NANDHA ENGINEERING COLLEGE

(An Autonomous Institution affiliated to Anna University Chennai and approved by AICTE, New Delhi) Erode-638 052,
Tamilnadu, India, Phone: 04294 – 225585

List of Open Electives for

All B.E. / B.Tech. Programmes [R17]

(This Curriculum and Syllabi are applicable to Students admitted from the academic year 2017-2018 onwards)

SEPTEMBER 2021

OPEN ELECTIVES										
S. NO.	**COURSE CODE**	**COURSE TITLE**	**CATEGORY**	**PRE-REQUISITE**	**CONTACT PERIODS**	**L**	**T**	**P**	**C**	**P.S**
1.	17AGZ01	Baking and Confectionery Technology	OE	-	3	3	0	0	3	VII
2.	17AGZ02	Food safety and quality control system	OE	-	3	3	0	0	3	VII
3.	17AGZ03	Farm Mechanization	OE	-	3	3	0	0	3	VIII
4.	17AGZ04	Processing of Fruits and Vegetables	OE	-	3	3	0	0	3	VIII
5.	17CHZ01	Waste Water Treatment	OE	-	3	3	0	0	3	VII
6.	17CHZ02	Piping Engineering	OE	-	3	3	0	0	3	VII
7.	17CHZ03	Process Automation	OE	-	3	3	0	0	3	VII
8.	17CHZ04	Process Instrumentation	OE	-	3	3	0	0	3	VII
9.	17CEZ01	Energy conservation in buildings	OE	-	3	3	0	0	3	VII
10.	17CEZ02	Air Pollution Management	OE	-	3	3	0	0	3	VIII
11.	17CEZ03	Building Services	OE	-	3	3	0	0	3	VIII
12.	17CEZ04	Road Safety Management	OE	-	3	3	0	0	3	VII
13	17CEZ05	Waste Management	OE	-	3	3	0	0	3	VII/VIII
14.	17CSZ01	Design Thinking	OE	-	3	3	0	0	3	VII
15.	17CSZ02	Digital Marketing	OE	-	3	3	0	0	3	VII
16.	17CSZ03	Software Engineering	OE	-	3	3	0	0	3	VIII
17.	17CSZ04	Unified Functional Testing	OE	-	3	3	0	0	3	VIII
18	17CSZ05	C Programming	OE	-	3	3	0	0	3	VI
19.	17CSZ06	Data Structures	OE	-	3	3	0	0	3	VI
20.	17CSZ07	Web Services using Java	OE	-	3	3	0	0	3	VI
21.	17ECZ01	Modern wireless communication system	OE	-	3	3	0	0	3	VII
22.	17ECZ02	Consumer Electronics	OE	-	3	3	0	0	3	VII
23.	17ECZ03	Automotive Electronics	OE	-	3	3	0	0	3	VIII

24.	17ECZ04	Electronic Testing	OE	-	3	3	0	0	3	VIII
25.	17EEZ01	Renewable Energy Technology	OE	-	3	3	0	0	3	VII
26.	17EEZ02	Smart Grid	OE	-	3	3	0	0	3	VII
27	17EEZ03	Energy Auditing, Conservation and Management	OE	-	3	3	0	0	3	VIII
28	17EEZ04	Electrical Machines	OE	-	3	3	0	0	3	VIII
29	17EIZ01	Autotronix	OE	-	3	3	0	0	3	VII
30	17EIZ02	Industrial Automation	OE	-	3	3	0	0	3	VII
31.	17EIZ03	Fiber Optic Sensors	OE	-	3	3	0	0	3	VIII
32.	17EIZ04	Ultrasonic Instrumentation	OE	-	3	3	0	0	3	VIII
33.	17ITZ01	Software Testing Tool	OE	-	3	3	0	0	3	VII
34.	17ITZ02	User Experience	OE	-	3	3	0	0	3	VII
35.	17ITZ03	Developing Mobile Apps	OE	-	3	3	0	0	3	VIII
36.	17ITZ04	Software Project Management	OE	-	3	3	0	0	3	VIII
37.	17ITZ05	Java Programming	OE	-	3	3	0	0	3	VII
38.	17MEZ01	Engineering Ergonomics	OE	-	3	3	0	0	3	VII / VIII
39.	17MEZ02	Energy Audit and Resource Management	OE	-	3	3	0	0	3	VII / VIII
40.	17MEZ03	Electric Vehicle Technology	OE	-	3	3	0	0	3	VII / VIII
41.	17MEZ04	Value Engineering	OE	-	3	3	0	0	3	VII / VIII
42.	17MEZ05	Smart Mobility	OE	-	3	3	0	0	3	VII / VIII
43.	17MEZ06	Smart Sensor Systems	OE	-	3	3	0	0	3	VII / VIII
44.	17MYZ01	Mathematical Structures	OE	-	3	3	0	0	3	VII
45.	17MYZ02	Optimization Techniques	OE	-	3	3	0	0	3	VII
46.	17MYZ03	Statics for Engineers	OE	-	3	3	0	0	3	VII
47.	17MYZ04	Statistics for Engineers	OE	-	3	3	0	0	3	VII
48.	17PYZ01	Nanomaterials	OE	-	3	3	0	0	3	VII
49.	17PYZ02	Nuclear physics and Reactors	OE	-	3	3	0	0	3	VII

50..	17PYZ03	Space science and technology	OE	-	3	3	0	0	3	VII
51	17CYZ01	Chemistry for Every Day Life	OE	-	3	3	0	0	3	VII
52	17CYZ02	E - Waste Management	OE	-	3	3	0	0	3	VII
53	17CYZ03	Industrial Chemistry	OE	-	3	3	0	0	3	VII
54	17EYZ01	Communicative Hindi	OE	-	3	3	0	0	3	VII
55	17EYZ02	Fundamentals of German	OE	-	3	3	0	0	3	VII
56	17EYZ03	Basics of Japanese	OE	-	3	3	0	0	3	VII
57	17EYZ04	Employability Enhancement and Analytical Skills	OE	-	3	3	0	0	3	VII
58	17EYZ05	Workplace Communication	OE	-	3	3	0	0	3	VII
59.	17GYZ01	Biology for Engineers	OE	-	3	3	0	0	3	VII
60.	17BMZ01	Health care technology	OE	-	3	3	0	0	3	VII
61.	17BMZ02	Telemedicine	OE	-	3	3	0	0	3	VII
62.	17BMZ03	Epidemiology and Pandemic Management	OE	-	3	3	0	0	3	VII
63	17BMZ04	Medical Ethics	OE	-	3	3	0	0	3	VII
64	17EYX01	Effective Communication	OE	-	3	3	0	0	3	VII
65	17AIZ01	Fundamentals of artificial intelligence and machine learning	OE	-	3	3	0	0	3	VII
66	17AIZ02	Data science fundamentals	OE	-	3	3	0	0	3	VII
67	17AIZ03	Introduction to Business analytics	OE	-	3	3	0	0	3	VIII
68	17AIZ04	Augmented reality/virtual reality technologies	OE	-	3	3	0	0	3	VII
69	17ITZ06	Data structures using C	OE	-	3	3	0	0	3	VII
70	17ITZ07	Product Lifecycle Management for Engineers	OE		3	3	0	0	3	VII

17AGZ01 – BAKING AND CONFECTIONERY TECHNOLOGY *(Common to All branches except Agricultural Branch)*					
		L	T	P	C
		3	0	0	3
PREREQUISITE : NIL	**QUESTION PATTERN:**				
COURSE OBJECTIVES AND OUTCOMES:					

Course Objectives		**Course Outcomes**		**Related Program Outcomes**
1.0	To know the basic knowledge about the baking	**1.1**	Able to choose the ingredients for production of bakery products	**a,f,g,h,l,l**
2.0	To know the basic principles about the equipments used in baking	**2.1**	Able to select the appropriate equipments for baking	**a,c,f,g**
3.0	To learn the basic knowledge about the bread making process	**3.1**	To adapt bread making process and identify defects in bread	**a,f,,l,l**
4.0	To know the processing steps for bakery products	**4.1**	Able to formulate various bakery products	**a,f,g,h,l**
5.0	To impart knowledge on basics of Confectionery products	**5.1**	To develop confectionery products and identify cause for defects	**a,c,f,l,l**

UNIT I - FUNCTIONS OF BAKING INGREDIENTS	**(9)**
Classification of bakery products. Bakery ingredients and their functions- flour, yeast, sugar, fat, egg, water, salt, coloring agents, flavoring agents, milk, milk powder, emulsifiers, leaveners, antioxidants and improvers	
UNIT II – BAKERY AND CONFECTIONERY EQUIPMENTS	**(9)**
Handling of ingredients- dough mixers, dividers, rounder, sheeter, laminating equipments, fermentation enclosures and brew equipment, ovens and slicers.	
UNIT III -BREAD MAKING PROCESS	**(9)**
Bread making methods- Straight dough/bulk fermentation, Sponge and dough, Activated dough development, Chorley wood bread process, No time process. Characteristics of good bread- Internal and external characters. Bread defects/faults and remedies. Spoilage of bread-Causes, detection and prevention.	
UNIT IV - BAKERY PRODUCTS	**(9)**
Biscuit making – Ingredients and their functions. Types of biscuit dough – Developed dough, short dough's, semi-sweet, enzyme modified doughs and batters. Methods of biscuit manufacturing. Cake making- Ingredients and their function. Methods for different types of cakes manufacture. Miscellaneous bakery products production - Wafers, puff pastry, chemically leavened bakery products.	
UNIT V – CONFECTIONERY PRODUCTS	**(9)**
Definition, importance of sugar confectionery, ingredients, Formulation and Processing methods. Industrial sugar confectionery manufacture - compositional effects, prevention of re-crystallization and stickiness. Manufacturing of Caramel, Toffee and Fudge. Aerated confectionery- Methods of aeration and Manufacturing processes. Confectionery product quality parameters, faults and corrective measures.	

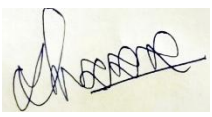
TOTAL (L: 45) = 45 PERIODS

TEXT BOOKS:

1. Samuel A. Matz, ―Bakery Technology and Engineering‖, 3rd Edition, Chapman and Hall, London, 2005
2. Cauvain, Stanley, P. and Young, Linda S., ―Technology of Bread Making‖, 2nd Edition, Aspen Publication, Maryland, 1999

REFERENCE BOOKS:

1. Servet Gulum Sumnu and Serpil Sahin, ―Food Engineering Aspects of Baking Sweet Goods‖, CRC Press, USA, 2008.
2. Samuel A. Matz, ―Equipment for Bakers‖, Pan Tech International Publication, 1988.
3. Ferenc A. Mohos, ―Confectionery and Chocolate Engineering: Principles and Applications‖, Wiley Blackwell, UK, 2010.



17AGZ02 -FOOD SAFETY AND QUALITY CONTROL SYSTEM *(Common to All branches except Agricultural Branch)*					
			L	**T**	**P**	**C**
			3	**0**	**0**	**3**
PREREQUISITE : NIL		**QUESTION PATTERN:**				
COURSE OBJECTIVES AND OUTCOMES:						
Course Objectives		**Course Outcomes**		**Related Program Outcomes**		
1.0	To know the basic knowledge about the food safety	**1.1**	To identify suitable food safety for foods	**a,e,f,g,h,l,j,l**		
2.0	To know the basic principles about Food quality and standards	**2.1**	Able to identify suitable food quality standards	**a,d,e,f,g,h,l,j,l**		
3.0	To learn the basic knowledge about Quality Assurance in food industry	**3.1**	To apply principles of quality assurance and quality management systems in food industries	**a,,e,f,g,h,l,j,l**		
4.0	To know about the regulations for food business operator	**4.1**	Able to appraise various regulations for food business operator	**a,e,f,g,h,l,j,l**		
5.0	To impart knowledge on Food quality management system	**5.1**	To apply principles of food quality management systems in food industries	**a,e,f,g,h,l,j,l**		

UNIT I - FOOD SAFETY	**(9)**
Principles and need for quality control and safety, strategy and criteria for food safety. Consumer lifestyle and demand, issues in food safety, food traceability and recall, Case studies in food safety.	
UNIT II – FOOD QUALITY AND STANDARDS	**(9)**
Quality of Foods, Quality Standards - mandatory and optional standards, Food Safety Systems - ISO 9000, ISO 14000, ISO 22000, Mechanism of developing and fixing food standards, Good Manufacturing Practice, HACCP, Standard operating procedure	
UNIT III –QUALITY ASSURANCE IN FOOD INDUSTRY	**(9)**
Objectives, importance and functions of quality control, Concept of Quality Assurance and Quality Control, Quality Control procedures, Quality Assurance procedures, International organizations: ISO, CAC, WTO, USFDA, Codex, EIC. National organizations: BIS, CCFS, Agmark, MMPO and APEDA, Good Laboratory Practices.	
UNIT IV - REGULATIONS FOR FOOD BUSINESS OPERATOR	**(9)**
Food adulteration and food safety, Food laws - Food Safety and Standards Act (FSSAI), Prevention of Food Adulteration Act, Packaged Commodities Rules, Functions of Food Business Operator, QA Audit, IPR and Patents, Issues affecting consumers	

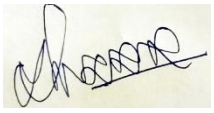
and industry - Genetically Modified Foods, Fortification, Pesticide Residues, Organic Foods, Food Additives.	
UNIT V – FOOD QUALITY MANAGEMENT SYSTEM	**(9)**
FSSAI functions, duties and responsibilities of food safety regulators, food safety and standards for food products, implementation, validation, verification and improvement of food safety management systems. Good Hygienic Practices (GHP), Good Laboratory Practices (GLP), FSSC 22000, Food Safety Audit.	
TOTAL (L: 45) = 45 PERIODS	

TEXT BOOKS:

1. Inteaz Alli, ―Food Quality Assurance: Principles and Practices‖, 2nd Edition, Taylor and Francis, UK, 2014.
2. Andres Vasconcellos J, ―Quality Assurance for the Food Industry: A Practical Approach‖, CRC Press, New York, 2004

REFERENCE BOOKS:

1. Da-Wen Sun, "Handbook of Food Safety Engineering", John Wiley & Sons, New Jersey, 2012.
2. Singh, S. P., ―Food Safety, Quality Assurance, and Global Trade: Concerns and Strategies‖, International Book Distributing Company, Lucknow, 2009
3. Yasmine Motarjemi and Huub Lelieveld., "Food Safety Management - A Practical Guide For The Food Industry", Elsevier, New York, 2014.



17AGZ03 FARM MECHANIZATION *(Common to All branches except Agricultural Branch)*					
			L	**T**	**P**	**C**
			3	**0**	**0**	**3**
PREREQUISITE : NIL		**QUESTION PATTERN: TYPE – III**			
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives		**Course Outcomes**			**Related Program Outcomes**
1.0	To introduce the concept and importance of farm mechanization	**1.1**	Able to explain the importance of farm mechanization		**a, f, g, h, k, l**
2.0	To understand the problems in implementing farm mechanization	**2.1**	Able to solve the problems involved in farm mechanization		**a, b, c, e, h, i, l**
3.0	To know the types of implements in farming operations	**3.1**	Able to identify tillage implements and intercultural operation implements		**a, b, c, d, e, g, i, k, l**
4.0	To gain knowledge on harvesting and plant protection machinery	**4.1**	Able to select suitable machinery for harvesting and plant protection		**a, b, c, d, e, h, k, l**
5.0	To know about the ergonomics and automation involved in farm machines	**5.1**	Abel to develop automation to improve existing farm machines		**a, b, c, d, e, h, k**

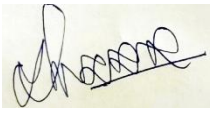
UNIT I - THE SCOPE OF MECHANIZATION INDIAN AGRICULTURE	**(9)**
Introduction to the concept of mechanization - definition and its impact in the agricultural development of the country and the role of agriculture in the economic progress of the country. Precision farming – its significance – history of farm mechanization in India. Different Sources of Power in agriculture – tractors, power tillers – bulldozers.History of Development of farm tractors in India.	
UNIT II - TILLAGE AND PROBLEMS IN FARM MECHANISATION	**(9)**
Major problems in adopting farm mechanisation inputs suitable to their specific needs- possible solutions to overcome them. Tillage – definition - objectives – types –their functions and applications.	
UNIT III - IMPLEMENTS USED IN FARMING OPERATIONS	**(9)**
Types of implements based on usage – primary and secondary – trailed and mounted – functions – applications – animal drawn ploughs. Planting machinery – Intercultural operations – weeders – types and their functions.	
UNIT IV - HARVESTING EQUIPMENTS AND PLANT PROTECTION MACHINERY	**(9)**
Different kinds of crop harvesting machinery – features – functions and applications. Basics of knapsack sprayers, foot pedal operated sprayers, power sprayers, boom sprayers and dusters.	
UNIT V - ERGONOMICS AND AUTOMATION	**(9)**
Ergonomic aspects of farm implements – automation of agricultural machinery – latest developments in automation – application of electronics in agriculture.	
TOTAL (L: 45) = 45 PERIODS	

TEXT BOOKS:

1. J.M. Shippen, C.R.Ellin and C.H. Clover, Basic farm machinery, Pergamon Press Ltd, 1987.
2. C.J. Studman, Agricultural and horticultural engineering, Butterworths PVT Ltd, 1990.

REFERENCES:

1. R.N. Kaul, and C.O. Egbo, Introduction to Agricultural Mechanisation, Macmillan, London, 1985.
2. S. Nath, Manual of Practicals in Farm Mechanisation, Unitech Printery, 1988.
3. C.P. Crossley, and J. Kilgour, Small Farm Mechanisation for Developing Countries, Wiley, London, 1983.
4. FAO - Elements of Agricultural Machinery (Vol 1 - 11). Agricultural Service Bulletin No.12, 1977.



17AGZ04 – PROCESSING OF FRUITS AND VEGETABLES *(Common to All branches except Agricultural Branch)*					
		L	**T**	**P**	**C**
		3	**0**	**0**	**3**
PREREQUISITE : NIL	**QUESTION PATTERN:**				

COURSE OBJECTIVES AND OUTCOMES:

Course Objectives		**Course Outcomes**		**Related Program Outcomes**
1.0	To impart knowledge on Structure ,composition and ripening of fruits and vegetables	**1.1**	Able to analyze the structure, composition and ripening of fruits and vegetables.	**a,f,g,h,l**
2.0	To learn the basic principles of cleaning, grading and on-farm processing	**2.1**	To gain knowledge on pretreatments of fruits and vegetables	**a,f,g,h,l**
3.0	To learn the basic knowledge about the preservation of horticultural crops	**3.1**	To gain insight on preservation of horticultural crops	**a,d,f,g,h,l**
4.0	To know about the drying and dehydration of fruits and vegetables	**4.1**	Analyze and select the suitable dryer for drying fruits and vegetables	**a,c,d,f,g,h,l**
5.0	To impart knowledge on storing the fruits and vegetables	**5.1**	Understand the fundamental concepts of storage and selecting suitable storage conditions.	**a,f,g,h,l**

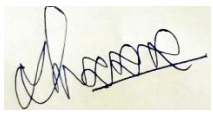
UNIT I - STRUCTURE, COMPOSITION AND RIPENING	**(9)**
Importance of post-harvest technology of horticultural crops –structure, cellular components, composition and nutritive value of horticultural crops – fruit ripening – Post-harvest physiological and biochemical changes in fruits and vegetables; maturity indices and standards for selected fruits and vegetables	
UNIT II – CLEANING, GRADING AND ON-FARM PROCESSING	**(9)**
Harvesting and washing of fruits, vegetables, spices and plantation crops – cleaning and grading - peeling - equipments – construction and working – pre-cooling – importance, methods. Commodity pretreatments - chemicals, wax coating, prepackaging	
UNIT III - PRESERVATION OF HORTICULTURAL CROPS	**(9)**
Thermal and non-thermal techniques for preservation of fruits and vegetables- minimal processing - quick freezing – canning – processing and concentration of juice - membrane separation process and application - hurdle technology. Preparation of processed products – Jam, jelly, squash, sauce, preserve and pickle	
UNIT IV - DRYING AND DEHYDRATION	**(9)**
Dehydration of horticultural crops– types of dryers, construction and working - methods – fluidized bed dryer, spouted bed dryer, osmotic dehydration and foam mat drying – principles, construction and operation. Valuable products from fruits and vegetables waste.	
UNIT V – STORAGE	**(9)**
Storage of horticultural commodities – storage under ambient conditions, low temperature storage, evaporative cooling – cold storage of horticultural commodities – estimation of cooling load - controlled atmosphere storage–modified atmosphere packaging.	
TOTAL (L: 45) = 45 PERIODS	

TEXT BOOKS:

1. Srivastava,R.P. and Sanjeev Kumar. 1998. Fruit and vegetable preservation. International Book Distributing Co., Lucknow.
2. Sudheer K. P. and V. Indra. 2007. Post-harvest Technology of Horticultural Crops. New India Publishing Company, New Delhi.

REFERENCE BOOKS:

1. Heid,J.L. and M.A.Joslyn. 1983. Food processing operations. Vol. II. AVI Publishing Co. Inc. Westport, Connecticut.
2. Potter, N.N.1976. Food science. AVI Publishing Co. Inc.Westport, Connecticut, 2nd edition.
3. Lal G, Siddapa GS &Tandon GL.1986. Preservation of Fruits and Vegetables. ICAR
4. Thompson AK. 1995. Post-Harvest Technology of Fruits and Vegetables.Blackwell Sci.



