M.D.UNIVERSITY, ROHTAK

(NAAC Accredited 'A+' Grade)

SCHEME OF STUDIES AND EXAMINATION

B.TECH (Robotics and Automation Engineering)

SEMESTER 7th AND 8th
Scheme effective from 2023-24

COURSECODEANDDEFINITIONS:

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
OEC	Open Elective Courses
PCC	Professional Core Courses
LC	Laboratory Courses
MC	Mandatory Courses
PT	Practical Training
S	Seminar
TH	Theory
Pr	Practical
PROJ	Project

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 nonprogrammable 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 $1/3^{rd}$ students of the class should opt for it.

MAHARSHI DAYANAND UNIVERSITY,ROHTAK

Scheme of Studies and Examination of B.TECH (Robotics and Automation Engineering)–7thSemester

w.e.f. 2023-24 (Scheme-G)

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 Theory	Practical	Total	
PCC-RA-401G	Hydraulic and Pneumatics	3	0	0	3	3	25	75	-	100	3
PCC-ME-403G	Entrepreneurship Development	3	0	0	3	3	25	75	-	100	3
PCC-RA-403G	Micro-controller and PLC	3	0	0	3	3	25	75	-	100	3
PCC-RA-405G	Digital Image Processing	3	0	0	3	3	25	75	-	100	3
LC-RA-401G	Hydraulic and Pneumatic Lab	0	0	2	2	1	25	-	25	50	3
PCC-RA-407G	Seminar	0	0	2	2	1	25	-	25	50	3
PROJ-RA-407G	Project-I	0	0	9	9	4.5	25	-	25	50	3
PT-RA-409G	Practical Training-II	0	0	2	2	ReferNote:1(Grading)					
MC-317G	Constitution of India	2	0	0	2	ReferNote:2(Grading)					
TOTAL CREDIT						18.5	175	300	75	550	

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.
PracticalTraining.Excellent:A;Good:B;Satisfactory:C;NotSatisfactory: F.
Note:2 The students will be awarded grades A, B, C & F in Evaluation of Constitution of India. A student who is awarded "F" grade is required to repeat.
Excellent-A; Good-B; Satisfactory-C; Not Satisfactory-F.

MAHARSHI DAYANAND UNIVERSITY, ROHTAK

Scheme of Studies and Examination of B.TECH (Robotics and Automation Engineering)–8thSemester

w.e.f. 2023-24 (Scheme-G)

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 Theory	Practical	Total	
PCC-RA-402G	Flexible manufacturing systems	3	0	0	3	3	25	75	-	100	3
PCC-RA-404G	Sensors & Signal Processing	3	0	0	3	3	25	75	-	100	3
PCC-RA-406G	Advanced Robotics	3	0	0	3	3	25	75	-	100	3
PCC-RA-408G	Neural Networks & FUZZY Systems	3	0	0	3	3	25	75	-	100	3
OEC/HSMC-III	Refer OEC List-III	3	0	0	3	3	25	75	-	100	3
LC-RA-402G	Workshop using MATLAB	0	0	2	2	1	25	-	25	50	3
PCC-RA-410G	Seminar	0	0	2	2	1	50	-	-	50	3
PROJ-RA- 408G	Project-II	0	0	10	10	5	25	-	25	50	3
TOTALCREDIT						22	225	375	50	650	

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

Students have to select any
One Open Elective Course-I from the list of courses.

List-I (Semester-VIII)

S.No.	Code	Name of Course	No. of Contact Hours	Credits
1.	OEC–ME-402G	Operation Research	3	3
2.	OEC–ME-410G	Quality Engineering	3	3
3.	OEC–EE-412G	Electrical Power Generation	3	3
4.	OEC-CSE-430G	Computer Communication	3	3
5.	OEC-CE-448G	Traffic Engineering and Road Safety	3	3
6.	OEC-CE-450G	Disaster Management	3	3
7.	OEC–ECE-453G	Microprocessor Application in Automobiles Sector	3	3
8.	HSMC-10G	Management Information Systems	3	3

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

Course code	PCC-RA-401G				
Category	Professional Core Courses				
Course title	**Hydraulic And Pneumatics**				
Scheme and Credits	L	T	P	**Credits**	Semester-VII
	3	0	0	3	
Objectives:	The course elaborates principles of hydraulic and pneumatic devices, electro-pneumatic components. It gives an overview of control systems associated with hydraulic applications.				
Class work	25Marks				
Exam	75Marks				
Total	100Marks				
Duration of Exam	03Hours				

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

Fluid Power Principles and Fundamentals

Introduction to fluid power, Advantages and applications, Fluid power systems, Types and Properties of Hydraulic fluids, Basics of hydraulics, Principles of flow, Work, Power and Torque, Reynolds number, Influence of temperature on viscosity, High water-based fluid, Fluid preparation, Common fire-resistant fluid, Biodegradable oils.

Hydraulic Linear Actuators

Hydraulic cylinder, Construction of cylinders, Seals in cylinders, Cylinder reliability, Cylinder force, Acceleration and losses, Calculation of cylinder forces, Flow velocity, Cylinder efficiency, Sizing of cylinder tubes, Piston rod design, Mounting style of cylinders, Cushioning of hydraulic cylinder, Hydraulic cylinder and their characteristic application.

UNIT-II

Hydraulic motors

Vane Motor, Gear Motor, Piston motor, Selection of hydro motor, Hydraulic or electrical motor, Hydraulic motor in circuits, Types of hydraulic transmission, Pump motor combination, Open loop and close loop system, Application of hydrostatic transmission.

Filter and Filtration

Nature, effect and sources of contamination, Effect of dirt on hydraulic components, System failure, Contamination level and standardization, Filter rating, Terminology and Design types of filters and Filter construction, Location of filter, Magnetic filter, Optimum filtration, Automatic particle counter and its performance characteristics.

Hydraulic Pumps

Pump classification-Gear Pump, Internal Gear pump, Generator Pump, Screw Pump, Vane Pump, Piston Pumps, Selecting and sizing of Hydraulic pumps, Pump ripple.

UNIT-III

Hydraulic Reservoir and Accumulators

Common types of reservoirs- their mounting and construction, Reservoir shapes and size, Reservoir accessories, Integral reservoirs, Hydraulic accumulator, Accumulators in circuit, Accumulator selection.

Hydraulic Circuits

Hydraulic circuits, Manual or Automatic Hydraulic systems, Regenerative circuits, Use of check Valve in hydraulic circuits, Standards in circuit diagram representation, Speed variation in cylinder motion, Some basic circuits, Functional diagram, Application of functional diagram, Electrical control of hydraulic system.

UNIT-IV

Hydro Pneumatic

Compressibility, Solution, Types of hydro Pneumatic systems, Hydraulic check unit, Hydro pneumatic cylinder, Parallel check unit, Integral air oil cylinder, Types of feed, Intensifier, Comparison of Hydro pneumatic, Hydraulic and pneumatic system.

Automation and Principle of Pneumatic Circuit Design

Pneumatic controls, Functional diagram in pneumatic circuit, Movement diagram, Cascade system of Pneumatic circuit design.

Maintenance and Trouble Shooting of Pneumatic system

Maintenance need of Pneumatic systems, Common problems in Pneumatic system, Maintenance schedule of Pneumatic system, Trouble shooting, Maintenance tips, Flow resistance, Seal failures, Maintenance of air compressor, Instructions for removal of operating troubles of air compressor.

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

CO1. Demonstrate knowledge of fundamental concepts of Pneumatic and Hydraulic control.

CO2. Identify various components of Pneumatic and Hydraulic control systems.

CO3. Design and analyze problems relating to Pneumatic and Hydraulic control systems and components.

Text Books & Reference Books:

1. S.R. Majumdar, Oil Hydraulic Systems-Principles and Maintenance, Tata McGraw Hill.
2. S.R. Majumdar, Pneumatic Systems-Principles and Maintenance, Tata McGraw Hill.
3. Farel Bradbury, Hydraulic Systems and Maintenance, Butterworth & Co (Publishers) Ltd.
4. R. Srinivasan, Hydraulic and Pneumatic Controls, Vijay Nicole.
5. Anthony Esposito, Fluid Power with Applications, PHI/Pearson Education.

