6th Semester

w.e.f. 2023-24

S. N.	Course Code	Course Title	Hours per week			Total Contact hrs/week	Credit	Examination Schedule (Marks)				Duration of Exam (Hours)
			L	T	P			Internal Assessment	External Examination	Practical	Total	
1	PCC-ME-302G	Manufacturing Technology	3	0	0	3	3	25	75		100	
2	PCC- RA-304G	Robotics Engineering and Application	3	0	0	3	3	25	75		100	
3	PCC- EE-309G	Microprocessor & Microcontroller	3	1	0	4	4	25	75		100	
4	PCC- RA-308G	Artificial intelligence in Robotics	3	0	0	3	3	25	75		100	
5	LC-ME-310G	Workshop Lab-I	0	0	3	3	1.5	25		25	50	
6	LC-RA-312G	Robotics Engineering and Application Lab	0	0	2	2	1	25		25	50	
7	LC-EE-311G	Microprocessor & Microcontroller Lab	0	0	2	2	1	25		25	50	
8	LC-RA-316G	Artificial Intelligence Lab using python	0	0	2	2	1	25		25	50	
9	PCC-RA-318G	Seminar	0	0	2	2	1	50			50	
10	PEC	Professional Elective Courses(PEC): Refer List -I	3	0	0	3	3	25	75		100	
11	**HSMC-II**	Refer List -II	2	0	0	2	2	25	75		100	
	TOTAL						**23.5**	**300**	**450**	**100**	**850**	

NOTE:

1. Each student has to undergo practical training of 4/6 weeks during summer vacation and its evaluation shall be carried out in the VII semester.

2. Assessment of Practical Training-II, undergone at the end of VI semester, will be based on seminar, viva-voce, report and certificate of practical training obtained by the student from the industry/ Professional organization/ Research Laboratory etc. According to performance letter grades A, B, C, F are to be awarded:

   Excellent: A; Good : B; Satisfactory:C; notsatisfactory: F.

A student who has been awarded ‘F’ grade will be required to repeat the practical training.

PROFESSIONAL ELECTIVE COURSES (PEC) (Semester-VI) LIST-I

S. No.	Code	Name of Course	No. of Contact Hours	Credits
1.	PEC-RA-320G	Internal Combustion Engines & Gas Turbines	3	3
2.	PEC-RA-322G	Welding Technology	3	3
3.	PEC-RA-324G	Air Craft Technology	3	3
4.	PEC-RA-326G	Reliability, Availability & Maintainability	3	3

Note: Students will have to select any one out of the list.

HUMANITIES AND SOCIAL SCIENCES INCLUDING MANAGEMENT COURSES (HSMC)-LIST-II.

List-II (Semester-VI)

S. No.	Code	Name of Course	No. of Contact Hours	Credits
1.	HSMC -02G	Organizational Behaviour	2	2
2.	HSMC -04G	Human Resource Management	2	2
3.	HSMC -06G	Industrial Psychology	2	2
4.	HSMC -08G	Fundamentals of Management	2	2

Note: Students have to select any one subject from the above list of courses.

Course code	**PCC-ME -301G**				
Category	Professional Core Courses				
Course title	**COMPUTER AIDED DESIGN & MANUFACTURING**				
Scheme and Credits	L	T	P	**Credits**	Semester-V
	3	0	0	3	
Objectives:	• Understand the fundamentals of various Computer Aided Design, basics of geometric modeling, curves surfaces, solids and Additive Manufacturing Technologies for application to various industrial needs. • Learn what Advanced/Additive manufacturing (AM) is and understand why it has become one of the most important technology trends in decades for product development and innovation. • Differentiate between subtractive and Additive manufacturing.				
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

UNIT-I

Introduction: Introduction to CAD/CAM/CAE, Design Process, Importance and Necessity of CAD, Applications of CAD, Hardware and Software requirement of CAD.
Fundamentals of Additive Manufacturing (AM), Basic steps to perform AM, Classification of AM, Applications of AM: Aerospace, Biomedical, Automotive, Bio-printing, Tissue & Organ Engineering, Architectural Engineering, Surgical simulation, Art, Health care.

UNIT-II

Basics of geometric and solid modeling, coordinate systems. Transformations: Introduction, transformation of points and line, 2-D rotation, reflection, scaling and combined transformation, homogeneous coordinates, 3-D scaling, shearing, rotation, reflection and translation, combined transformations. Curves: Algebraic and geometric forms, reparametrization, Analytical and Synthetic curves, cubic splines, Bezier curves and B-spline curves.
Surfaces and Solids: Plane surface, ruled surface, surface of revolution, tabulated cylinder, bi-cubic surface, Bezier surface, B-spline surface, Solid models and representation scheme, boundary representation, constructive solid geometry, sweep representation, cell decomposition.

UNIT-III

Finite Element Method: Introduction, Procedure, Finite Element Analysis, Finite Element Modeling, Analysis of 1D, 2D structural problems.

Design for Additive Manufacturing, Software issues for AM, Direct Digital Manufacturing.

Difference between machining and additive manufacturing. Photo polymerization Processes, Powder bed fusion processes, Extrusion Based systems, Printing Processes, Effects of significant parameters.

UNIT-IV

Flexible Manufacturing Systems & Computer aided process planning: Introduction, FMS components, types of FMS, FMS layouts, planning for FMS, advantages and applications Conventional process planning, types of CAPP, Steps in variant process planning, planning for CAPP.

COURSE OUTCOMES: Upon completion of this course the student will be able to:

1. Demonstrate the knowledge of Computer Aided design and Additive Manufacturing.
2. Able to understand the concept of wireframe modeling, surface modeling and solid modeling.
3. Able to understand the method of manufacturing of liquid based, powder based and solid based techniques

References:

1. CAD/ CAM by Groover and Zimmer, Prantice Hall.
2. CAD/ CAM Theory and Practice by Zeid, McGraw Hill
3. Numerical Control and Computer Aided Manufacturing by Kundra, Rao & Tiwari, TMH.
4. Ian Gibson, Davin Rosen, Brent Stucker “Additive Manufacturing Technologies, Springer, 2nd Ed, 2014.

Course code	**PCC-RA-303G**				
Category	Professional Core Courses				
Course title	**INDUSTRIAL AUTOMATION & ROBOTICS**				
Scheme and Credits	L	T	P	**Credits**	Semester-V
	3	1	0	4	
Objectives:	• To develop the student's knowledge in various robot structures and their workspace. • To develop student's skills in performing spatial transformations associated with rigid body motions and robot systems. • To provide the student with knowledge of the singularity issues associated with the operation of robotic systems. • 4. To provide the student with some knowledge and analysis skills associated with trajectory planning and robot control.				
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

UNIT-I

Introduction: Concept and scope of automation: Socio economic impacts of automation, Types of Automation, Low Cost Automation

Fluid Power: Fluid power control elements, Standard graphical symbols, Fluid power generators, Hydraulic and pneumatic Cylinders - construction, design and mounting; Hydraulic and pneumatic Valves for pressure, flow and direction control.

UNIT-II

Basic hydraulic and pneumatic circuits: Direct and Indirect Control of Single/Double Acting Cylinders, designing of logic circuits for a given time displacement diagram & sequence ofoperations, Hydraulic & Pneumatic Circuits using Time Delay Valve & Quick Exhaust Valve, Memory Circuit & Speed Control of a Cylinder, Troubleshooting and "Causes & Effects of Malfunctions" Basics of Control Chain, Circuit Layouts, Designation of specific Elements in a Circuit.

Fluidics: Boolean algebra, Truth Tables, Logic Gates, Coanda effect.

UNIT-III

Electrical and Electronic Controls: Basics of Programmable logic controllers (PLC), Architecture & Components of PLC, Ladder Logic Diagrams

Transfer Devices and feeders: Classification, Constructional details and Applications ofTransfer devices, Vibratory bowl feeders, Reciprocating tube, Centrifugal hopper feeders

UNIT-IV

Robotics: Introduction, Classification based on geometry, control and path movement,Robot Specifications, Robot Performance Parameters, Robot Programming, Machine Vision, Teach pendants, Industrial Applications of Robots

Course Outcomes (COs): After studying this course, students will be able:

CO1:Students will demonstrate knowledge of the relationship between mechanical structures of industrial robots and their operational workspace characteristics.
CO2. Students will demonstrate an ability to apply spatial transformation to obtain forward kinematics equation of robot manipulators.
CO3. Students will demonstrate an ability to solve inverse kinematics of simple robot manipulators.
CO4. Students will demonstrate an ability to obtain the Jacobian matrix and use it to identify singularities.

Text Books:

1. Anthony Esposito, Fluid Power with applications, Pearson
2. S. R Majumdar, Pneumatic Control, McGraw Hill
3. S. R Deb, Robotic Technology and Flexible Automation, Tata Mc Hill
4. Saeed B. Niku Introduction to Robotics, Wiley India
5. Ashitava Ghosal, Robotics, Oxford

Course code	ESC-CSE-205G				
Category	Professional Core Courses				
Course title	DIGITAL ELECTRONICS				
Scheme and Credits	L	T	P	**Credits**	Semester-V
	3	0	0	3	
Objectives:	1. To Understand working of logic families and logic gates. 2. Design and implement Combinational and Sequential logic circuits. 3. To Understand the process of Analog to Digital conversion and Digital to Analog conversion. 4. TO Use PLDs to implement the given logical problem				
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

UNIT-I

FUNDAMENTALSOFDIGITAL SYSTEMSAND LOGICFAMILIES

Digital signals, digital circuits, AND, OR, NOT, NAND, NOR and Exclusive-OR operations, Boolean algebra, examples of IC gates, number systems-binary, signed binary, octal hexadecimal number, binary arithmetic, one's and two's complements arithmetic, codes, error detecting and correcting codes.

UNIT-II

COMBINATIONAL DIGITALCIRCUITS

Standard representation for logic functions, K-map representation, and simplification of logic functions using K-map, minimization of logical functions. Don't care conditions, Multiplexer, De-Multiplexer/Decoders, Adders, Subtractors, BCD arithmetic, carry look ahead adder, serial adder, ALU, elementary ALU design, popular MSI chips, digital comparator, parity checker/generator, code converters, priority encoders, decoders/drivers for display devices, Q-M method of function realization.

UNIT-III

SEQUENTIAL CIRCUITSAND SYSTEMS

A1-bit memory, the circuit properties of Bistable latch, the clocked SR flipflop, J-K-T and D Types flip flops, applications of flipflops, shift registers, applications of shift registers, serial to Parallel converter, parallel to serial converter, ring counter, sequence generator, ripple (Asynchronous)counters, synchronous counters, counters design using flipflops, special counter IC's, asynchronous sequential counters, applications of counters.

UNIT-IV

A/D ANDD/A CONVERTERS

Digital to analog converters: weighted resistor/converter, R-2RLadder D/A converter, Specifications for D/A converters, examples of D/A converter lCs, sample and hold circuit, Analog to digital converters: quantization and encoding, parallel comparator A/D converter, successive approximation A/D converter, counting A/D converter, dual slope A/D converter,

SEMICONDUCTOR MEMORIES AND PROGRAMMABLE LOGIC DEVICES

Memory organization and operation, expanding memory size, classification and characteristics of memories, sequential memory, read only memory (ROM), read and write memory (RAM), Content addressable memory (CAM), ROMasaPLD, Programmable logic array, Programmable array logic, complex Programmable logic devices (CPLDS), Field Programmable Gate Array (FPGA).

Course Outcome (COs): At the end of the course, the student shall be able to:

CO 1- Understand the knowledge of operations of microprocessor.

CO 2- Understand the assembly language programming using concepts like assembler directives, procedures, macros, software interrupts

CO 3- Acquire knowledge about basic concepts of serial communication in 8086

CO 4 - Learn about the concept of Interrupts and interfacing details of 8086.