7CHZ01 – WASTE WATER TREATMENT *(Common to All branches except Chemical Branch)*				
L	**T**	**P**	**C**
3	**0**	**0**	**3**

PREREQUISITE : NIL	**QUESTION PATTERN: TYPE 3**

COURSE OBJECTIVES AND OUTCOMES

Course Objectives		**Course Outcomes**		**Related Program outcomes**
1.0	To examine the sources, constituents and environmental concerns of waste water and treatment methods	**1.1**	Get familiarized with sources, constituents and environmental concerns of waste water and treatment methods	**a, c, e, f**
2.0	To appraise various physical and chemical treatment processes	**2.1**	Comprehend various physical and chemical treatment processes	**a, c, d, e, f**
3.0	To understand various biological treatment processes	**3.1**	Explain various biological treatment processes	**a, c, d, e, f**
4.0	To explore various advanced treatment process and Zero Liquid Discharge systems	**4.1**	Get familiarized with various advanced treatment process and Zero Liquid Discharge systems	**a, c, d, e, f, g**
5.0	To understand selection of process and modelling of reactors used in waste water treatment	**5.1**	Able to select and perform modelling of reactors used in waste water treatment	**a, b, c, d, e, f**

UNIT I : INTRODUCTION TO WASTE WATER TREATMENT	**(9)**
Wastewater Sources and types, physical and chemical properties - Constituents in waste water – Impact of wastewater -Health and Environment Concerns in waste water and environmental regulations, thermal treatment processes, Wastewater Reclamation and reuse	
UNIT II : PHYSICAL AND CHEMICAL TREATMENT PROCESSES	**(9)**
Physical and chemical properties of wastewater, Physical Unit Operations –Screening, Equalization, Flocculation, sedimentation, Clarification, Filtration, Flotation and Aeration Systems. Chemical Unit Process – Chemical Coagulation, Precipitation, Oxidation and Neutralization	
UNIT III : BIOLOGICAL TREATMENT PROCESS	**(9)**
Microbial metabolism – Bacterial growth– Aerobic and Anaerobic biological oxidation – Activated Sludge process – Trickling filters – Rotating biological contactors – Combined treatment processes – Chemical reactors and filters.	
UNIT IV : ADVANCED TREATMENT PROCESS	**(9)**
Need for Advanced Wastewater Treatment - Technologies used in advanced treatment – Depth Filtration – Surface Filtration – Membrane Separation Process- Absorption – Ion Exchange – Advanced oxidation process – ZLD Concept	

UNIT V : PROCESS ANALYSIS AND SELECTION	(9)
Components of waste water flows – Analysis of Data – design and analysis of biological reactors for waste water treatment – Mass Balance Analysis – Modeling of ideal and non ideal flow in Reactors – Process Selection.	
TOTAL(L:45) = 45 PERIODS	

TEXT BOOKS:

1. "Industrial Waste Water Management, Treatment and Disposal-MOP FD-3", Water Environment Federation, 3rd Edition, Tata McGraw Hill Professional Publishing Company, New York, 2008
2. Metcalf, Eddy and Tchobanoglous G., "Waste Water Engineering Treatment and Reuse", 2nd Edition, Tata McGraw Hill Company, NewYork, 2002.

REFERENCES:

1. Arceivala S.J., "Wastewater Treatment for Pollution Control", 3rd Edition, McGraw-Hill, 2006
2. Eckenfelder W.W., "Industrial Water Pollution Control", 2nd Edition, McGraw-Hill, 1999

17CHZ02 - PIPING ENGINEERING *(Common to All branches except Chemical Branch)*				
	L	**T**	**P**	**C**
	3	**0**	**0**	**3**
PREREQUISITE : NIL	**QUESTION PATTERN: TYPE - 3**			

COURSE OBJECTIVES AND OUTCOMES:

Course Objectives		Course Outcomes		Related Program outcomes
1.0	To impact knowledge of piping fundamentals and fluid flow phenomena	1.1	Understand the fundamental principles of fluid flow, pipes and fittings and standard codes.	**a, b, c, d**
2.0	To understand the concept of piping generic design	2.1	Examine the types of pipes , pipe network and generic design of pipes and pipe supports	**a, b, c, d**
3.0	To learn design aspects of pipeline systems for air, water, steam and oil	3.1	Perform design of pipeline systems for air, water, steam and oil	**a, b, c, d, e, f**
4.0	To gain exposure about design aspects of pipeline systems for gases, refrigeration and slurry	4.1	Perform design of pipeline systems for gases, refrigeration and slurry	**b, c, d, e, f**
5.0	To explain safety environmental and economics concepts in operation and maintenance	5.1	Apply operation and maintenance techniques to ensure safety operations	**b, c, d, e, f**

UNIT I - PIPING FUNDAMENTALS	**(9)**
Equations of flow for Newtonian and Non-Newtonian fluids; losses in pipes and fittings; Types of pipes and fittings. Piping standards and codes.	
UNIT II - PIPING GENERIC DESIGN	**(9)**
Piping layout- series and parallel pipes - Pipe network. Stress analysis and design of pipe supports.	
UNIT III - PIPING DESIGN FOR UTILITIES	**(9)**
Design of pipeline system – Air, Water, Steam and Oil.	
UNIT IV - PIPING DESIGN FOR PROCESSES	**(9)**
Design of pipeline system – Gases, Refrigeration, slurry and wastewater.	

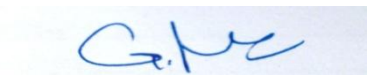
UNIT V -OPERATION AND MAINTENANCE	(9)
Coating, cleaning; freeze prevention, leak detection, corrosion and protection. Pipeline failures - Piping insulation and heat tracing, repair techniques; Pipeline economics.	
	TOTAL(L:45) = 45 PERIODS

TEXT BOOKS:

1. Henry Liu, ―Pipeline Engineering‖, 2nd Edition, Lewis Publishers, 2003
2. John J Mcketta, ― Piping Handbook‖, 3rd Edition, Marcel Dekker Publication, 1992.

REFERENCES:

1. George A. Antaki, ―Piping and Pipeline Engineering: Design, Construction, Maintenance, Integrity and Repair‖, Marcel Dekker Publications, 2003.
2. Mohinder L. Nayyar, ―Piping Handbook‖, 7th Edition, McGraw Hill, 2000.



17CHZ03 - PROCESS AUTOMATION *(Common to All branches except Chemical Branch)*					
		L	**T**	**P**	**C**
		3	**0**	**0**	**3**
PREREQUISITE : NIL		**QUESTION PATTERN: TYPE 3**			
COURSE OBJECTIVES AND OUTCOMES					
Course Objectives		**Course Outcomes**			**Related Program outcomes**
1.0	To understand the basic concepts of chemical process industries	**1.1**	Understand the concepts of unit operations and unit processes.		**a, d, f**
2.0	To learn the fundamentals of mechanical operations and their significance in chemical industries	**2.1**	Apply the principles of size reduction, separation and transportation for handling solids in Chemical process industries.		**b, c, d, f**
3.0	To gain exposure over fluid properties and types of fluids	**3.1**	Comprehend the importance of fluid properties, types of fluids and select the manometers for pressure measurement		**a, b, c, d**
4.0	To understand the heat transfer mechanisms and the types of heat exchange equipments	**4.1**	Familiarize with modes of heat transfer and acquire knowledge on types of heat exchangers.		**b, c, d, f**
5.0	To have a basic idea on process calculations carried out in chemical industries.	**5.1**	Understand and apply the concepts of units and dimensions, mole, weight percentage, mole percentage in process calculations.		**a, b, c**

UNIT I : INTRODUCTION TO UNIT OPERATIONS	**(9)**
Principles of measurement and classification of process control instruments; temperature, pressure, fluid flow, liquid level, velocity, fluid density, viscosity. Instrument scaling; sensors; transmitters and control valves; instrumentation symbols and labels	
UNIT II : PROCESS AUTOMATION	**(9)**
Basic concepts; terminology and techniques for process control; control modes; Tuning process controllers	
UNIT III : ADVANCED CONTROL	**(9)**
Advanced control techniques, feed forward and ratio control; controller design; adaptive control system; statistical process control; expert system; multivariable control techniques; supervisory control.	
UNIT IV : DIGITAL CONTROL	**(9)**
Digital control techniques; z transforms; sampling and filtering; response of discrete time systems; sampled data control systems; design of digital controllers.	

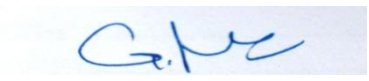
UNIT V :OPTIMAL CONTROL	(9)
Optimization and simulation; optimization techniques; single and multivariable constrained optimization; dynamic simulation of distillation columns and reactors.	
TOTAL (L:45)= 45 PERIODS	

TEXT BOOKS:

1. Jon Stenerson, "Industrial Automation and Process Control", 1st Edition, Prentice Hall, 2002
2. K.L.S. Sharma, Overview of Industrial Process Automation, 1st Edition, 2011

REFERENCES:

1. B.R. Mehta Y. Jaganmohan Reddy, "Industrial Process Automation Systems, Design and Implementation", 1st Edition, 2014.
2. Stamatios Manesis, George Nikolakopoulos, "Introduction to Industrial Automation" 1st Edition, CRC Press



17CHZ04 – PROCESS INSTRUMENTATION *(Common to All branches except Chemical Branch)*					
		L	**T**	**P**	**C**
		3	**0**	**0**	**3**
PREREQUISITE : NIL		**QUESTION PATTERN: TYPE - 3**			

COURSE OBJECTIVES AND OUTCOMES

Course Objectives		**Course Outcomes**		**Related Program outcomes**
1.0	To learn about the basic knowledge of instruments used for measurement	**1.1**	Understand the importance of measurements and the selection of instruments	**a, d, e,**
2.0	To learn the basic concept of thermometer used in industry	**2.1**	Understand the knowledge about measuring the temperature and instrument calibration.	**b, e, g**
3.0	To learn basic knowledge about the manometers	**3.1**	Understand the knowledge about gauge and vacuum pressure measuring instruments	**a, b, g, l**
4.0	To learn basic knowledge about the various types of flow meters.	**4.1**	Understand the different meters used for measuring the fluid flow.	**b, d, e**
5.0	To learn about the methods used for measuring fluid properties	**5.1**	Understand the measurements of fluid properties like density, viscosity.	**a, e, f**

UNIT I : PRINCIPLES OF MEASUREMENTS	**(9)**
Qualities of measurements; Static and dynamic characteristics. Measurement of force, strain, and torques. Transducers-resistive, capacitive, inductive and piezoelectric devices; Applications in chemical process industries.	
UNIT II : TEMPERATURE MEASUREMENT	**(9)**
Thermometer: Liquid and gas- filled vapour pressure, Bimetallic and resistance types. Thermocouples and thermistors; Radiation pyrometery. Infrared thermometry, Special types- paint and crayons, pellets, strips and seger cones. Calibration of instrument.	
UNIT III : PRESSURE AND VACUUM MEASUREMENTS	**(9)**
Manometers, bourdon gauge and bellows gauge, vacuum measurement- mechanical, thermal and ionization gauges.	
UNIT IV :FLOW AND LEVEL MEASUREMENTS	**(9)**
Variable head and area flow meters. Mass and quantity flow meters, Magnetic, Vortex and Coreolis meter.	

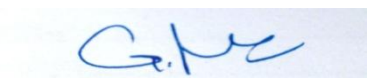
Level measurements-direct and indirect methods.	
UNIT V :MISCELLANEOUS MEASUREMENTS	**(9)**
Measurement of density, specific gravity, Viscosity, Humidity, pH, Thermal conductivity and electrical conductivity; Gas analyzers-CO/CO2, SOx and NOx.	
	TOTAL(L:45) = 45 PERIODS

TEXT BOOKS:

1. Patranabis D., ―Principles of Industrial Instrumentation‖, Tata-McGraw Hill, New Delhi, 2009
2. Eckmen D.P., ―Industrial instrumentation‖, Wiley Eastern, New Delhi, 2004.

REFERENCES:

1. Perry R.H. and Green D.W., ―Perry‘s Chemical Engineers‘ Hand Book‖, McGraw Hill, New Delhi, 2009
2. Singh S.K., ―Industrial Instrumentation and Control‖, 2nd Edition, Tata McGraw-Hill Publishing Company, New Delhi, 2006.



17CEZ01 – ENERGY CONSERVATION IN BUILDINGS *(Common to All branches except CIVIL Branch)*					
			L	**T**	**P**	**C**
			3	**0**	**0**	**3**
PREREQUISITE :		**QUESTION PATTERN : TYPE - 3**			
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives		**Course Outcomes**		**Related Program outcomes**	
1.0	To know about the climate zones	**1.1**	Get idea on climate effects on building systems	**b,f, h**	
2.0	To get idea on energy estimates considering about climate zones.	**2.1**	Perform energy estimation for buildings	**f, h**	
3.0	To understand about principles of energy in building design	**3.1**	Implement thermal insulation techniques in buildings.	**f, h, i, l**	
4.0	To follow the guidelines for design aspects	**4.1**	Plan for the energy conservation methods in buildings.	**f, h, i, l**	
5.0	To gain knowledge on energy conservation in buildings and monitoring systems	**5.1**	Apply monitoring and control of energy systems in buildings	**f, h, i, l**	

UNIT I CLIMATE	**(6)**
Climate and shelter – Historic buildings – Modern architecture – Examples from different climate zones.	
UNIT II ENERGY ESTIMATION	**(9)**
Thermal comfort – Solar geometry and shading – Heating and cooling loads – Energy estimates and site planning – Integrative Modeling methods and building simulation	
UNIT III PRINCIPLES OF ENERGY	**(9)**
Principles of Energy conscious building design – Energy conservation in buildings – Day lighting – Water heating and photovoltaic systems – Advances in thermal insulation – Heat gain / loss through building components – Solar architecture	
UNIT IV ENERGY CONSERVATION	**(9)**
Passive solar heating – Direct gain – Thermal storage wall – Sunspace – Convective air loop – Passive cooling – Ventilation – Radiation – Evaporation and Dehumidification – Mass effect – Design guidelines	
UNIT V MONITORING AND CONTROL SYSTEMS	**(12)**
Energy conservation in building – Air conditioning – HVAC equipment – Computer packages for thermal design of buildings and performance prediction – Monitoring and instrumentation of passive buildings – Control systems for energy efficient buildings – Illustrative passive buildings – Integration of emerging technologies – Intelligent building design principles.	
TOTAL: L: 45 = 45 PERIODS	
TEXT BOOKS: 1. J.K. Nayak and J.A. Prajapati Hadbook on Energy Consious Buildings, Solar Energy Control MNES, 2006. 2. J.A. Clarke, Energy Simulation in Building Design (2e) Butterworth 2001.	

REFERENCES:

1. J.R. Williams, Passive Solar Heating, Ann Arbar Science, 1983.
2. R.W. Jones, J.D. Balcomb, C.E. Kosiewiez, G.S. Lazarus, R.D. McFarland and W.O. Wray, Passive Solar Design Hanbook, Vol.3, Report of U.S. Department of Energy (DOE/CS-0127/3), 1982.
3. M.S. Sodha, N.K., Bansal, P.K. Bansal, A.Kumar and M.A.S. Malik. Solar Passive Building, Science and Design, Pergamon Press, 1986.
4. J.L. Threlkeld, Thermal Environmental Engineering, Prentice Hall, 1970.

17CEZ02 – AIR POLLUTION MANAGEMENT *(Common to All branches except CIVIL Branch)*					
			L	T	P	C
			3	0	0	3
PREREQUISITE :		**QUESTION PATTERN : TYPE - 3**			
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives		**Course Outcomes**		**Related Program outcomes**	
1.0	To study the sources and effects of pollutants	**1.1**	Understand about nature and characteristics of air pollutants.	**b,g**	
2.0	To know about source inventory and control mechanism	**2.1**	Identify the basic elements of atmosphere and its stability.	**c,e,g,l**	
3.0	To get idea on principles and design of control measures on air pollution	**3.1**	Design stacks and particulate air pollution control devices to meet applicable standards	**a,c,e,g,l**	
4.0	To know the air quality standards and monitoring	**4.1**	Understand the basic concepts of air quality management	**e,g,l**	
5.0	To study about the characteristics and effects of noise pollution and the methods of controlling the same	**5.1**	Identify, formulate and solve air and noise pollution problems.	**b,c,e,k,l**	

UNIT I SOURCES AND EFFECTS OF AIR POLLUTANTS	**(9)**
Classification of air pollutants – Particulates and gaseous pollutants – Sources of air pollution – Source inventory – Effects of air pollution on human beings, materials, vegetation, animals – global warming-ozone layer depletion, Sampling and Analysis – Basic Principles of Sampling – Source and ambient sampling – Analysis of pollutants – Principles.	
UNIT II DISPERSION OF POLLUTANTS	**(9)**
Elements of atmosphere – Meteorological factors – Wind roses – Lapse rate - Atmospheric stability and turbulence – Plume rise – Dispersion of pollutants – Dispersion models – Applications.	
UNIT III AIR POLLUTION CONTROL	**(12)**
Concepts of control – Principles and design of control measures – Particulates control by gravitational, centrifugal, filtration, scrubbing, electrostatic precipitation – Selection criteria for equipment - gaseous pollutant control by adsorption, absorption, condensation, combustion – Pollution control for specific major industries.	
UNIT IV AIR QUALITY MANAGEMENT	**(8)**
Air quality standards – Air quality monitoring – Preventive measures - Air pollution control efforts – Zoning – Town planning regulation of new industries – Legislation and enforcement – Environmental Impact Assessment and Air quality.	
UNIT V NOISE POLLUTION	**(7)**
Sources of noise pollution – Effects – Assessment - Standards – Control methods – Prevention.	
TOTAL: L: 45 = 45 PERIODS	

TEXT BOOKS:

1. Anjaneyulu, D., "Air Pollution and Control Technologies", Allied Publishers, Mumbai, 2002.
2. Rao, C.S. Environmental Pollution Control Engineering, Wiley Eastern Ltd., New Delhi, 1996.
3. Rao M.N., and Rao H. V. N., Air Pollution Control, Tata McGraw Hill, New Delhi, 1996.

REFERENCES:

1. Heumann.W.L.,"IndustrialAirPollutionControlSystems",McGrawHill,NewYark,1997.
2. MahajanS.P.,"PollutionControlinProcessIndustries",TataMcGrawHillPublishingCompany,NewDelhi, 1991.
3. Garg,S.K.,"EnvironmentalEngineeringVol.II",KhannaPublishers,NewDelhi,1998
4. Mahajan,S.P.,"PollutionControlinProcessIndustries",TataMcGrawHill,NewDelhi,1991.
5. Thod Godesh, "Air Quality, Lewis India Edition, 2013.

17CEZ03 – BUILDING SERVICES *(Common to All branches except CIVIL Branch)*				
	L	**T**	**P**	**C**
	3	**0**	**0**	**3**

PREREQUISITE :	**QUESTION PATTERN : TYPE - 3**

COURSE OBJECTIVES AND OUTCOMES:

	Course Objectives		**Course Outcomes**	**Related Program outcomes**
1.0	To understand about electrical systems in building and its specifications	**1.1**	Know about the basic electrical systems in buildings	**b,c,g**
2.0	To get idea on special features required for illumination	**2.1**	Gain knowledge about the modern lighting systems.	**c,g**
3.0	To know about the concepts of refrigeration and other safety installations as per NBC	**3.1**	Study about the HVAC systems.	**c,g**
4.0	To know about the safety regulations in buildings	**4.1**	Be familiar with the concept of planning considerations and fire safety installation in buildings	**b,c,e,i**
5.0	To plan and schedule the frequency of inspection and maintenance of building including drainage	**5.1**	Students will be able to understand the role of global issues and professional bodies.	**b,c,e,g,l**

UNIT I ELECTRICAL SYSTEMS IN BUILDINGS	**(9)**
Basics of electricity – Single / Three phase supply – Protective devices in electrical installations – Earthing for safety – Types of earthing – ISI specifications – Types of wires, wiring systems and their choice – Planning electrical wiring for building – Main and distribution boards – Transformers and switch gears – Layout of substations	
UNIT II PRINCIPLES OF ILLUMINATION & DESIGN	**(9)**
Visual tasks – Factors affecting visual tasks – Modern theory of light and colour – Synthesis of light – Additive and subtractive synthesis of colour – Luminous flux – Candela – Solid angle illumination – Utilisation factor – Depreciation factor – MSCP – MHCP – Lans of illumination – Classification of lighting – Artificial light sources – Spectral energy distribution – Luminous efficiency – Colour temperature – Colour rendering. Design of modern lighting – Lighting for stores, offices, schools, hospitals and house lighting. Elementary idea of special features required and minimum level of illumination required for physically handicapped and elderly in building types.	
UNIT III REFRIGERATION PRINCIPLES & APPLICATIONS	**(9)**
Thermodynamics – Heat – Temperature, measurement transfer – Change of state – Sensible heat – Latent heat of fusion, evaporation, sublimation – saturation temperature – Super heated vapour – Sub cooled liquid – Pressure temperature relationship for liquids – Refrigerants – Vapour compression cycle – Compressors – Evaporators – Refrigerant control devices – Electric motors – Starters – Air handling units – Cooling towers – Window type and packaged air-conditioners – Chilled water plant – Fan coil systems – Water piping – Cooling load – Air conditioning systems for different types of buildings – Protection against fire to be caused by A.C. Systems	
UNIT IV FIRE SAFETY INSTALLATION	**(9)**
Causes of fire in buildings – Safety regulations – NBC – Planning considerations in buildings like non-combustible materials, construction, staircases and lift lobbies, fire escapes and A.C. systems. Special features required for physically handicapped and elderly in building types – Heat and smoke detectors – Fire alarm system, snorkel ladder – Fire lighting pump and water storage – Dry and wet risers – Automatic sprinklers.	

UNIT V PLUMBING AND DRAINAGE	(9)
Plumbing fixtures and fixture fittings – Water conserving fittings – Over flows – Strainers and connectors – Prohibited fixtures – Special fixtures – Installation of water closet – Urinals - Flushing devices – Floor drains – Shower stall – Bath tub – Bidets – Minimum plumbing facilities – Rain water harvesting systems – Necessity – Construction – Different types .	
	TOTAL: L: 45 = 45 PERIODS

TEXT BOOKS:

1. Udayakumar, "A Text Book on Building Services", Eswar Press, 2007.
2. Handbook for Building Engineers in Metric systems, NBC, New Delhi, 1968.