Coursecode	PCC-ME-403G				
Category	Professional Core Courses				
Coursetitle	**Entrepreneurship Development**				
SchemeandCredits	L	T	P	**Credits**	Semester-VII
	3	0	0	3	
Objectives:	To familiarize the students with the basics of Entrepreneurship Development.				
Classwork	25Marks				
Exam	75Marks				
Total	100Marks				
Duration of Exam	03Hours				

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have6 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

Entrepreneurship : Concept and Definitions; Entrepreneurship and Economic Development; Types of Entrepreneurs; Factor Affecting Entrepreneurial Growth – Economic, Non-Economic Factors; EDP Programmes; Entrepreneurial Training; Traits/Qualities of an Entrepreneurs; Manager Vs. Entrepreneur, types of entrepreneurships, Entrepreneurial myths.

UNIT-II

Opportunity Identification and Product Selection: Entrepreneurial Opportunity Search & Identification; Criteria to Select a Product; Conducting Feasibility Studies; Sources of business ideas, launching a new product; export marketing, Methods of Project Appraisal, Project Report Preparation; Project Planning and Scheduling.Sources of finance for entrepreneurs.

UNIT-III

Small Enterprises andEnterpriseLaunchingFormalities:DefinitionofSmallScale;Rationale; Objective; Scope;SSI; Registration ;NOC from Pollution Board; Machinery and Equipment Selection ,Role of SSI in Economic Development ofIndia;majorproblemfacedbySSI,MSMEs–DefinitionandSignificanceinIndianEconomy;MSMESchemes,ChallengesandDifficulties in availing MSME Schemes.

UNIT-IV

Role of Support Institutions and Management of Small Business :Director of Industries; DIC; SIDO;SIDBI;SmallIndustriesDevelopmentCorporation(SIDC);SISI;NSIC;NISBUD;State FinancialCorporationSIC;VentureCapital:Concept,venturecapitalfinancingschemesoffered by various financial institutions in India, Legal issues–Forming business entity, considerations and criteria, requirements for formation of a Private/Public Limited Company,

CourseOutcomes(CO'S): At the end of the course,thestudentshallbeableto:

CO1-Students will be able understand who the entrepreneurs areandwhatcompetencesneeded CO2-Students willbeable tounderstand insights into the management, opportunity search, identificationofaproduct,marketflexibilitystudies, projectfinalizationetc.requiredfor small businessenterprise.

CO3-Studentswillbeable to write are portand dooralpresentation onthetopicssuchas productidentification,businessideas, export marketingetc.

CO4-Studentswillbeable toknow the differentfinancialandotherassistanceavailablefor establishingsmallindustrialunits.

TextBooks&ReferenceBooks:

1. "Entrepreneurshipdevelopmentsmallbusinessenterprises",Pearson,PoornimaMCharantimath,2013.
2. RoyRajiv,"Entrepreneurship",OxfordUniversityPress,2011.
3. "InnovationandEntrepreneurship",Harperbusiness-Drucker.F,Peter,2006.
4. "Entrepreneurship", Tata Mc-graw HillPublishing Co.ltd new Delhi- Robert D. Hisrich, Mathew J.Manimala,MichaelP PetersandDeanA.Shepherd,8th Edition,2012
5. EnterpreneurshipDevelopment-S.Chand&Co.,Delhi-S.S.Khanka1999
6. Small-Scale Industries and Entrepreneurship. Himalaya PublishingHouse,Delhi–Vasant Desai2003.
7. EntrepreneurshipManagement-Cynthia,Kaulgud,Aruna,VikasPublishingHouse,Delhi,2003.
8. EntrepreneurshipIdeasinAction-L.Greene,ThomsonAsia Pvt.Ltd.,Singapore,2004.

Coursecode	**PCC-RA-403G**				
Category	ProfessionalCoreCourses				
Coursetitle	**MICROCONTROLLER AND PLC**				
SchemeandCredits	L	T	P	**Credits**	Semester-VII
	3	0	0	3	
Objectives:	• To introduce the basic features, programming methods and applications of Micro • controllers • To study about programming in microcontroller • Discuss different applications in microcontroller • To know about the design of systems using PLC is introduced in detail. • To know about the applications in PLC				
Classwork	25Marks				
Exam	75Marks				
Total	100Marks				
DurationofExam	03Hours				

Note: Examiner willset nine questions in total. Question one willbe compulsory. Question one will have6 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 questionsin total, first being compulsoryandselecting onefromeachunit.

UNIT-I

INTRODUCTION TO MICROCONTROLLER

8051 Architecture:– Memory map - Addressing modes, I/O Ports –Counters andTimers – Serial data - I/O – Interrupts –Instruction set,, Data transfer instructions,Arithmetic and Logical Instructions, Jump and Call Instructions , Assembly LanguageProgramming tools.

UNIT II

MICROCONTROLLER PROGRAMMING& APPLICATIONS

8051 Assembly Language Programming- Block transfer, arithmetic operations, Codeconversion, Time delaygeneration, Interrupt programming, Lookup table techniquesInterfacing of Keyboards – Interfacing of DisplayDevices – Pulse measurement –Analog to Digital and Digital to Analog Converter – Interfacing Hardware Circuit Serial Data Communication – Network Configuration.

UNIT III

PROGRAMMABLE LOGIC CONTROLLERS

Introduction –– Principles of operation – PLC Architecture and specifications – PLChardware components Analog & digital I/O modules , CPU & memory module –Programming devices – PLC ladder diagram, Converting simple relay ladder diagramin to PLC relay ladder diagram. PLC programming Simple instructions – Manuallyoperated switches – Mechanically operated a Proximity switch - Latching relays,

UNIT V

APPLICATIONS OF PROGRAMMABLE LOGIC CONTROLLERS.

Timer instructions - On delay, Off delay, Cyclic and Retentive timers, Up /DownCounters, control instructions – Data manipulating instructions, math instructions;Applications of PLC – Simple materials handling applications, Automatic control ofwarehouse door, Automatic lubrication of supplier Conveyor belt, motor control,Automatic car washing machine, Bottle label detection and process control application.

CourseOutcomes(CO'S): Attheendofthecourse,thestudentshallbeableto:

CO1- Students will be able to introduce the basic features, programming methods and applications of Micro controllers

CO2-Studentswillbeable tostudy about programming in microcontroller

CO3-Studentswillbeable todiscuss different applications in microcontroller

CO4-Studentswillbeable to know about the design of systems using PLC is introduced in detail.

CO5-Studentswillbeable toknow about the applications in PLC

TEXT BOOKS& REFERENCES BOOKS:

1. Muhammad Ali Mazdi ,J.G.Mazdi&R.D.McKinlay "The 8051 Microcontroller&Embedded systems Using assembly & C " 2nd Edition Pearson Education , Inc ,2006
2. Udayasankara.v&Mallikarjunaswamy .M.S ,'8051 Microcontroller, Hardware,Software & Applications ,Tata McGraw Hill Education Pvt Limited. New Delhi ,2009.
3. Gary Dunning , 'Introduction to Programmable Logic Controllers'' ThomsonLearning, 2001.
4. Singh. B.P., "Microprocessors and Microcontrollers", Galgotia Publications (P) Ltd,First edition,New Delhi, 1997.
5. Parr, "Programmable Controllers: An Engineers Guide", 3rd Edition, Elsevier, IndianReprint, 2013
6. Valdes-Perez, Microcontrollers: Fundamentals and Applications with PIC, Taylor &Francis, IndianReprint, 2013.
7. Bolton , "Programmable Logic Controllers" 5th Edition Newnes, ,2009

Coursecode	PCC-RA-405G				
Category	Professional Core Courses				
Coursetitle	**Digital Image Processing**				
SchemeandCredits	L	T	P	**Credits**	Semester-VII
	3	0	0	3	
Objectives:	• To become familiar with digital image fundamentals • To get exposed to simple image enhancement techniques in Spatial and Frequency domain. • To learn concepts of degradation function and restoration techniques. • To study the image segmentation and representation techniques. • To become familiar with image compression and recognition methods				
Classwork	25Marks				
Exam	75Marks				
Total	100Marks				
DurationofExam	03Hours				

Note: Examiner will set nine questions in total. Question one willbe compulsory. Question one will have6 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 questionsin total, first being compulsoryandselecting onefromeachunit.