References:

1. Mazidi and Mazidi: The 8051 Microcontroller and Embedded Systems, Pearson Education.
2. V. Deshmukh: Microcontroller (Theory and Application), TMH.
3. D. V. Hall: Microprocessors and Interfacing, TMH
4. Programming and Customizing the 8051 Microcontroller: Predko; TMH

Course code	**PCC-ME -307G**				
Category	Professional Core Courses				
Course title	**KINEMATICS OF MACHINE**				
Scheme and Credits	L	T	P	**Credits**	Semester-V
	3	0	0	3	
Objectives:	• To understand the kinematics and rigid- body dynamics of kinematically driven machine components. • To understand the motion of linked mechanisms in terms of the displacement, velocity and acceleration at any point in a rigid link. • To be able to design some linkage mechanisms and cam systems to generate specified output motion. • To understand the kinematics of gear trains.				
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

UNIT-I

Introduction: mechanism and machines, kinematics links, kinematics pairs, kinematics chains, degree of freedom, Grubler's rule, kinematics inversion, equivalent linkages, four link planar mechanisms, straight line mechanisms, steering mechanisms, pantograph, problems.

Kinematics Analysis of Plane Mechanisms: displacement analysis, velocity diagram, velocity determination, relative velocity method, instantaneous center of velocity, Kennedy's theorem, graphical and analytical methods of velocity and acceleration analysis, problems.

UNIT-II

Cams: Classification of cams and followers, disc cam nomenclature, construction of displacement, velocity and acceleration diagrams for different types of follower motions, analysis of follower motions, determination of basic dimension, synthesis of cam profile by graphical methods, cams with specified contours, problems.

Gears: fundamental law of gearing, involute spur gears, characteristics of involute and cycloidal action, Interference and undercutting, center distance variation, path of contact, arc of contact, non standard gear teeth, helical, spiral bevel and worm gears, problems.

UNIT-III

Gear Trains: synthesis of simple, compound and reverted gear trains, analysis of epicylic gear trains, problems.

Kinematics synthesis of Mechanisms: function generation, path generation, Freudenstein's equation, two and three position synthesis of four bar and slider crank mechanisms by graphical and analytical methods, precision positions, structural error; Chebychev spacing, transmission angle, problems.

UNIT-IV

Friction : Types of friction, laws of friction, motion along inclined plane, screw threads, efficiency on inclined plane, friction in journal bearing, friction circle and friction axis, pivots and collar friction, uniform pressure and uniform wear.

Belts and pulleys: Open and cross belt drive, velocity ratio, slip, material for belts, crowning of pulleys, law of belting, types of pulleys, length of belts, ratio of tension, centrifugal tension, power transmitted by belts and ropes, initial tension, creep, chain drives, chain length, classification of chains.

Course Outcomes : Students would be able :

CO1 - To understand about the applications of mechanism and machines.

CO2 - To understand about the basics Cams and Friction

CO3 - Students get familiarity about power transmitted with Belts and pulleys and also Gears and Gear Trains.

CO4 - Students having familiarization with calculate Kinematics Analysis of Plane Mechanisms

CO5 - Students would be able to know the Kinematics synthesis of Mechanisms.

TEXT BOOKS:

1. Theory of Mechanisms and Machines: Amitabha Ghosh and Ashok kumar Malik, Third Edition Affiliated East-West Press.

2. Theory of Machines and Mechanisms: Joseph Edward Shigley and John Joseph Uicker, Jr. Second Edition, MGH, New York.

References:

1. Mechanism and Machine Theory : J.S. Rao and R.V. Dukkipati Second Edition New age International.

2. Theory and Machines: S.S. Rattan, Tata McGraw Hill.

3. Theory of Machines, Beven, Pearson Indian Education Service Pvt. Ltd. India.

Course code	PCC-CSE-203G				
Category	Professional Core Courses				
Course title	DATA STRUCTURES & ALGORITHMS				
Scheme and Credits	L	T	P	**Credits**	Semester-V
	3	0	0	3	
Objectives:	1. To impart the basic concepts of data structures and algorithms. 2. To understand concepts about searching and sorting techniques 3. To understand basic concepts about stacks, queues, lists, trees and graphs. 4. To enable them to write algorithms for solving problems with the help of fundamental data structures				
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

UNIT-I

Introduction: Basic Terminologies: Concept of Data Structure, Choice of right Data Structure, Algorithms, how to design and develop algorithm, Complexity of algorithm. Operations: insertion, deletion, traversal etc.; Analysis of an Algorithm, Searching: Linear Search and Binary Search Techniques and their complexity analysis.

UNIT-II

Stacks and Queues: Stack and its operations: Algorithms and their complexity analysis, Applications of Stacks: Expression Conversion and evaluation -corresponding algorithms and complexity analysis. queue, Types of Queue: Simple Queue, Circular Queue, Priority Queue; Operations on each types of Queues: Algorithms and their analysis

UNIT-III

Linked Lists: Singly linked lists: Representation in memory, Algorithms of several operations: Traversing, Searching, Insertion into, Deletion from linked list; Linked representation of Stack and Queue, Header nodes, Doubly linked list: operations on it and algorithmic analysis; Circular Linked Lists: all operations their algorithms and the complexity analysis.

Trees: Basic Tree Terminologies, Different types of Trees: Binary Tree, Threaded Binary Tree, Binary Search Tree, AVL Tree; Tree operations on each of the trees and their algorithms with complexity analysis. Applications of Binary Trees. B Tree, B+ Tree: definitions, algorithms and analysis

UNIT-IV

Sorting and Hashing: Objective and properties of different sorting algorithms: Selection Sort, Bubble Sort, Insertion Sort, Selection Sort Quick Sort, Merge Sort, Heap Sort; Performance and Comparison among all the methods.

Graph: Basic Terminologies and Representations, Graph search and traversal algorithms and

complexity analysis. Minimum Spanning Tree: Kruskal's Algorithm, Prim's Algorithm.

Course Outcomes (COs):

CO1.At the end of the course, the student shall be able to: 1. For a given algorithm student will able to analyze the algorithms to determine the time and computation complexity and justify the correctness.

CO2. For a given Search problem (Linear Search and Binary Search) student will able to implement it.

CO3. For a given problem of Stacks, Queues and linked list student will able to implement it and analyze the same to determine the time and computation complexity.

CO4. Student will able to write an algorithm Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort and compare their performance in term of Space and Time complexity.

CO5. Student will able to implement Graph search and traversal algorithms and determine the time and computation complexity.

Text Books:

1. "Fundamentals of Data Structures", Illustrated Edition by Ellis Horowitz, Sartaj Sahni, Computer Science Press.Hydraulics & Fluid Mechanics – Modi & Seth, Pub. - Standard Book House, N.Delhi

References:

1. Algorithms, Data Structures, and Problem Solving with C++", Illustrated Edition by Mark Allen Weiss, Addison-Wesley Publishing Company
2. "How to Solve it by Computer", 2nd Impression by R.G. Dromey, Pearson Education.

Course code	**HSMC -01G**				
Category	**HUMANITIES AND SOCIAL SCIENCES INCLUDING MANAGEMENT COURSES (HSMC)**				
Course title	**ECONOMICS FOR ENGINEERS**				
Scheme and Credits	L	T	P	**Credits**	Semester-V
	2	0	0	2	
Objectives:	• Acquaint the students to basic concepts of economics and their operational significance. • To stimulate the students to think systematically and objectively about contemporary economic problems.				
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

UNIT-I

Definition of Economics- Various definitions, types of economics- Micro and Macro Economics, nature of economic problem, Production Possibility Curve, Economic laws and their nature, Relationship between Science, Engineering, Technology and Economic Development.

Demand- Meaning of Demand, Law of Demand, Elasticity of Demand- meaning, factors affecting it, its practical application and importance.

UNIT-II

Production- Meaning of Production and factors of production, Law of variable proportions, Returns to scale, Internal and external economies and diseconomies of scale.

Various concepts of cost of production- Fixed cost, Variable cost, Money cost, Real cost, Accounting cost, Marginal cost, Opportunity cost. Shape of Average cost, Marginal cost, Total cost etc. in short run and long run.

UNIT-III

Market- Meaning of Market, Types of Market- Perfect Competition, Monopoly, Monopolistic Competition and Oligopoly (main features).

Supply- Supply and law of supply, Role of demand & supply in price determination and effect of changes in demand and supply on prices.

UNIT-IV

Indian Economy- Nature and characteristics of Indian economy as under developed, developing and mixed economy (brief and elementary introduction), Privatization - meaning, merits and demerits. Globalization of Indian economy - merits and demerits.

Banking- Concept of a Bank, Commercial Bank- functions, Central Bank- functions, Difference between Commercial & Central Bank.

COURSE OUTCOMES

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

CO1 - The students will able to understand the basic concept of economics.
CO2 - The student will able to understand the concept of production and cost.
CO3 - The student will able to understand the concept of market.
CO4 - The student will able to understand the concept of privatization, globalization and banks.

REFERENCES:

1. Jain T.R., Economics for Engineers, VK Publication.
2. Chopra P. N., Principle of Economics, Kalyani Publishers.
3. Dewett K. K., Modern economic theory, S. Chand.
4. H. L. Ahuja., Modern economic theory, S. Chand.
5. Dutt Rudar & Sundhram K. P. M., Indian Economy.
6. Mishra S. K., Modern Micro Economics, Pragati Publications.
7. Singh Jaswinder, Managerial Economics, dreamtech press.
8. A Text Book of Economic Theory Stonier and Hague (Longman's Landon).
9. Micro Economic Theory – M.L. Jhingan (S.Chand).
10. Micro Economic Theory - H.L. Ahuja (S.Chand).
11. Modern Micro Economics : S.K. Mishra (Pragati Publications).
12. Economic Theory - A.B.N. Kulkarni & A.B. Kalkundrikar (R.Chand & Co).

Course code	**HSMC -03G**				
Category	**HUMANITIES AND SOCIAL SCIENCES INCLUDING MANAGEMENT COURSES (HSMC)**				
Course title	**FINANCIAL ACCOUNTING**				
Scheme and Credits	L	T	P	**Credits**	Semester-V
	2	0	0	2	
Objectives:	The role of accounting is to provide information to investors, policy-makers, regulators, and other decision-makers to facilitate the allocation of resources in society. The purpose of this course is to understand the accounting process and to develop skills necessary to evaluate an enterprise's financial position and its operating, investing and financing activities				
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

UNIT-I

Theoretical Framework:Accounting as an information system, the users of financial accounting information and their needs. Qualitative characteristics of accounting, information. Functions, advantages and limitations of accounting. Branches of accounting. Bases of accounting; cash basis and accrual basis.

The nature of financial accounting principles – Basic concepts and conventions: entity, money measurement, going concern, cost, realization, accruals, periodicity, consistency, prudence (conservatism), materiality and full disclosures.

Financial accounting standards: Concept, benefits, procedure for issuing accounting standards in India. International Financial Reporting Standards (IFRS): - Need and procedures, Convergence to IFRS, Distinction between Indian Accounting Standards (Ind ASs) and Accounting Standards (ASs).

Accounting Process From recording of a business transaction to preparation of trial balance including adjustments: Capital and Revenue expenditure & receipts, Preparation trial balance, Profit and Loss Account and Balance Sheet(Sole Proprietorship only).

UNIT-II

Business Income: Measurement of business income-Net income: the accounting period, the continuity doctrine and matching concept. Objectives of measurement. Revenue: concept, revenue recognition principles, recognition of expenses.

The nature of depreciation. The accounting concept of depreciation. Factors in the measurement of depreciation. Methods of computing depreciation: straight line method and diminishing balance method; Disposal of depreciable assets-change of method

Inventories: Meaning. Significance of inventory valuation. Inventory Record Systems: periodic and perpetual. Methods: FIFO, LIFO and Weighted Average. Preparation of financial statements of not for profit organizations.

UNIT-III

Accounting for Hire Purchase and Installment System, Consignment, and Joint Venture:Accounting for Hire Purchase Transactions, Journal entries and ledger accounts in the books of Hire Vendors and Hire purchaser for large value items including default and repossession, stock and debtors system. Consignment: Features, Accounting treatment in the books of the consignor and consignee.

Joint Venture: Accounting procedures: Joint Bank Account, Records Maintained by Coventurer of all transactions and only his own transactions. (Memorandum joint venture account).