REFERENCES:

1. E.R.Ambrose, "Heat Pumps and Electric Heating", John and Wiley and Sons, Inc., New York, 1968.
2. Handbook for Building Engineers in Metric systems, NBC, New Delhi, 1968.
3. R.G.Hopkinson and J.D.Kay, "The Lighting of buildings", Faber and Faber, London, 1969.
4. William H.Severns and Julian R.Fellows, "Air-conditioning and Refrigeration", John Wiley and Sons, London, 1988.
5. A.F.C. Sherratt, "Air-conditioning and Energy Conservation", the Architectural Press, London, 1980.

17CEZ04 – ROAD SAFTEY MANAGEMENT *(Common to All branches except CIVIL Branch)*					
			L	T	P	C
			3	0	0	3
PREREQUISITE : NIL		**QUESTION PATTERN : TYPE - 3**			
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives		**Course Outcomes**		**Related Program outcomes**	
1.0	To gain knowledge on road safety and methods in accident analysis	**1.1**	Identify the road safety factors	**f, h**	
2.0	To investigate accident prone area	**2.1**	Analyze accidents and accident data	**f, h**	
3.0	To know the accident analysis techniques	**3.1**	Sketch collision and condition diagrams	**f, h, i, l**	
4.0	To understand the steps involved in safety audit	**4.1**	Demonstrate the road safety audit	**f, h, i, l**	
5.0	To investigate safety considerations and mitigation measures	**5.1**	Asses accident prone areas	**f, h, i, l**	

UNIT I INTRODUCTION	**(9)**
Road safety – Road safety demographics – 4E's of road safety – Road users decisions – Causes of accidents - Human factors – Road and its condition – Environmental studies – Safety management - roles and responsibilities.	
UNIT II ACCIDENT DATA COLLECTION	**(9)**
Accident data collection – accident investigation and reduction – Crash factors and interaction – accident costs and prevention – Types of statistics – Crash reconstruction – Computer record systems – RADMS – Case studies.	
UNIT III ACCIDENT ANALYSIS TECHNIQUES	**(9)**
Principles for effective road safety analysis – Collision diagram – Preparation, spatial analysis of accidents – Methods and GIS in accident analysis – Black spot, Black route and area identification – Area prediction models – Development – Empirical Bayes approach – Before and after evaluation – Case studies.	
UNIT IV ROAD SAFETY AUDIT	**(9)**
Need for road safety audit – Concept and elements of safety audit – Steps in road safety audit – Safety audit for existing roads – Road safety legislation – Legal requirements – Provisions of Motor Vehicle Act and NGO's in prevention of accidents	
UNIT V ACCIDENT STUDIES AND INVESTIGATION	**(9)**
Accident data – Identification of accident prone location – Prioritization – Investigation safety considerations on completed roads and in work zone – Mitigation measures.	
TOTAL: L: 45 = 45 PERIODS	

TEXT BOOKS:

1. Evans L., ―Traffic Safety‖, Science Serving Society, 2004
2. Odgen K.W., ―Safer Roads: A Guide to Road Safety Engineering‖, Avebury Technical, 1996.

REFERENCES:

1. Elvik R. and Vaa T., ―The Handbook of Road Safety Measures‖, Elsevier, 2004
2. Rober F. Baker, ―The Highway Risk Problem – Policy Issues in Highway Safety‖, 2nd Edition, John Wiley and Sons, 2012
3. Ministry of Surface Transport, ―Accident Investigation and Prevention Manual for Highway Engineers in India and other Developed Countries‖, 2011.

17CSZ01 DESIGN THINKING *(Common to All branches except CSE Branch)*					
			L	T	P	C
			3	0	0	3
PRE REQUISITE : NIL		**QUESTION PATTERN: TYPE -3**			
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives		**Course Outcomes**		**Related Program outcomes**	
1.0	To acquire Design Thinking skills.	**1.1**	The students will be able to have a sense of self-efficacy & creative confidence.	**a,c,j,k**	
2.0	To know how to discover the problems.	**2.1**	The students will be able to interpret and visualize the scenario.	**a,c,j,k**	
3.0	To understand the ways of interpretation.	**3.1**	The students will be able to know how to manage a Design Thinking workshop Layout, roles, times and process.	**a,b,c,j,k**	
4.0	To learn by doing projects.	**4.1**	The students will be able to apply Design thinking tools to increase research output.	**a,b,c,k**	
5.0	To solve so called "wicked problems" (problems for which neither question nor answer is well defined).	**5.1**	The students will be able to do experiments by creating prototype and by obtaining feedback.	**a,b,c,k**	

UNIT I INTRODUCTION TO DESIGN THINKING	**(9)**
Overview - Use of Design Thinking – Design Process. Getting Started: Define Challenges – Create a Project Plan. Design Thinking Tools.	
UNIT II DISCOVERY	**(9)**
Understand the Challenge: Review the Challenge - Build your Team - Refine your Plan. Prepare Research: Identify Sources of Inspiration - Select Research Participants - Prepare For Fieldwork. Gather Inspiration: Immerse Yourself in Context - Seek Inspiration In Analogous Settings - Learn From Experts - Learn From Users.	
UNIT III INTERPRETATION	**(9)**
Tell Stories: Capture Your COURSEs - Share Inspiring Stories. Search for meaning: Find Themes - Make Sense of Findings - Define Insights. Frame Opportunities: Create a Visual Reminder - Make Insights Actionable.	
UNIT IV IDEATION	**(9)**
Generate Ideas: Prepare for Brainstorming - Facilitate Brainstorming - Select Promising Ideas - Sketch to Think. Refine Ideas - Do a Reality Check - Describe Your Idea.	
UNIT V EXPERIMENTATION AND EVOLUTION	**(9)**
Make Prototypes: Create a Prototype. Get Feedback: Identify Sources for Feedback - Select Feedback Participants - Facilitate Feedback Conversations - Capture Feedback COURSEs - Integrate Feedback. Track COURSEs: Define Success - Document Progress. Move Forward: Plan Next.	
TOTAL (L: 45) = 45 PERIODS	

REFERENCES:

1. http://www.designthinkingforeducators.com/toolkit
2. https://hbr.org/2008/06/design-thinking
3. http://asimetrica.org/wp-content/uploads/2014/06/design-thinking.pdf

17CSZ02 DIGITAL MARKETING *(Common to All branches except CSE Branch)*					
		L	**T**	**P**	**C**
		3	**0**	**0**	**3**
PRE REQUISITE : NIL		**QUESTION PATTERN: TYPE - 3**			
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives		**Course Outcomes**		**Related Program outcomes**	
1.0	To understand the concepts of effective digital marketing.	**1.1**	The students will be able to find the forward thinking companies to build up their brands.	**c,g,h,i,j,k,l**	
2.0	To realize the consumer and business relationship.	**2.1**	The students will be able to understand the consumer and business relationship.	**c,f,g,h,i,j,k**	
3.0	To make change in the digital landscape.	**3.1**	The students will be able to develop a far deeper understanding of the changing digital landscape.	**c,f,h,i,j,k,l**	
4.0	To become familiar with web marketing.	**4.1**	The students will be able to understand the behavior of online marketing.	**c,f,,h,i,j,k,l**	
5.0	To identify the latest digital marketing trends.	**5.1**	The students will be able to iidentify the latest digital marketing trends and skill sets needed for today's marketer.	**c,f,h,i,j,k,l**	

UNIT I INTRODUCTION TO E-MARKETING	**(9)**
Principles and Drivers of New Marketing Environment - Digital Media Industry - Reaching Audience Through Digital Channels- Traditional and Digital Marketing - Introduction to Online Marketing Environment - Dotcom Evolution - Internet Relationships - Business in Modern Economy - Integrating E-Business to an Existing Business Model - Online Marketing Mix - Mobile Marketing - Digital Signage.	
UNIT II E-BUSINESS	**(9)**
Purchase Behavior of Consumers in Digital Marketing Format - Online Customer Expectations - Online B2C Buying Process - Online B2B Buying Behavior -Website Designing - Website Content - Forms of Search Engines – Working of Search Engines - Revenue Models in Search Engine Positioning – SEO - Display Advertising - Trends. 33.	
UNIT III PRICING STRATEGIES	**(9)**
Product Attributes and Web Marketing Implications - Augmented Product Concept - Customizing the Offering - Dimensions of Branding Online - Internet Pricing Influences - Price and Customer Value - Online Pricing Strategies and Tactics – Time- based Online Pricing - Personalized Pricing - Bundle Pricing.	
UNIT IV ONLINE MARKETING BEHAVIOR	**(9)**
Internet Enabled Retailing - Turning Experience Goods into Search Goods - Personalization through Mass Customization - Choice Assistance - Personalized Messaging - Selling through Online Intermediaries - Direct to Customer Interaction - Online Channel Design for B2C and B2B Marketing.	
UNIT V E-MARKETING COMMUNICATION	**(9)**
Integrating Online Communication into IMC Process - Online Advertising – Email Marketing - Viral Marketing - Affiliate Marketing - Participatory Communication Networks - Social Media Communities - Consumer Engagement - Co-Created Content Management - Interactive Digital Networks - Customer – Led Marketing Campaigns- Legal and Ethical aspects related to Digital Marketing.	
TOTAL (L: 45) = 45 PERIODS	

TEXT BOOK:

1. Smith P R Chaffey Dave, "E-Marketing Excellence: The Heart of E-Business", 2nd ed., Elsevier, USA, 2005.
2. Strauss Judy, "E-Marketing", 7th Edition, Prentice Hall, India, 2013.

17CSZ03 SOFTWARE ENGINEERING *(Common to All branches except CSE Branch)*					
			L	T	P	C
			3	0	0	3
PRE REQUISITE : NIL		**QUESTION PATTERN: TYPE - 3**			
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives		**Course Outcomes**		**Related Program outcomes**	
1.0	To Understand the life cycle models of software process.	**1.1**	The students will be able to identify the key activities in managing a software project.	**a,b,c,d,e,j**	
2.0	To Understand fundamental concepts of requirements engineering.	**2.1**	The students will be able to compare different process models.	**b,c,e,l**	
3.0	To learn the systematic procedure for software design.	**3.1**	The students will be able to implement the Concepts of requirements engineering.	**a,b,c,d,e,i,j,l**	
4.0	To Implement the strategies for software testing.	**4.1**	The students will be able to apply systematic procedure for software design and deployment.	**a,c,d,l**	
5.0	To explore the significance of project planning and management.	**5.1**	The students will be able to compare and contrast the various testing and maintenance.	**a,b,d,e,k,l**	

UNIT I SOFTWARE PROCESS	**(9)**
Introduction –Software Engineering Paradigm – life cycle models (water fall, incremental, spiral, WINWIN spiral, evolutionary, prototyping, object oriented) - system engineering – computer based system – verification – validation.	
UNIT II SOFTWARE REQUIREMENTS	**(9)**
Functional and non-functional - user – system –requirement engineering process – feasibility studies – requirements – elicitation – validation and management – software prototyping – prototyping in the software process – rapid prototyping techniques – user interface prototyping - Software document. Analysis and modeling – data, functional and behavioral models – structured analysis and data dictionary.	
UNIT III SOFTWARE DESIGN	**(9)**
Design process – Design Concepts-Design Model– Design Heuristic – Architectural Design – Architectural styles, Architectural Design, Architectural Mapping using Data Flow- User Interface Design: Interface analysis, Interface Design –Component level Design: Designing Class based components, traditional Components.	
UNIT IV SOFTWARE TESTING	**(9)**
Taxonomy of software testing – levels – test activities – types of software test – black box testing – testing boundary conditions – structural testing – test coverage criteria based on data flow mechanisms – regression testing – testing in the large - software testing strategies - testing using extreme programming.	
UNIT V SOFTWARE PROJECT MANAGEMENT	**(9)**
Estimation – FP Based, LOC Based, Make/Buy Decision, COCOMO II - Planning – Project Plan, Planning Process, RFP Risk Management – Identification, Projection, RMMM - Scheduling and Tracking –Relationship between people and effort, Task Set & Network, Scheduling, EVA – Process and Project Metrics	
TOTAL (L: 45) = 45 PERIODS	

TEXT BOOK:

1. Roger S. Pressman, "Software Engineering – A Practitioner's Approach", 7th ed., Mc Graw-Hill International Edition, 2010.

REFERENCES:

1. Ian Sommerville, "Software Engineering", 9th ed., Pearson Education Asia, 2011.
2. Rajib Mall, "Fundamentals of Software Engineering", 3rd edition, PHI COURSE Private Limited, 2009.
3. Pankaj Jalote, "Software Engineering - A Precise Approach", Wiley India, 2010.
4. Kelkar S.A., "Software Engineering", Prentice Hall of India Pvt Ltd, 2007.
5. Stephen R. Schach, "Software Engineering", Tata McGraw-Hill Publishing Company.

17CSZ04 UNIFIED FUNCTIONAL TESTING
(Common to All branches except CSE Branch)

	L	T	P	C
	3	0	0	3

PRE REQUISITE : NIL | **QUESTION PATTERN: TYPE -3**

COURSE OBJECTIVES AND OUTCOMES:

Course Objectives		Course Outcomes		Related Program outcomes
1.0	To know the fundamentals of testing tool.	**1.1**	The students will be able to identify the need of software testing tools.	**a,e,l,j,k,l**
2.0	To learn about Unified testing tool.	**2.1**	The students will be able to explore about Unified testing tool.	**a,b,e,f,l**
3.0	To understand VB Script fundamentals.	**3.1**	The students will be able to implement VB script in real time application.	**a,b,e,k,l**
4.0	To learn framework of Automation.	**4.1**	The students will be able to work with automation tools.	**a,b,k,l,g**
5.0	To study about test cases.	**5.1**	The students will be able to develop test cases for applications.	**a,b,e,f,k,l**

UNIT I - INTRODUCTION **(6)**

Introduction to Automation–UFT Installation and Sample Application Walkthrough–Planning before Automation.

UNIT II - UNIFIED FUNCTIONAL TESTING **(12)**

Create your First Script–Managing User Interface Controls–Parameterization – Data Driven Test–Verifying Tests – Checkpoints–Actions–Working with Shared Repository–UFT Editor View.

UNIT III - VB SCRIPT **(9)**

VBScript Fundamentals–Using Functions–Capture Dynamic Values–Reporter Object and Custom Checkpoint– Working with External Files.

UNIT IV - AUTOMATION FRAMEWORK **(9)**

Debugging Scripts–Working with Dynamic Objects–Recovery Scenario–Batch Execution–Automation Frameworks– What's new with UFT 11.5–Best Practices in Automation.

UNIT V - TEST CASES **(9)**

Sample Naming and Coding Conventions–Common UFT Issues and FAQs–Sample Test Cases for Automation.

TOTAL (L: 45) = 45 PERIODS

TEXT BOOK:

1. Navneesh Garg, "Test Automation using HP Unified Functional Testing (UFT) 11.5", Adact In Group Pvt. Ltd. 2013.

REFERENCE:

1. Rajeev Gupta, "Agile Automation and Unified Functional Testing", Pearson India Education Service Pvt. Ltd. 2016.

17CSZ05 C PROGRAMMING
(Common to All branches except CSE Branch)

	L	T	P	C
	3	0	0	3

PRE REQUISITE : NIL	**QUESTION PATTERN : TYPE - 1**

COURSE OBJECTIVES AND OUTCOMES:

	Course Objectives		Course Outcomes	Related Program outcomes
1.0	To know the correct and efficient ways of solving problems.	**1.1**	The student will be able to understand the basic terminology used in computer programming.	**a,b,c,d,e,h,j,k,l**
2.0	To learn the basics of C declarations, operators and expressions.	**2.1**	The student can use different data types and operators in a computer program.	**a,b,c,d,e,h,i,j,k,l**
3.0	To work on all the elementary statements (Loop, Branch).	**3.1**	The student will be able to design programs involving decision structures and loops.	**a,b,c,d,e,h,i,j,k,l**
4.0	To learn the manipulation of arrays and strings	**4.1**	The student will be able to write programs using arrays and strings.	**a,b,c,d,e,h,i,j,k,l**
5.0	To learn the manipulation of functions	**5.1**	The student will be able to develop programs using functions by different parameter passing techniques.	**a,b,c,d,e,h,i,j,k,l**

UNIT I -OVERVIEW OF C	**(9)**
Introduction to C - Structure of C program - Programming Rules - C Declarations: Tokens - keywords - identifiers - constants - data types - variable declaration and initialization - type conversion - constant and volatile variables - operators and expressions	
UNIT II -CONTROL STRUCTURES	
Managing Input and Output operations - Decision Statements: if Statements - if-else Statement - Nested if-else - if-else-if ladder -goto statement – switch statement - nested switch case - Loop Control: for loop - while loop - do while loop - Nested Loop Statements - break and continue statement	
UNIT III - ARRAYS AND STRINGS	**(9)**
Introduction to Array - Definition - Array initialization - Characteristics - One Dimensional Array - Array operations -Two dimensional arrays -Strings and String handling functions.	
UNIT IV - FUNCTIONS	**(9)**
Functions: Basics - definition - Elements of User defined Functions - return statement, Function types, Parameter Passing Techniques, Function returning more values - Passing Array to Functions - Recursion - Storage classes.	
UNIT V -POINTERS AND FILE MANAGEMENT	**(9)**

Pointer concepts - Pointers & Arrays, Structure concepts - Defining, Declaring, Accessing Member Variables, Structure within Structure - Union - File Management in C
TOTAL (L: 45) = 45 PERIODS

TEXT BOOK:

1. Ashok N. Kamthane, "Programming in C", 2nd ed., Pearson Education, 2013.

REFERENCES:

1. YashavantKanetkar, "Let us C", BPB publications, New Delhi, 3rd ed., 2011.
2. PradipDey, ManasGhosh, "Fundamentals of Computing and Programming in C", 1st ed., Oxford University Press, 2009.
3. Byron S Gottfried, "Programming with C", Schaum's Outlines, 2nd ed., Tata McGraw-Hill, 2006.
4. R.G. Dromey, "How to Solve it by Computer", Pearson Education, 4th Reprint, 2007.

17CSZ06 DATA STRUCTURES *(Common to All branches except CSE Branch)*				
	L	**T**	**P**	**C**
	3	**0**	**0**	**3**
PRE REQUISITE : 17CSC01 / 17CSC02	**QUESTION PATTERN: TYPE - I**			

COURSE OBJECTIVES AND OUTCOMES:

	Course Objectives		Course Outcomes	Related Program outcomes
1.0	To review the Python programming language and learn Stack ADT.	**1.1**	The students will be able to recall and familiarize python programming and implement Stack ADT.	**a,b,c,h,k,l**
2.0	To be able to implement the abstract data type list as a linked list using the node and reference pattern.	**2.1**	The students will be able to compare the performance of our linked list implementation with Python's list implementation.	**a,b,c,h,k,l**
3.0	To understand the abstract data types queue, deque using Python.	**3.1**	The students will be able to implement the ADTs queue, and deque using Python lists.	**a,b,c,h,k,l**
4.0	To understand what a tree data structure is and how it is used.	**4.1**	The students will be able to implement trees using classes and references.	**a,b,c,d,h,k,l**
5.0	To see how graphs can be used to solve a wide variety of problems	**5.1**	The students will be able to design graph abstract data type using multiple internal representations.	**a,b,c,d,g,h,k,l**

UNIT I – INTRODUCTION TO LINEAR DATA STRUCTURES	**(9)**
Abstract Data Types (ADTs) and Data Structures – Non Primitive Data structures: array, list, tuples, dictionaries, set. Classes and Objects in Python. Stack ADT – Operations - Applications - Evaluating arithmetic expressions- Conversion of Infix to postfix expression	
UNIT II - LINEAR DATA STRUCTURES - LIST	**(9)**
Array Vs List. Concept of linked list –Single linked list –Representation –Methods and functions on list –Operations: Traversing –Insertion – Deletion – Double linked list –Representation –Operations, traversing –Insertion–Deletion–Circular link list.	
UNIT III - LINEAR DATA STRUCTURES – QUEUE	**(9)**
Queue: Representation and Implementation –Programs on Queue – Insert & Delete operations –Circular queue – Representation –Deque –Applications of queue	
UNIT IV - NON LINEAR DATA STRUCTURES – TREE	**(9)**
Definitions - Binary Trees - The Search tree ADT – Binary Search Trees – AVL Tree – Tree Traversals – B-Tree - Priority Queues (Heap) –simple implementations of Binary Heap.	

UNIT V - NON LINEAR DATA STRUCTURES – GRAPH	(9)
Definition – Representation of Graph – Types of graph - Breadth-first traversal - Depth-first traversal – Topological Sort – Applications of graphs.	
TOTAL (L: 45) = 45 PERIODS	

TEXT BOOKS:

1. Dr. R. Nageswara Rao, "Core Python Programming", Dreamtech Press, ed., 2017.
2. Bradley N. Miller, David L. Ranum," Problem Solving with Algorithms and Data Structures Using Python", Franklin, Beedle & Associates, 2011.

REFERENCES:

1. Michael T. Goodrich, Irvine Roberto Tamassia, Michael H. Goldwasser, "Data Structures and Algorithms in Python", 2013 edition.
2. Kenneth A. Lambert, "Fundamentals of Python: Data Structures", 1st ed., Cengage Learning, 06-Nov-2013.