UNIT-I

DIGITAL IMAGE FUNDAMENTALS

Steps in Digital Image Processing – Components – Elements of Visual Perception – Image Sensing and Acquisition – Image Sampling and Quantization – Relationships between pixels - Color image fundamentals - RGB, HSI models, Two-dimensional mathematical preliminaries, 2D transforms - DFT, DCT.

UNIT II

IMAGE ENHANCEMENT&RESTORATION

Spatial Domain: Gray level transformations – Histogram processing – Basics of Spatial Filtering– Smoothing and Sharpening Spatial Filtering, Frequency Domain: Introduction to Fourier Transform– Smoothing and Sharpening frequency domain filters – Ideal, Butterworth and Gaussian filters, Homomorphic filtering, Color image enhancement.

Image Restoration - degradation model, Properties, Noise models – Mean Filters – Order Statistics – Adaptive filters – Band reject Filters – Band pass Filters – Notch Filters – Optimum Notch Filtering – Inverse Filtering – Wiener filtering

UNIT III

IMAGE SEGMENTATION

Edge detection, Edge linking via Hough transform – Thresholding - Region based segmentation – Region growing – Region splitting and merging – Morphological processing- erosion and dilation, Segmentation by morphological

watersheds – basic concepts – Dam construction – Watershed segmentation algorithm.

UNIT IV
IMAGE COMPRESSION AND RECOGNITION

Need for data compression, Huffman, Run Length Encoding, Shift codes, Arithmetic coding, JPEG standard, MPEG. Boundary representation, Boundary description, Fourier Descriptor, Regional Descriptors – Topological feature, Texture - Patterns and Pattern classes - Recognition based on matching.

COURSE OUTCOMES: At the end of the course, the students should be able to:
CO1- Know and understand the basics and fundamentals of digital image processing, such as digitization, sampling, quantization, and 2D-transforms.
CO2- Operate on images using the techniques of smoothing, sharpening and enhancement.
CO3- Understand the restoration concepts and filtering techniques.
CO4- Learn the basics of segmentation, features extraction, compression and recognition methods for color models.

TEXT BOOKS& REFERENCE BOOKS
1. Rafael C. Gonzalez, Richard E. Woods, ‗Digital Image Processing‗, Pearson, Third Edition, 2010.
2. Anil K. Jain, ‗Fundamentals of Digital Image Processing‗, Pearson, 2002.
3. Kenneth R. Castleman, ‗Digital Image Processing‗, Pearson, 2006.
4. Rafael C. Gonzalez, Richard E. Woods, Steven Eddins, ‗Digital Image Processing using MATLAB‗, Pearson Education, Inc., 2011.
5. D,E. Dudgeon and RM. Mersereau, ‗Multidimensional Digital Signal Processing‗, Prentice Hall Professional Technical Reference, 1990.
6. William K. Pratt, ‗Digital Image Processing‗, John Wiley, New York, 2002
7. Milan Sonka et al ‗Image processing, analysis and machine vision‗, Brookes/Cole, Vikas Publishing House, 2nd edition, 1999.

Course code	**LC-RA-401G**			
Category	Professional Core Courses			
Course title	**Hydraulic and Pneumatic Lab**			
Scheme and Credits	L	T	P	**Credits**
	0	0	2	1
Objectives:	To provide knowledge on electrical circuits, signal conditioning To make familiar about control system and power electronics in designing hydraulic and pneumatic systems.			
Internal Practical Class Marks	25Marks			
External Practical Class Marks	25Marks			
Total	50Marks			
Duration of Exam	03Hours			

(Note: the "Credits" column header row also shows "Semester-VII" alongside.)

List of Experiments:

1. Design and testing of hydraulic circuits using-
   a. Pressure control
   b. Flow control
   c. Direction control
2. Design of circuit with programmed logic sequence, using an optional PLC in hydraulic Electro- hydraulic Trainer.
3. Design and testing of pneumatic circuits using-
   a. Pressure control
   b. Flow control
   c. Direction control
   d. Circuits with logic controls
   e. Circuits with timers
   f. Circuits with multiple cylinder sequences in pneumatic electro pneumatic trainer.
4. Design of circuits using mechanical feedback systems.
5. Velocity control of single and double acting hydraulic and pneumatic cylinders.
6. Design of Pneumatic system using any commercially available simulation software.
7. Design of Hydraulic system using any commercially available simulation software.

Course Outcomes(COs): At the end of the course,the student shall be able to:
CO1-Describe hydraulic and pneumatic systems and overview of control systems & actuators.
CO 2-Differentiate between various sensors, transducers and actuators and their applications.
CO3-Relate various signal conditioning units, amplifiers, logic gates and their role in programmable logic controllers.

Note:
1) At least six experiments are to be performed in the semester.
2) At least seven experiments should be performed form the above list. Remaining two experiments may either be performed from the above list or as designed &set by the concerned institute as per the scope of the syllabus.

Coursecode	PCC-RA-407G				
Category	Professional Core Courses				
Coursetitle	**SEMINAR**				
SchemeandCredits	L	T	P	**Credits**	Semester-VII
	0	0	2	1	
Objectives:	To teach the student how to face interview and presentation given And remove their hesitation and improve their communications skills and overall personal developments.				
InternalClassMarks	25Marks				
ExternalClassMarks	25Marks				
Total	50Marks				
DurationofExam	03Hours				

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

Coursecode	**PROJ-RA-407G**				
Category	ProfessionalCoreCourses				
Coursetitle	**PROJECT-I**				
SchemeandCredits	L	T	P	**Credits**	Semester-VII
	0	0	9	4.5	
Objectives:	Thiscourseisaimedtoprovidemore weightageforprojectwork. The project work could be done in the form of aminorpractical project in the college.Participationin anytechnical event/ competitiontofabricateanddemonstrate aninnovativemachineor productcouldbeencouragedunderthiscourse.				
InternalProjectMarks	25				
ExternalProjectMarks	25				
Total	50				
DurationofExam	03Hours				

The students expected to take up a project under the guidance of teacher from the college. The project must bebasedon mechanicalengineering problems,whichcanbe extended uptothe full semester. The students may be asked to work individually or in a group normally not more than four –six students in a group(If any large/bigprojects occurs then strength of students increases ap per guide supervision). Viva- voce must be based on the preliminary report submitted by students related to the project.

Coursecode	PT-RA-409G
Category	EngineeringScienceCourses
Coursetitle	PRACTICALTRAINING-II

SchemeandCredits	L	T	P	Credits	Semester-VII
	0	0	2	0	

Objectives:	• Achievingtheobjectivesoftheliniversityanditscollegesanddepartment sinpracticaltraining. • Providing students with practical skills, whichmatch the requirements of the job market and allow them to directly enter the work communityin aseriousandconstructivemanner. • Providing students with experience to help them take decisions pertainingtotheir future careerobjectives. • Providing college students, the full opportunity to apply theoretical knowledge (gained during their studies) in a real work environmentat a later stage of their studies. • Developing the student's understanding of theneeds of the job market and reaching thisunderstandingsuccessfully
InternalPracticalTraining Marks	25Marks
ExternalPracticalTraining Marks	25Marks
Total	50Marks
DurationofExam	03Hours

PRACTICALTRAININGVIVA-VOCE:
1) Assessment of PracticalTraining-I,undergoneat the end of VIsemester,willbe basedon seminar, viva-voce,reportand certificate of practicaltrainingobtainedbythe student from the industry/Professionalorganization/ResearchLaboratorywiththepriorapprovaloftheDirector-Principal/Mechanical Software /AutomobileWorkshop.**According toperformance letter grades A,B,C,Fareto be awarded:Excellent:A;Good : B ;Satisfactory: C; Notsatisfactory:F.**Astudent whohasbeenawarded„F"gradewillberequiredtorepeatthe practical training.
2) **Each studenthas toundergopractical trainingof4/6weeksduringsummervacation and its evaluationshall be carried out in the VII semester.**

Coursecode	MC-317G				
Category	MandatoryCourse				
Coursetitle	**ConstitutionofIndia**				
SchemeandCredits	L	T	P	**Credits**	Semester-VII
	2	0	0	0	

MC-317G is mandatory non-credit course in which the students will be awarded grades.

Note:2 The students will be awarded grades A,B,C& Fin Evaluation of Constitution of India. A student who is awarded„F"gradeis required to repeat.
Excellent: A;Good:B;Satisfactory:C; Not Satisfactory:F.