UNIT-IV

Accounting for Inland Branches Inland Branches; Dependent branches only and Ascertainment of Profit by Debtors Method & Stock and Debtors Method.

Accounting for Dissolution of Partnership Firm Dissolution of the Partnership Firm Including Insolvency of partners, sale to a limited company and piecemeal distribution.

Computerized Accounting System (using any popular accounting software); Creation of Vouchers; recording transactions; preparing reports, cash book, bank book, ledger accounts, trial balance, Profit and loss account, Balance Sheet.

Learning outcomes

After studying this course, you should be able to:

- define bookkeeping and accounting
- explain the general purposes and functions of accounting
- explain the differences between management and financial accounting
- describe the main elements of financial accounting information – assets, liabilities, revenue and expenses
- identify the main financial statements and their purposes.

References:

1. Lal, Jawahar and Seema Srivastava, Financial Accounting, Himalaya Publishing House.

2. Monga, J.R., Financial Accounting: Concepts and Applications, Mayoor Paper Backs, New Delhi.

3. Shukla, M.C., T.S. Grewal and S.C.Gupta. Advanced Accounts. Vol.-I. S. Chand & Co., New Delhi.

4. S. N. Maheshwari, Financial Accounting, Vikas Publication, New Delhi. T.S, Grewal, Introduction to Accounting, S. Chand and Co., New Delhi

5. P.C. Tulsian, Financial Accounting, Tata McGraw Hill, New Delhi.

6. Bhushan Kumar Goyal and HN Tiwari,Financial Accounting,Vikas publishing House, New Delhi.

7. Jain, S.P. and K.L. Narang. Financial Accounting. Kalyani Publishers, New Delhi.

Course code	**OEC –ME-301G**				
Category	**OPEN ELECTIVE COURSES(OEC)**				
Course title	**AIR AND NOISE POLLUTION AND CONTROL**				
Scheme and Credits	L	T	P	**Credits**	Semester-VI
	2	0	0	2	
Objectives:	To impart knowledge on the sources, effects and control techniques of air pollutants and noise pollution.				
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

UNIT-I

Atmosphere as a place of disposal of pollutants – Air Pollution – Definition – Air Pollution and Global Climate – Units of measurements of pollutants – Air quality criteria – emission standards – National ambient air quality standards – Air pollution indices – Air quality management in India.

UNIT-II

Sources and classification of air pollutants – Man made – Natural sources – Type of air pollutants – Pollution due to automobiles – Analysis of air pollutants – Chemical, Instrumental and biological methods. Air pollution and its effects on human beings, plants and animals – Economic effects of air pollution – Effect of air pollution on meteorological conditions – Changes on the Meso scale, Micro scale and Macro scale.

UNIT-III

Sampling and measurement of particulate and gaseous pollutants – Ambient air sampling – Stack sampling. Environmental factors – Meteorology – temperature lapse rate and stability – Adiabatic lapse rate – Wind Rose – Inversion – Wind velocity and turbulence –Plume behaviour – Dispersion of air pollutants- Air Quality Modeling.

Control of gaseous contaminants: Absorption, Adsorption, Condensation and Combustion, Control of sulphur oxides, nitrogen oxides, carbon monoxide, and hydro carbons.Automotive emission control, catalytic convertor, Euro-I, Euro-II and Euro-III specifications, Indian specifications.

UNIT-IV

Noise Pollution: Basics of acoustics and specification of sound; sound power, sound intensity and sound pressure levels; plane, point and line sources, multiple sources; outdoor and indoor

noise propagation; psycho-acoustics and noise criteria, effects of noise on health, annoyance rating schemes; special noise environments: Infra-sound, ultrasound, impulsive sound and sonic boom; noise standards and limit values; noise instrumentation and monitoring procedure, Noise indices.

OUTCOMES: The students completing the course will have

- an understanding of the nature and characteristics of air pollutants, noise pollution and basic concepts of air quality management
- ability to identify, formulate and solve air and noise pollution problems
- ability to design stacks and particulate air pollution control devices to meet applicable laws.

TEXTBOOKS:

- C. S. Rao, "Environmental Pollution Control Engineering", Wiley Eastern Limited, 2000.
- M. N. Rao, H. V. N. Rao, Air pollution, Tata McGraw Hill Pvt Ltd, New Delhi, 1993
- Dr. Y. Anjaneyulu, "Air Pollution and Control Technologies", Allied publishers Pvt. Ltd., 2002.

REFERENCES:

- Noel De Nevers, "Air pollution control Engineering", McGraw Hill International Edition, McGraw Hill Inc, New Delhi, latest edition
- Air Pollution act, India, latest edition
- Peterson and E.Gross Jr., "Hand Book of Noise Measurement", latest edition
- Mukherjee, "Environmental Pollution and Health Hazards", causes and effects, latest edition
- Antony Milne, "Noise Pollution: Impact and Counter Measures", David & Charles PLC, latest edition
- Kenneth wark, Cecil F.Warner, "Air Pollution its Origin and Control", Harper and Row Publishers, New York, latest edition
- Peavy, Rowe and Tchobanoglous: Environmental Engineering.
- Martin Crawford: Air Pollution Control Theory.
- Warkand Warner: Air Pollution: Its Origin and Control.
- Keshav Kant and Rajni Kant, "Air Pollution and Control Engineering", Khanna Publishing House.
- Environmental Noise Pollution – PE Cunniff, McGraw Hill, New York, latest edition
- Nevers: Air Pollution Control Engineering.
- M. P. Poonia and S C Sharma," Environmental Engineering, Khanna Publishing House.
- My cock, Mc Kenna and Theodore: Handbook of Air Pollution Control Engineering and
- Technology. Suess and Crax ford: W.H.O. Manualon Urban Air Quality Management
- OP Gupta,Elements of Environmental Polluton Control, Khanna Publishing House.

Course code	**OEC –ME-303G**				
Category	**OPEN ELECTIVE COURSES(OEC)**				
Course title	**INSTALLATION TESTING & MAINTENANCE OF ELECTRICAL EQUIPMENTS**				
Scheme and Credits	L	T	P	**Credits**	Semester-VI
	2	0	0	2	
Objectives:	The course content should be taught and implemented with the aim to develop required skills in the students so that they are able to acquire following competency: Undertake installation, commissioning and maintenance of various power system• components and equipment.				
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

UNIT-I

Installation of Electrical Equipements: Introduction Unloading of electrical equipment at site Inspection Storage Foundation Alignment of electrical machines Tools/Instruments necessary for installation Inspection, storage and handling of transformer, switchgear and induction motor Preparation of technical report

Commissioning And Testing:Tests before commissioning of electrical equipment :Electrical and Mechanical test Specific tests on - transformer, induction motor, alternator, synchronous power and electrical power installation Need of gradually loading of Various Tests to be performed after commissioning and before starting the machine Various instruments required for testing Commissioning of switchgear Test report on commissioning and test certificate electrical equipment Preparations before commissioning of power transformer Commissioning- power transformer, three phase induction motor Transformer insulation oil: Properties as per IS, sampling, testing and filtering/purifying, standard tests as per IS Measurement of insulation resistance of different equipments/machines Methods of Drying the winding of electrical equipments and its record Classification and measurement of insulation resistance, Polarization Index Appropriate insulation test for specific purpose Factor affecting

UNIT-II

Maintenance Of Electrical Equipments: General aspect of maintenance, Classification Preventive maintenance-concept, classification, advantages, activities, functions of the Maintenance Department Breakdown maintenance-concept, advantages, activities Reasons of failure of electrical equipment due to poor maintenance Factors for preparing maintenance schedule Frequency of maintenance Maintenance schedule of transformer below and above 1000kVA Maintenance schedule - induction motor, circuit Breaker, overhead line, storage Battery Probable faults due to poor maintenance in transformer, induction motor, circuit breaker, overhead lines and battery

UNIT-III

Trouble Shooting:Causes of fault in electrical equipments- Internal and external Instruments and tools for trouble shooting Common troubles in electrical equipment – DC Machines, AC Machines, Transformers, Circuit- breaker, under-ground cable, electrical Installation Need of trouble shooting chart, advantages Trouble shooting chart – DC Motor, DC Generator, Transformer, Synchronous Motor, Induction Motor, Circuit-breaker Trouble shooting chart for Domestic appliances- electrical iron, ceiling fan, Washing machine, Air cooler, Vacuum cleaner Fluorescent tube light: Construction, working and troubleshooting chart

UNIT-IV

Earthing:Necessity of earthing System earthing : advantage of neutral earthing of generator in power station Equipment earthing: Objective Types of earth electrodesMethods of earthing : plate earthing,pipe earthing and coil earthing Earthing in extra high voltage and underground cable Earthing resistance- factor affecting Determination of maximum permissible resistance of the earthing system Measurement of earth resistance: voltmeterammeter method, earth tester method, ohm meter method and earth loop tester method Define: earthing , grounding and bonding Comparison between equipment earthing and system grounding Earthing procedure - Building installation, Domestic appliances, Industrial premises Earthing in substation, generating station and overhead line

Electrical Accidents And Safety: Causes of electrical accidents Factors affecting the severity of electrical shock Actions to be taken when a person gets attached to live part Safety regulations and safety measures Indian electricity supply act 1948- 1956 Factory act 1948 Procedure of shut down for sub- station and power lines Permit to work : certificate of (i)requisition for shut down(ii) Permit to work and (iii)Line clear certificate Instruction for the safety of persons working on a job with a permit to work Fire extinguishers- For fixed installation and portable devices

COURSE OUTCOMES (COs): The theory should be taught and practical should be undertaken in such a manner that students are able to acquire different learning outcomes in cognitive, psychomotor and affective domains to demonstrate the following course outcomes:

- Unload the electrical equipments/machines based on scientific procedure
- Commission various electrical equipment/machines
- Prepare maintenance schedule of different equipment and machines
- Prepare trouble shooting chart for various electrical equipment, machines and domestic appliances v. Carry out different types of earthing
- Apply electrical safety regulations and rules during maintenance.

REFERENCES:

1. Testing Commissioning operation and maintenance of Electrical Equipments by Rao S, Khanna Publication (Latest edition)

2. Installation, commissioning & maintenance of Electrical equipments by Singh TARLOK, S.K.Kataria & Sons, New Delhi, latest edition

3. Electrical power system by Wadhwa C.L., New Age international Publications.

Course code	**OEC –ME-305G**				
Category	**OPEN ELECTIVE COURSES(OEC)**				
Course title	**MICROPROCESSOR AND INTERFACING**				
Scheme and Credits	L	T	P	**Credits**	Semester-VI
	2	0	0	2	
Objectives:	This course deals with the systematic study of the Architecture and programming issues of 8086-microprocessor family and interfacing with other peripheral ICs and co-processor. In addition, various 32-bit and 64 bit microprocessors are introduced. The aim of this course is to give the students basic knowledge of the microprocessors needed to develop the systems using it.				
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

UNIT-I

Architecture of 8085: Functional block diagram—Registers, ALU, Bus systems. Pin configuration, Timing and control signals, Machine cycle and timing diagrams. Interrupts—Types of interrupt, interrupt structure.

Programming of 8085: Instruction format, Addressing modes, Instruction set. Development of assembly language programs.

UNIT-II

Interfacing Devices:(a).The 8255 PPI chip: Architecture, pin configuration, control words, modes and Interfacing with 8085. (b). The 8254 PIC chip: Architecture, pin configuration, control words, modes and Interfacing with 8085.

UNIT-III

Interrupt and DMA controller: The 8259 Interrupt controller chip: Architecture, pin configuration, control words, modes.

Introduction to Microcontrollers, comparison with Microprocessor, Architecture and programming of 8051 microcontroller & brief introduction to PIC Microcontroller.

UNIT-IV

Architecture of 8086: Functional block diagram of 8086, details of sub-blocks such as EU, BIU,memory segmentation, physical address computations, pin configuration, program relocation, Minimum and Maximum modes of 8086— Block diagrams and machine cycles. UNIT6. Programming of 8086: Instruction format, Addressing modes, Instruction set and programs.