17CSZ07 - WEB SERVICES USING JAVA					
		L	T	P	C
		3	0	0	3
PRE REQUISITE : Nil					
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives		**Course Outcomes**		**Related Program outcomes**	
1.0	To build strong expertise in developing front end application using HTML5 and CSS3.	**1.1**	The students will be able to develop web page using HTML5 and CSS3.	**a,b,c,d,e,l**	
2.0	To create threads and interfaces in Java classes.	**2.1**	The students will be able to create threads and interfaces in Java classes.	**a,b**	
3.0	To design and build a simple database system and demonstrate competence with the fundamental tasks involved with modeling, designing, and implementing a DBMS.	**3.1**	The students will be able to explain various file organizing & Indexing structure.	**a,b,c,k**	
4.0	To develop PL/SQL programs and this would help in web page development.	**4.1**	The students will be able to develop Nested PL/SQL Subprograms suitable for full stack development.	**a,b,c,d,e,l**	
5.0	To build strong expertise in developing front end application using jQuery Mobile.	**5.1**	The students will be able to implement MVC and responsive design to scale well across PC, tablet and Mobile phone using jQuery mobile.	**a,b,c,j,k**	

UNIT I HTML AND WEB DESIGN	**(9)**
HTML5 – Introduction HTML5 - Getting Started, HTML5 - Elements & Attributes, CSS3, JavaScript Fundamentals, Grid System, Bootstrap Components- Basic components, DOM manipulation & events, Basic AJAX with Jquery.	
UNIT II CORE JAVA	**(9)**
Class & Objects, Access Modifiers and final keyword Basics, Types of exceptions, User Defined Exceptions, Convert primitive data type to objects. Integer, Float, Double, Long, Character, Boolean Collection basics, String Methods	
UNIT III DBMS MYSQL	**(9)**
Database Design - Life Cycle, Physical Model, Logical Model, Database Design Process, Normal Forms in DBMS, 1NF, 2NF, 3NF, BCNF, Introduction to NoSQL, GROUP BY clause, Introduction to Subquery	
UNIT IV PL/SQL	**(9)**
Introduction to PL/SQL, PL/SQL architecture, PL/SQL Anonymous Block, PL/SQL Data Types, Oracle RAISE_APPLICATION_ERROR, PL/SQL Exception Propagation, PL/SQL Package, PL/SQL Procedure, Parameter Modes in PL/SQL Subprograms, PL/SQL Function, Nested PL/SQL Subprograms.	
UNIT V JSON API	**(9)**
Introduction to XML, XML Features, HTML vs XML, XML HttpRequest, XML Web Services, Introduction to JSON, JSON vs XML, JSON Data Types, JSON.parse(), JSON with Ajax.	
TOTAL (L: 45) = 45 PERIODS	

TEXT/ REFERENCE BOOKS:

1. Henry F Korth, Abraham Silberschatz, S.Sudharashan, “Database System Concepts”, 6th ed., McGraw Hill, 2011.
2. Herbert Schildt, “The Complete Reference (Fully updated for jdk7)”, Oracle press Ninth Edition, 2014.
3. Jeffrey C.Jackson, “Web Technologies—A Computer Science Perspective”, Pearson Education, 2006.

17ECZ01 - MODERN WIRELESS COMMUNICATION SYSTEM *(Common to All Branches except ECE branch)*					
			L	**T**	**P**	**C**
			3	**0**	**0**	**3**
PREREQUISITE : NIL		**QUESTION PATTERN : TYPE - 3**			
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives		**Course Outcomes**			**Related Program outcomes**
1.0	To learn the comprehensive background concepts of wireless and mobile communication.	**1.1**	The Students will be able to know the fundamentals of basic mobile communication wireless networks.		**a,b,c**
2.0	To enable the students to gain knowledge on multiple access methods	**2.1**	The Students will be able to understand the different networking topologies and multiple access methods.		**a,b,d,l**
3.0	To know the flavor of personal communication systems.	**3.1**	The Students will be able to acquire the generation of personal communication technologies		**b,c,d,l**
4.0	To know about the various concept of multiple access methods.	**4.1**	The Students will be able to highlight the different access technologies		**b,d,e,l**
5.0	To study the highlights of the latest communication networks and out the next generation networks.	**5.1**	The Students will be able to identify the different data services		**b,c,l**

UNIT- I TRANSMISSION FUNDAMENTALS	**(9)**
Cell phone Generations: 1G, 2G, 2.5G, 3G & 4G, Buying a Cell phone, Radio, Analog vs Digital , AM and FM , Carrier- based signalling, spread-spectrum signalling.	
UNIT- II NETWORK CONCEPTS	**(9)**
Communication Networks: LANs, MANs, WANs, circuit switching, packet switching, Duplexing , Multiplexing: FDMA, TDMA, SDMA, CDMA, Voice Coding.	
UNIT- III PERSONAL COMMUNICATION SERVICES	**(9)**
GSM, HSCSD, GPRS, D-AMPS, CDMA One, CDMA Two, Packet Data Systems	
UNIT- IV 3G & BEYOND	**(9)**
IMT-2000, W-CDMA, CDMA 2000, EDGE, Wi-Fi, WiMAX, OFDM.	
UNIT- V MOBILE DATA SERVICES & SHORT-RANGE NETWORKS	**(9)**
Mobile Data Services: Messaging, wireless web, WAP, site Design, Short-Range Wireless Networks: Unlicensed spectrum, WLANs, cordless phones, mobile OSs, IrDA , Bluetooth.	
TOTAL (L: 45) = 45 PERIODS	

TEXT BOOKS:

1. Andy Dornan, – "The essential guide to wireless communications applications from cellular systems to WAP and M-Commerce", Prentice Hall, 2nd Edition , 2002.
2. Theodore S. Rappaport, – "Wireless Communications Principles and Practice", Pearson Education, 2nd Edition, 2009.

REFERENCES :

1. Misra, "Wireless Communications and Networks: 3G & Beyond", Tata McGraw-Hill, 2013.
2. William Stallings, "Wireless communications and networking", Prentice Hall, 2005.

17ECZ02 - CONSUMER ELECTRONICS (Common to All Branches except ECE branch)					
			L	T	P	C
			3	0	0	3
PREREQUISITE : NIL		**QUESTION PATTERN : TYPE - 3**			
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives		**Course Outcomes**			**Related Program outcomes**
1.0	To make students to learn and understand the basics of audio technology.	**1.1**	The Students will be able to understand the concepts of audio system.		**a,b,c**
2.0	To enable the student to understand the basics of video technology.	**2.1**	The Students will be able to understand the concepts of video system.		**a,b,d,l**
3.0	To make the students to understand the electronic gadgets and telecommunication systems.	**3.1**	The Students will be able to analysis different techniques involved in audio and video processing		**b,c,d,l**
4.0	To make the students to understand the consumer gadgets.	**4.1**	The students can have knowledge of various new developments in office equipment and domestic appliances.		**b,d,e,l**
5.0	To motivate the students to To analyze and design consumer appliances.	**5.1**	The Students will be able to understand the working concepts of consumer applications		**b,c,e,l**

UNIT - I AUDIO SYSTEM COMPONENTS	**(9)**
Introduction to wave motion – Interference and superposition of waves – Beats, Resonance, Echos – characteristics of microphones – types of microphone – wireless microphones – Types of headphones –Loudspeakers.	
UNIT-II AUDIO PROCESSING	**(9)**
Audio Filters, Types of AGC – Loudspeaker Impedance matching – Pre-emphasis and De-emphasis noise reduction – Optical recording and reproduction – stereophony, Quadraphony – Stereo controls –Equalizers –Mixer.	
UNIT - III VIDEO STANDARDS AND SYSTEMS	**(9)**
Elements of a TV system, scanning process – resolution, interlacing, composite signal The Kell factor. LED, LCD, Types of TV camera-Color TV systems- The NTSC system-The PAL systems- The SECAM system. Broadcasting of TV programs-Digital Video Recorder and CCTV Surveillance system	
UNIT - IV COMMUNICATION AND CONSUMER GADGETS	**(9)**
Radio system – VHF and UHF – Cellular communication - Types of mobile phones – Establishing cell-Smart card– Facsimile machine – electronic calculators – Digital clocks– Xerography - TV Remote.	
UNIT - V CONSUMER APPLICATIONS	**(9)**
Washing Machines – electronic controller, fuzzy logic, Hardware and Software development – Air Conditioners – Components, Remote Controls, Unitary and central air conditioner systems – Bar Coders – Bar codes, scanner and decoder – Set Top Box – Types, firmware development, Interactive program guides.	
TOTAL (L: 45) = 45 PERIODS	

TEXT BOOK:

1. S.P.Bali, Consumer Electronics, Pearson Education, 2005.

REFERENCES :

1. C.A. Schuler and W.L.Mc Namee, Modern Industrial Electronics, McGraw Hill, 2002.
2. D.J. Shanefield, Industrial Electronics for Engineers, Chemists and Technicians, Jaico Publishing House, 2007

17ECZ03 - AUTOMOTIVE ELECTRONICS
(Common to All Branches except ECE branch)

L	T	P	C
3	0	0	3

PREREQUISITE : Nil | **QUESTION PATTERN : TYPE - 3**

COURSE OBJECTIVES AND OUTCOMES:

	Course Objectives		Course Outcomes	Related Program outcomes
1.0	To understand the concept of storage batteries in vehicles.	**1.1**	The students able to diagnosis battery condition and its maintenance.	**a,b,d,e**
2.0	To study about various electrical components in vehicles.	**2.1**	The students able to trouble shoot the failures in electrical components.	**a,b,c,d**
3.0	To gain the knowledge of electronic ignition systems.	**3.1**	The students able to learn about electronic ignition system.	**a,c,e**
4.0	To understand the electronic control system.	**4.1**	The students able gain aware of electronic control system.	**a,b,c,d,e**
5.0	To able to study about Sensors and lighting system ofvehicle.	**5.1**	The student able to have knowledge of sensors andlightingsystemofvehicle.	**a,b,c,e,f**

UNIT I - TYPES OF BATTERIES **(9)**

Principle and Types of Lead Acid Battery, Characteristics, Battery Rating, Capacity and Efficiency, Various Tests on Battery, Battery–Charging Techniques, Maintenance of batteries.

UNIT II - ELECTRICAL COMPONENTS **(9)**

Starter Motor, types, Starter drive mechanisms, Starter Switches and Solenoids, Charging system components, DC Generators and Alternators. Voltage and Current Regulation, Cut –out relays and regulators,Horns and Wiper Mechanisms, Air conditioning, Chassis electrical systems.

UNIT III – ELECTRONIC CONTROL SYSTEM **(9)**

Introduction to Digital Engine ControlSystemCurrent trends in automotive electronic engine management system, electronic fuel control, electromagneticinterference suppression, electromagnetic compatibility.– Infotainment systems – Navigation systems

UNIT IV - ELECTRONIC IGNITION SYSYTEMS **(9)**

Battery Coil and Magneto–Ignition System, Spark Plugs - Electronically–Assisted and Full Electronic Ignition System, Non–Contact–type Ignition Triggering devices, Capacitive Discharge Ignition Distributor–less Ignition System, Digital Ignition System.

UNIT V - WIRING, LIGHTING AND OTHER INSTRUMENTS AND SENSORS **(9)**

Automotive Wiring, Insulated and Earth Return System, Positive and Negative Earth Systems, Head Lamp, LED lighting system and Indicator Lamp Details, Anti–Dazzling and Dipper Details, Electrical and Electronic Fuel Lift Pumps, Dash Board Instruments and their Sensors like speed, throttle position, exhaust oxygen level, manifoldpressure, crankshaft position, coolant temperature, exhaust temperature, air massflow for engine application.

TOTAL (L: 45) = 45 PERIODS

TEXT BOOKS:

1. Young, A.P. and Griffith, S.L., Automobile Electrical Equipments, ELBS and New Press.
2. Kholi .P.L.Automotive Electrical Equipment,Tata McGraw-Hill co ltd,New Delhi,2004.

REFERENCES

1. Crouse.W.H. Automobile Electrical Equi\pment,McGraw Hill Book CoInc.NewYork,2005.
2. Judge.A.W.Modern Electrical Equipments of Automobiles,Chapman& Hall, London 2004.
3. BOSCH Automotive Handbook, Bentley Publications, Massachusetts Avenue, London, 2010.
4. Bechhold "Understanding Automotive Electronics", SAE, 1998.
5. William B.Riddens "Understanding Automotive Electronics", 5th edition – Butterworth Heinemann Woburn, 1998.
6. Markus Mueck, IngolfKarls"Networking Vehicles to Everything" Walter de Gruyter GmbH & Co KG, 2018.

17ECZ04 - ELECTRONIC TESTING *(Common to All Branches except ECE branch)*				
	L	**T**	**P**	**C**
	3	**0**	**0**	**3**
PREREQUISITE : NIL	**QUESTION PATTERN : TYPE - 3**			

COURSE OBJECTIVES AND OUTCOMES:

	Course Objectives		Course Outcomes	Related Program outcomes
1.0	To make students to learn and understand the basics of electronic testing.	1.1	The Students can have knowledge of different types of faults and fault modeling.	**a,b,c**
2.0	To enable the student to understand the basics of testing and the testing equipments	2.1	The Students will be able to design the different testing schemes for Digital circuits.	**a,b,d,l**
3.0	To enable the student to the different testing methods.	3.1	The Students will be able to understand testing schemes for memories and mixed signal systems.	**b,c,d,l**
4.0	To make the students to learn about testable system design.	4.1	The students can have knowledge of various testability design schemes.	**b,d,e,l**
5.0	To motivate the students to implement the loaded board testing.	5.1	The Students will be able to Diagnosis the Faults at module level.	**b,c,e,l**

UNIT I - INTRODUCTION	**(9)**
Test process and automatic test equipment, test economics and product quality, fault modeling.	
UNIT II - DIGITAL TESTING	**(9)**
Logic and fault simulation, testability measures, combinational and sequential circuit test generation.	
UNIT III - ANALOG TESTING	**(9)**
Memory Test, DSP Based Analog and Mixed Signal Test, Model based analog and mixed signal test, delay test, IIDQ test.	
UNIT IV - DESIGN FOR TESTABILITY	**(9)**
Built-in self-test, Scan chain design, Random Logic BIST, Memory BIST, Boundary scan test standard, Analog test bus, Functional Microprocessor Test, Fault Dictionary, Diagnostic Tree, Testable System Design, Core Based Design and Test Wrapper Design, Test design for SOCs, Pre-Silicon to Post silicon test for FPGA.	
UNIT V - LOADED BOARD TESTING	**(9)**
Unpowered short circuit tests, unpowered analog tests, Powered in-circuit analog, digital and mixed Signal tests, optical and X-ray inspection procedures, functional block level design of in-circuit test Equipment	
TOTAL (L: 45) = 45 PERIODS	

TEXT BOOKS:

1. Michael L. Bushnell and Vishwani D. Augural, "Essentials of Electronic Testing for Digital, Memory & Mixed-Signal VLSI Circuits", Springer, 2006.
2. Mehdi Dehbashi, Görschwin Fey "Debug Automation from Pre-Silicon to Post-Silicon" Springer, 25-Sep-2014.

REFERENCE :

1. Dimitris Gizopouilos, "Advances in Electronic Testing", Springer 2006.

17EEZ01-RENEWABLE ENERGY TECHNOLOGY
(Common to All Branches except EEE branch)

	L	T	P	C
	3	0	0	3

PREREQUISITE : NIL | **QUESTION PATTERN : TYPE - 3**

COURSE OBJECTIVES AND OUTCOMES:

	Course Objectives		Course Outcomes	Related Program outcomes
1.0	To Import the fundamental concepts of energy status and role of renewable energy.	**1.1**	The students will be able to analyze the appropriate kinds of energy for future development.	**c,d,e,i,l,k**
2.0	To learn about the types of solar collectors and solar cells.	**2.1**	The students will be able to design solar equipment like dryer, furnace, water heater, pump using solar energy	**c,e,f,h,l,k**
3.0	To provide knowledge on wind turbine types and wind energy application.	**3.1**	The students will be able to design wind power plants using vertical and horizontal axis turbine.	**d,e,f,g,h,i,**
4.0	To acquire knowledge on the basics of biomass resources and their conversion technologies	**4.1**	The students will be able to construct different biogas plant using biomass resource.	**,e,f,g,h,l,k**
5.0	To gain knowledge on other renewable energy sources	**5.1**	The students will be able to implement new ideas like fuel cell technology, OTEC, tidal and wave energy	**f,g,h,i,l,**

UNIT I - INTRODUCTION **(9)**

World energy status, Current energy scenario in India, Environmental aspects of energy utilization, Environment- Economy - Energy and Sustainable Development, Energy planning. Reserves of Energy resources - Renewable energy resources - Potentials - Achievements - applications - Technical and social implications, issues in grid integration of power from renewable energy sources.

UNIT II - SOLAR ENERGY **(9)**

Basic concepts, Solar radiation – Measurement, Solar thermal systems – Flat plate and concentrating collectors, Solar passive space – Solar heating and cooling techniques – Solar desalination – Solar Pond – Solar cooker – Solar dryers – Solar furnaces – Solar pumping – Solar green house- Solar thermal electric power plant – Solar photo voltaic conversion – Solar cells – PV applications – Hybrid systems.

UNIT III - WIND ENERGY **(9)**

Introduction – Availability- Wind power plants, Power from the wind, Wind energy conversion systems, site characteristics – Wind turbines types – Horizontal and vertical axis – Design principles of wind turbine – Blade element theory - Magnus effect – Performance – Wind energy Applications – Hybrid systems – Wind energy storage – Safety and environmental aspects.

UNIT IV - BIOMASS ENERGY **(9)**

Biomass – Usable forms- composition – Fuel properties – Applications – Biomass resource – Biomass conversion technologies – Direction combustion – Pyrolysis – Gasification – Anaerobic digestion –Bioethanol and Biodiesel Production – Economics – Recent developments – Energy farming – Biogas technology – Family biogas plants – Community and institutional biogas plants – design consideration – Applications

UNIT V - OTHER RENEWABLE ENERGY SOURCES	(9)
Tidal energy – Wave energy – Open and closed OTEC Cycles – Small hydro – Geothermal energy – Social and environmental aspects – Fuel cell technology: Types, principle of operation, applications –Hydrogen energy production – Storage – Transportation – Utilization.	
	TOTAL = 45 PERIODS

TEXTBOOKS:

1. Godfrey Boyle, "Renewable Energy", Power for a Sustainable Future, Oxford University Press, U.K, 1996
2. Twidell.J.W & Weir.A, "Renewable Energy Sources", EFN Spon Ltd., UK, 1986.
3. Tiwari.G.N, "Solar Energy - Fundamentals Design", Modelling and applications, Narosa Publishing House, New Delhi, 2002.

REFERENCES:

1. Kothari P, K C Singal and Rakesh Ranjan, "Renewable Energy Sources and Emerging Technologies", PHI Pvt. Ltd.,New Delhi, 2008.
2. G.D. Rai, "Non Conventional Energy Sources", Khanna Publishers, New Delhi, 1999.
3. S.P. Sukhatme, "Solar Energy", Tata McGraw Hill Publishing Company Ltd., New Delhi, 1997.

17EEZ02-SMART GRID (Common to All Branches except EEE branch)					
		L	T	P	C
		3	0	0	3
PREREQUISITE : NIL		**QUESTION PATTERN : TYPE - 3**			

COURSE OBJECTIVES AND OUTCOMES:

Course Objectives		Course Outcomes		Related Program outcomes
1.0	Need for smart grid to attain a perfect power system network	1.1	The students will be able to know smart grid for the perfect power system	c,d,e,i,l,k
2.0	DC distribution grid to attain maximum efficiency	2.1	The students will be able to know various types of DC grids and their interconnections	c,e,f,h,l,k
3.0	IntelliGrid architecture for the effective distribution	3.1	The students will be able to intelliGrid structure for the forthcoming power criteria	d,e,f,g,h,i,
4.0	Various technology alternatives for the grid connected networks.	4.1	The students will be able to know various alternating trends for the smart grid distribution	,e,f,g,h,l,k

UNIT I - INTRODUCTION	**(9)**
Introduction to smart grid- Electricity network-Local energy networks- Electric transportation- Low carbon central generation-Attributes of the smart grid- Alternate views of a smart grid.	
UNIT II - SMART GRID TO EVOLVE A PERFECT POWER SYSTEM	**(9)**
Introduction-Overview of the perfect power system configurations-Device level power system-Building integrated power systems- Distributed power systems- Fully integrated power system.	
UNIT III - DC DISTRIBUTION AND SMART GRID	**(9)**
AC Vs DC sources-Benefits of and drives of DC power delivery systems-Powering equipment and appliances with DC-Data centres and information technology loads-Future neighbourhood-Potential future work and research.	
UNIT IV - INTELLIGRID ARCHITECTURE FOR THE SMART GRID	**(9)**
Introduction - Intelligrid today- Smart grid vision based on the intelligrid architecture. Dynamic Energy Systems concept- Smart energy efficient end use devices-Smart distributed energy resources-Advanced whole building control systems .Power Quality & EMC in Smart Grid, Power Quality issues of Grid connected Renewable Energy Sources; Power Quality Conditioners for Smart Grid, Web based Power Quality Monitoring, Power Quality Audit.	
UNIT V - SMART GRID TECHNOLOGIES	**(9)**
Transmission: Technology Drivers, Smart energy resources, Smart substations, Substation Automation. Distribution: DMS, Volt/VAR control, Fault Detection, Outage management, High-Efficiency Distribution Transformers, Phase Shifting Transformers.	
	TOTAL = 45 PERIODS

TEXTBOOKS:

1. Janaka Ekanayake, Kithsiri Liyanage, Jianzhong.Wu, Akihiko Yokoyama, Nick Jenkins, "Smart Grid: Technology and Applications"- Wiley, 2012.
2. James Momoh, "Smart Grid: Fundamentals of Design and Analysis"-Wiley, IEEE Press, 2012.
3. Clark W Gellings, "The Smart Grid, Enabling Energy Efficiency and Demand Side Response"- CRC Press, 2009.