Course Objectives: Students will be able to:
1. Understand the premises informing the twin themes of liberty and freedom from a civilrights perspective.
2. To address the growth of Indian opinion regarding modern Indian intellectuals" constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.
3. ToaddresstheroleofsocialisminIndiaafterthecommencementoftheBolshevikRevolutionin1917anditsimpactonthei nitialdraftingoftheIndianConstitution.

UNIT-I
Philosophy of Indian Constitution, Salient features of Indian Constitution, Preamble, and Nature of Indian Constitution ,Procedure for amendment of the Constitution.
UNIT-II
Federal structure and distribution of legislative and financial powers between the Union and the States
UNIT-III
Organs of Governance: President – Qualification and Powers of the President, Governor Qualification and Powers of Governor, Parliament: Composition, Qualifications and Disqualifications, Judiciary: Appointment, Tenure and Removal of Judges.

UNIT-IV
Fundamental Rights: Origin and development of Fundamental rights, Need for fundamental rights. Introduction to Right to equality, Right to freedom, Right against exploitation, Right to freedom of religion,Cultural and Education rights and Fundamental duties.

Course Outcomes: Students will be able to:
1. Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhiin Indian
2. politics.
3. Discuss the intellectual origins of the framework of argument that informed the conceptualizationofsocial reforms leading to revolution in India.
4. Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.
5. Discuss the passage of the Hindu Code Bill of 1956. The examination of the regular students will beconducted by the concerned college/Institute internally.

References:

1. TheConstitutionofIndia,1950(BareAct),GovernmentPublication.
2. Dr.S.N.Busi,Dr.B.R.AmbedkarframingofIndianConstitution,latestEdition
3. M.P.Jain,IndianConstitutionLaw,Lexis Nexis,latestedition
4. D.D.Basu,IntroductiontoConstitutionofIndia,LexisNexis,latestedition.

Coursecode	**PCC-RA-402G**				
Category	ProfessionalCoreCourses				
Coursetitle	**Flexible Manufacturing Systems**				
SchemeandCredits	L	T	P	**Credits**	Semester-VIII
	3	0	0	3	
Objectives:	• Modern manufacturing systems • To understand the concepts and applications of flexible manufacturing systems				
Classwork	25Marks				
Exam	75Marks				
Total	100Marks				
DurationofExam	03Hours				

Note: Examiner willset nine questions in total. Question one willbe compulsory. Question one will have6 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 questionsin total, first being compulsoryandselecting onefromeachunit.

<div align="center">

UNIT-I
</div>

PLANNING, SCHEDULING AND CONTROL OF FLEXIBLE MANUFACTURING SYSTEMS
Introduction to FMS– development of manufacturing systems – benefits – major elements – types of flexibility – FMS application and flexibility –single product, single batch, n – batch scheduling problem – knowledge-based scheduling system.

<div align="center">

UNIT II
</div>

COMPUTER CONTROL AND SOFTWARE FOR FLEXIBLE MANUFACTURING SYSTEMS
Introduction – composition of FMS– hierarchy of computer control –computer control of work center andassembly lines – FMS supervisory computer control – types of software specification and selection – trends.
FMS SIMULATION AND DATA BASE
Application of simulation – model of FMS– simulation software – limitation – manufacturing data systems – dataflow – FMS database systems – planning for FMS database.

<div align="center">

UNIT III
</div>

TECHNOLOGY AND JUSTIFICATION OF FMS
Introduction – matrix formulation – mathematical programming formulation –graph formulation – knowledge-based system for group technology – economic justification of FMS- application of possibility distributions in FMS systems justification.

<div align="center">

UNIT IV
</div>

APPLICATIONS OF FMS AND FACTORY OF THE FUTURE
FMS application in machining, sheet metal fabrication, prismatic component production – aerospace application – FMS development towards factories of the future – artificial intelligence and expert systems in FMS – design philosophy and characteristics for future.

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

CO1- Ability to perform Planning, Scheduling and control of Flexible Manufacturing systems

CO2- Perform simulation on software's use of group technology to product classification

Text Book &ReferenceBooks:

1. Jha, N.K. "Handbook of flexible manufacturing systems", Academic Press Inc., 1991.
2. Groover M.P., "Automation, Production Systems and Computer Integrated Manufacturing", Prentice Hall of India Pvt., New Delhi, 1996.
3. Kalpakjian, "Manufacturing Engineering and Technology", Addison-Wesley Publishsing Co., 1995.
4. Radhakrishnan P. and Subramanyan S., "CAD/CAM/CIM", Wiley Eastern Ltd., New Age International Ltd., 1994.
5. Raouf, A. and Ben-Daya, M., Editors, "Flexible manufacturing systems: recent development", Elsevier Science, 1995.
6. 5. Taiichi Ohno, "Toyota Production System: Beyond large-scale Production", Productivity Press (India) Pvt. Ltd. 1992.

Coursecode	PCC-RA-404G				
Category	Professional Core Courses				
Coursetitle	**Sensor & Signal Processing**				
SchemeandCredits	L	T	P	**Credits**	Semester-VIII
	3	0	0	3	
Objectives:	• Understand various technologies associated in manufacturing of sensors • Acquire knowledge about types of sensors used in modern digital systems • Get acquainted about material properties required to make sensors				
Classwork	25Marks				
Exam	75Marks				
Total	100Marks				
DurationofExam	03Hours				

Note: Examiner willset nine questions in total. Question one willbe compulsory. Question one will have6 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 questionsin total, first being compulsoryandselecting onefromeachunit.

UNIT-I

Introduction to sensor bases measurement systems: General concepts and terminology, sensor classification, primary sensors, material for sensors, microsensor technology, magneto resistors, light dependent resistors, resistive hygrometers, resistive gas sensors, liquid conductivity sensors.

UNIT-II

Reactance Variation and Electromagnetic Sensors: Capacitive Sensors, Inductive Sensors, Electromagnetic Sensors. Signal Conditioning for Reactance Variation Sensors: Problems and Alternatives, ac Bridges Carrier Amplifiers, Coherent Detection, Specific Signal Conditioners for Capacitive Sensors, Resolver-to-Digital and Digital-to-Resolver Converters.

UNIT-III

Digital and intelligent sensors-position encoders, resonant sensors, sensors based on quartz resonators, SAW sensors, Vibrating wire strain gages, vibrating cylinder sensors, Digital flow meters.
Sensors based on semiconductor junctions -Thermometers based on semiconductor junctions, magneto diodes and magneto transistors, photodiodes and phototransistors, sensors based on MOSFET transistors, charge-coupled sensors – types of CCD imaging sensors, ultrasonic-based sensors.

UNIT IV

SMART SENSORS
Radiation Sensors - Smart Sensors - Film sensor, MEMS & Nano Sensors – applications -Automobile, Aerospace, Home appliances, Manufacturing, Medical diagnostics, Environmentalmonitoring.
SIGNAL CONDITIONING AND DATA ACQUISITION

Amplification – Filtering – Sample and Hold circuits –Data Acquisition: Single channel and multichannel data acquisition – Data logging

CourseOutcomes(CO'S): Attheendof thecourse,thestudent shall beable to:
1. Appreciate various types of sensors
2. Describe the manufacturing process of sensors
3. Understand about the material properties required to make sensors
4. Use sensors specific to the end use application
5. Design systems integrated with sensors

Books:
1. E. O. Doebelin, 'Measurement Systems – Applications and Design ', TataMcGraw Hill, edition 1992.
2. A. K. Sawhney, ' A course in Electrical and Electronic Measurement andInstrumentation', Dhanpat Rai and Co (P) Ltd, 2004.
3. Beckwith, Marangoni and Lienhard, 'Mechanical Measurements', Addison – Wesley,5th Edition, 2000.
4. D. Roy Choudry, Sheil Jain, ' Linear Integrated Circuits', New Age International Pvt.Ltd., 2000.
5. Patranabis. D, "Sensors and Transducers", 2nd edition PHI, New Delhi, 2003.

Coursecode	PEC-RA-406G				
Category	Professional Core Courses				
Coursetitle	**Advanced Robotics**				
SchemeandCredits	L	T	P	**Credits**	Semester-VIII
	3	0	0	3	
Objectives:	• Provide an understanding of the role of automation technology in robot industry. • Develop high level mathematical skills for analysis and synthesis of an articulated armrobot. • Develop skills in the selection and application of different robots for various tasks				
Classwork	25Marks				
Exam	75Marks				
Total	100Marks				
DurationofExam	03Hours				

Note: Examiner willset nine questions in total. Question one willbe compulsory. Question one will have6 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 questionsin total, first being compulsoryandselecting one fromeachunit.