Course Outcomes: At the end of the course, a student will be able to:

- Explain the architecture, pin configuration of various microprocessors and Interfacing ICs
- Identify various addressing modes
- Perform various microprocessor based programs
- Apply the concepts of 8086 programming like interfacing, interrupts, stacks & subroutines.
- Interpret & Solve various automation based problems using microprocessor

TEXT BOOKS:

1. Microprocessor Architecture, Programming & Applications with 8085: Ramesh S Gaonkar; Wiley Eastern Ltd.

2. Microprocessor and applications – A.K.Ray. , TMH

REFERENCES:

1. Microprocessors and interfacing : Hall; TMH

2. The 8088 & 8086 Microprocessors-Programming, interfacing,Hardware& Applications :Triebel& Singh; PHI

3. Microcomputer systems: the 8086/8088 Family: architecture, Programming &Design : Yu-Chang Liu & Glenn A Gibson; PHI.

4. Advanced Microprocessors and Interfacing :Badri Ram; TMH.

Course code	**LC-ME -311G**				
Category	Engineering Science courses				
Course title	**COMPUTER AIDED DESIGN & MANUFACTURING LAB**				
Scheme and Credits	L	T	P	**Credits**	Semester-VI
	0	0	2	1	
Objectives:	At the end of the course, the student shall be able to: Display of the basic fundamentals of modeling package. Explore the surface and solid modeling features. Learning the techniques of 3D modeling of various mechanical parts.				
Class work mark	25 Marks				
Practical mark	25 Marks				
Total	50 Marks				
Duration of Exam	03 Hours				

List of Experiments:

The students will be required to carry out the following exercises using software packages (e.g. Solid works / Pro Engineer/AutoCAD/ I-Deas/ Solid Edge/CURA etc.)

1. CAD Modeling Assignments
   (i) Use and learn import/export techniques and customization of software.
   (ii) Construction of simple machine parts and components like Coupling, Crankshaft, Pulley, Piston , Connecting rod, nuts, bolts, gears and helical springs
   (iii) Assembly drawing with sectioning and bill of materials from given detailed drawings of assemblies: Lathe Tail stock, Machine vice, Pedestal bearing, Drill jigs and Milling fixture.
   (iv) Make the part family/family table of a bolt.

2. CAM Assignments Tool path generation, Part programming, G & M codes development for machining operations, Physical interpretation of machining features and tool geometries.

3. To perform reverse engineering of a product using 3D scanner.

4. To print coupling, crankshaft, pulley, piston, connecting rod, nuts, bolts with FDM 3D printer with suitable filament like Nylon, ABS etc.

5. To print a product with FDM 3D printer which is developed with reverse engineering.

6. To Draw Orthographic projection Drawings (Front, Top and side) of boiler safety valve giving name the various components of the valve.

7. Make an Isometric dimensioned drawing of a connecting Rod using isometric grid and snap.

8. Draw 3D models by extruding simple 2D objects, dimension and name the objects.

Course Outcomes (COs): At the end of the course, the student shall be able to:

CO 1- Display of the basic fundamentals of modeling package.

CO 2- Explore the surface and solid modeling features.

CO 3- Learning the techniques of 3D modeling of various mechanical parts.

CO 4- To expedite the procedure and benefits of FEA and CAE.

Note:-

1. At least Five experiments are to be performed in the semester.
2. At least five experiments should be performed from the above list. Remaining three experiments may either be performed from the above list or designed & set by the concerned institute as per the scope of the syllabus.
3. The students will be required to carry out the following exercises using educational software (AutoCAD, I-DEAS, Pro-Engineer etc).

Coursecode	LC-CSE-211G				
Category	Professional Core Course				
Coursetitle	Digital Electronics Lab				
Scheme and Credits	L	T	P	Credits	Semester 3
	0	0	3	1.5	
Class work	25 Marks				
Exam	25 Marks				
75	100 Marks				
Duration of Exam	03 Hours				

Implementation all experiments with help of Bread- Board.

1. Study of Logic Gates: Truth-table verification of OR, AND, NOT, XOR, NAND and NOR gates;
2. Realization of OR, AND, NOT and XOR functions using universal gates.
3. Half Adder / Full Adder: Realization using basic and XOR gates.
4. Half Subtractor / Full Subtractor: Realization using NAND gates.
5. 4-Bit Binary-to-Gray & Gray-to-Binary Code Converter: Realization using XOR gates.
6. 4-Bit and 8-Bit Comparator: Implementation using IC7485 magnitude comparator chips.
7. Multiplexer: Truth-table verification and realization of Half adder and Full adder.
8. Demultiplexer: Truth-table verification and realization of Half subtractor and Full subtractor.
9. Flip Flops: Truth-table verification of JK Master Slave FF, T-type and D-type FF.
10. Asynchronous Counter: Realization of 4-bit up counter and Mod-N counter.
11. Synchronous Counter: Realization of 4-bit up/down counter and Mod-N counter.
12. Shift Register: Study of shift right, SIPO, SISO, PIPO, PISO & Shift left operations.
13. DAC Operation: Study of 8-bit DAC, obtain staircase waveform.
14. ADC Operations: Study of 8-bit ADC

Course code	**LC-ME -315G**				
Category	Engineering Science courses				
Course title	**KINEMATICS OF MACHINES LAB**				
Scheme and Credits	L	T	P	**Credits**	Semester-V
	0	0	2	1	
Objectives:	• To understand the kinematics and rigid- body dynamics of kinematically driven machine components. • To understand the motion of linked mechanisms in terms of the displacement, velocity and acceleration at any point in a rigid link. • To be able to design some linkage mechanisms and cam systems to generate specified output motion. • To understand the kinematics of gear trains.				
Class work mark	25 Marks				
Practical mark	25 Marks				
Total	50 Marks				
Duration of Exam	03 Hours				

List of Experiments:

1. To study various types of Kinematic links, pairs, chains and Mechanisms.
2. To study inversions of 4 Bar Mechanisms, Single and double slider crank mechanisms.
3. To plot slider displacement, velocity and acceleration against crank rotation for single slider crank mechanism.
4. To find coefficient of friction between belt and pulley.
5. To study various type of cam and follower arrangements.
6. To plot follower displacement vs cam rotation for various Cam Follower systems.
7. To generate spur gear involute tooth profile using simulated gear shaping process.
8. To study various types of gears – Helical, cross helical worm, bevel gear.
9. To study various types of gear trains – simple, compound, reverted, epicyclic and differential.
10. To find co-efficient of friction between belt and pulley.
11. To study the working of Screw Jack and determine its efficiency.
12. Create various types of linkage mechanism in CAD and simulate for motion outputs and study the relevant effects.
13. Creation of various joints like revolute, planes, spherical, cam follower and study the degree of freedom and motion patterns available.
14. To design a cam profile by using the requirement graph using on-line engineering handbook and verify the same using a 3D mechanism on CAD.

Course Outcomes (COs): After studying this course, students will be able:

CO 1- Understand the various practical demonstrations of mechanism.

CO 2- Knowledge of Motions in mechanism with practical demonstration.

CO 3- Learning the Special purpose machine members used in designing of a machine.

CO 4- Synthesis of working model using the various linkages.

Note:

1. At least ten experiments are to be performed in the Semester.

2. At least eight experiments should be performed from the above list. However these experiments should include experiments at Sr. No. 12, 13 and 14. Remaining two experiments may either be performed from the above list or as designed & set by the concerned institution as per the scope of the syllabus.

Coursecode	LC-CSE-213G				
Category	Professional Core Course				
Coursetitle	Data Structure & Algorithms Lab Using C				
Scheme and Credits	L	T	P	Credits	Semester 3
	0	0	3	1.5	
Class work	25 Marks				
Exam	25 Marks				
Total	50 Marks				
Duration of Exam	03 Hours				

Data Structures Lab List of practical exercises, to be implemented in C Language.

1. Write a menu driven program that implements following operations (using separate functions) on a linear array:
   - Insert a new element at end as well as at a given position
   - Delete an element from a given whose value is given or whose position is given
   - To find the location of a given element
   - To display the elements of the linear array
2. Write a menu driven program that maintains a linear linked list whose elements are stored in on ascending order and implements the following operations (using separate functions):
   - Insert a new element
   - Delete an existing element
   - Search an element
   - Display all the elements
3. Write a program to demonstrate the use of stack (implemented using linear array) in converting arithmetic expression from infix notation to postfix notation.
4. Program to demonstrate the use of stack (implemented using linear linked lists) in evaluating arithmetic expression in postfix notation.
5. Program to demonstration the implementation of various operations on a linear queue represented using a linear array.
6. Program to demonstration the implementation of various operations on a circular queue represented using a linear array.
7. Program to demonstration the implementation of various operations on a queue represented using a linear linked list (linked queue).
8. Program to illustrate the implementation of different operations on a binary search tree.
9. Program to illustrate the traversal of graph using breadth-first search
10. Program to illustrate the traversal of graph using depth-first search.
11. Program to sort an array of integers in ascending order using bubble sort.
12. Program to sort an array of integers in ascending order using selection sort.
13. Program to sort an array of integers in ascending order using insertion sort.
14. Program to sort an array of integers in ascending order using radix sort.
15. Program to sort an array of integers in ascending order using merge sort.
16. Program to sort an array of integers in ascending order using quick sort.
17. Program to sort an array of integers in ascending order using heap sort.
18. Program to sort an array of integers in ascending order using shell sort.
19. Program to demonstrate the use of linear search to search a given element in an array.
20. Program to demonstrate the use of binary search to search a given element in a sorted array in ascending order.

<table>
<tr><td>Course code</td><td colspan="5">PT-RA -319G</td></tr>
<tr><td>Category</td><td colspan="5">Engineering Science courses</td></tr>
<tr><td>Course title</td><td colspan="5">PRACTICAL TRAINING -I</td></tr>
<tr><td rowspan="2">Scheme and Credits</td><td>L</td><td>T</td><td>P</td><td>Credits</td><td rowspan="2">Semester-V</td></tr>
<tr><td>0</td><td>0</td><td>2</td><td>1</td></tr>
<tr><td>Objectives:</td><td colspan="5">• Achieving the objectives of the University and its colleges and departments in practical training.
• Providing students with practical skills, which match the requirements of the job market and allow them to directly enter the work community in a serious and constructive manner.
• Providing students with experience to help them take decisions pertaining to their future career objectives.
• Providing college students the full opportunity to apply theoretical knowledge (gained during their studies) in a real work environment at a later stage of their studies.
• Developing the student's understanding of the needs of the job market and reaching this understanding successfully.
.</td></tr>
<tr><td>Class work mark</td><td colspan="5">25 Marks</td></tr>
<tr><td>Practical mark</td><td colspan="5">25 Marks</td></tr>
<tr><td>Total</td><td colspan="5">50 Marks</td></tr>
<tr><td>Duration of Exam</td><td colspan="5">03 Hours</td></tr>
</table>

PRACTICAL TRAINING VIVA-VOCE:

1) **Assessment of Practical Training-I, undergone at the end of IV semester, will be based on seminar, viva-voce, report and certificate of practical training obtained by the student from the industry/** Professional organization/ Research Laboratory with the prior approval of the Director-Principal/ **Mechanical Software /Automobile Workshop. According to performance letter grades A, B, C, F are to be awarded:**

Excellent : A ; Good : B ; Satisfactory : C ; Not satisfactory : F.

A student who has been awarded 'F' grade will be required to repeat the practical training.

2) Each student has to undergo practical training of 4/6 weeks during summer vacation and its evaluation shall be carried out in the V semester.