REFERENCES:

1. Smart Grid: Technology and applications Author(s): Janaka Ekanayake, Kithsiri Liyanage, Jianzhong Wu, Akihiko Yokoyama, Nick Jenkins, Published Online: 22nd February 2012 Smart Grid Handbook, 3 volume Set Chen-Ching Liu, Stephen McArthur, Seung-Jae Lee John Wiley & Sons, 1 Aug 2016 - Science - 1900 pages

17EEZ03-ENERGY AUDITING,CONSERVATION AND MANAGEMENT *(Common to All Branches except EEE branch)*					
		L	**T**	**P**	**C**
		3	**0**	**0**	**3**
PREREQUISITE : NIL		**QUESTION PATTERN : TYPE - 3**			

COURSE OBJECTIVES AND OUTCOMES:

Course Objectives		**Course Outcomes**		**Related Program outcomes**
1.0	To introduce about Energy Management Systems (EMS).	**1.1**	The students will be able to uunderstand the role of energy managers in Industries	**a,b,g,l**
2.0	To enable the students to understand the scope for energy saving in residential sector, industries and commercial establishments.	**2.1**	The students will be able to evaluate total energy systems energy audit	**a,b.cf,l**
3.0	To analyze the concepts of New technologies and new products are coming up in the market, for energy saving.	**3.1**	The students will be able to aanalyze the concepts of Energy conservation in Centrifugal pumps, Fans &Blowers, Air compressor	**b,c,e,g**
4.0	To learn the Knowledge of thermodynamic principles, usage of thermal insulation in buildings, lighting devices and new electric motor.	**4.1**	The students will be able to ddemonstrate energy consumption & energy saving potentials – Design consideration. Refrigeration & Air conditioning	**g,h,l**
5.0	To realize energy conservation is better way to meet demand in short span of time rather than constructing new power plant.	**5.1**	The students will be able to perceive knowledge Organizational background desired for energy management motivation	**c,f,g**

UNIT I - ENERGY CONSERVATION PRINCIPLES	**(9)**
Energy scenario -Principles of energy conservation -Resource availability -Energy savings -Current energy consum ption in India -Roles and responsibilities of energy managers in industries.	
UNIT II – ENERGY CONSERVATION IN STEAM SYSTEMS	**(9)**
Power plant components -Conservation measures in steam systems, losses in boiler -Methodology of upgrading boiler performance -Blow down control, excess air control -Pressure reducing stations -Condensate recovery - Condensate pumping -Thermo compressor -Recovery of flash steam -Air removal and venting -Steam traps -Cooling towers.	
UNIT III - ENERGY CONSERVATION IN FLUID MACHINERY	**(9)**
Centrifugal pumps -Energy consumption and energy saving potentials -Design consideration -Minimizing over design -Fans and blowers : specification, safety margin, choice of fans, controls and design considerations-Air compressor and compressed air systems: selection of compressed air layout, energy conservation aspects to be considered at design stage.	
UNIT IV - ELECTRICAL ENERGY CONSERVATION	**(9)**
Potential areas for electrical energy conservation invarious industries: conservation methods, energy management opportunities in electrical heating, lighting system, cable selection -Energy efficient motors -Factors involved in determination of motor efficiency -Adjustable AC drives -Variable speed drives -Energy efficiency in electrical system.	

UNIT V - ENERGY AUDITING	(9)
Energy audit: need, preliminary audit, detailed audit, methodology and approach -Instruments for audit, monitoring energy and energy savings.	
	TOTAL = 45 PERIODS

TEXT BOOKS:

1. Reay.D.A, ―Industrial energy conservation‖, Pergamon Press, 1st ed., 2003.
2. Albert Thumann, ―Handbook of energy audits‖, 6th ed., The Fairmount Press, 2003.

REFERENCES:

1. Smith.C.B, ―Energy Management Principles‖, Pergamon Press, 2006.
2. Hamies, ―Energy Auditing and Conservation; Methods, Measurements, Management and Case study‖, Hemisphere, 2003.
3. Trivedi. P.R and Jolka .K.R, ― Energy Management‖, Common Wealth Publication, 2002.

17EEZ04 - ELECTRICAL MACHINES *(Common to All Branches except EEE branch)*				
	L	**T**	**P**	**C**
	3	**0**	**0**	**3**
PREREQUISITE : NIL	**QUESTION PATTERN : TYPE - 3**			

COURSE OBJECTIVES AND OUTCOMES:

	Course Objectives		Course Outcomes	Related Program outcomes
1.0	To understand the concepts of field energy, co energy, mechanical force and production of torque and EMF.	**1.1**	The students will be able to understand the constructional details and principle of operation of DC motors, induction machines, alternators, transformers and fractional horse-power motors	**a, b, c**
2.0	To understand different types of Transformer construction, working principle and their performance.	**2.1**	The students will be able to evaluate the performance of starting and operating characteristics of various electrical machines used in industrial and domestic applications	**a, b, c**
3.0	To understand the working principle of induction machines	**3.1**	The students will be able to choose an appropriate method of speed control and braking for the drive motors	**a, b, c**
4.0	To know various excitation systems in synchronous machines	**4.1**	The students will be able to understand the concepts of synchronous motors	**a, b, c, d**
5.0	To analyze the various concepts of DCS and SCADA	**5.1**	The students will be able to understand the manufacturing concepts in machines	**a, b, c**

UNIT I - DC MOTORS	**(9)**
Construction and working principle, emf equation, torque equation, starting and running characteristics, speed control, braking, duty of operation, choice of motors.	
UNIT II – TRANSFORMERS	**(9)**
Construction and working principle, equivalent circuit, regulation and efficiency, autotransformers, industrial applications – welding transformer and furnace transformer.	
UNIT III - THREE PHASE INDUCTION MACHINES	**(9)**
Construction and working principle. Induction motors – torque equation, torque–slip characteristics, starting and running characteristics, speed control, braking, choice of motor for industrial applications and traction.	
UNIT IV - SYNCHRONOUS MACHINES	**(9)**
Construction, principle of operation and types, various types of excitation systems, stand alone and grid connected modes of operation, voltage and frequency control.	
UNIT V - FRACTIONAL HORSE POWER MACHINES	**(9)**
Factory Automation: Flexible Manufacturing Systems concept – Automatic feeding lines, ASRS, transfer lines, automatic inspection – Computer Integrated Manufacture – CNC - Intelligent automation - Industrial networking, - Bus standards - HMI Systems - DCS and SCADA - Wireless controls.	
	TOTAL = 45 PERIODS

TEXT BOOKS:

1. D.P.Kothari and I.J.Nagrath, "Electric Machines", McGraw Hill Education Private Limited, 4th ed, 2010.
2. Ashfaq Husain, "Electric machines", Dhanpat Rai & Company, 2nd ed, 2002.

REFERENCES:

1. Gopal K. Dubey, "Fundamentals of Electrical Drives", Narosa publishing house, 2nd ed, 2011.
2. A Fitzgerald , Charles Kingsley , Stephen Umans, "Electric Machinery", McGraw Hill Education Private Limited, 6th ed, 2002.
3. K. Murugesh Kumar, "Induction & Synchronous Machines", Vikas Publishing House Pvt Ltd., 2009.
4. Edward Hughes, "Electrical and Electronic Technology", Dorling Kindersley (India) Pvt. Ltd., 10th ed, 2011.

17EIZ01 AUTOTRONIX
(Common to All Branches except EIE branch)

	L	T	P	C
	3	0	0	3

PREREQUISITE:

QUESTION PATTERN: TYPE -3

COURSE OBJECTIVES AND OUTCOMES:

Course Objectives		Course Outcomes (At the end of this course, the students will be able to)		Related Program outcomes
1.0	To imparts the applications of sensors on automotive systems.	**1.1**	Understand the application of electronics in automotive industry.	**a,c,d,f,k**
2.0	To afford information with emission control system.	**2.1**	Identify different control systems in automotives and their control.	**a,c,d,f,k**
3.0	To give enough idea about control circuits for engines.	**3.1**	Design and implement various control algorithms in automotives.	**a,c,d,f,k**
4.0	To focus on the extent and nature of electronic circuitry in automotive systems.	**4.1**	Demonstrate different instrumentation systems in automotives.	**a,c,d,f,k**
5.0	To provide knowledge with Monitoring systems, ignition systems and fuel systems.	**5.1**	Identify, formulate and solve real time engineering problems.	**a,c,d,f,k**

UNIT I - FUNDAMENTALS OF AUTOMOTIVE ELECTRONICS **(9)**

Electronic Engine Management System – Components – Open and Closed Loop Control Strategies– PID Control– Look Up Tables – Introduction – Modern Control Strategies Like Fuzzy Logic and Adaptive Control – Controlled Parameters – SI and CI Engines.

UNIT II – SENSORS AND ACTUATORS **(9)**

Introduction – Basic Sensor Arrangement – Types Of Sensors – Hall Effect Sensor – Hot Wire Anemometer– Thermistor – Piezo-Electric Sensor – Piezo-Resistive Sensors – Oxygen Concentration Sensor – Lambda Sensor – Crankshaft Angular Position Sensor – Cam Position Sensor – Mass Air Flow (MAF) Rate – Manifold Absolute Pressure (MAP).

UNIT III - SPARK IGNITION ENGINE MANAGEMENT **(9)**

Feedback Carburetor System – Throttle Body Injection – Multi Point Fuel Injection System – Injection System Controls – Advantage of Electronic Ignition Systems – Three Way Catalytic Converter – Conversion Efficiency Versus Lambda – Group and Sequential Injection Techniques – Fuel System Components – Advantages of Electronic Ignition Systems – Solid State Ignition Systems.

UNIT IV – COMPRESSION IGNITION ENGINE MANAGEMENT **(9)**

Fuel Injection System – Parameters Affecting Combustion – Noise and Emissions in CI Engines – Pilot, Main, Advanced – Post Injection and Retarded Post Injection – Electronically Controlled Unit Injection System – Layout of the Common Rail Fuel Injection System – Fuel Injector – Fuel Pump.

UNIT V - DIGITAL ENGINE CONTROL SYSTEM **(9)**

Open Loop and Closed Loop Control System – Engine Cooling and Warm Up Control – Idle Speed Control – Acceleration and Full Load Enrichment – Deceleration Fuel Cut-off – Fuel Control Maps – Open Loop Control of Fuel Injection – Closed Loop Lambda Control.

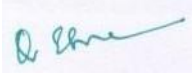
TOTAL = 45 PERIODS

TEXT BOOKS:

1. Arthur Primrose Young, Leonard Griffiths, "Automobile Electrical and Electronic Equipment", London Butterworths, 9th ed, 1986.
2. William Ribbens, "Understanding Automotive Electronics: An Engineering Perspective", Butterworth- Heinemann, 7th ed., 2013.

REFERENCES:

1. Allan Bonnick, "Automotive Computer Controlled Systems" Taylor & Francis, Fifth Edition, 2001.
2. Tom Denton, "Automobile Electrical and Electronics Systems", Butterworth- Heinemann, Fourth Edition, 2004.
3. Robert Bosch GmbH, "Diesel-Engine Management", John Wiley & Sons, Fourth Edition, 2006.
4. Robert Bosch GmbH and Horst Bauer, "Gasoline-Engine Management", Bentley Publishers, Second Edition, 2006.
5. Robert. N, Brady, "Automotive Computers and Digital Instrumentation", Prentice Hall, First Edition, 1988.
6. V.A.W Hillier, "Fundamentals of Automotive Electronics", Nelson Thornes Limited, Sixth Edition, 2012.



17EIZ02 INDUSTRIAL AUTOMATION *(Common to All Branches except EIE branch)*					
			L	**T**	**P**	**C**
			3	**0**	**0**	**3**
PREREQUISITE:		**QUESTION PATTERN: TYPE - 3**			
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives		**Course Outcomes**		**Related Program Outcomes**	
1.0	To make students to learn and understand the basics of robotics	**1.1**	The students can be able to explain the evolution of robotics	**a,c,f,h,i**	
2.0	To make the student to summarize drives	**2.1**	The students will be able to apply the knowledge in drives for robotics	**a,b,c,d,f,i**	
3.0	To infer the student about the manipulator controls	**3.1**	The students will be able to analyse the manipulator controls	**a,b,c,d,f,g,i**	
4.0	To have the knowledge about the path planning and robot kinematics	**4.1**	The students will be able to expertize in kinematics and path planning.	**a,b,c,d,f,g,i,j, k**	
5.0	To motivate the student to apply robot techniques for real time problems	**5.1**	The student will be able to analyze the different kind of robot techniques for various applications	**a,b,c,d,f,g,i,j, k**	

UNIT - I BASIC CONCEPTS	**(9)**
Definition and origin of robotics –different types of robotics–various generations of robots –degrees of freedom – Asimov's laws of robotics – dynamic stabilization of robots	
UNIT - II POWER SOURCES AND SENSORS	**(9)**
Hydraulic, pneumatic and electric drives–determination of HP of motor and gearing ratio–variable speed arrangements –path determination –micro machines in robotics–machine vision–ranging –laser –acoustic–magnetic, fiber optic and tactile sensors.	
UNIT - III MANIPULATORS, ACTUATORS AND GRIPPERS	**(9)**
Construction of manipulators–manipulator dynamics and force control–electronic and pneumatic manipulator control circuits–end effectors–U various types of grippers–design considerations.	
UNIT - IV KINEMATICS AND PATH PLANNING	**(9)**
Solution of inverse kinematics problem–multiple solution jacobian work envelop–hill climbing Techniques – robot programming languages	
UNIT - V CASE STUDIES	**(9)**
Mutiple robots–machine interface–robots in manufacturing and non-manufacturing applications –robot cell design– selection of robot.	
TOTAL = 45 PERIODS	

TEXT BOOKS:

1. Industrial Robotics (SIE): Technology, Programming and Applications Nicholas Odrey, Mitchell Weiss, Mikell Groover, Roger Nagel, Ashish Dutta , Mcgrawhill, 2012.
2. Ghosh, Control in Robotics and Automation: Sensor Based Integration, Allied Publishers, Chennai, 1999.

REFERENCES:

1. S.R. Deb, Robotics technology and flexible Automation, John Wiley, USA 1992.
2. C.R. Asfahl., Robots and manufacturing Automation, John Wiley, USA 1992.
3. R.D. Klafter, T.A. Chimielewski, M. Negin, Robotic Engineering – An integrated approach, Prentice Hall of India, New Delhi, 1994.
4. P.J. Mc Kerrow, Introduction to Robotics, Addison Wesley, USA, 1991.
5. Issac Asimov I Robot, Ballantine Books, New York, 1986.

17EIZ03 FIBER OPTIC SENSORS
(Common to All Branches except EIE branch)

	L	T	P	C
	3	0	0	3

PREREQUISITE:	**QUESTION PATTERN: TYPE - 3**

COURSE OBJECTIVES AND OUTCOMES:

Course Objectives		Course Outcomes (At the end of this course, the students will be able to)		Related Program outcomes
1.0	To familiarize about fiber optic sensor technology.	**1.1**	Understand about the various sensor technology.	**a,b,c,i**
2.0	To study about Optical resonators.	**2.1**	Recognize the importance and applications of grating sensors.	**a,b,c,i**
3.0	To acquire knowledge about magnetic sensors.	**3.1**	Design and implementation of distributed and magnetic sensors.	**a,b,c,i**
4.0	To know about Chemical and Biosensors.	**4.1**	Know the concepts of chemical and bio sensors.	**a,b,c,i**
5.0	To gain knowledge about smart structures.	**5.1**	Study about the various applications of fiber optic sensors.	**a,b,c,i**

UNIT I - SENSOR TECHNOLOGY **(9)**

The Emergence of Fiber Optic Sensor Technology-Optical Fibers-Light Sources-Optical Detectors- Optical Modulators- Intensity-Based and Interferometric Sensors-Fabry perot, Mach Zender, Michelson and Sagnac.

UNIT II – GRATING SENSORS **(9)**

Multimode Grating and Polarisation Sensors-Sensors Based on Relative Movement of Opposed Gratings-Grating Period Modulation-Sensors Based on the Photoelastic Effect-Retardation Plates- Fiber Grating Sensors.

UNIT III - DISTRIBUTED AND MAGNETIC SENSORS **(9)**

Fiber Optic Distributed and Magnetic Sensor-Distributed Sensing- Basic Principles of Sensor Multiplexing- Interferometric Sensor Multiplexing-Faraday effect sensors-Magneto strictive–Lorentz force sensors-Evanescent Field Absorption Sensors.

UNIT IV – CHEMICAL AND BIOSENSOR **(9)**

Fiber Optic Chemical and Biosensor: Reagent Mediated sensor-Humidity sensor – pH sensor – Hydrogen sensor – CO2 sensor – Ammonia sensor – Chloride sensor – Glucose sensor – Oxygen sensor – Surface Plasmonic Resonance based sensor.

UNIT V - APPLICATIONS **(9)**

Industrial Applications of Fiber Optic Sensors : Temperature – Pressure – fluid level – flow – position – vibration – rotation measurements – Current -voltage measurement – Chemical analysis. Introduction to smart structures – Applications –skins.

TOTAL = 45 PERIODS

TEXT BOOKS:

1. Eric Udd, William B. Spillman, Jr., "Fiber Optic Sensors: An Introduction for Engineers and Scientists", John Wiley & Sons 2011.
2. Bhagavānadāsa Gupta, Banshi Das Gupta, "Fiber Optic Sensors: Principles and Applications", New India Publishing 2006.

REFERENCES:

1. David A. Krohn, “Fiber optic sensors: fundamentals and applications”, ISA Publishing 2000.
2. Francis T.S. Yu, Shizhuo Yin, Paul B. Ruffin, “Fiber Optic Sensors”, CRC Press Publisher 2010.
3. B.Culshaw and J.Daykin, “Optic fiber Sensors Systems and Applications”, Artech House 1989.
4. KTV Grattan & BT Meggit, “Optical fiber sensor technology & Applications”, Kluwer Academic 2000.

17EIZ04 ULTRASONIC INSTRUMENTATION *(Common to All Branches except EIE branch)*				
	L	**T**	**P**	**C**
	3	**0**	**0**	**3**

PREREQUISITE:	**QUESTION PATTERN: TYPE -3**

COURSE OBJECTIVES AND OUTCOMES:

Course Objectives		**Course Outcomes** At the end of this course, the students will be able to		**Related Program outcomes**
1.0	To provide adequate knowledge about the properties of ultrasonic waves.	**1.1**	Demonstrate properties and characteristics of ultrasonic wave.	**b,c,i**
2.0	To afford with the facts about method of generation.	**2.1**	Generate and test ultrasonic waves using different methods.	**b,c,i**
3.0	To give the data about Instruments testing and properties of waves.	**3.1**	Measure the properties of ultrasonic wave and apply to various real time applications	**b,c,i**
4.0	To analyze about the Engine Instruments.	**4.1**	Analyze Gyroscopic Instruments and engine Instruments.	**b,c,i**
5.0	To furnish with details about the applications of ultrasonic waves and Instruments.	**5.1**	Examine the applications of Ultrasonic Instruments.	**b,c,i**

UNIT I - ULTRASONIC WAVES CHARACTERISTICS	**(9)**
Ultrasonic waves – Principle and propagation of various waves – Characterization of ultrasonic transmission – Reflection and transmission coefficients – Intensity and attenuation of sounds beam. Power level – Medium parameters.	
UNIT II – ULTRASONIC WAVE GENERATION	**(9)**
Generation of ultrasonic waves – Magnetostrictive and piezoelectric effects – Search unit types – Construction and characteristics	
UNIT III - ULTRASONIC TEST METHODS	**(9)**
Ultrasonic test methods – Pulse echo – Transit time – Resonance – Direct contact and immersion type – Ultrasonic methods of flaw detection.	
UNIT IV – ULTRASONIC MEASUREMENTS	**(9)**
Ultrasonic measurements – Ultrasonic methods of measuring thickness, depth and flow – Variables affecting ultrasonic testing in various applications.	
UNIT V - ULTRASONIC APPLICATIONS	**(9)**
Ultrasonic applications – Ultrasonic applications in medical diagnosis and therapy, acoustical holography.	
	TOTAL = 45 PERIODS

TEXT BOOKS:

1. J David and N Cheeke, " Fundamentals and Applications of Ultrasonic Waves", CRC Press 2002.
2. Dale Ensminger, " Ultrasonic: Fundamentals, Technology and Applications", CRC press 1988.

REFERENCES:

1. Baldev Raj Palanichamy and V Rajendran, "Science and Technology of Ultrasonic", Alpha Science 2004.
2. Emmanuel P Papadakis, " Ultrasonic Instruments and Devices: Reference for Modern Instrumentation Techniques, and Technology", Academic Press, 1999.