UNIT-I
Review of serial, parallel robotic manipulators: Kinematic chain; Degrees of freedom;Forward and Inverse Kinematics; Dynamics
Different types of wheeled mobile robots and walking machines: robots with wheels -Omni directional, torus, etc., legged robots - Biped, Quadruped, etc.

UNIT II
Algorithmic issues for inverse and forward kinematics of robotic systems: Efficiency (Computational Count); Accuracy in numerical calculations; Numericalstability (tolerances in numerical solutions of algebraic and differential equations).
Kinematic design of serial and parallel robots based on singularity and workspace: Workspace and calculation, Singularity and calculation.

UNIT III
Manipulability and dexterity techniques.
Dynamic algorithms -Inverse, forward: Formulation of dynamic model (equations ofmotion); Newton-Euler algorithm; Use of computer-orientated approaches, e.g.,Decoupled Natural Orthogonal Complement (DeNOC) based; Inverse dynamics;Forward dynamics; Mechanical design (choice of material, cross-section, etc.)

UNIT IV
Control of robotic systems: Basics of control; PD, PI and PID control; Force control;Adaptive control
Mechanicaldesign of robot links and joints: Design from mechanical failure andstiffness criteria; Consideration of natural frequency in design.

CourseOutcomes(CO'S): Attheendofthecourse,thestudentshallbeableto:
1. Design multi-jointed serially linked manipulators.
2. Identify intermediate arm matrices describing individual links.
3. Determine the joint angle equations to attain a global position and angle of the endeffector.
4. Determine how to identify velocity profiles of individual joints to achieve a desiredglobal spatial trajectory.
5. Relate driving currents and torques needed to control this trajectory for electricallydriven robots

TextBooks&ReferencesBooks:
1. Ghosal, A., "Robotics", Oxford, New Delhi, 2006
2. Roland Siegwart, Illah R Nourbakhsh, Davide Scaramuzza, "Autonomous Mobile Robots", 2.PHI, 2011
3. Craig, J.J., "Introduction to Robotics: Mechanics and Control", Pearson, Delhi, 3rdEdition, 2009
4. Tsai, L, "Robot Analysis", John Wiley & Sons, Singapore, 1999
5. Saha, S.K., "Introduction to Robotics", Tata McGraw Hill, 4th reprint, 2010

Coursecode	PCC-RA-408G				
Category	Professional Core Courses				
Coursetitle	**Neural Networks and Fuzzy Logic**				
SchemeandCredits	L	T	P	**Credits**	Semester-VIII
	3	0	0	3	
Objectives:	• To introduce the concepts and understanding of artificial neural networks • To provide adequate knowledge about supervised and unsupervised neural networks • To introduce neural network design concepts • To expose neural networks-based methods to solve real world complex problems • To teach about the concept of fuzziness involved in various systems and provide adequate knowledge about fuzzy set theory, and fuzzy logic • To provide knowledge of fuzzy logic to design the real world fuzzy systems				
Classwork	25Marks				
Exam	75Marks				
Total	100Marks				
DurationofExam	03Hours				

Note: Examiner willset nine questions in total. Question one willbe compulsory. Question one will have6 parts of 2.5 marks each from all units and remaining eight questions of 15marks each to be set by taking two questions from each unit. The students have to attempt fivequestionsin total, first being compulsoryandselecting onefromeachunit.

UNIT-I

Introduction to Artificial Neural Networks:
Artificial Neural Networks and their biological motivation – Terminology – Models of neuron –Topology – characteristics of artificial neural networks – types of activation functions.

Learning methods:
Error correction learning – Hebbian learning – Perceptron – XOR Problem– Perceptron learning rule convergence theorem – Adaline.

UNIT-II

Supervised Learning Neural Networks:
Perceptron – Single Layer, Multilayer and their architecture, Error back propagation algorithm, Generalized delta rule, Concept of Training, Testing and Cross-validation data sets for design and validation of networks. Over-fitting. Stopping criterion for training.

Unsupervised Learning Neural Networks:
Competitive Learning Networks – Maxnet, Mexican Hat Net, Kohonen Self-Organizing Networks – architecture, training algorithm, K-means and LMS algorithms, Radial Basis Function (RBF) neural network -architecture and algorithm, and Discrete Hopfield networks. Introduction to the concept of Support Vector Machine based classifier.

UNIT-III

Fuzzy logic:

Introduction to fuzzy logic, Basic Fuzzy logic theory, Fuzzy sets -properties & operations, Fuzzy relation – Operations on fuzzy relations, Fuzzy Membership functions, Fuzzy Rules and Fuzzy Reasoning, Fuzzification and Defuzzification methods, Fuzzy Inference Systems, Mamdani Fuzzy Models, Fuzzy knowledge-based controllers.

UNIT-IV

Applications of Fuzzy Logic and Fuzzy Systems:

Fuzzy pattern recognition, fuzzy image processing, Simple applications of Fuzzy knowledge-based controllers like washing machines, home heating system, and train break control.

CourseOutcomes(CO'S): Attheendof thecourse,thestudent shall beable to:

CO1-Comprehend the concepts of biological neurons and artificial neurons

CO2- Analyze the feed-forward and feedback neural networks and their learning algorithms.

CO3- Calculate Comprehend the neural network training and design concepts

CO4- Analyze the application of neural networks to nonlinear real world problem

CO5- Comprehend the concept of fuzziness involved in various systems, fuzzy set theory and fuzzy logic

CO6- Apply fuzzy logic to real world problems.

Text Books &ReferencesBooks:-

1. Hagan, Demuth, and Beale, Neural Network Design, Thomson Learning
2. Simon Haykin, Neural Network- A Comprehensive Foundation, Pearson Education
3. Christopher M Bishop, Neural Networks For Pattern Recognition, Oxford University Press
4. William W Hsieh, Machine Learning Methods in the Environmental Sciences Neural Network and Kernels, Cambridge Publications
5. S. N. Sivanandam, S. Sumathi, and S. N. Deepa, Introduction to Neural Network Using Matlab Tata McGraw-Hill Publications
6. Bart Kosko, Neural networks and Fuzzy Systems, Pearson Education
7. J. S. R. Jang, C.T. Sun, and E. Mizutani, Neuro-Fuzzy and Soft Computing, PHI
8. J. M. Zurada, Introduction to Artificial Neural Systems, Jaico publishers

Coursecode	OEC–ME-402G				
Category	OpenElectiveCourses(OEC)(Semester-VIII)List-III				
Coursetitle	**OPERATIONSRESEARCH**				
SchemeandCredits	L	T	P	**Credits**	Semester-VIII
	3	0	0	3	
Objectives:	Theaimsofoperationresearchinclude:solvingoperational questions, solving questions related to resources" operations, and solving decision-making questions. Operational research has a relationwith differentareas of studyand ithas severalapplications. Operation research is considered as a tool of productivity. In comparison to traditional approaches, operation research provides more extensive, quantitative, and detailed information about different issues and managers can implement their decisions based on quantitative analyses. Operation research will be a good assistance for managers in different areas.				
Classwork	25Marks				
Exam	75Marks				
Total	100Marks				
DurationofExam	03Hours				

Note: Examiner willset nine questions in total. Question one willbe compulsory. Question one will have6 partsof 2.5 markseach from all unitsand remaining eight questionsof 15 marks each to be set by taking two questions from each unit. The students have to attempt fivequestionsin total, first being compulsoryandselecting one fromeachunit.

<h3 style="text-align:center">UNIT-I</h3>

Introduction:Definition,role ofoperations researchin decision-making,applications in industry. Concept onO.R. model building–Types& methods.
Linear Programming (LP): Programming definition, formulation, solution- graphical, simplex GaussJordanreductionprocessinsimplexmethods,BIG-Mmethodscomputational,problems.