Course code	MC-315G			
Category	Mandatory Course			
Course title	**Essence of Indian Traditional Knowledge**			
Scheme and credits	L	T	P	Credits
	2	0	0	0

Course Contents

- Basic structure of Indian knowledge System:
- Modern Science and Indian Knowledge System
- Yoga and Holistic Health care
- Case studies

References

1. V. Sivaramakrishnan (Ed.), *Cultural Heritage of India-course material*, Bharatiya Vidya Bhavan, Mumbai. 5th Edition, 2014
2. Swami Jitatmanand, *Modern Physics and Vedant*, Bharatiya Vidya Bhavan
3. Swami Jitatmanand, *Holistic Science and Vedant*, Bharatiya Vidya Bhavan
4. Fritzof Capra, *Tao of Physics*
5. Fritzof Capra, *The Wave of life*
6. VN Jha (Eng. Trans.), *Tarkasangraha of Annam Bhatta*, International Chinmay Foundation, Velliarnad, Arnakulam
7. *Yoga Sutra of Patanjali*, Ramakrishna Mission, Kolkata
8. GN Jha (Eng. Trans.), Ed. RN Jha, *Yoga-darshanam with Vyasa Bhashya*, Vidyanidhi Prakashan, Delhi 2016
9. RN Jha, *Science of Consciousness Psychotherapyand Yoga Practices*, Vidyanidhi Prakashan, Delhi 2016
10. P B Sharma (English translation), Shodashang Hridayan

Course code	**PCC-ME -302G**				
Category	Professional Core Courses				
Course title	**Manufacturing Technology-II**				
Scheme and Credits	L	T	P	**Credits**	Semester-VI
	3	0	0	3	
Objectives:	(i) To provide knowledge onmachines and related tools for manufacturing various components. (ii) To understand the relationship between process and system in manufacturing domain. (iii) To identify the techniques for the quality assurance of the products and the optimality of the process in terms of resources and time management.				
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

UNIT-I

Mechanism of Metal Cutting: Deformation of metal during machining, nomenclature of lathe, milling tools, mechanics of chip formation, built-up edges, mechanics of orthogonal and oblique cutting, Merchant cutting force circle and shear angle relationship in orthogonal cutting, factors affecting tool forces. Cutting speed, feed and depth of cut, surface finish. Temperature distribution at tool chip interface. Numerical on cutting forces and Merchant circle.

Cutting Tool Materials & Cutting Fluids: Characteristics of tool materials, various types of cutting tool materials, coated tools, cutting tool selection, Types of tool wear, tool life, factors governing tool life, Purpose and types of cutting fluids, basic actions of cutting fluids, effect of cutting fluid on tool life, selections of cutting fluid.

UNIT-II

Unconventional Machining Processes: Abrasive jet machining: Principles, applications, process parameters. Ultrasonic machining: Principles, applications, analysis of process parameters. Electro-chemical machining and grinding: Principles, classifications, choice of electrolytes, applications. Electric discharge machining: Principles, selection of tools materials and dielectric fluid. Electron beam machining: Generation of electron beam, relative merits and demerits. Laser beam machining: Principles and applications.

Jigs & Fixtures: Introduction, location and location devices, clamping and clamping devises, Drill Jigs, Milling Fixtures.

UNIT-III

Numerical Control of Machine Tools; Introduction, Numerical Control & its growth, NC Machines tools, Axes of NC Machines, Classification of NC System, CNC, DNC and Machining Centre. Machine Control unit, NC tools & Tool changer.

Manual Part Programming; coordinate, Feed, Speed & Tool, Preparation & Miscellaneous functions, Examples of two axes part programming for Turning and Milling Operations, G & M Codes.

UNIT-IV

Group Technology; Definition and concept, Group and Family, working of group technology, Stages for Adopting Group Technology, Advantages of Group Technology.

Component Classification and Coding, Personnel and Group Technology, Planning the introduction of Group Technology, Group Technology layout.

Course Objectives (COs): At the end of the course, the student shall be able to:

CO 1- Acquire knowledge about mechanics of chip formation and to identify the factors related to tool wear and machinability.

CO 2- Learn about different gear manufacturing and gear finishing operations.

CO 3- Select the proper cutting tool material and components of jigs and fixtures.

CO 4- Understand the basics principles of non-conventional machining processes and their applications.

CO 5- Identify and select different measuring instruments for the inspection of different components.

Text Books

1. Manufacturing Technology – Vol. - 2, P.N. Rao, T.M.H, New Delhi
2. Computer Aided Manufacturing: S Kumar & B Kant Khan, Satya Prakashan, New Delhi .

References:

1. Principles of Machine Tools – G.C. Sen & A. Bhattacharya, Tata McGraw Hill, New Delhi
2. Manufacturing Engg.& Tech, Kalpakian, Serope Addison -Wisly Publishing Co. New York.
3. Modern Machining Processes: P.C. Pandey & H.S. Shan, T.M.H. Company, New Delhi
4. Text Book of Production Engineering: P.C. Sharma, S.Chand & Sons.
5. Production Engineering by KC Jain & AK Chilate, PHI, New Delhi

Course code	**PCC-RA -304G**				
Category	Professional Core Courses				
Course title	**Robotics Engineering and Applications**				
Scheme and Credits	L	T	P	**Credits**	Semester-VI
	3	0	0	3	
Objectives:	1. Familiarity with robot terminology, robot types and robotic applications. 2. Formulating transformation matrices and kinematic equations for robots and solving them. 3. Synthesizing robot programs for a variety of applications. 4. Designing the procedures needed to accomplish robotics tasks. 5. Synthesizing robotic components such as actuators, visions systems, and sensors, into a robotics system.				
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

UNIT-I

Introduction History of robots, classification based on geometry, devices, control and path movement, Present status and future trends. Basic components of robotic system. Basic terminology- Accuracy, Repeatability, Resolution, Degree of freedom. Mechanisms and transmission, End effectors, Grippers-different methods of gripping, Mechanical grippers-Slider crank mechanism, Screw type, Rotary actuators, Cam type gripper, Magnetic grippers, Vacuum grippers, Air operated grippers; Specifications of robot.

UNIT-II

Drive systems and Sensors Drive system- hydraulic, pneumatic and electric systems Sensors in robot – Touch sensors, Tactile sensor, Proximity and range sensors, Robotic vision sensor, Force sensor, Light sensors, Pressure sensors.

UNIT-III

Kinematics and Dynamics of Robots 2D, 3D Transformation, Scaling, Rotation, Translation, Homogeneous coordinates, multiple transformation, Simple problems. Matrix representation, Forward and Reverse Kinematics Of Three Degree of Freedom, Homogeneous Transformations, Inverse kinematics of Robot, Robot Arm dynamics, D-H representation of robots, Basics of Trajectory Planning.

UNIT-IV

Robot Control, Programming and Applications Robot Controls-Point to point control, Continuous path control, Intelligent robot, Control system for robot joint, Control actions, Feedback devices, Encoder, Resolver, LVDT, Motion Interpolations, Adaptive control. Introduction to Robotic Programming, On-line and off-line programming, programming examples.
Robot applications- Industrial Applications of Robots for Material handling, Machine loading and unloading, assembly operation, Inspection, continuous arc welding, Spot welding, Spray painting, cleaning, robot for underwater applications etc.

Course Outcomes: At the end of the course, the student shall be able to:

CO 1- Familiar with robot terminology, robot types and robotic applications.

CO 2- Formulate transformation matrices and kinematic equations for robots and solving them.

CO 3- Synthesize robot programs for a variety of applications.

CO 4- Design the procedures needed to accomplish robotics tasks.

CO 5- Synthesize robotic components such as actuators, visions systems, and sensors, into a robotics system.

Text Books & References Books:

1. Mikell P Groover, Nicholas G Odrey, Mitchel Weiss, Roger N Nagel, Ashish Dutta, “Industrial Robotics, Technology programming and Applications", McGraw Hill, 2012.
2. Craig. J. J. “Introduction to Robotics- mechanics and control”, Addison- Wesley, 1999. Reference Books:
3. S.R. Deb, “Robotics Technology and flexible automation”, Tata McGraw-Hill Education., 2009.
4. 4ichard D. Klafter, Thomas .A, ChriElewski, Michael Negin, "Robotics Engineering an Integrated Approach", PHI Learning., 2009.
5. Francis N. Nagy, Andras Siegler, "Engineering foundation of Robotics", Prentice Hall Inc., 1987.
6. P.A. Janaki Raman, "Robotics and Image Processing an Introduction", Tata McGraw Hill Publishing company Ltd., 1995.
7. Carl D. Crane and Joseph Duffy, "Kinematic Analysis of Robot manipulators", Cambridge University press, 2008.
8. Fu. K. S., Gonzalez. R. C. & Lee C.S.G., “Robotics control, sensing, vision and intelligence”, McGraw Hill Book co, 1987
9. Ray Asfahl. C., “Robots and Manufacturing Automation”, John Wiley & Sons Inc.,1985

Course code	PCC-EE-309G				
Category	Professional Core Courses				
Course title	**MICROPROCESSOR & MICROCONTROLLER**				
Scheme and Credits	L	T	P	**Credits**	Semester-V
	3	0	0	3	
Objectives:	1. To develop an in-depth understanding of the operation of microprocessors. 2. To master the assembly language programming using concepts like assembler directives, procedures, macros, software interrupts etc. 3. To create an exposure to basic peripherals, its programming and interfacing techniques 4. To understand the concept of Interrupts and interfacing details of 8086. 5. To impart the basic concepts of serial communication in 8086.				
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

UNIT-I

8086 MICROPROCESSORS

Introduction to 8086 Architecture, Features, Signals, I/O & Memory Interfacing, Addressing Modes, Interrupts, Minimum Mode & Maximum Mode Operation, Instruction Set, Assembly Language Programming.

UNIT-II

PERIPHERAL DEVICES

Parallel Peripheral Interface (8255), A/D & D/A Interface, Timer / Counter (8253), Keyboard and Display Controller (8279), USART (8251), Interrupt Controller (8259), DMA Controller (8237)

UNIT-III

INTRODUCTION OF MICROCONTROLLER

Different types of microcontrollers: Embedded microcontrollers, External memory microcontrollers; Processor Architectures: Harvard V/S Princeton , CISC V/S RISC; microcontrollers memory types; microcontrollers features : clocking, i/o pins, interrupts, timers, peripherals.

UNIT-IV

8051 ARCHITECTURE

Microcontroller 8051- Architecture, Pin Diagram, I/O Ports, Internal RAM and Registers, Interrupts, Addressing Modes, Memory Organization and External Addressing, Instruction Set, Assembly Language Programming, Real Time Applications of Microcontroller- Interfacing with LCD, ADC, DAC, Stepper Motor, Key Board and Sensors.

Course Outcome (COs): At the end of the course, the student shall be able to:

CO 1- Understand the knowledge of operations of microprocessor.

CO 2- Understand the assembly language programming using concepts like assembler directives, procedures, macros, software interrupts

CO 3- Acquire knowledge about basic concepts of serial communication in 8086

CO 4 - Learn about the concept of Interrupts and interfacing details of 8086.

References:

1. Mazidi and Mazidi: The 8051 Microcontroller and Embedded Systems, Pearson Education.
2. V. Deshmukh: Microcontroller (Theory and Application), TMH.
3. D. V. Hall: Microprocessors and Interfacing, TMH
4. Programming and Customizing the 8051 Microcontroller: Predko; TMH

Course code	**PCC-RA -308G**				
Category	Professional Core Courses				
Course title	**Artificial Intelligence in Robotics**				
Scheme and Credits	L	T	P	**Credits**	Semester-VI
	3	0	0	3	
Objectives:	1) To provide historical perspective of AI and its foundation. 2) To provide the most fundamental knowledge to the students so that they become familiar with basic principles of AI towards problem solving, inference, knowledge representation and learning. 3) Explore application of AI techniques in Expert systems, Neural Networks. 4) Explore the current trends, potential, limitations, and implications of AI.\ 5) Explore AI in robotics				
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

UNIT-I

Introduction: Definition of AI, History of AI, Need for AI in Robotics, nature of AI problems, examples of AI problems.

Problem solving by search: Uninformed Search: Depth First Search (DFS), Breadth First Search (BFS). Informed Search: Best First Search, A*. Local Search: Hill Climbing. Problem Reduction Search: AO*. Population Based Search: Ant Colony Optimization, Genetic Algorithm. Game Playing: Min Max Algorithm, Alpha-Beta Pruning.