17ITZ01 - SOFTWARE TESTING TOOL *(Common to All branches except IT Branch)*					
			L	**T**	**P**	**C**
			3	**0**	**0**	**3**
PRE REQUISITE : NIL		**QUESTION PATTERN: TYPE - 3**				
COURSE OBJECTIVES AND OUTCOMES:						
Course Objectives		**Course Outcomes**			**Related Program outcomes**	
1.0	Understand the basic trends of software testing tools.	**1.1**	The students will be to utilize the concepts in software testing tools		**a,c,j,k**	
2.0	Be exposed to the Software testing tools	**2.1**	The students will be to learn the working of automation testing		**a,c,j,k**	
3.0	Understand of how the testing tools can be integrated into the real time projects.	**3.1**	The students will be to design the test cases and to getting familiarity over testing tools.		**a,b,c,j,k**	
4.0	Be familiar with all kinds of software testing tools.	**4.1**	The students will be to use the techniques, skills and modern software testing tools necessary for testing		**a,b,c,k**	
5.0	To develop test cases using tools and to enable the learner to become a Software Tester	**5.1**	The students will be to use the testing tools to check the behavior of the real time application		**a,b,c,k**	

UNIT I TEST AUTOMATION WITH SELENIUM	**(9)**
Introduction to Selenium - How to use Selenium – Test Automation for Web Application - IDE - Building Test Cases - Running Test cases - Assertion	
UNIT II SELENIUM-IDE	**(9)**
Introduction - Download Selenium IDE - Features of Selenium IDE - Creating Selenium IDE Tests - Script Debugging - Inserting Verification Points - Pattern Matching - Selenium User Extensions - Different Browser Execution	
UNIT III ENVIRONMENT SETUP AND SELENIUM RC	**(9)**
Selenium RC Architecture - RC Scripting - Selenese Commands - Actions - Accessors - Assertions - Web Driver - Architecture - Scripting using Web Driver - Most Used Commands	
UNIT IV FUNCTIONALITY TOOL	**(9)**
Introduction to Silk Test - Silk Test Architecture - Automated Testing Process - Quick start with Silk Test - Configuring the settings - Exposure to Silk Test IDE - Plug and Play test case.	
UNIT V TEST MANAGEMENT TOOL	**(9)**
Introduction - Testing Process - Specifying Testing Requirements - Planning Tests - Calling Tests with Parameters - Creating and Viewing Requirements Coverage - Generating Automated Test Scripts - Running Tests - Defining Test Sets	
TOTAL (L: 45) = 45 PERIODS	

TEXT BOOK:

1. Dr. K.V.K.K Prasad , Software Testing Tools, Dream tech 2012

REFERENCES:

1. https://www.seleniumhq.org/docs/
2. https://www.tutorialspoint.com/selenium/selenium_pdf_version.htm
3. URL: www.onestoptesting.com/SilkTest
4. URL: www.onestoptesting.com/testdirector

17ITZ02 - USER EXPERIENCE *(Common to All branches except IT Branch))*					
			L	**T**	**P**	**C**
			3	**0**	**0**	**3**
PRE REQUISITE : NIL		**QUESTION PATTERN: TYPE - 3**				

COURSE OBJECTIVES AND OUTCOMES:

Course Objectives		**Course Outcomes**		**Related Program outcomes**
1.0	To understand the concepts of User Experience Design	**1.1**	The students will be able to familiarize with the elements of User Experience Design	a, k, l
2.0	To impart the fundamental concepts of User Experience Design process to research and define	**2.1**	The students will be able to implement the User Experience Design research process	a,d,f
3.0	To gain exposure about ideating UX design process	**3.1**	The students will be able to design UX design process	a,c,d,e
4.0	To get knowledge about Prototyping and testing UX design process	**4.1**	The students will be able to build a simple prototype for a UX design process	c,d,f
5.0	To learn about strategies in improving UX design process	**5.1**	The students will be able to work improvising UX design process	a,c,d,e

UNIT I - UX INTRODUCTION AND ELEMENTS	**(9)**
Introducing User Experience–From Product Design to User Experience Design–Designing (for) Experience: Use Matters–User Experience and the Web–The Elements of User Experience: The Strategy Plane–The Scope Plane–The Structure Plane–The Skeleton Plane–The Surface Plane.	
UNIT II –UX DESIGN PROCESS: RESEARCH, DEFINE	**(9)**
UX Design Process– Definition and Methodology– Balancing needs through iterative development: Success for end user –Success for company and advertiser – System of balance – Fitting User research – Case study on scheduling service.	
UNIT III –UX DESIGN PROCESS: IDEATE/DESIGN	**(9)**
Visual Design Principles–Information Design and Data Visualizatiion– Interaction Design– Information Architecture–Wireframing&Storybarding–UIElements and Widgets– Screen Design and Layouts.	
UNIT IV -UX DESIGN PROCESS: PROTOTYPE & TEST	**(9)**
Testing Design– Usability Testing– Types of Usability Testing –Usability Testing Process–Prepare and plan for the Usability Tests– Prototype Design to Test– Introduction of prototyping tools–Conduct Usability Test– Communicate Usability Test Results.	
UNIT V -UX DESIGN PROCESS: ITERATE/ IMPROVE&DELIVER	**(9)**
Understanding the Usability Test findings–Applying the Usability Test feedback in improving the design– Communication with implementation team– Giving UX Deliverables to implementation team.	
TOTAL (L: 45) = 45 PERIODS	

TEXT BOOKS:

1. Jesse James Garrett, "The Elements of User Experience: User-Centred Design for the Web and Beyond", New Riders, Second edition,2010.
2. Elizabeth Goodman, Mike Kuniavsky, Andrea Moed, "Observing the User Experience: A Practitioner's Guide to User Research", Morgan Kaufmann, Second edition, 2012.

REFERENCES:

1. Bill Buxton, "Sketching User Experiences: Getting the Design Right and the Right Design (Interactive Technologies)", Morgan Kaufmann, First edition, 2007.
2. Jeff Rubin Dana Chisnell, "Handbook of Usability Testing: How to Plan, Design, and Conduct Effective Tests", Wiley Publishing, Inc., Second Edition, 2008

17ITZ03 - DEVELOPING MOBILE APPS *(Common to All branches except IT Branch)*					
			L	T	P	C
			3	0	0	3
PRE REQUISITE : NIL		**QUESTION PATTERN: TYPE - 3**			
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives		**Course Outcomes**			**Related Program outcomes**
1.0	To understand basics of mobility.	**1.1**	The students will be to appreciatetheMobilityandscape.		**a,c,d,g,l**
2.0	To understand basic building blocks of mobile apps.	**2.1**	The students will be to design userinterfaces and native data handling.		**c,d,g,l**
3.0	To understand other add on features of mobile application.	**3.1**	The students will be to appreciationofnuancessuch as native hardwareplay,location awareness, graphics, and Multimedia.		**c,d,g,l**
4.0	To understand mobile application testing	**4.1**	The students will be to understand various testing techniques.		**c,d,g,l**
5.0	To understand application marketing concepts.	**5.1**	The students will be to understand techniques of apps marketing.		**c,d,g,l**

UNIT I GETTINGSTARTEDWITHMOBILITY	(9)
Mobility and scape,Mobile platforms,Mobile apps development ,Overview of Android platform,settingupthe mobile app development environment alongwith an emulator, acase studyon Mobile appdevelopment.	
UNIT II BUILDINGBLOCKSOF MOBILEAPPS	(12)
Appuserinterfacedesigning–mobileUIresources(Layout,UIelements,Draw-able,Menu),Activity-statesand life cycle, interaction amongstactivities.App functionality beyond user interface - Threads,sync task, Services – states and lifecycle, Notifications, Broadcast receivers,Telephonyand SMS APIs Native data handling– on-device file I/O, shared preferences, mobile databases such as SQLite, and enterprisedata access (viaInternet/Intranet)	
UNIT III SPRUCINGUP MOBILEAPPS	(9)
Graphicsandanimation–customviews,canvas,animationAPIs,multimedia–audio/videoplaybackandrecord, location awareness,and native hardware access(sensors suchasaccelerometerandgyroscope)	
UNIT IV TESTINGMOBILEAPPS	(8)
Debuggingmobileapps,Whiteboxtesting,Blackboxtestingandtestautomationofmobileapps,JUnitforAndroid, Robotium, MonkeyTalk.	
UNIT V TAKINGAPPSTOMARKET	(7)
Versioning, signingand packaging mobile apps,distributingappson mobile marketplace.	
TOTAL (L: 45) = 45 PERIODS	

TEXT BOOK:

1. AnubhavPradhan, AnilVDeshpande, “Mobile AppsDevelopment”, FirstEdition, 2013.

REFERENCES:

1. BarryBurd, “Android Application DevelopmentAll inone forDummies”, FirstEdition, 2013.
2. “Teach YourselfAndroidApplication Developmentin 24 Hours”, SAMS Publication.

17ITZ04 - SOFTWARE PROJECT MANAGEMENT *(Common to All branches except IT Branch)*					
		L	**T**	**P**	**C**
		3	**0**	**0**	**3**
PRE REQUISITE : NIL		**QUESTION PATTERN: TYPE - 3**			

COURSE OBJECTIVES AND OUTCOMES:

Course Objectives		Course Outcomes		Related Program outcomes
1.0	To understand basic project Management.	**1.1**	The Students able to understand basic project Management.	**a,c,d,g,l**
2.0	To understand project life cycle.	**2.1**	The Students able to understand project life cycle.	**c,d,g,l**
3.0	To learn activity planning.	**3.1**	The Students able to learn activity planning.	**c,d,g,l**
4.0	To understand project management and control.	**4.1**	The Students able to understand project management and control.	**c,d,g,l**
5.0	To understand communication in team.	**5.1**	The Students able to understand communication in team.	**c,d,g,l**

UNIT I PROJECT EVALUATION AND PROJECT PLANNING	**(9)**
Importance of Software Project Management – Activities Methodologies – Categorization of Software Projects – Setting objectives – Management Principles – Management Control – Project portfolio Management – Cost-benefit evaluation technology – Risk evaluation – Strategic program Management – Stepwise Project Planning.	
UNIT II PROJECT LIFE CYCLE AND EFFORT ESTIMATION	**(9)**
Software process and Process Models – Choice of Process models – mental delivery – Rapid Application development – Agile methods – Extreme Programming – SCRUM – Managing interactive processes – Basics of Software estimation – Effort and Cost estimation techniques – COSMIC Full function points – COCOMO II A Parametric Productivity Model – Staffing Pattern.	
UNIT III ACTIVITY PLANNING AND RISK MANAGEMENT	**(9)**
The seven traditional tools of quality - New management tools - Six sigma: Concepts, Methodology, applications to manufacturing, service sector including IT - Bench marking - Reason to bench mark, Bench marking process – FMEA - Stages, Types.	
UNIT IV PROJECT MANAGEMENT AND CONTROL	**(9)**
Framework for Management and control – Collection of data Project termination – Visualizing progress – Cost monitoring – Earned Value Analysis- Project tracking – Change control- Software Configuration Management – Managing contracts – Contract Management.	
UNIT V STAFFING IN SOFTWARE PROJECTS	**(9)**
Managing people – Organizational behavior – Best methods of staff selection – Motivation – The Oldham-Hackman job characteristic model – Ethical and Programmed concerns – Working in teams – Decision making – Teamstructures – Virtual teams – Communications genres – Communication plans.	
TOTAL (L: 45) = 45 PERIODS	

TEXT BOOK:

1. Bob Hughes, Mike Cotterell and Rajib Mall: Software Project Management – Fifth Edition, Tata McGraw Hill, New Delhi, 2012.

REFERENCES:

1. Robert K. Wysocki "Effective Software Project Management" – Wiley Publication, 2011.
2. Walker Royce: "Software Project Management"- Addison-Wesley, 1998.
3. Gopalaswamy Ramesh, "Managing Global Software Projects" – McGraw Hill Education (India), Fourteenth Reprint 2013.

17ITZ05 - JAVA PROGRAMMING (Common to All branches except IT Branch)				
	L	T	P	C
	3	0	0	3
PRE REQUISITE : NIL	**QUESTION PATTERN: TYPE –III**			

COURSE OBJECTIVES AND OUTCOMES:

Course Objectives		Course Outcomes		Related Program outcomes
1.0	To understand Object Oriented Programming concepts and basic characteristics of Java	1.1	The students will be able to implement fundamental concepts of Java.	**a, b, c, d**
2.0	To implement the keywords and inheritance concepts using class.	2.1	The students will be able to gain the knowledge on inheritance	**b, c, d, k**
3.0	To define exceptions and use I/O streams	3.1	The students will be able to understand the knowledge on handling exceptions and using Files	**b, c, d, k**
4.0	To know the principles of packages and interfaces	4.1	The students will be able to use packages and implement interfaces in Java classes.	**b, c, d, k**
5.0	To develop a java application with threads.	5.1	The students will be able to gain the knowledge about threads and advantages of multithreading.	**b, c, d, k, l**

UNIT I INTRODUCTION	**(9)**
Introduction of Java - Features of Java – Application of Java – Data Types –Statements – Operators – Control statements - Basics of Oops Concepts: Class – Objects – Methods –Constructor – finalizer –Access Control.	
UNIT II INHERITANCE AND KEYWORDS	**(9)**
Inheritance: Types of Inheritance – Polymorphism – Method Overloading – Method Overriding- super – final with inheritance – Abstract Class - Keywords : static –final - this - String – Arrays	
UNIT III EXCEPTION HANDLING AND FILES	**(9)**
Exception-Handling Fundamentals, Exception Types, Uncaught Exceptions, Using try and catch, Multiple catch Clauses, Nested try Statements, throw, throws, finally, Java's Built-in Exceptions, Creating Your Own Exception Subclasses, Using Exceptions. I/O Basics- Streams – Byte streams and Character streams – Reading and Writing Console – Reading and Writing Files	
UNIT IV PACKAGES AND INTERFACES	**(9)**
Packages and Interfaces: Packages, Access Protection, Importing Packages. Interfaces – defining an interface, implementing interface, differences between classes and interfaces and extending interfaces.	
UNIT V THREADS	**(9)**
Java Thread Model - Main Thread - Creating a Thread - Creating Multiple Threads - Using isAlive( ) and join( ) - Thread Priorities - Synchronization - Interthread Communication - Suspending, Resuming, and Stopping Threads- Using Multithreading.	
TOTAL (L: 45) = 45 PERIODS	

TEXT BOOK:

1. Herbert Schildt, “The Complete Reference (Fully updated for jdk7)”, Oracle press Ninth Edition,2014.

REFERENCE:

1. Deitel&Deitel, “Java How to Program”, Prentice Hall, 10th Edition, 2016.

17MEZ01 - ENGINEERING ERGONOMICS *(Common to All branches except Mechanical Branch)*				
L	**T**	**P**	**C**
3	**0**	**0**	**3**
PREREQUISITE : NIL	**QUESTION PATTERN : TYPE - 3**		

COURSE OBJECTIVES AND OUTCOMES:

Course Objectives		Course Outcomes		Related Program Outcomes
1.0	To introduce the concept of work posture and work station design	**1.1**	Assess the design of workstation	a, b, c, e, f, k, l
2.0	To acquire knowledge on human factors in computer use and screen displays	**2.1**	Demonstrate the human factors involved in computer use and screen displays	a, b, e , f
3.0	To teach the organizational aspects of office ergonomics	**3.1**	Explain the organizational aspects of office ergonomics	a, b, e, f
4.0	To acquire knowledge on health issues due to working conditions	**4.1**	Examine the health issues related to working conditions	a, b, c, e, f, k, l
5.0	To introduce the human factors in manual handling, environment and risk assessment	**5.1**	Summarize the environment and risk aspects during manual handling condtions	a, b, c, e, f, l

UNIT I : WORKING POSTURE AND WORK STATION DESIGN	**(9)**
Working posture - sitting versus standing, the back, posture, maintenance and monitoring of good postures - Design of workstation - desks, partitions, chairs, accessories - Workstation trials - task analysis	
UNIT II : COMPUTER USE AND SCREEN DISPLAYS	**(9)**
Computer Use - desktops, flat screens, laptops, wireless technology, out of office working - Screen displays - memory, displays - Input devices	
UNIT III : ORGANIZATIONAL ISSUES AND TRAINING	**(9)**
Organizational Issues - job design, work rate, rest breaks, overtime, incentives, motivation, shift work, compressed working week, managing change - training - trainees, training methods, the course, alternative approaches, making training more effective, after the course	
UNIT IV : WORK RELATED ILL HEALTH AND DISABILITY	**(9)**
Work related ill health - upper limb disorders (ULD) - types of upper limb disorders, causes of upper limb disorders, responding to ULDs, backache, visual fatigue, stress - Disability - workstation arrangements, computer work, general environment	
UNIT V : MANUAL HANDLING, ENVIRONMENT AND RISK ASSESSMENT	**(9)**
Manual Handling - Injuries, Reducing the Risk - Environment - Noise, lighting, thermal comfort - Risk Assessment - sample checklists	
TOTAL (L:45) = 45 PERIODS	

TEXTBOOKS:

1. Céline McKeown, "Office Ergonomics : Practical Applications", CRC Press, 2008
2. Anne D. Kroemer and Karl H.E. Kroemer, "Office Ergonomics : Ease and Efficiency at Work", 2nd ed., CRC Press, 2016

REFERENCES:

1. Céline McKeown, "Office Ergonomics and Human Factors : Practical Applications", 2nd ed., CRC Press, 2018
2. Dan MacLeod, "The Office Ergonomics Tool Kit With Training Disc", 1st ed., CRC Press, 1998
3. Susan Orr, Howard Allan Vanes, Office Ergonomics", 1st ed., Howard Vanes, 2007
4. Craig Chasen, "Safety Managers Guide to Office Ergonomics", 1st ed., Wiley-Blackwell, 2009

17MEZ02 – ENERGY AUDIT AND RESOURCE MANAGEMENT *(Common to All branches except Mechanical Branch)*				
L	**T**	**P**	**C**
3	**0**	**0**	**3**
PREREQUISITE : NIL	**QUESTION PATTERN : TYPE - 3**		

COURSE OBJECTIVES AND OUTCOMES:

Course Objectives		Course Outcomes		Related Program Outcomes
1.0	To understand basic energy conversion, conservation and management principles	**1.1**	Summarize the working principles of various energy conversion systems	**a, b, g, k, l**
2.0	To enable students to identify sources of energy loss and target savings	**2.1**	Outline the fundamentals of process integration	**a, b, g, j, k, l**
3.0	To make students understand design of waste heat recovery systems and power generation systems	**3.1**	Assess energy, fuel consumption and wastage in existing facilities through effective metering	**a, b, j, l**
4.0	To acquire an overview of energy management system	**4.1**	Demonstrate the steps involved in energy monitoring	**a, b, j, l**
5.0	To enable students in carrying out life cycle cost analysis and budget estimation	**5.1**	Estimate energy costs and perform energy audit	**a, b, g, j, k, l**

UNIT I : NECESSITY FOR ENERGY AUDIT AND MANAGEMENT	**(9)**
An overview of energy consumption and its effects – Reasons to save energy (financial and environmental) – Fuels and combustion – Boilers (classification, types, working principle of important types) – Furnaces – Insulation & Refractories.	
UNIT II : PROCESS INTEGRATION	**(9)**
Steam systems – Pinch technology – Basics of pinch technology – Cogeneration – Concept of tri-generation – Waste heat recovery	
UNIT III : ENERGY ANALYSIS, ASSESSMENT, MONITORING AND CONSERVATION	**(9)**
Electrical systems – Electric motors – Fans & blowers – Compressed air systems – Refrigeration and air conditioning systems - Pumps & pumping systems – Lighting systems – Energy efficient technologies in electrical systems	
UNIT IV: ENERGY MANAGEMENT AND MONITORING	**(9)**
Financial techniques for assessing energy conservation measures - Fixed and variable cost - Interest charges - Simple payback period - Net Present Value - Discounted cash flow method - Lifecycle analysis. Definition & objective of Energy management - Energy Audit - Types & Methodology - Energy audit report format	
UNIT V : ENERGY AUDITS AND ENERGY MODELING	**(9)**
Understanding Energy Costs – Benchmarking and Energy Performance – Fuel and Energy Substitution – Material Balances – Energy Balances – Instruments – Organizational background desired for energy management – Case studies of energy audit in different industries	
TOTAL (L:45) = 45 PERIODS	

TEXTBOOKS:

1. T.D. Eastop and D.R. Croft (1996), Energy Efficiency for Engineers and Technologists, Longman Harlow.
2. Charles M. Gottschalk (1996), Industrial Energy Conservation, John Wiley & Sons.