<h3 style="text-align:center">UNIT-II</h3>

Deterministic Model: Transportation model-balanced & unbalanced, north west rule, Vogel"s Method, least cost or matrix minimal, Stepperg stone method, MODI methods, degeneracy, assignment,travelingsalesman, problems. AdvancedTopicOfLP:Duality,PRIMAL-DUALrelations-itssolution,shadowprice,economicinterpretation,dual-simplex,post-optimality&sensitivityanalysis,problems.

<h3 style="text-align:center">UNIT-III</h3>

Waiting Line Models: Introduction, queue parameters, M/M/1 queue, performance of queuing systems,applicationsin industries,problems.
Project Line Models:Network diagram, event, activity, defects in network, PERT & CPM, float in network, variance and probability of completion time, project cost- direct, indirect, total, optimalproject costby crashing ofnetwork, resourceslevelingin project, problems.

<h3 style="text-align:center">UNIT-IV</h3>

Simulation :Introduction, design of simulation, models & experiments, model validation, process generation,time flow mechanism ,Monte Carlo methods-its applications in industries, problems. Decision Theory: Decision process, SIMON model types of decision making environment- certainty, risk, uncertainty,decision making with utilities,problems.

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

CO1-Discusstheroleofoperationsresearchindecision-making, and its applications in industry and should be able to formulate and design real-world problems through models & experiments. CO2- Knowledge of various types of deterministic models like linear programming, transportation model etc.

CO3-Explorevarioustypesof stochastic models like waiting line model ,project line model, simulation etc.

CO4-Deduce the relationship between a linear program and its dual and perform sensitivity analysis.

CO5-Describedifferentdecision-makingenvironmentsandapplydecisionmakingprocessin the real world situations

Text Books:

1) Operation Research–TAHA,PHI,NewDelhi.
2) PrincipleofOperationsResearch–Ackoff,Churchaman,arnoff,OxfordIBH,Delhi.

ReferenceBooks:

1) OperationResearch-Gupta&Sharma,NationalPublishers,NewDelhi.
2) QuantitativeTechniques-Vohra,TMH,NewDelhi8.PrinciplesofoperationResearch (with ApplicationstoManagerial Decisions)by H.M.Wagher, PrenticeHall ofIndia, NewDelhi.
3) OperationResearch–Sharma,Gupta,WileyEastern,NewDelhi.
4) OperationResearch–Philips,Revindran,Solgeberg,WileyISE.

Coursecode	OEC-ME-410G				
Category	Open Elective Courses(OEC)(Semester-VIII)List-III				
Coursetitle	**QUALITYENGINEERING**				
SchemeandCredits	L	T	P	**Credits**	Semester-VIII
	3	0	0	3	
Objectives:	To understand the concept of Quality Engineering which Emphasizes growth,creativity,and analytical thinking.				
Classwork	25Marks				
Exam	75Marks				
Total	100Marks				
DurationofExam	03Hours				

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have6 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.

Section-A
Basic Concepts of Quality: Definitions of Quality and its importance in industry, Quality function, Quality Characteristics, Quality process, Quality Traits, Applications of Quality Concept, Introduction to quality control, Computer aided quality control, Total quality control(TQC) and its implementation, Elements of TQC, Quality Circle, Objectives of quality circle, Role of management in quality circle, Quality in service organizations, characteristics of a serviceorganization,Importantservicedimensions,Designofservicequality.

Section -B
Basic Statistical Concepts: The Concept of variation, Distinction between variables and attributes data, The frequency distribution, graphical representation of frequency distribution, Quantitative description of distribution, the normal curve, concept of probability, laws of probability, probability distributions, hyper geometric distribution, binomial distribution, The Poisson distribution.

Section-C
Quality systems: Quality systems, need for quality System ,Need for standardization, History of ISO:9000 series standards and its features, steps to registration, India and ISO:9000,Automated inspection systems technologies,Different forms of Inspection, Industrial inspection,

SectionD
Total Quality Management: Introduction o TQM, Concepts, Characteristics of TQM, Relevance of TQM, Approaches to TQM Implementation, TQM philosophies, Taguchi Philosphy,JIT,Kaizen, Six Sigmaapproach, 5-S approach

Course Outcomes: Upon completion of this course the student will be able to:
CO1-Attain the basic techniques of quality improvement,fundamental knowledge of statistics and probability
CO2-Use control charts to analyze for improving the process quality.
CO3-Describe different sampling plans

CO4-Acquire basic knowledge of total quality management CO5-Understand the modern quality management techniques

Text Books:
1. Quality planning and Analysis,Juran and Gryna,TMH,NewDelhi
2. Quality Management, Kanishka Bed,Oxford University Press,NewDelhi
3. Introductionto SQC,MontgomeryDC,3e,Wiley,NewDelhi
4. Fundamentals of quality control and improvement,AMitra, Mcmillanpub. Company, NY

ReferenceBooks:
1. FundamentalsofAppliedStatistics,GuptaandKapoor,Sultan ChandandSons,New Delhi.

Coursecode	OEC–EE-412G				
Category	OpenElectiveCourses(OEC)(Semester-VIII)List-III				
Coursetitle	**ELECTRICALPOWERGENERATION**				
SchemeandCredits	L	T	P	**Credits**	Semester-VIII
	3	0	0	3	
Objectives:	TheaimsofElectricalpowergenerationinclude:Theaimof subject is to get knowledge about power generation and its related issues.				
Classwork	25Marks				
Exam	75Marks				
Total	100Marks				
DurationofExam	03Hours				

Note: Examiner willset nine questions in total. Question one willbe compulsory. Question one willhave 10 parts of 2.5 marks from all units and remaining eight questions of 12.5 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsoryandselecting one from eachUnit.

Section-A
INTRODUCTION:Energysources,theiravailability,recenttrendsinPowerGeneration, Interconnected Generation of Power Plants.

Section-B
POWER GENERATION PLANNING: Load forecasting, load curves, load duration curve, Base load and Peak load Power Plants, connected Load, maximum demand, demand factor, Group diversity factor, load factor, significance of load factor, plant factor, capacity factor, selection of unit size, No. of Units, reserves,cost of power generation,Depreciation,tariff.

Section-C
CONVENTIONAL ENERGY SOURCES: Selection of site,capacity calculations,classification, Schematic diagram and working of Thermal Power Stations, Hydro Electric Plant, NuclearPower Plantand Diesel Power Stations.

Section-D
ELECTRIC ENERGY CONSERVATION &MANAGEMENT: Energy management, Energy Audit,Energy Efficient Motors, Co-generation.

Course Outcomes:Upon completion ofthis course the student will be able to: The knowledge about power generation and its related issues.

TEXTBOOKS:
1. Electric PowerGeneration,B.R.Gupta
2. PowerGeneration, Operationand Control, Wood and Wollenberg, John Wiley & Sons,1984.

REF.BOOKS:

1. ACourseinElectricPowerSystem,Soni,Gupta,Bhatnagar,DhanpatRai&Sons
2. PowerSystemEngineering,Nagrath&Kothari,TataMc-GrawHill,NewDelhi
3. PowerPlantEngg:G.D.Rai
4. ElectricPower:S.L.Uppal(KhannaPublishing)

Course code	OEC-CSE-430G				
Category	Open Elective Courses(OEC)(SemesterVIII)List-III				
Course title	**COMPUTER COMMUNICATION**				
Scheme and Credits	L	T	P	**Credits**	Semester-VIII
	3	0	0	3	
Objectives:	1. To Build an understanding of the fundamental concepts of 2. computer networking and familiarizing the student with the basic taxonomy and terminology of the computer networking and data communication. 3. To outline various models, topologies and devices of Computer Networks. 4. To explain the functions of various layers in Network Reference Model. 5. To apply different network concepts in various network communication protocols.				
Classwork	25Marks				
Exam	75Marks				
Total	100Marks				
Duration of Exam	03Hours				

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have6 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 Data Communication: Need, components, Data representations communication model, Characteristics of an effective Communication system, Transmission modes: Simplex, Half Duplex and Full Duplex. Serial and parallel transmission. Unicasting, Multicasting, Broadcasting, Amplitude Modulation (AM), Frequency Modulation (FM), Phase Modulation(PM),Amplitude Shift Keying, Frequency Shift Keying,Phase Shift Keying,
MULTIPLEXING: FDM, WDM, TDM, packet switching and circuit switching.
Transmission Media: Copper cable, Twisted-Pair Cable, Coaxial Cable, Fiber-Optic Cable.Introduction to Computer Network:applications, benefits and problems, Types of Networks:PAN, LAN, MAN and WAN.