UNIT-II

Knowledge Representation: Types of Knowledge, Knowledge Representation Techniques/schemes: Propositional Logic, Predicate Logic, Semantic nets, Frames. Knowledge representation issues. Rule based systems.

Reasoning under Uncertainty: Basics of Probability Theory, Probabilistic Reasoning,
Bayesian Reasoning, Dempster-Shafer Theory.

Planning: Introduction to Planning, Representation of Planning, Partial-order Planning.

UNIT III

Learning: Introduction to Learning, Types of Learning: Learning by Induction, Rote Learning, Symbol Based Learning, Identification Trees, Explanation Based Learning, Transformational Analogy, Introduction to Neural Networks, Expert Systems, Current trends in Artificial Intelligence

UNIT-IV

AI IN ROBOTICS:

Robotic perception, localization, mapping- configuring space, planning uncertain movements, dynamics and control of movement, Ethics and risks of artificial intelligence in robotics.

Course Outcomes (COs): At the end of the course, the student shall be able to:

CO 1- Identify problems that are amenable to solution by AI methods.
CO 2- Identify appropriate AI methods to solve a given problem.
CO 3- Formalise a given problem in the language/framework of different AI methods.
CO4- Implement basic AI algorithms.
CO5- Design and carry out an empirical evaluation of different algorithms on a problem formalisation, and state the conclusions that the evaluation supports

Text Books:

1. Artificial Intelligence: A Modern Approach Third Edition Stuart Russell and Peter Norvig, 2010, Pearson Education.
2. Stuart Russell, Peter Norvig, "Artificial Intelligence: A modern approch", Pearson Education, India2003.
3. Negnevitsky, M, "Artificial Intelligence: A guide to Intelligent Systems",. Harlow: Addison-Wesley, 2002.
4. David Jefferis, "Artificial Intelligence: Robotics and Machine Evolution", Crabtree Publishing Company, 1992.

References:

1. Elaine Rich, Kevin Knight, & Shivashankar B Nair, Artificial Intelligence, McGraw Hill, 3rd ed.,2009.
2. Introduction to Artificial Intelligence & Expert Systems, Dan W Patterson, PHI.,2010.
3. Artificial intelligence, Patrick Henry Winston, 1992, Addition Wesley 3 Ed.

Course code	**LC-ME -310G**				
Category	Engineering Science courses				
Course title	**WORKSHOP LAB -I**				
Scheme and Credits	L	T	P	**Credits**	Semester-VI
	0	0	3	1.5	
Objectives:	To study and practice the various operations that can be performed in lathe, shaper, drilling, milling machines,NC,CNC machine etc. To understanding with the practical knowledge required in the core industries and different types of components using the machine tools.				
Class work mark	25 Marks				
Practical mark	25 Marks				
Total	50 Marks				
Duration of Exam	03 Hours				

List of Experiments: (MANUFACTURING TECHNOLOGY –II LAB)

1. Study and Practice of Orthogonal & Oblique Cutting on a Lathe.
2. Machining time calculation and comparison with actual machining time while cylindrical turning on a Lathe and finding out cutting efficiency.
3. Study of Tool Life while Milling a component on the Milling Machine.
4. Study of Tool Wear of a cutting tool while Drilling on a Drilling Machine.
5. Study of Speed, Feed, Tool, Preparatory (Geometric) and miscellaneous functions for N. C part programming.
6. Part Programming and proving on a NC lathe for:- a. Outside Turning b. Facing and Step Turning c. Taper Turning d. Drilling e. Outside Threading
7. Part Programming and Proving on a NC Milling Machine:-
    a. Point to Point Programming
    b. Absolute Programming
    c. Incremental Programming
8. Part Programming and Proving for Milling a Rectangular Slot.

Course Outcome (COs): At the end of the course, the student shall have practical exposure of:
CO 1- vapour power cycles and find and compare different cycles based on their performance parameters and efficiencies.
CO 2- steam boilers, their types and components.
CO 3- fundamentals of flow of steam through a nozzle.
CO 4- steam turbines and can calculate their work done and efficiencies.
CO 5- types and working of condensers and compressors and define their different types of efficiencies

NOTE:

1. At least Six experiments are to be performed in the Semester.

Course code	**LC-RA -312G**				
Category	Engineering Science courses				
Course title	**Robotics Engineering and Application Lab**				
Scheme and Credits	L	T	P	**Credits**	Semester-VI
	0	0	2	1	
Objectives:	To introduce different types of robotics and demonstrate them to identify different parts and components. To write programming for simple operations.				
Class work mark	25 Marks				
Practical mark	25 Marks				
Total	50 Marks				
Duration of Exam	03 Hours				

List of Experiments:

1. Determination of maximum and minimum position of links.
2. Verification of transformation (Position and orientation) with respect to gripper and world coordinate system
3. Estimation of accuracy, repeatability and resolution.
4. Robot programming and simulation for pick and place
5. Robot programming and simulation for Colour identification
6. Robot programming and simulation for Shape identification
7. Robot programming and simulation for machining (cutting, welding)
8. Robot programming and simulation for writing practice
9. Robot programming and simulation for any industrial process (Packaging, Assembly)
10. Robot programming and simulation for multi process.

Course Outcomes (COs): After studying this course, students will be able:

CO 1- Use of any robotic simulation software to model the different types of robots and calculate work volume for different robots

NOTE:

1. At least ten experiments are to be performed in the Semester.
2. At least seven experiments should be performed from the above list. Remaining three experiments may either be performed from the above list or designed & set by the concerned institution as per the scope of the syllabus.

Coursecode	LC-EE-311G				
Category	Professional Core Course				
Coursetitle	Microprocessor and Microcontroller Lab				
Scheme and Credits	L	T	P	Credits	Semester 5
	0	0	2	1	
Class work	25 Marks				
Exam	25 Marks				
75	100 Marks				
Duration of Exam	03 Hours				

Notes:

(i) At least 10 experiments are to be performed by students in the semester.

(ii) At least 7 experiments should be performed from the list, remaining three experiments may either be performed from the above list or designed and set by the concerned institution as per the scope of the syllabus.

(iii) Group of students for practical should be 15 to 20 in number.

List of Experiments:

1. Write a program using 8085 and verify for:
   a. Addition of two 8-bit numbers.
   b. Addition of two 8-bit numbers (with carry).
2. Write a program using 8085 and verify for:
   a. 8-bit subtraction (display borrow)
   b. 16-bit subtraction (display borrow)
3. Write a program using 8085 for multiplication of two 8- bit numbers by repeated addition method. Check for minimum number of additions and test for typical data.
4. Write a program using 8085 for multiplication of two 8- bit numbers by bit rotation method and verify.
5. Write a program using 8086 for finding the square root of a given number and verify.
6. Write a program using 8086 for copying 12 bytes of data from source to destination and verify.
7. Write a program using 8086 and verify for:
   a. Finding the largest number from an array.
   b. Finding the smallest number from an array.
8. Write a program using 8086 for arranging an array of numbers in descending order and verify.
9. Write a program using 8086 for arranging an array of numbers in ascending order and verify.
10. Write a program to interface a two-digit number using seven-segment LEDs. Use 8085/8086 microprocessor and 8255 PPI.
11. Write a program to control the operation of stepper motor using 8085/8086 microprocessor and 8255 PPI.
12. To study implementation & interfacing of Display devices Like LCD, LED Bar graph & seven segment display with Microcontroller 8051/AT89C51
13. To study implementation & interfacing of Different motors like stepper motor, DC motor & servo Motors.
14. Write an ALP for temperature & pressure measurement
15. Write a program to interface a graphical LCD with 89C51

Note:

1. Each laboratory group shall not be more than about 20 students.

2. To allow fair opportunity of practical hands-on experience to each student, each experiment may either done by each student individually or in group of not more than 3-4 students. Larger groups be strictly discouraged/disallowed.

Course code	**LC-RA-316G**				
Category	Professional Core Ccourses				
Course title	**Artificial Intelligence Lab Using Python**				
Scheme and Credits	L	T	P	**Credits**	Semester-V
	0	0	2	1	
Class work mark	25 Marks				
Practical mark	25 Marks				
Total	50 Marks				
Duration of Exam	03 Hours				

List of Experiments:

1. Write a Program to Implement Breadth First Search using Python.
2. Write a Program to Implement Depth First Search using Python.
3. Write a Program to Implement Tic-Tac-Toe game using Python.
4. Write a Program to Implement 8-Puzzle problem using Python.
5. Write a Program to Implement Water-Jug problem using Python.
6. Write a Program to Implement Travelling Salesman Problem using Python.
7. Write a Program to Implement Tower of Hanoi using Python.
8. Write a Program to Implement Monkey Banana Problem using Python.
9. Write a Program to Implement Missionaries-Cannibals Problems using Python.
10. Write a Program to Implement 8-Queens Problem using Python.

Note: At least 5 to 10 more exercises to be given by the teacher concerned.

Course code	**PCC-ME -318 G**				
Category	Professional Core Courses				
Course title	**SEMINAR**				
Scheme and Credits	L	T	P	**Credits**	Semester-VI
	0	0	2	1	
Objectives:	1. To teach the student how to face interview and presentation given and remove their hesitation and improve their communications skills and overall personal developments.				
Practical Class mark	25 Marks				
Total	25Marks				
Duration of Exam	03 Hours				

Selecting of Seminar Topics by Teacher or concerned to teacher by students. A seminar topic given by students in semester.

Course code	**PEC-ME -320G**				
Category	Professional Elective Courses				
Course title	**INTERNAL COMBUSTION ENGINES & GAS TURBINES**				
Scheme and Credits	L	T	P	**Credits**	Semester-VI
	3	0	0	3	
Objectives:	1. To familiarize with the terminology associated with IC engines. 2. To understand the basics of IC engines. 3. To understand combustion, and various parameters and variables affecting it in various types of IC engines. 4. To learn about various systems used in IC engines and the type of IC engine required for various applications				
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

UNIT-I

Air Standard Cycles: Internal and external combustion engines; classification of I.C. Engines, Cycles of operation in four stroke and two stroke I.C. Engines, Wankel Engines, Assumptions made in air standard cycle; Otto cycle; diesel cycle, dual combustion cycle, comparison of Otto, diesel and dual combustion cycles; sterling and Ericsson cycles; air standard efficiency, specific work output, specific weight; work ratio; mean effective pressure; deviation of actual engine cycle from ideal cycle. Problems.

Carburetion, fuel Injection and Ignition systems: Mixture requirements for various operating conditions in S.I. Engines; elementary carburetor, Requirements of a diesel injection system; types of inject systems; petrol injection, Requirements of ignition system; types of ignition systems ignition timing; spark plugs. Problems.

UNIT-II

Combustion in I.C. Engines: S.I. engines; Ignition limits; stages of combustion in S.I. Engines; Ignition lag; velocity of flame propagation; detonation; effects of engine variables on detonation; theories of detonation; octane rating of fuels; pre-ignition; S.I. engine combustion chambers, Stages of combustion in C.I. Engines; delay period; variables affecting delay period; knock in C.I. engines, Cetane rating; C.I. engine combustion chambers.

Lubrication and Cooling Systems: Functions of a lubricating system, Types of lubrication system; mist, wet sump and dry sump systems; properties of lubricating oil; SAE rating of lubricants, engine performance and lubrication, Necessity of engine cooling; disadvantages of overcooling; cooling systems; air-cooling, water cooling; radiators.

UNIT-III

Engine Testing and Performance: Performance parameters: BHP, IHP, mechanical efficiency, brake mean effective pressure and indicative mean effective pressure, torque, volumetric efficiency; specific fuel consumption (BSFC, ISFC), thermal efficiency; heat balance; Basic engine measurements; fuel and air consumption, brake power, indicated power and friction power, heat lost to coolant and exhaust gases; performance curves. Problems.

Air pollution from I.C. Engine and Its remedies: Pollutants from S.I. and C.I. Engines, Methods of emission control; alternative fuels for I.C. Engines; the current scenario on the pollution front.