REFERENCES:

1. Paul W. O'Callaghan (1988), Design and Management for Energy Conservation, Pergamon Press, London.
2. Frank Krieth and Ronald E. West (1983), Handbook of Industrial Energy Conservation, von Nostrand Reinhold Company.
3. Attilio Bisio and Sharon Boots (1995), Encyclopedia of Energy Technology and the Environment, Volumes 1–4, Wiley-Interscience Publication, John Wiley & Sons,
4. Course Material for Energy Audit and Managers Exam (2005), (www.energymanagertraining.com) Vol. 1 – 4

17MEZ03 ELECTRIC VEHICLE TECHNOLOGY *(Common to All branches except Mechanical Branch)*				
	L	**T**	**P**	**C**
	3	**0**	**0**	**3**
PREREQUISITE : NIL	**QUESTION PATTERN : TYPE - 3**			

COURSE OBJECTIVES AND OUTCOMES:

Course Objectives		Course Outcomes		Related Program Outcomes
1.0	To introduce the working principles of batteries and their types	**1.1**	Differentiate the types of batteries which are used in electrical vehicles	**a, c, e, g, k, l**
2.0	To acquire knowledge on applications of alternative energy sources in vehicles	**2.1**	List the types of alternative energy sources and/or working principles of fuel cells	**a, c, e, g, k, l**
3.0	To teach students the stages in hydrogen supply and storage for electric vehicles	**3.1**	Assess the potential of hydrogen energy in vehicles and energy storage techniques	**a, c, e, g, k, l**
4.0	To gain knowledge on electrical actuation systems and controllers	**4.1**	Recommend an electrical drive and its controller in vehicular applications	**a, c, e, g, k, l**
5.0	To introduce the concept of mathematical modeling and design considerations	**5.1**	Explain the concepts of electric vehicle modeling and design aspects	**a, c, e, g, k, l**

UNIT I : INTRODUCTION AND BATTERIES	**(9)**
Types of electric vehicle - battery parameters - lead acid batteries - nickel based batteries - battery charging - designer's choice of battery - use of batteries in hybrid vehicles - battery modeling	
UNIT II : ALTERNATIVE ENERGY SOURCES AND FUEL CELLS	**(9)**
Solar photo voltaics - wind power - flywheels - super capacitors - supply rails - hydrogen fuel cells - fuel cell thermodynamics - connecting cells in series - water and thermal management in PEM fuel cell	
UNIT III : HYDROGEN SUPPLY AND STORAGE	**(9)**
Introduction - fuel reforming - fuel cell requirements, steam reforming, partial oxidation and autothermal reforming, further fuel processing, mobile applications - storage as hydrogen - chemical methods	
UNIT IV : ELECTRIC MACHINES AND CONTROLLERS	**(9)**
Brushed DC electric motor - DC regulation and voltage conversion - brushless electric motors - motor cooling, efficiency, size and mass - electrical machines for hybrid vehicles	
UNIT V : ELECTRIC VEHICLE MODELING AND DESIGN CONSIDERATIONS	**(9)**
Introduction - tractive effort - modeling vehicle acceleration and electric vehicle range - simulations - aerodynamic considerations - rolling resistance - transmission efficiency - vehicle mass - general issues	
TOTAL (L: 45) = 45 PERIODS	

TEXTBOOKS:

1. James Larminie, John Lowry, "Electric Vehicle Technology Explained", 2nd ed., John Wiley & Sons Ltd 2015
2. Iqbal Husain, "Electric and Hybrid Vehicles : Design Fundamentals", 2nd ed., CRC Press, 2010

REFERENCES:

1. Mehrdad Ehsani, Yimin Gao, Ali Emadi, "Modern Electric, Hybrid Electric, and Fuel Cell Vehicles : Fundamentals, Theory, and Design", Standards media, 2009
2. Chau.K.T, "Electric vehicle machines and drives : Design, Analysis and Application", Wiley-Blackwell, 2015
3. James D Halderman, "Hybrid and Alternative Fuel Vehicles", 4th ed., Pearson Education, 2015
4. Jingyu Yan, Huihuan Qian, Yangsheng Xu, "Hybrid Electric Vehicle Design and Control : Intelligent Omnidirectional Hybrids", McGraw-Hill Education,2013
5. Chris Mi and Abul Masrur.M, "Hybrid Electric Vehicles : Principles and Applications with Practical Perspectives", 2nd ed., Wiley-Blackwell, 2017

17MEZ04 VALUE ENGINEERING *(Common to All branches except Mechanical Branch)*					
			L	**T**	**P**	**C**
			3	**0**	**0**	**3**
PREREQUISITE : NIL		**QUESTION PATTERN : TYPE - 3**			
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives		**Course Outcomes**		**Related Program Outcomes**	
1.0	To introduce the concept of value engineering for eliminating the unnecessary costs	**1.1**	Estimate the value of a product and/or identify the primary and secondary functions of a product	**a, e, f, h, l**	
2.0	To understand the elements of cost and find worth	**2.1**	Determine the cost, worth of a product and their elements	**a, b, d, e, i, k**	
3.0	To acquire knowledge on various value engineering techniques	**3.1**	Demonstrate the value engineering techniques for industrial applications	**a, b, e, i, j**	
4.0	To provide awareness about team dynamics and job plan	**4.1**	Summarize the stages in team dynamics and value engineering job plan	**a, e, i, j, k**	
5.0	To introduce the financial aspects and human factors of value engineering	**5.1**	Illustrate the financial aspects and human factors of value engineering	**a, b, e, i, k, l**	

UNIT I : VALUE AND FUNCTION	**(9)**
Seven types values - economic value - cost, use, esteem and exchange values - mathematical model of value - types and levels of functions - function identification - method of finding functions of a product - case study - vocabulary of verbs and nouns	
UNIT II : COST AND WORTH	**(9)**
Cost and price - elements of cost - direct material, direct labour, direct expenses, overheads - calculation of cost - case study - method of determining function cost - evaluation of worth - guidelines to find out worth - value gap and value index	
UNIT III : VALUE ENGINEERING TECHNIQUES	**(9)**
Brainstorming and Gordon techniques - feasibility ranking - morphological analysis technique - ABC analysis - probabilistic approach - make or buy - function-cost-worth analysis - FAST - weighted evaluation method - evaluation matrix - life cycle cost	
UNIT IV : TEAM DYNAMICS AND JOB PLAN	**(9)**
Team structure - team building - physical, intellectual, spiritual transformations - job plan - orientation phase - information phase - function phase - creative phase - evaluation phase - recommendation phase - implementation phase - audit phase	
UNIT V : FINANCIAL ASPECTS AND HUMAN RELATION	**(9)**
Break-even point - payback period - return on investment - discounted cash flows - balance sheet and profit and loss account - human aspects in value engineering - individual ego states - techniques of transactions - human interactions - Managerial grid	
TOTAL (L: 45) = 45 PERIODS	

TEXTBOOKS:

1. Mukhophadhyaya A K, "Value Engineering", 1st ed., Sage Publications Pvt. Ltd., New Delhi, 2003
2. Mukhophadhyaya A K, "Value Engineering Mastermind", 1st ed., Sage Publications Pvt. Ltd., New Delhi, 2009

REFERENCES:

1. Richard J Park, "Value Engineering - A plan for inventions", St.Lucie Press, London, 1998
2. Iyer. S. S, "Value Engineering: A How to Manual", 3rd ed., New age publishers, 2009
3. Larry W Zimmesman. P E , "Value Engineering : A Practical approach for owners designers and contractors", 1st ed., CBS Publishers, Delhi, 2010
4. Theodore C. Fowler, "Value Analysis in Design", 1st ed., SAVE International, 2001
5. Arthus E Mudge, "Value Engineering", SAVE International, 1988

17MEZ05 – SMART MOBILITY *(Common to All branches except Mechanical Branch)*				
	L	**T**	**P**	**C**
	3	**0**	**0**	**3**
PREREQUISITE : NIL	**QUESTION PATTERN : TYPE – 3**			

COURSE OBJECTIVES AND OUTCOMES:

	Course Objectives		Course Outcomes	Related Program outcomes
1.0	To understand concept of autonomous vehicles	**1.1**	The students will be able to utilize the electronic systems in automobiles	**a, b, c, d, k, l**
2.0	To learn about sensor technology of automated vehicle	2.1	The students will be able to analyze sensors for automotive application	**a, b, c, d, e**
3.0	To understand about computer vision and deep learning	3.1	The students will be able to apply knowledge of Computer Vision and Deep learning in autonomous vehicle	**a, b, c, d, k, l**
4.0	To acquire knowledge on localization and path planning	4.1	The students will be able to apply fundamentals of path planning in autonomous vehicle	**a, b, c, k, l**
5.0	Become familiar with the concept of connected vehicles	5.1	The students will be able to implement connected vehicle systems	**a, b, c, k, l**

UNIT I : BASICS OF SMART MOBILITY	**(9)**
Introduction to the concept of automotive electronics - history and evolution - infotainment - body - chassis and powertrain electronics - advanced driver assistance electronic systems - basic control system - theory applied to automobiles - overview of the operation of ECUs, basic cyber - physical system theory and autonomous vehicles - role of surroundings sensing systems and autonomy - role of wireless data networks and autonomy	
UNIT II : SENSOR TECHNOLOGY FOR AUTOMATED VEHICLES	**(9)**
Basics of radar technology and systems - ultrasonic sonar systems - Lidar sensor technology and systems - camera technology - night vision technology - other sensors - use of sensor data fusion - integration of sensor data to on-board control systems	
UNIT III : COMPUTER VISION AND DEEP LEARNING	**(9)**
Introduction - computer vision - fundamentals - deep learning - neural networks - deep neural networks - convolutional neural networks - Keras - tensor flow - sensor fusion - Kalman filters - dashboard electronics	
UNIT IV : LOCALISATION AND PATH PLANNING	**(9)**
Introduction to localization - motion models - particle filters - implementation of a particle filter - path planning - search - prediction - behaviour planning - trajectory generation - control-PID - system integration - ROS driverless car technology - moral - legal - roadblock issues - technical issues - security issues - fuzzy logic - PWM controllers	
UNIT V : CONNECTED CAR TECHNOLOGY	**(9)**
Connectivity fundamentals - navigation and other applications - vehicle-to-vehicle technology and applications - vehicle-to-roadside and vehicle-to-infrastructure applications - wireless security overview connected car display technology - center console technology - gauge cluster technology - heads-up display technology - warning technology-driver notification - obstacle crossing - identification of friend or foe vehicles	
TOTAL (L: 45) = 45 PERIODS	

TEXT BOOKS:

1. Markus Maurer, J. Christian Gerdes, Barbara Lenz and Hermann Winner, “Autonomous Driving: Technical, Legal and Social Aspects”, Springer, 2016
2. Hod Lipson and Melba Kurman, “Driverless: Intelligent Cars and the Road Ahead”, MIT press, 2016

REFERENCES :

1. Michael E. McGrath, “Autonomous Vehicles: Opportunities, Strategies and disruptions”, 2016
2. Vivekwadhwa and Alex salkever, “The driver in the driverless car”, 2017
3. G. Mullett, “Wireless Telecommunications Systems and Networks”, Thomson- Delmar Learning, 2006
4. G. Mullett, “Basic Telecommunications : The Physical Layer”, Thomson-Delmar Learning, 2003

17MYZ01 MATHEMATICAL STRUCTURES *(Common to All Branches)*					
			L	T	P	C
			3	0	0	3
PREREQUISITE : NIL		**QUESTION PAPER TYPE: 4**			
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives		**Course Outcomes**			**Related Program outcomes**
1.0	To understand the basic concepts of logic and their applications.	**1.1**	To extend the logical and mathematical ability to deal with abstraction.		**a,b,c**
2.0	To give you a familiarity with rigour and a grounding in the art of formal reasoning.	**2.1**	Be aware of counting principle.		**a,b,d,l**
3.0	To understand the concepts of sets and relations.	**3.1**	Exposed to concepts and properties of set theory		**a,c,g**
4.0	To understand basic concepts of functions.	**4.1**	Identify and analyze the basic proofs involving functions.		**a,b,g,i**
5.0	To understand the characteristic of a group and the coset .	**5.1**	Be exposed to concepts and properties of algebraic structures such as Semi groups.		**a,b,c,k**

UNIT I - PROPOSITIONAL CALCULUS	**(9)**
Propositions - Logical connectives - Compound propositions - Conditional and biconditional propositions - Truth tables - Tautologies and Contradictions - Logical and Equivalences and implications - DeMorgan's Laws - Normal forms.	
UNIT II: PREDICATE CALCULUS	**(9)**
Predicates - Statement Function – Variables - free and bound variables – Quantifiers - Universe of discourse - Logical equivalences and implications for quantified statements.	
UNIT III: SET THEORY	**(9)**
Cartesian product of sets - Relations of sets - Types of relations and their properties – Relational matrix and the graph of a relation - Equivalence relations – Partial ordering – Poset – Hasse diagram.	
UNIT IV –FUNCTIONS	**(9)**
Definition – Classification of functions – Composition of functions – Inverse functions – Binary and n-ary operations – Characteristic function of a set.	
UNIT V – ALGEBRAIC STRUCTURES	**(9)**
Algebraic systems - Semigroups and monoids - Groups – Subgroups - Homomorphisms – Normal subgroup and coset – Lagrange's theorem.	
	TOTAL = 45(L) PERIODS

TEXT BOOKS:

1. Tremblay J.P and Manohar R, "Discrete Mathematical Structures with Applications to Computer Science" ,Tata McGraw-HILL, New Delhi, ,30th Reprint 2011.
2. Veerarajan.T, "Discrete Mathematics with Graph Theory and Combinatorics", Fourth Edition, Tata McGraw Hill , New Delhi, Reprint2013.

REFERENCES:

1. Kenneth H.Rosen, "Discrete Mathematics and its Applications", Fifth Edition, Tata McGraw- Hillpublications, New Delhi 2012.
2. Venkatraman M.K., "Discrete Mathematics", The National Publishing Company, Chennai, 2007.

17MYZ02 OPTIMIZATION TECHNIQUES *(Common to All Branches)*					
		L	**T**	**P**	**C**
		3	**0**	**0**	**3**
PREREQUISITE : NIL		**QUESTION PAPER TYPE: 4**			

COURSE OBJECTIVES AND OUTCOMES:

Course Objectives		Course Outcomes		Related Program outcomes
1.0	To provide the concept and an understanding of basic concepts in Operations Research.	**1.1**	Construct and solve linear programming models to answer business optimization problems.	**a,b,c,d,l**
2.0	To understand, develop and solve mathematical model of Transport and assignment problems.	**2.1**	Apply transportation and assignment models to find optimal solution in warehousing and Travelling.	**a,b,g,i,k,l**
3.0	To understand, develop and solve mathematical model of linear programming problems.	**3.1**	Prepare project scheduling using PERT and CPM.	**a,b,c,f,k**
4.0	To provide Techniques for Analysis and Modeling in Computer Applications.	**4.1**	Appraise theoretical predictions obtained from Game Theory analyses against real world conflicts.	**a,c,k,l**
5.0	To understand network modeling for planning and scheduling the project activities.	**5.1**	Identify and analyze appropriate queuing model to reduce the waiting time in queue.	**a,i,k,l**

UNIT I - LINEAR PROGRAMMING MODELS	**(9)**
Mathematical Formulation - Graphical Solution of Linear Programming Models - Simplex Method - Big-M Method.	
UNIT II - TRANSPORTATION AND ASSIGNMENT MODELS	**(9)**
Mathematical Formulation of Transportation Problem - Methods for Finding Initial Basic Feasible Solution: North West Corner Rule, Least Cost Method, VAM - Optimum solution – Mathematical Formulation of Assignment Models.	
UNIT III - PERT AND CPM	**(9)**
Network Construction – Critical Path Method – Project Evaluation and Review Technique.	
UNIT IV - GAME THEORY	**(9)**
Definition - Pay-off - Two Person Zero - Sum Games - The Maximin - Minimax Principle - Games without Saddle Points (Mixed Strategies) - 2x2 Games without Saddle Points - Graphical Method for 2xn or mx2 Games.	
UNIT V QUEUEING MODELS	**(9)**
Characteristics of Queuing Models – Poisson Queues – (M/M/1): (FIFO/∞/∞), (M/M/1): (FIFO/N/∞), (M/M/C): (FIFO/∞/∞), (M/M/C) : (FIFO/N/∞) Models.	
TOTAL = 45(L) PERIODS	

TEXT BOOKS:

1. Taha, H.A. "Operations Research: An Introduction", 8th Edition, Pearson Education, 2008.
2. V.Sundaresan, K.S.Ganapathy Subramanian, K.Ganesan, "Resource Management Techniques", A.R.Publication, 2002.

REFERENCES:

1. A .M. Natarajan, P. Balasubramani, A.Tamilarasi, “Operations Research” , Pearson Education, Asia, 2005.
2. Prem Kumar Gupta , D.S. Hira “Operations Research”, S. Chand & Company Ltd., New Delhi, Third Edition, 2003.
3. Manmohan .,Kandi swarp.,Gupta., “Operations Research”,Sultan Chand & Sons(first edition),New delhi

17MYZ03 STATICS FOR ENGINEERS *(Common to All Branches)*					
		L	**T**	**P**	**C**
		3	**0**	**0**	**3**
PREREQUISITE : NIL		**QUESTION PAPER TYPE: 4**			
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives		**Course Outcomes**		**Related Program outcomes**	
1.0	To Aware knowledge of parallel forces		Knowledge about different types of forces and their resultant	**a,b,c,d,f,i,k**	
2.0	To know the concept of equilibrium of forces.		To bring the polygon of forces to be in equilibrium	**a,b,c,d,f,i,k**	
3.0	To acquire the knowledge of moments and couples.		Moments and couples of parallel forces.	**a,b,c,d,f,i,k**	
4.0	To know resultant of co-planar forces acting on a rigid body.		To know about co-planar forces	**a,b,c,d,f,i,k**	
5.0	To learn the necessary and sufficient conditions of equilibrium		Necessary and sufficient conditions to bring the equilibrium of forces	**a,b,c,d,f,i,k**	

UNIT I	**(9)**
Forces acting at a point – Parallelogram law – triangle law.	
UNIT II	**(9)**
(λ, μ) theorem – Polygon of forces – conditions of equilibrium.	
UNIT III	**(9)**
Parallel forces – Moments and couples composition of parallel forces (like and unlike).	
UNIT IV	**(9)**
Moment of a force about a point – Varignons theorem – Co-planar forces acting on a rigid body – Theorem on three co-planar forces in equilibrium.	
UNIT V	**(9)**
Reduction of a system of co-planar forces to a single force and a couple – necessary and sufficient conditions of equilibrium only – Equation to the line of action of the resultant.	
TOTAL (L: 45) = 45 PERIODS	

TEXT BOOK:

1. M.K.Venkataraman, Statics, Agasthiar Publications, Trichy,1999.

REFERENCES:

1. A.V.Dharmapadam, Statics, S.Viswanathan Printers and Publishing Pvt., Ltd, 1993.
2. P.Duraipandian and Laxmi Duraipandian, Mechanics, S.Chand and Company Ltd, Ram Nagar, New Delhi-55, 1985.
3. Dr.P.P.Gupta, Statics, Kedal Nath Ram Nath, Meerut, 1983-84.

17MYZ04 STATISTICS FOR ENGINEERS *(Common to All Branches)*				
	L	**T**	**P**	**C**
	3	**0**	**0**	**3**
PREREQUISITE : NIL	**QUESTION PAPER TYPE :4**			

COURSE OBJECTIVES AND OUTCOMES:

	Course Objectives		Course Outcomes	Related Program outcomes
1.0	To assess the validity of statistical conclusions.	**1.1**	Have a fundamental knowledge of the basic statistics and probability distribution concepts.	**a,b,c,d,i,k**
2.0	Determine the outcomes and probabilities for experiments.	**2.1**	Observe that the empirical distribution of sample means is closer to bell shaped when the size of the sample increases.	**a,b,c,e,f,g,i,k**
3.0	Understand how to develop Null and Alternative Hypotheses	**3.1**	Perform Test of Hypothesis as well as calculate confidence interval for a population parameter for single sample and two sample cases.	**a,b,c,f,g,k**
4.0	Understand Difference between Parametric and Nonparametric Statistical Procedures.	**4.1**	Understand various methods of non parametric tests and concepts related to the testing of hypothesis. Obtain the theoretical and practical knowledge on the analysis of non parametric.	**a,b,c,d,i,j,k**
5.0	To estimate the relationships among variables.	**5.1**	To find the application of correlation, regression and time series analysis in various aspects.	**a,b,c,e,f,k**

UNIT I INTRODUCTION TO STATISTICS	**(9)**
Statistics – Definition, Types. Types of variables – Organizing data – Descriptive Measures: Mean, Median, Mode, Standard Deviation, Mean Deviation.	
UNIT II INTRODUCTION TO PROBABILITY	**(9)**
Basic definitions and rules for probability - conditional probability - independence of events - Probability distributions: Binomial, Poisson and Normal distributions.	
UNIT III TESTING OF HYPOTHESIS	**(9)**
Hypothesis testing: one sample and two sample tests for means and proportions of large samples(z-test), one sample and two sample tests for means of small samples (t-test), F-test for two sample standard deviations. ANOVA one way and two ways.	
UNIT IV NON-PARAMETRIC METHODS	**(9)**
Chi-square test for single sample standard deviation. Chi-square tests for independence of attributes and goodness of fit. Rank sum test. Kolmogorov – Smirnov – test for goodness of fit, comparing two populations. Mann – Whitney U test and Kruskal Wallis test.	
UNIT V CORRELATION, REGRESSION AND TIME SERIES ANALYSIS	**(9)**
Correlation analysis, estimation of regression line. Time series analysis: variations in time series, trend analysis, Cyclical variations, seasonal variations and irregular variations (Self-study).	
TOTAL :(L: 45) = 45 PERIODS	

TEXT BOOKS:

1. Richard I. Levin, David S. Rubin, Statistics for Management, 7th Ed, 2011.
2. Aczel A.D. and Sounderpandian J., Complete Business Statistics 6th edition, Tata McGraw – Hill, Publishing company Ltd, New Delhi, 2012.
3.

REFERENCES:

1. Srivatsava TN and Shailaja rego, Statistics for Management Tata McGraw Hill, 2008.
2. Ken Black, Business Statistics, 6th Ed., Wiley India Edition, 2009.
3. Anderson D.R. Sweeney D.J. and Williams T.A., Statistics for business and economics, 9th edition, Thomson (South- Western) Asia, Singapore, 2012.
4. N.D. Vohra, Business Statistics, Tata McGraw Hill, 2012.

17PYZ01- NANOMATERIALS *(Common to All Branches)*					
		L	**T**	**P**	**C**
		3	**0**	**0**	**3**
PREREQUISITE : NIL		**QUESTION PATTERN: TYPE - 3**			
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives		**Course Outcomes**		**Related Program Outcomes**	
1.0	To provide basic knowledge about nanomaterials	**1.1**	Acquire knowledge of basics of nanomaterials	**a,b**	
2.0	To provide the distinguished properties of nanomaterials from others	**2.1**	Understand the peculiar properties of nanomaterials	**a,b**	
3.0	To give the detailed knowledge of preparation of various nanomaterials	**3.1**	Know the various microscopy techniques involved in analysis of nanomaterials	**a,b,e**	
4.0	To understand the properties of nanomaterials and the mechanismsused in characterization	**4.1**	Understand the synthesis of different types of nanomaterials	**a,b,e**	
5.0	To provide in-depth knowledge pplications of nanomaterials in engineering and biology.	**5.1**	Appreciate the application of nanomaterials in engineering and biology	**a,b,e**	

UNIT I - FUNDAMENTAL PRINCIPLES OF NANOMATERIALS	**(9)**
Size & scale, units, scaling Laws, atoms, molecules & clusters, super molecules, nanoscale phenomena; Tunneling, Chemical Bonds (types and strength); Intermolecular forces, molecular and crystalline structures; Hierarchical structures and functionality; Surfaces and interfaces, bulk to surface transition, self-assembly and surface reconstruction.	
UNIT II – PROPERTIES OF NANO MATERIALS	**(9)**
Size dependence of properties, phenomena and properties at nanoscale; Mechanical/frictional, optical, electrical transport; Magnetic properties.	
UNIT III – SYNTHESIS OF NANOMATERIALS	**(9)**
Fabrication techniques: Self-assembly, self-replication, sol-gels; Langmuir-Blodgett thin films, nanolithograph, bio-inspired syntheses, microfluidic processes; Chemical vapor deposition; Semiconductors, cadmium sulfide, silicon, fullerenes carbon nanotubes; Nano-composites, nanoporous materials, biological materials.	
UNIT IV –NANOMATERIAL CHARACTERIZATION	**(9)**
Electronmicroscopy, scanningprobemicroscopies, nearfieldmicroscopy, micro-andnearfieldRaman spectroscopy, surface-enhancedRaman, spectroscopy, X-rayphotoelectronspectroscopy.	
UNIT V –APPLICATIONS OF NANOMATERIALS	**(9)**
Nanoelectronics, Nano sensors, environmental, biological, energy storage and fuel cells.	
TOTAL = 45 PERIODS	

TEXT BOOKS:

1. EdelsteinA.A.andCammarata,R.C.,"Nanomaterials-Synthesis,PropertiesandApplications",Instituteof Physics Publishing, 1998.
2. NalwaH.S.,"HandbookofNanostructuredMaterialsandNanotechnology",Vols.1-5,AcademicPress2000.