UNIT-II
Network Topologies: Introduction to Computer Network Topologies: Mesh Topology, Bus Topology, Star Topology, Ring Topology, Tree Topology, Hybrid Topology, Irregular – Topology.
OSI and TCP/IP Model: Layering architecture of networks, OSI model, Functions of each layer, Services and Protocolsof eachlayer.

UNIT-III
Media Access Control, Random Access: ALOHA,CSMA andCSMA/CD. ControlledAccess: Reservation, Pollingand Token Passing. Channelization:FDMA, TDMA andCDMA
Ethernet: Featuresandtypes of LANs,Types of Ethernets- Thicknet,Thinnet,Fast Ethernet and Gigabit and 10G Ethernet etc. Concept of Carrier Sense Multiple Access (CSMA)/CD in Ethernet.
Network addressing: Physical addressing, logical addressing and port addressing, MAC addressing in Ethernet, IP

V4 addressing:concept of subnet, network and host address,IP address Classes-A, B,C, Dand E classes.Introduction to classless addressing.

UNIT-IV

LANinterconnectingdevices: Repeater,Hubs,Switches,Bridges,Routers, Gateways.

Internet and E-mail: Concept of Internet, Advantages of Internet, Security issues in using internet. Application of Internet in various fields: Scientific, Business, Research, Sports, Medicine& Health Care,Engineering,Teaching. HTTP andFTP

Email:concept,Protocols:SMTP,POP,IMAP.

LearningOutcomes:Bytheendofthecoursethestudentswillbeableto:
1. Independentlyunderstandbasiccomputernetworktechnology.
2. UnderstandandexplainDataCommunicationsSystemanditscomponents.
3. Identifythedifferenttypesofnetworktopologiesandprotocols.
4. Enumeratethe layersoftheOSImodelandTCP/IP.Explainthefunction(s)ofeachlayer.
5. Identifythedifferenttypesofnetworkdevices andtheirfunctionswithinanetwork

TextBook:
1. AndrewSTanenbaum,ComputerNetworks,5thEdition,Pearsonpublications,2010.
2. Forouzan,DataCommunicationandnetworking,5thEdition,TataMcGrawHill,2012.
3. WilliamStalling,Data&Computer Communication6thedition,LPEPearsonEducation, 2013.

ReferenceBooks:
1. DataCommunications,ComputerNetworksandOpenSystems(4thedition),HalsallFred,2000, AddisonWesley, Low Price Edition.
2. ComputerNetworks–ASystemApproach,LarryL.Peterson&BruceS.Davie,2Edition ComputerNetworking–ED Tittel , 2002, T.M.H.

Course code	OEC-CE-448G				
Category	Open Elective Courses(OEC)(SemesterVIII)List-III				
Course title	**Traffic Engineering and Road Safety**				
Scheme and Credits	L	T	P	Credits	Semester8th
	3	0	0	3	
Classwork	25Marks				
Exam	75Marks				
Total	100Marks				
Duration of Exam	3Hours				

COURSEOBJECTIVES:

- Acquaint the students to basic concepts of Traffic and their significance.
- To stimulate the students to think systematically and objectively about various traffic problems

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have6 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.

COURSECONTENT
Unit-I

Module-1: Traffic Characteristics: Importance of traffic characteristics. Road user characteristics. Vehicular characteristics. Max dimensions and weights of vehicles allowed in India.

Module-2: TrafficStudies: Traffic volume study,speed study and origin and destination study. Speed and delay study.

Unit-II

Module-3: Traffic Accidents: Accident surveys.Causes of road accidents and preventive measures. Capacity and Level of Service.

Module-4: Relationship between speed, volume and density, PCU,Design service volume, Capacity of non-urbanroads. IRC recommendations ,Brief review of capacity of urban roads.

Unit-III

Module-5: Traffic Control Devices: Signs, Signals, markings and islands. Types of signs, Types of signals,Design of Signal, Intersections at grade and grade separated inter sections. Types of grades separate dinter sections, Parking surveys: On street parking,off street parking.

Unit-IV

Module-6 Road safety audit, RSA team, RSA Report, Elements of RSA,Vehicular air pollution and Situation in India, Motor vehicle act, Vehicular emission norms in India and abroad, Alternate fuels, Factors affecting fuel consumption.

COURSEOUTCOMES:

After completing this course , students should be able:

- To realize the significance of traffic engineering into day life.
- To understand the processes involved in traffic studies.
- To appreciate the role of Traffic regulations.

RECOMMENDEDBOOKS:

- Principles of Transportation Engineering by Chakroborty &Das,Prentice Hall,India.
- Highway Engg by S.K.Khanna& C.E.G.Justo, Nem ChandBros.,Roorkee.
- TrafficEnggandTransportPlanningbyL.R.Kadiyali,KhannaPublishers,Delhi.
- Principles ofTransportationandHighwayEngineering by G.V.Rao, TataMcGraw-Hill Publishing Co. Ltd. N.Delhi.

Coursecode	**OEC-CE-450G**				
Category	OpenElectiveCourses(OEC)(SemesterVIII)List-III				
Coursetitle	**DisasterManagement**				
SchemeandCredits	L	T	P	Credits	**Semester8th**
	3	0	0	3	
Classwork	25Marks				
Exam	75Marks				
Total	100Marks				
DurationofExam	3Hours				

COURSEOBJECTIVES:
- To provide basic conceptual understanding of disasters and its relationships with development.
- Provide an understanding of the social nature of naturalhazard sand disasters
- Increase awareness of hazards and disasters around the worldand the unequal social consequences stemming from disaster events.

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have6 partsof 2.5 markseach from all unitsand remaining eight questionsof 15 marks each to be set by taking two questions from each unit. The students have to attempt fivequestionsin total, first being compulsoryandselecting one fromeachunit.

COURSECONTENT
Unit-I
Introduction: Terminology,GlobalandIndian scenario, role ofengineer, importance of study in human life, long term effects of disaster. Geological Mass Movement and land disasters, Atmosphericdisasters, Disaster Mitigation

Unit-II
Natural Disaster: Nature of natural disaster, Flood, Flash flood, drought, cloud burst, Earthquake, Landslides, Avalanches, Volcanic eruptions, Mudflow, Cyclone, Storm, Storm Surge,climatechange,globalwarming, sealevel rise,ozonedepletion
Man-made Disasters: Chemical, Industrial, Nuclear and Fire Hazards. Role of growing populationandsubsequent industrialization, urbanizationandchanging lifestyle of humanbeings in frequent occurrences of manmade disasters.

Unit-III
Case Studies: Damage profile analysis- Uttarkashi/Bhuj/Latur earthquakes, Kerala floods, cyclone Fani andAmphan, Bihar floods,Covid19.

UnitIV
Disaster Management: Importance of public awareness, Preparation and execution of emergency management programme. Scope and responsibilities of NationalInstitute of Disaster Management (NIDM) and National disaster management authority (NDMA) in India.ApplicationsofGIS, Remote sensing andGPS in thisregard.

COURSEOUTCOMES:

After completing thiscourse,studentsshouldbeable:

1. Toknownatural aswell asmanmadedisasterandtheirextentandpossibleeffectsonthe economy.
2. ToPlannationalimportancestructuresbaseduponthepservioushistory.
3. To acquaint with governmentpolicies, acts and variousorganizationalstructures associated with an emergency.
4. Toknowthesimpledosanddon'tsinsuchextremeeventsandactaccordingly.

REFERENCEBOOKS:

1. SinghalJ.P.DisasterManagement,LaxmiPublications,2010.ISBN-10:9380386427ISBN-13:978-9380386423
2. TusharBhattacharya,DisasterScienceandManagement, McGrawHillIndiaEducationPvt. Ltd.,2012.ISBN-10: 1259007367,ISBN-13: 978-1259007361]
3. GuptaAnilK,SreejaS.Nair.EnvironmentalKnowledgeforDisasterRisk Management, NIDM, New Delhi, 2011

Coursecode	OEC–ECE-453G				
Category	OpenElectiveCourses(OEC)(Semester-VIII)List-III				
Coursetitle	**MICROPROCESSORAPPLICATIONINAUTOMOBILES SECTOR**				
SchemeandCredits	L	T	P	**Credits**	Semester-VIII
	3	0	0	3	
Objectives:	This coursedealswiththesystematicstudyoftheArchitectureand programmingissuesof8085-microprocessorfamilyandinterfacing withother peripheral ICsandcoprocessor.Theaimofthiscourseis togivethestudentsbasicknowledge ofthemicroprocessors needed to developthe systems using it.				
Classwork	25Marks				
Exam	75Marks				
Total	100Marks				
DurationofExam	03Hours				

Note: Examiner willset nine questions in total. Question one willbe compulsory. Question one will have6 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 questionsin total, first being compulsoryandselecting onefromeachunit.