UNIT-IV

Rotary Compressors: Root and vane blowers; Static and total head values; Centrifugal compressors- Velocity diagrams, slip factor, ratio of compression, pressure coefficient, pre-whirl; Axial flow compressor- Degree of reaction, polytropic efficincy, surging, choking and stalling, performance characteristics, Problems.

Gas Turbines: Brayton cycle; Components of a gas turbine plant; open and closed types of gas turbine plants; Optimum pressure ratio; Improvements of the basic gas turbine cycle; multi stage compression with intercooling; multi stage expansion with reheating between stages; exhaust gas heat exchanger, Applications of gas turbines. Problems.

Course Outcomes (COs): At the end of the course, the student shall be able to:

CO 1- Understand the Air Standard Cycles with their applications.
CO 2- Analyze carburetion, injection and ignition systems with new technologies.
CO 3- Conceptualize Combustion System of IC Engines.
CO 4- Knowledge of Lubrication and Cooling systems and fuel cells.
CO 5- Analyses the gas turbines.

Text Books:

1. Internal Combustion Engines –V. Ganesan, Pub.-Tata McGraw-Hill.
2. Gas Turbines - V. Ganesan, Pub.- Tata McGraw Hill.
3. Engineering fundamental of the I.C.Engine – Willard W. Pulkrabek Pub.-PHI,India

References:

1. Internal Combustion Engines & Air pollution- Obert E.F, Pub.-Hopper & Row Pub., New York
2. Internal Combustion Engines Fundamentals- John B. Heywood, Pub.-McGraw Hill, New York
3. Fundamentals of Internal Combustion Engines-H.N. Gupta, PHI, New Delhi

Course code	**PEC-ME -322G**				
Category	Professional Elective Courses				
Course title	**WELDING TECHNOLOGY**				
Scheme and Credits	L	T	P	**Credits**	Semester-VI
	3	0	0	3	
Objectives:	1. To study essential concepts for welding processes. 2. To study various techniques for weld testing. 3. To study the concept special welding processes and welding automation.				
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

UNIT-I

Oxy-Acetylene Welding: Introduction: Welding processes and their principles, Industrial Applications, Principles of Oxy- Acetylene Welding, Procedure, Types of flames, Poping, Flash Back and Fire. Equipment and Accessories: Torches, Regulators, Pressure Gauges, Gas Cylinders, Filler Rods and Welding Fluxes. Welded Joints and their Defects: Types of Joints and Welding Positions, Common Welding Defects and their control.

Automation in Welding: Introduction, Manual Welding, Semi-Automatic Welding, Automatic Welding, Welding Mechanization, Flexible Automated Welding, Robotic Welding, Types of Welding Robots, Robot Selection Mechanics, Joint tracking system.

UNIT-II

Electric Arc Welding: Principle of Electric Arc Welding: Principle, Welding Procedure, Arc Length, Arc Force and Arc Blow. Equipment and Accessories: Welding Machines, A.C. and D.C. Transformers, Motor Generators, Rectifiers, Use of Tong Tester for measuring welding currents, Types of Electrodes and Indian system of classification and coding of covered Electrodes for Mild Steels.

UNIT-III

Special and Allied Welding Processes: Resistance Welding: Principle, Types and Applications, Equipment and Machinery required. Metal Inert Gas Arc Welding (MIG): Principle, Advantage of Gas Shielded Arc Welding, Types of Metal Transfer, Welding Equipment and Shielding Gases, MIG Welding and its components.CO_2 Welding: Difference from MIG Welding, Principle of operation, Welding Equipments, Welding Parameters, Joint Design, Welding Procedure, Advantages, Disadvantages and Applications. Tungsten Inert Gas Arc Welding: Welding Equipment-Electrodes, Inert gases and Torches, Inert gas shielded, Spot welding Processes. Submerged Arc Welding: Principle of the Process and its Applications, Fluxes and Welding Rods. Soldering and Brazing: Soft and Hard Solders, Fluxes, Soldering Iron, Soldering procedure, principle of Brazing and different methods of Brazing, Comparison between Brazing and Soldering.

UNIT-IV

Destructive Testing of Welds: Destructive tests: their advantage and Types such as Tensile Test, Bend Test, Impact Test, Hardness Test, Fatigue Tests, Equipment required and the test piece Geometry. Computer systems for Welding Engineering: Introduction, computer systems, software for welding engineers, magdata, weld cost, weld vol, distortcalc, cut best, weld best, ferrite predictor and weld selector.

Non Destructive Testing of Welds: Non Destructive Tests: their Advantages and Limitations, Comparison with Destructive Tests, Visual Examination, Dye Penetrant Inspection, Magnetic Particle Inspection, X-Rays and Gamma Rays Inspection and Ultrasonic Inspection of Welds. Standards/ codes for welding.

Course Outcome (COs): At the end of the course, the student shall be able to:

CO 1- Lay down Principles and applications of oxyacetylene and electric arc welding.

CO 2- Understand various types of weld testing.

CO 3- Have Knowledge of techniques of welding automation.

CO 4- Describe methods of advanced and special welding processes. Course Contents:

Text Books: 1. Welding and Welding Technology by R. Little- Tata McGraw Hill Publication.

2. Welding Processes and Technology by R. S. Parmar- Khanna Publication.

References:

1. Welding Technology by Koeingsberger, J. R. Adair- Macmillan.

2. Welding Technology by Rossi- Mc Graw Hill Publications.

3. Welding Handbook, Eighth Edition, Vol. 1 & 2- American Welding Society.

4. Welding, Hoffman, Pearson Indian Education Services, Pvt. Ltd. India

Course code	**PEC-ME -324G**				
Category	Professional Elective Courses				
Course title	**AIRCRAFT TECHNOLOGY**				
Scheme and Credits	L	T	P	**Credits**	Semester-VI
	3	0	0	3	
Objectives:	To understand the principles of operation of aircrafts, aerodynamics, general familiarization of aircraft engine systems, maintenance procedures and standard practices.				
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

UNIT-I

Principles of Flight: History of flights, Aircraft configurations, Flight control systems; Mechanical control, Powered control, Fly-By-Wire and digital Fly-By-Wire control systems, flying limits, Airframe & engine manufacturers.

Aircraft Thermodynamics: First law of thermodynamics, Second law of thermodynamics, Air standard cycles, Brayton cycle & its variants.

UNIT-II

Aircraft Propulsion: Thrust, Thrust equation, Propulsive efficiency, Factors effecting thrust, Fundamentals of gas turbine engines, Aircraft engine construction, Classification of compressors; centrifugal and axial compressor, Effect of pressure, velocity & temperature change through the compressor, classification of combustion chambers and performance, classification of gas turbines & operation, convergent/divergent nozzles, Type of aircraft engines; turbo jet, turbo-prop & turbo fan engines.

UNIT-III

Aerodynamics of Airplanes: Basics of aerodynamics, Wing airfoil profile and effects, Thrust, drag, lift & gravity, Control surfaces; aileron, elevator, rudder, slat, flap & spoiler, servo tab etc. Thrust reversers.

Engine Systems, Inspection& Maintenance: Fuel system, Lubrication system, Compressor air flow control system, Turbine vanes and blade cooling, Full authority digital electronic engine control, Engine starting and ignition, Fire protection system, Engine Inlet cowling anti icing, environmental control system, engine indicating system, Standard practices of aero engine maintenance, engine overhauling, Bore scope inspection.

UNIT-IV

Miscellaneous Aviation: Concepts and flight of Helicopter, Drone, Air taxi, Rocket etc. History & overview of air war fare, Difference between civil & fighter craft aerodynamics & engines,

Development &types of fighter crafts, fighter craft weapons & firing, Safety, maintenance & emergency features. Maritime fighters.

Course Outcomes (COs): At the end of the course, the student shall be able to:

CO 1- Explore principles of flight and the basic thermodynamics involved.

CO 2- Have knowledge of Propulsion fundamentals and application of gas turbine system in aircraft.

CO 3- Understand aerodynamics, different aircraft systems, inspection and maintenance.

CO 4- Explore different aviation systems along with fighter crafts.

References:

1. Kermode, A.C. Flight without formulae, Pearson Education; latest edition

2. Anderson, J.D. Introduction to flights, McGraw-Hill latest edition

3. Engineering Thermodynamics- P K Nag, Tata McGraw Hill

4. Thermodynamics: An Engineering Approach- Cengel and Boles, McGraw Hill Company

5. Hill P.G & Peterson, C.R. "Mechanics & Thermodynamics of propulsion" Pearson education latest edition

6. United Technologies' Pratt & Whitney, "The Aircraft Gas Turbine Engine and its Operation

7. Kroes & Wild, "Aircraft Power Plants", 7th Edition- McGraw Hill, New York, latest edition

8. Mekinley, J.L and R.D. Bent, Aircraft Power Plants, McGraw Hill latest edition

9. Teager, S, "Aircraft Gas Turbine Technology, McGraw Hill latest edition

10. Aviation Maintenance Technician Hand Book- Power Plant Volume -2 FAA-H-8083-32.

Course code	**PEC-ME -326G**				
Category	Professional Elective Courses				
Course title	**RELIABILITY, AVAILABILITY & MAINTAINABILITY**				
Scheme and Credits	L	T	P	**Credits**	Semester-VI
	3	0	0	3	
Objectives:	The objective of the course is to provide the students with the fundamental concepts, the necessary knowledge and the basic skills related to systems reliability, availability and maintainability.				
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

UNIT-I

Introduction to Reliability Availability and Maintainability (RAM), Development of RAM Engineering, Reliability Availability and Maintainability utilization factors, down time consequences. Failure data analysis, MTBF, MTBR, MTTR, Reliability improvement and apportionment;

UNIT-II

Concept of terro-technology; Statistical distribution associated with reliability engineering.; Quantitative measures of reliability, Bath tub curve; Quantitative; Fault tree analysis (FTA),Failure mode and effect analysis (FMEA), Failure mode, effect and criticality analysis (FMECA).

UNIT-III

Reliability engineering fundamentals and applications, Historical perspectives, Definition of Reliability, Role of Reliability evaluation, Reliability assessment, relationship between Different Reliability functions, typical Hazard functions, Mean time to failure, Cumulative Hazard function and average failure rate.

Application of Probability distribution function in Reliability evaluation combinational Aspects of Reliability, Markov models optimization of system Reliability, Heuristic Methods applied to optimal system Reliability.

UNIT-IV

Maintainability : Definition and application of Maintainability Engineering, Factors affecting Maintainability. Maintainability design criteria, operating and down time categories, Mean time to activity restore equipment, Mean Maintenance man hours, Mean time for corrective and Preventive Maintenance, measures of maintainability and measures to assure maintainability.

Availability, types of Availability, Steady state availability, approaches to increase equipment Availability, Markov analysis of availability.

Course Outcomes: At the end of his course, the students will be able to:

CO 1 Evaluate the reliability of a system and its subcomponents

CO 2 Gain the necessary knowledge about failure distributions and apply failure maintenance techniques.

CO 3 Perform reliability analysis of a system and designing the same CO 4 Estimate systems availability and maintainability,

CO 4 Develop the Markov model for the mechanical systems.

References:

1. Reliability Engineering Fundamentals R. Ramakumar

2 Maintainability, Availability and Dimitri Kececelogu

3. Reliability Engineering Govil

4. Reliability Engineering Balguruswamy

5. Elsayed A. Elsayed, Reliability is Engineering, Addison Wesley, latest edition

6.Cher Ming Tan, "Reliability Assessment of Integrated Circuits and its misconception", Nova Science Publisher, Inc, latest edition

Course code	**HSMC-02G**				
Category	**HUMANITIES AND SOCIAL SCIENCES INCLUDING MANAGEMENT COURSES (HSMC)**				
Course title	**ORGANIZATIONAL BEHAVIOUR**				
Scheme and Credits	L	T	P	**Credits**	Semester-V
	2	0	0	2	
Objectives:	The objective of this course is to expose the students to basic concepts of management and provide insights necessary to understand behavioral processes at individual, team and organizational level.				
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

UNIT-I

Introduction of Management- Meaning, definitions, nature of management; Managerial levels, skills and roles in an organization; Functions of Management: Planning, Organizing, staffing, Directing & Controlling, Interrelationship of managerial functions, scope of management & Importance of management. Management and social responsibility, difference between management and administration.