<div align="center">

UNIT-I

</div>

Architecture: General 8 bit microprocessor and its architecture 8085,Z-80 and MC 6800 MPU andits pin functions-Architecture-Functionsofdifferentsections.

<div align="center">

UNIT-II

</div>

Instruction Set: Instruction format-addressing modes-instruction set of 8085 MPU-T-STATE Machine cycle and instruction cycles-Timing diagrams-Different machine cycles-Fetch and execute operations-estimationof execution times.

<div align="center">

UNIT-III

</div>

AssemblyLanguage Programming:Constructof thelanguage programming-Assemblyformatof 8085-AssemblyDirective-Multipleprecisionadditionandsubtraction-BCDtoBinaryandBinaryto BCD Multiplication, Division, Code conversion using look up tables-stack and subroutines. Data Transfer Schemes: Interrupt structure-ProgrammedI/O, DMA-Serial I/O.

<div align="center">

UNIT-IV

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Interfacing Devices: Types of interfacing devices-Input/Output ports 8212, 8255,8251,8279. Octal latches and tristate buffers-A/D and D/A converters-Switches, LED"s ROM and RAM interfacing. Applications: Data acquisitions-Temperature control-Stepper motor control Automotive applications engine control,Suspensionsystemcontrol, Driver informationsystems, Developmentofahighspeed,highprecision learning control systemfortheenginecontrol.

CourseOutcomes(COs): Attheend ofthecourse,astudent willbeable to:Explainthe architecture,pin configuration ofvariousmicroprocessorsandInterfacing devices**.**

ReferenceBooks:
1. Ramesh,Goankar.S.,MicroprocessorArchietectureProgrammingandApplications,Wiley Eastern Ltd.,New Delhi,1986.
2. Aditya .P. Mathur,IntroductiontoMicroprocessors,III EditionTata McGraw HillPublishuing Co Ltd New Delhi,1989.
3. Ahson.S.I., Microprocessorswith Applicationsin ProcessControl,TataMcGrawHill New Delhi,1986.SAETransactions,1986Sec3.
4. JabezDhinagfar.S.,MicroprocessorApplicationsinAutomobiles.
5. L.BiancoandA.Labella.,AutomotiveMicroElectronics,ElseviersciencePublishers,1986.

Coursecode	HSMC-10G
Category	HumanitiesAndSocialSciencesIncludingManagementCourses(HSMC)-(Semester-VIII)List-III
Coursetitle	**MANAGEMENTINFORMATIONSYSTEMS**
SchemeandCredits	<table><tr><td>L</td><td>T</td><td>P</td><td>**Credits**</td><td rowspan="2">Semester-VIII</td></tr><tr><td>3</td><td>0</td><td>0</td><td>3</td></tr></table>
Objectives:	Its main goals are to help an organization's executives make decisions that improve the organization's agenda and incorporate the company's organizationalstructureanddynamicstobetterleveragethe organizationforacompetitiveadvantage.
Classwork	25Marks
Exam	75Marks
Total	100Marks
DurationofExam	03Hours

Note: Examiner willset nine questions in total. Question one willbe compulsory. Question one will have6 partsof 2.5 markseach from all unitsand remaining eight questionsof 15 marks each to be set by taking two questions from each unit. The students have to attempt fivequestionsin total, first being compulsoryandselecting onefromeachunit.

UNIT-I
Foundation of Information Systems: Introduction to information system in business, 8 fundamentals of information systems, Solving business problems with information systems, Types of information systems, Effectiveness and efficiency criteriain information system.

UNIT-II
An overviewof Management Information Systems: Definition of a management 8 information system, MIS versus Data processing, MIS & Decision Support Systems, MIS & Information Resources Management, Enduser computing, Concept ofanMIS,Structure ofa Management informationsystem.

UNIT-III
Conceptsofplanning:Conceptoforganizationalplanning,ThePlanningProcess,8Computational supportforplanning.Businessapplicationsofinformation technology:Internet&electroniccommerceanditsapplications EnterpriseSolutions, Information SystemforBusiness Operations(SDLC),Information System forStrategicAdvantage, DecisionSupport Systems and its benefits and characteristics.

UNIT-IV
Managing Information Technology: Enterprise & global management, Security & 8 Ethical challenges, Planning & Implementing changes. Advanced Concepts in Information Systems: Enterprise Resource Planning, Supply Chain Management, Customer Relationship Management, and Procurement Management.

Course Outcomes (COs): Upon successful completion of this course, students will be able to CO1. Understand the leadership role of Management Information Systems in achieving business competitive advantage through informed decision making. CO2. Analyze and synthesize business information and systems to facilitate evaluation of strategic alternatives. CO3. Effectively communicate strategic alternativesto facilitate decision making.

TextBook:
1. OBrian,"ManagementInformationSystem",TMH
2. GordonB.Davis&MargretheH.Olson,"ManagementInformationSystem",TMH
3. RaviKalakota,AndrewWinston,"FrontiersofElectronicCommerce",AddisonWesley.

ReferenceBooks:-
1. OBrian,"IntroductiontoInformationSystem",MCGRAWHILL.
2. Murdick,"InformationSystemforModernManagement",PHI.
3. Jawadekar,"ManagementInformationSystem",TMH.
4. JainSarika,"InformationSystem",PPM
5. Davis,"InformationSystem",PalgraveMacmillan

Coursecode	**LC-RA-402G**				
Category	ProfessionalCoreCourses				
Coursetitle	**WORKSHOPUSING MATLAB**				
SchemeandCredits	L	T	P	**Credits**	Semester-VIII
	0	0	2	1	
Objectives:	Tounderstandtheconstructionandworkingprincipleofvarious partsof anautomobile.				
InternalPracticalMarks	25Marks				
ExternalPracticalMarks	25Marks				
Total	50Marks				
DurationofExam	03Hours				

The course is intended to assist undergraduates in learning the basics of programming ingeneral and programming MATLAB/SCILAB in particular. Basics of programming inMATLAB/SCILAB will be covered, with the goal of having students become comfortableenough to continue learning MATLAB/SCILAB and other programming languages on theirown.

Note:
1. Atleasttenexperimentsaretobeperformedinthe Semester.

Coursecode	**PCC-RA-410G**
Category	ProfessionalCoreCourses
Coursetitle	**SEMINAR**
SchemeandCredits	L | T | P | **Credits** 0 | 0 | 2 | 1 | Semester-VIII
Objectives:	Toteachthestudenthowtofaceinterviewandpresentationgiven andremovetheirhesitationandimprovetheircommunications skillsand overall personal developments.
InternalPracticalMarks	25Marks
ExternalPracticalMarks	25Marks
Total	50Marks
DurationofExam	03Hours

SelectingofSeminarTopics byTeacherorconcernedtoteacherbystudents.Aseminar topic given by students in semester.

Coursecode	PROJ-RA-408G				
Category	ProfessionalCoreCourses				
Coursetitle	PROJECT-II				
SchemeandCredits	L	T	P	**Credits**	Semester-VIII
	0	0	10	5	
Objectives:	Thiscourseisaimedtoprovidemore weightageforprojectwork. The project work could be done in the form of amajorpractical project in the college.Participationin anytechnical event/ competitionto fabricateanddemonstrate aninnovativemachineor productcouldbeencouragedunderthiscourse.				
InternalProject Marks	25Marks				
ExternalProjectMarks	25Marks				
Total	50Marks				
DurationofExam	03Hours				

The students expected to take up a project under the guidance of teacher from the college. The project must bebasedon mechanicalengineering problems,whichcanbe extended uptothe full semester. The students may be asked to work individually or in a group normally not more than four –six students in a group(If any large/bigprojects occurs then strength of students increases ap per guide supervision). Viva- voce must be based on the preliminary report submitted by students related to the project.