UNIT-II

Introduction of organization:-Meaning and process of Organization, Management v/s Organization;
Fundamentals of Organizational Behavior: Concepts, evolution, importance and relationship with other Fields; Contemporary challenges and opportunities of OB.
Individual Processes and Behavior-Personality- Concept, determinants and applications; Perception- Concept, process and applications, Learning- Concept ,theories ; Motivation- Concept, techniques and importance.

UNIT-III

Interpersonal Processes- Teams and Groups- Definition of Group, Stages of group development, Types of groups, meaning of team, merits and demerits of team; difference between team and group, Conflict- Concept, sources, types, management of conflict; Leadership: Concept, function, styles & qualities of leadership.
Communication – Meaning, process, channels of communication, importance, barriers and overcome of communication.

UNIT-IV

Organizational Processes: Organizational structure - Meaning and types of organizational structure and their effect on human behavior; Organizational culture - Elements, types and factors affecting organizational culture. Organizational change: Concept, types & factors affecting organizational change, Resistance to Change.

Course Outcomes :On completion of this course, the students will be able

CO1: Students will be able to apply the managerial concepts in practical life.

CO2: The students will be able to understand the concept of organizational behavior at individual level and interpersonal level.
CO3: Students will be able to understand the behavioral dynamics in organizations.
CO4: Students will be able to understand the organizational culture and change.

References:

1. Robbins, S.P. and Decenzo, D.A. Fundamentals of Management, Pearson Education Asia, New Delhi.
2. Stoner, J et. al, Management, New Delhi, PHI, New Delhi.
3. Satya Raju, Management – Text & Cases, PHI, New Delhi.
4. Kavita Singh, Organisational Behaviour: Text and cases. New Delhi: Pearson Education.
5. Pareek, Udai, Understanding Organisational Behaviour, Oxford University Press, New Delhi.
6. Robbins, S.P. & Judge, T.A., Organisational Behaviour, Prentice Hall of India, New Delhi.
7. Ghuman Karminder, Aswathappa K., Management concept practice and cases, Mc Graw Hill education.
8. Chhabra T. N., Fundamental of Management, Sun India Publications-New Delhi.

Course code	**HSMC-04G**				
Category	**HUMANITIES AND SOCIAL SCIENCES INCLUDING MANAGEMENT COURSES (HSMC)**				
Course title	**HUMAN RESOURCE MANAGEMENT**				
Scheme and Credits	L	T	P	**Credits**	Semester-V
	2	0	0	2	
Objectives:	1. To acquaint the students with the concept and function of human resource management 2. To learn the various human resource systems and programme in an organization to achieve higher productivity 3. To acquaint the students with knowledge of career planning and development, occupational safety, health and wellbeing and union management relationship.				
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

UNIT-I

Human Resource Management: concept and scope; Roles, responsibilities and competencies of HR manager; Challenges to HR professionals; Human Resource Planning & Forecasting: significance and process.

UNIT-II

HR Sourcing: Recruitment, Selection and Induction. Job Analysis: job Description and job Specification; Job Design: concept and methods; Job Evaluation-concept &methods; Performance appraisal and counselling.

UNIT-III

Training: training process and methods; Career planning and Development; Succession planning; Employee Compensation: basic concepts & determinants;

UNIT-IV

Industrial Relations and Grievance Handling; Employee welfare; Dispute Resolution; International Human Resource Management; Contemporary Issues in HRM. HR Audit &Accounting, ethics & corporate social responsibility.

Course Outcomes :On completion of this course, the students will be able

CO1: To develop the understanding of the concept of human resource management and to understand its relevance in organizations.

CO2: To develop necessary skill set for application of various HR issues.

CO3: To analyse the strategic issues and strategies required to select and develop manpower resources.

CO4: To integrate the knowledge of HR concepts to take correct business decisions.

Suggested Readings: 1. K. Aswathapa Human resource Management: Text and cases, 6th edition, Tata McGraw Hill, New Delhi,2012

2. Uday Kumar Haldar &Juthika Sarkar(2012) Human resource Management New Delhi, Oxford University Press.

3. De Cenvo, Da & Robbins S.P.(2010) Fundamentals of Human Resource Management, 9th edition, New York, John Wiley & Sons.

4. Gary Dessler (2008) Human Resource Management, 11th edition New Delhi: Pearson Prentice Hall.

5. Tanuja Agarwala, Strategic Human resource Management, Oxford University Press 2007.

References:

1. Handbook of Industrial and Organizational Psychology: Personnel Psychology(Vol. 1). New Delhi: Sage Publications, New Delhi. Armstrong, M. latest edition

2. A Handbook of Human Resource Management Practice (9th ed.). New Delhi : Kogan Page India, Aswathappa, K. latest edition

3. Managing Human Resources. India: Thomson Asi Private Limited. Bratton, J. & Gold, J. latest edition

4. Human Resource Management Theory and Practice (4th ed.), New York, NY: Palgrave Macmillan. Cascio, W.F &Aguinis, H. latest edition

Course code	**HSMC-06G**				
Category	**OPEN ELECTIVE COURSES(OEC)**				
Course title	**INDUSTRIAL PSYCHOLOGY**				
Scheme and Credits	L	T	P	**Credits**	Semester-V
	2	0	0	2	
Objectives:	1. To acquaint students with the applications of psychometric tools and inventories in organizations 2. To acquaint the students with the tools of behavioral and organizational interventions & develop the skills to analyze behavioral issues in organizations. 3. To gain an understanding of the functioning of an organizations through organized field visit. 4. To gain firsthand experience through focused group discussions.				
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

UNIT-I

Structured Experience Students need to learn to plan, design and conduct the structured exercises in any of the following areas under supervisor supervision: self-awareness, team building, interpersonal skills, leadership skills, perception, decision-making and problem solving, creativity, power and politics, communication skills, conflict, stress management, motivation and goal setting, or any recent developments.

UNIT-II

HRD Instruments: (any five: administered, scored, interpreted and discussed) Role efficacy, role stress, coping styles, HRD climate, TOBI, SPRIO, MAOB, emotional intelligence, ENNEAGRAM, conflict management styles, OCTAPACE, leadership, trust, life and goal planning or any recent developments.

Field Visit: Students will get firsthand experience of the organization. Can take up any project given by the organization and write a report. A student can undertake specific or overall activity of the organizations in consultation with the supervisor. The student can choose any organization and write a report: education sector, government sector, health sector, banking sector, service industry, NGO, or any recent developments.

UNIT-III

Force-field Analysis and Appreciative Inquiry Students will conduct with the help of supervisor all the steps of force field analysis (identifying the problem and identifying the desired state; identifying the forces involved, and determining the strengths of each force. Action plans for increasing driving forces and reducing restraining forces and appreciative inquiry (4 D approach: discovery, dreaming, designing and destiny) as an OD intervention. After conducting the same students will write the report of the same.

UNIT-IV

Focused Group Discussion Either students conduct a focus group based on need diagnostic or problem focused group study in any area of consumer behavior (customers of sales, retail, banking, insurance, aviation etc) or industrial / organizational psychology/human resource and submit a report. a) Select the team b) Select the participants c) Decide on time and location d) Prepare for and conduct focus group discussion e) Submit a report .

Course Learning Outcomes (CLOs) By the end of this course, students will be able to demonstrate the following:

1. Describe major topics and subspecialties including critical theory and research finding that have defined the field of I/O psychology
2. Describe the complicated systems of individual and group psychological processes involved in the world of work
3. Connect the basic principles of I/O psychology to personnel and human resources management within the organization
4. Describe the ways in which individual career choices and work-lefe success can be improved through the benefits of I/O psychology
5. Use APA style writing and to enhance psychological writing

References:

1. Barbour, R. (2007). Doing Focus Groups. Los Angeles: Sage Publications. Clark, A.W. latest edition
2. Experimenting with organizational life: The action research approach. New York: Plenum Press. Cooperrider, D.L., Whitney, D. &Stavros, J.M. latest edition
3. Appreciative Inquiry Handbook: For Leaders of Change (2nd ed.). San Francisco, USA: Berrett – Koehler Publishers Inc. French, W.L., Cecil, H.B., & Vohra, V. latest edition
4. Organizational Development: Behavioral Science Interventions for Organization Improvement (latest ed.). New Delhi: Prentice Hall. Krueger, R.A., Casey, M.A. latest edition
5. Focus Groups: A practical guide for Applied Research (latest ed.). Los Angeles: Sage Publications, Los Angeles. Litosselitti, L. latest edition
6. Using Focus Groups in Research. New York, NY:Continuum. Pareek, U. & Purhoit, S. latest edition
7. Training Instruments in HRD and OD (3rd ed.). New Delhi: Tata McGraw Hill. Pfeiffer, J.W. &Jones, J.E. latest edition
8. A Handbook of structured Experiences for Human Relations Training. San Diego, CA: University Associates Inc. Sayeed, O.B & Pareek, U. latest edition
9. Actualizing Managerial Roles: Studies in Role Efficacy. New Delhi: Tata McGraw – Hill Publishing Company Limited. Watkins, J.M., Bernard, J., Kelly, M.R. latest edition
10. Appreciative Inquiry: Change at the Speed of Imagination (2nd ed.). USA: John Wiley and Sons Inc.

Course code	**HSMC-08G**				
Category	**HUMANITIES AND SOCIAL SCIENCES INCLUDING MANAGEMENT COURSES (HSMC)**				
Course title	**FUNDAMENTALS OF MANAGEMENT**				
Scheme and Credits	L	T	P	**Credits**	Semester-V
	2	0	0	2	
Objectives:	Students will be able to understand the how evolution of Management and contribution of Management thinkers. The importance of staffing and training ;the concept of material management and inventory control; the components of marketing and advertising ;various sources of finance and capital structure.				
Class work	25 Marks				
Exam	75 Marks				
Total	100 Marks				
Duration of Exam	03 Hours				

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

UNIT-I

Meaning of management, Definitions of Management, Characteristics of management, Management vs. Administration. Management-Art, Science and Profession. Importance of Management. Development of Management thoughts. Principles of Management. The Management Functions, Inter-relationship of Managerial functions. Nature and Significance of staffing, Personnel management, Functions of personnel management, Manpower planning, Process of manpower planning, Recruitment, Selection; Promotion - Seniority Vs. Merit. Training - objectives and types of training.

UNIT-II

Production Management : Definition, Objectives, Functions and Scope, Production Planning and Control; its significance, stages in production planning and control. Brief introduction to the concepts of material management, inventory control; its importance and various methods.

UNIT-III

Marketing Management - Definition of marketing, marketing concept, objectives & Functions of marketing. Marketing Research - Meaning; Definition; objectives; Importance; Limitations; Process. Advertising - meaning of advertising, objectives, functions, criticism.

UNIT-IV

Introduction of Financial Management, Objectives of Financial Management, Functions and Importance of Financial Management. Brief Introduction to the concept of capital structure and various sources of finance.

Course outcomes:

Students will be able to understand

CO1 - Evolution of Management and contribution of Management thinkers.

CO2 - importance of staffing and training

CO3 - the concept of material management and inventory control

CO4 - the components of marketing and advertising

CO5 - various sources of finance and capital structure

TEXT BOOKS: 1. Principles and Practice of Management - R.S. Gupta, B.D.Sharma, N.S. Bhalla.(Kalyani Publishers)

2. Organisation and Management - R.D. Aggarwal (Tata Mc Graw Hill)

REFERENCES:

1. Principles & Practices of Management – L.M. Prasad (Sultan Chand & Sons)

2. Management – Harold, Koontz and Cyrilo Donell (Mc.Graw Hill).

3. Marketing Management – S.A. Sherlikar (Himalaya Publishing House, Bombay).

4. Financial Management - I.M. Pandey (Vikas Publishing House, New Delhi)

5. Management - James A.F. Stoner & R.Edward Freeman, PHI.