.**Reference Book:**

1. Benedek et al G., "Nanostructured Carbon for Advanced Applications", Kluwer Academic Publishers 2001

17PYZ02 NUCLEAR PHYSICS AND REACTORS *(Common to All Branches)*				
	L	**T**	**P**	**C**
	3	**0**	**0**	**3**
PREREQUISITE : NIL	**QUESTION PATTERN: TYPE - 3**			

COURSE OBJECTIVES AND OUTCOMES:

	Course Objectives		Course Outcomes	Related Program Outcomes
1.0	To provide knowledge of building block of nature – Nuclei –and its interaction with light	**1.1**	Acquire knowledge regarding fundamentals of nuclear reactions	**a,b**
2.0	To provide knowledge about the various reactors and power generation	**2.1**	Understand the interaction of light with matter	**a,b**
3.0	To empower knowledge in core science of reactor designing.	**3.1**	Acquire the knowledge about power generation form nuclear reactions	**a,b,d**
4.0	To provide the understanding of different types of reactors	**4.1**	Understand the mechanisms involved in reactor designing	**a,b,d**
5.0	To provide understanding of effective methods to utilize the nuclear energy	**5.1**	Enhance knowledge of thermal energy generation and reactor safety	**a,b,e**

UNIT I - STRUCTURE OF NUCLEI AND REACTIONS	**(9)**
Fundamental particles, structure of nuclei; Binding Energy – nuclear stability – radioactive decay-nuclear reactions	
UNIT II – INTERACTION OF RADIATION WITH MATTER	**(9)**
Neutron interactions- energy loss in scattering collisions. Nuclear fission reaction- gamma ray interaction with matter- charged particles.	
UNIT III – NUCLEAR REACTOR AND NUCLEAR POWER	**(9)**
Fission chain reaction – reactor fuels. Nuclear power resources- power plants –nuclear reactors	
UNIT IV–NUCLEAR REACTOR THEROY	**(9)**
One group reactor equation –slab reactor –thermal reactor –reflected reactor	
UNIT V –HEAT REMOVAL FROM NUCLEAR REACTORS	**(9)**
Heat generations in reactors – heat flow in reactors, heat transfer mechanism. Radiation shielding: Gamma ray shielding, nuclear reactor shielding.	
TOTAL = 45 PERIODS	

TEXT BOOKS:

1. Leroy Murray Raymond, :Nuclear Reactor Physics", Prentice Hall

REFERENCES:

1. R. Lamarsh John, J. Baratta Anthony, "Introduction to Nuclear Engineering".

17PYZ03- SPACE SCIENCE AND TECHNOLOGY *(Common to All Branches)*					
			L	**T**	**P**	**C**
			3	**0**	**0**	**3**
PREREQUISITE : NIL		**QUESTION PATTERN: TYPE - 3**			
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives		**Course Outcomes**		**Related Program Outcomes**	
1.0	To provide basics of space technology	**1.1**	Acquire knowledge about classical theory of satellite orbits	**a,b**	
2.0	To provide the understanding of transportation and satellite communication	**2.1**	Understand the rocket transportation to space	**a,b**	
3.0	To impart the understanding of satellite based communication systems.	**3.1**	Acquire the applications of satellite communication and navigation	**a,b**	
4.0	To give the knowledge of advanced applications in engineering and astronomy.	**4.1**	Appreciate the applications of space technology changed human life	**a,b,e ,l**	
5.0	To provide knowledge of application of space technology and manned missions	**5.1**	Understand the importance of manned mission	**a,b,e ,l**	

UNIT I - EARTH AND ORBITING SATELLITES	**(9)**
Basic principles -Keplerian orbits and Kepler equations. orbital elements, from velocity and position information. Perturbation theory and applications, Data receiving and handling	
UNIT II – ROCKETS AND ROCKET PROPULSION	**(9)**
Rockets and rocket propulsion, liquid fuels, solid fuels, Electromagnetic propulsion, Ion propulsion, Important satellite launching stations – Facilities at ISRO, NASA and ESRO Russian and Chinese facilities.	
UNIT III – SATELLITE COMMUNICATION AND GPS	**(9)**
Earth to satellite communication, Laser communication, Satellite to satellite communication Global navigation satellite systems, Application of GPS systems.	
UNIT IV – APPLICATIONS OF SPACE TECHNOLOGY	**(9)**
Physics of the earth's space, Solar observations in infrared, visible and X-rays, Communication satellite and applications, Earth resource monitoring, Remote sensing and others, Hubble space telescope. Military, applications, Weather satellite and applications.	
UNIT V – MANNED FLIGHTS	**(9)**
Manned flights to moon, Manned orbiting space crafts, NASA Space shuttles, Immunology and infection in space, The ISS and application, Russian space crafts, Skylab.	
	TOTAL = 45 PERIODS

TEXT BOOKS:

1. Space Science and Technology by Hans Mark, John Wiley and Sons.
2. The Cambridge encyclopedia of Space, missions, applications and exploration by Verger et at, Cambridge University Press 2003

REFERENCE BOOK :

1. Space environment and it's interaction with spacecraft by C. Uberoi and S.C. Chakravorty, IISc — ISRO Educational Program
2. Introduction to GPS the global positioning system by El-Rabbany, Ahmed, London: Artech house

17CYZ01 CHEMISTRY FOR EVERY DAY LIFE *(Common to All Branches)*				
L	**T**	**P**	**C**
3	**0**	**0**	**3**
PREREQUISITE : NIL	**QUESTION PATTERN: TYPE - 3**		

COURSE OBJECTIVES AND OUTCOMES:

Course Objectives		Course Outcomes		Related Program Outcomes
1.0	Imparting knowledge on basic concepts of food additives.	**1.1**	Identify the role and importance of chemistry in daily life.	**a,b,d**
2.0	To know about the importance of oils and fats.	**2.1**	Understand the feasibility of synthesis of detergent.	**a,b,f**
3.0	To understand the impacts of using cosmetics and perfumes.	**3.1**	Use the modern cosmetics and perfumes and their industrial applications.	**a,b,e**
4.0	Basic information and applications of Polymers in daily life.	**4.1**	Acquire the knowledge management of plastics.	**a,b,e**
5.0	To understand the usage of fertilizers in the soil.	**5.1**	Outline the applications of fertilizers in soil	**a,b,h**

UNIT I - FOOD ADDITIVES	**(9)**
Introduction – role and importance of chemistry in day to day life - Food additives - Fruits - vegetables - milk and egg - constituents and benefits - chemistry of soft drinks – soda and beverages - adulterants - simple tests for the identification of adulterants in food stuffs.	
UNIT II – OILS AND FATS	**(9)**
Classification of oils - fat splitting - distillation of completely miscible and non miscible oils - saponification value - iodine number - acid value - Soap and Synthetic Detergent - preparation of soap and detergent - different types of soap.	
UNIT III – COSMESTICS AND PERFUMES	**(9)**
A general study including preparation and uses - Hair dye - hairspray - Shampoo - Sun-tan lotions - face powder - lipsticks - talcum powder – nail enamel - creams (cold, vanishing and shaving creams) - antiperspirants and artificial flavours.	
UNIT IV – POLYMERS IN EVERY DAY LIFE	**(9)**
Types and classification of polymers - Typical examples of polymers used as commodity plastics – textiles - electronic and automobile components - medical and aerospace materials - Problems of plastic waste management.	
UNIT V – COMPOSITION OF SOIL	**(9)**
Inorganic and organic components in soil - micro and macro nutrients - Fertilizers - Classification of Fertilizers - Straight Fertilizers - Compound/Complex Fertilizers - Manufacture and general properties of Fertilizer products - Urea and DAP.	
TOTAL = 45 PERIODS	

TEXT BOOKS:

1. H.E. Cox and Pearson. Analysis of Foods – H.E. Cox; 13. Chemical Analysis of Foods.
2. Brady, N.C and Weil, R.R 2002. The Nature and properties of Soils (13th Ed.). Pearson Education.

.

REFERENCES:

1. J. R. Fried, Polymer Science and Technology (Prentice Hall).
2. N. Shakuntala Many and S. Swamy "Foods – Facts and Principles"., 4th ed. New Age Internatl (1998).
3. Karunakaran et al., "Engineering Chemistry", Sonaversity, Sona College of Technology, Salem, 2014.

17CYZ02 E - WASTE MANAGEMENT *(Common to All Branches)*					
			L	**T**	**P**	**C**
			3	**0**	**0**	**3**
PREREQUISITE : NIL		**QUESTION PATTERN: TYPE - 3**				

COURSE OBJECTIVES AND OUTCOMES:

Course Objectives		**Course Outcomes**		**Related Program Outcomes**
1.0	To understand the basic concepts of e-waste and solid waste.	**1.1**	Identify the role and impacts of e-waste.	**a,b,e**
2.0	To understand the principles of handling of e- waste.	**2.1**	Understand the feasibility of handling e-waste	**a,b,h**
3.0	To know about the importance of disposal of solid waste.	**3.1**	Use the modern technique for the disposal of waste.	**a,b,d**
4.0	To understand the impacts of medical waste.	**4.1**	Acquire the knowledge of industrial importance of management of biomedical waste.	**a,b,e**
5.0	To understand the management of solid waste.	**5.1**	Outline the treatment of solid waste.	**a,b,d**

UNIT I - INTRODUCTION OF E - WASTE	**(9)**
E- Waste – Definition – characteristics - sources of e-waste – constitutes of e-waste – hazardous substances in e-waste – chlorinated compounds – heavy metals and other metals – radioactive substances – protection of public health and the environment - Effects of e-waste on environment and human health	
UNIT II – E - WASTE MANAGEMENT	**(9)**
Introduction – Need for e-waste management– e-waste handling rules - Management of e-waste – Inventory management – production process modification – volume reduction –recovery and reuse .	
UNIT III – DISPOSAL METHODS OF E - WASTE	**(9)**
Disposal treatment of e-waste - incineration - acid baths – landfills - Recycling of e-waste – collection – recycling – disposal of hazardous waste – Global scenario of e-waste	
UNIT IV – CHARACTERIZATION OF MEDICAL WASTE	**(9)**
Bio-medical wastes (Management and Handling) Rules(1998) - Amendments and guidelines - segregation- packaging- storage - transport of infectious waste - Techniques of Bio-medical waste management - Health and safety rules.	
UNIT V – SOLID WASTE AND ITS TREATMENT	**(9)**
Types of solid wastes: municipal solid waste - industrial wastes - hazardous wastes - Solid waste treatments - Landfills - Biological process – Composting - production of biofertilizers and energy. Thermal process – Incineration. Waste management through Reduce, Recycle and Reuse. Kitchen waste management.	
TOTAL = 45 PERIODS	

TEXT BOOKS:

1. H.E. Cox and Pearson. Analysis of Foods – H.E. Cox; 13. Chemical Analysis of Foods.
2. Johri R., "E-waste: implications, regulations, and management in India and current global best practices", TERI Press, New Delhi

.**REFERENCES :**

1. J. R. Fried , Polymer Science and Technology (Prentice Hall).
2. N. Shakuntala Many and S. Swamy "Foods – Facts and Principles"., 4th ed. New Age Internatl (1998).
3. Karunakaran et al., "Engineering Chemistry", Sona university, Sona College of Technology, Salem, 2014.
4. Peavy H.S., Rowe D.R., Tchobanoglous G., "Environmental Engineering", Tata McGraw Hill Publishing Company Ltd., New Delhi.
3. Tchobanoglous G., Theisen H., Viquel S.A., "Integrated Solid Waste Management: Engineering, Principles and Management issues", Tata McGraw Hill Publishing Company Ltd., New Delhi.
4. CPHEEO Manual on Municipal Solid Waste Management.

17CYZ03 INDUSTRIAL CHEMISTRY *(Common to All Branches)*				
	L	T	P	C
	3	0	0	3

PREREQUISITE : NIL	QUESTION PATTERN: TYPE - 3

COURSE OBJECTIVES AND OUTCOMES:

Course Objectives		Course Outcomes		Related Program Outcomes
1.0	Basic information and applications of dyes in textile industry.	**1.1**	Identify the role and importance of dyes in daily life.	**a,b,e**
2.0	To know about the chemistry of building materials.	**2.1**	Use the modern engineering tools for building materials and their industrial applications.	**a,b,h**
3.0	To understand the concepts of design and development of drugs.	**3.1**	Understand the feasibility of uses of drug	**a,b,e**
4.0	Imparting knowledge on basic concepts and applications of petroleum industry	**4.1**	Acquire the knowledge of industrial importance of petrochemicals.	**a,b,d**
5.0	To understand the applications of paints and pigments.	**5.1**	Outline the principles and applications of Paints and distempers	**a,b,e**

UNIT I - TEXTILE INDUSTRY	**(9)**
General introduction for textile dyes – Edible dyes - Fabric brighteners - Classification of textile dyes – Edible dyes - Fabric brighteners with special reference. Industrial applications of methyl orange - malachite green – indigo - alizarin.	
UNIT II – CHEMISTRY OF BUILDING MATERIALS	**(9)**
Lime – classification – properties of lime. Cement – classification – Portland cement and its chemical composition – analysis of cement. Concretes – weathering of concrete - cement and its prevention – special cements - gypsum – plaster of Paris. Glass - types – manufacturing, properties and uses.	
UNIT III – DRUGS AND PHARMACEUTICALS	**(9)**
Drug discovery - design and development - Applications of analgesics agents - Antipyretic agents - Anti- inflammatory agents (Aspirin) - Antibiotics - (Chloramphenicol) - Antibacterial and Antifungal agents - (Sulphonamides) - HIVAIDS related drugs (AZT- Zidovudine).	
UNIT IV – PETROLEUM AND PETROCHEMICAL INDUSTRY	**(9)**
Chemical composition of crude petroleum – refining of petroleum - types - applications of petroleum products- Fractional distillation of petroleum (principle and process) - cracking (thermal and catalytic cracking). Petrochemicals – applications of Vinyl acetate and butadiene.	
UNIT V – PAINTS AND PIGMENTS	**(9)**
Introduction to paints and pigments - classification of pigments – applications of white pigments-blue pigments- Paints and distempers - requirements of a good paint – emulsion - luminescent paints - fire retardant paints – varnishes - solvents and thinners.	
	TOTAL = 45 PERIODS

TEXT BOOKS:

1. S. S. Dara: A Text book of Engineering chemistry, S. Chand and company Ltd. New Delhi.
2. A. K. De, Environmental chemistry: New Age International Pvt Ltd, New Delhi.

.**REFERENCES:**

1. E. Stocchi Industrial chemistry, volume I, Ellis Harwood Ltd. UK.
2. Industrial chemistry by Helen Njen Njenga, University of Nairobi and William Wanasolo.
3. An Introduction to Industrial Chemistry, 3rd ed. Alan Heaton, Ed. Blackie Academic & Professional, Chapman & Hall: New York, 1996. 413 pp. ISBN 0 7514 0272 9.
4. R. Gopalan, D. Venkappayya, S. Nagarajan: Engineering Chemistry, Vikas Publications, New Delhi.
5. B. K. Sharma: Engineering Chemistry, Goel Publishing House, Meerut

17EYZ01 – COMMUNICATIVE HINDI *(Common to All Branches)*				
	L	**T**	**P**	**C**
	2	**0**	**2**	**3**

PREREQUISITE : Nil	**QUESTION PATTERN : TYPE - 1**

COURSE OBJECTIVES AND OUTCOMES:

Course Objectives		**Course Outcomes**		**Related Program outcomes**
1.0	To impart knowledge in Hindi.	**1.1**	On completion of this course the students will be able to Achieve proficiency in Hindi.	**i,j,l**
2.0	To introduce the language skills, vocabulary, grammar to the students	**2.1**	Develop their different skills in Hindi language.	**i,j,l**
3.0	To introduce themselves and initiate a conversation.	**3.1**	Develop their skills in communicative Hindi.	**i,j,l**
4.0	To develop the ability among the students to read and understand small texts written in Hindi.	**4.1**	Express their ideas in Hindi language	**i,j,l**
5.0	To enable the students to elementary conversational skills.	**5.1**	Get Job in National companies and survive at any place of India	**i,j,l**

UNIT I - Basic Sounds & Letters/Letter-sounds	**(9)**
Letters – Consonants & Vowels - Joining Words – Numbers - Gender.	
UNIT II - Grammar	**(9)**
Basic Grammatical Structure- Usage of Noun, Pronoun and Verb – Basic sentence Pattern – Tenses – Phrases.	
UNIT III – Composition	**(9)**
Short story collections - Lesson – Letter Writing- Filling the blanks.	
UNIT IV - Reading	**(9)**
Poem – Short-story – Newspaper - Letters.	
UNIT V - Speaking	**(9)**
Short Conversation – Self-introduction – Asking questions.	
TOTAL (L: 45) = 45 PERIODS	

TEXT BOOKS/ REFERENCES

1. Prathmic Hindi Books

17EYZ02 – FUNDAMENTALS OF GERMAN *(Common to All Branches)*					
		L	**T**	**P**	**C**
		2	**0**	**2**	**3**
PREREQUISITE : NIL		**QUESTION PATTERN : TYPE - 1**			
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives		**Course Outcomes**		**Related Program outcomes**	
1.0	To introduce the language, phonetics and the special characters in German languag.	**1.1**	Achieve proficiency in German.	**i,j,l**	
2.0	To introduce German culture and traditions to the students.	**2.1**	Identify German culture and traditions.	**i,j,l**	
3.0	To introduce themselves and initiate a conversation..	**3.1**	Read and Understand the text written in German.	**i,j,l**	
4.0	To develop the ability among the students to read and understand small texts written in German.	**4.1**	Express their ideas in German.	**i,j,l**	
5.0	To enable the students to elementary conversational skills.	**5.1**	Get good job in foreign countries	**i,j,l**	

UNIT - I	**(9)**
Wichtige Sprachhandlungen: Phonetics – Sich begrüßen - Sich und andere vorstellen formell / informell - Zahlen von 1 bis 1 Milliarde - verstehen & sprechen. **Grammatik:** regelmäßige Verben im Präsens - "sein" und haben im Präsens - Personalpronomen im Nominativ.	
UNIT-II	**(9)**
Wichtige Sprachhandlungen: Telefon Nummern verstehen und sprechen Uhrzeiten verstehen und sagen Verneinung "nicht und kein" (formell und informell). **Grammatik :** Wortstellung – Aussagesatz – W-Frage und Satzfrage (Ja/Nein Frage) Nomen buchstabieren und notieren bestimmter und unbestimmter Artikel und Negativartikel im Nom. & Akkusativ.	
UNIT - III	**(9)**
Wichtige Sprachhandlungen: Tageszeiten verstehen und über Termine sprechen-Verabredungen verstehen - Aufgaben im Haushalt verstehen. **Grammatik:** Personalpronomen im Akkusativ und Dativ - W-Fragen "wie, wer, wohin, wo, was usw.- Genitiv bei Personennamen - Modalverben im Präsens "können, müssen, möchten".	
UNIT - IV	**(9)**
Wichtige Sprachhandlungen: Sich austauschen, was man kann, muss – Bezeichnungen Lebensmittel – Mengenangaben verstehen – Preise verstehen und Einkaufzettel schreiben **Grammatik**: Wortstellung in Sätzen mit Modalverben – Konnektor "und" – "noch"- kein ----------mehr – "wie viel, wie viele, wie alt, wie lange" –Possessivartikel im Nominativ.	
UNIT - V	**(9)**
Wichtige Sprachhandlungen: Freizeitanzeigen verstehen – Hobbys und Sportarten Anzeigen für Freizeitpartner schreiben bzw. darauf antworten – Vorlieben und Abneigungen ausdrucken **Grammatik**: Verben mit Vokalwechsel im Präsens – Modalverben im Präsens " dürfen, wollen und mögen- "haben und sein" im Präteritum – regelmäßige Verben im Perfekt – Konnektoren "denn, oder, aber.	
TOTAL (L: 45) = 45 PERIODS	

TEXT/ REFERENCES BOOKS

1. Studio d A1. Deutsch als Fremdsprache with CD.(Kursbuch und Sprach training).

17EYZ03 – BASICS OF JAPANESE

(Common to All Branches)

L	T	P	C
2	0	2	3

PREREQUISITE : NIL

QUESTION PATTERN : TYPE - 1

COURSE OBJECTIVES AND OUTCOMES:

	Course Objectives		Course Outcomes	Related Program outcomes
1.0	To help students learn the Japanese scripts.	**1.1**	. Understand the Japanese scripts.	**i,j,l**
2.0	To make the students acquire basic conversational skills.	**2.1**	Understand the culture and traditions.	**i,j,l**
3.0	To enable students to know about Japan and Japanese culture.	**3.1**	Read and Understand the text written in Japanes.	**i,j,l**
4.0	To create an advantageous situation for the students to have better opportunity for employability by companies who have association with Japan.	**4.1**	Express their ideas in Japanese in Written and Spoken form.	**i,j,l**
5.0	To enable the students to elementary conversational skills.	**5.1**	Get good job in foreign countries	**i,j,l**

UNIT- I **(9)**

1. Introduction to Japanese language. Hiragana Chart 1 - vowels and consonants and related vocabulary.
2. Self introduction
3. Grammar – usage of particles wa, no, mo and ka and exercises
4. Numbers (1-100)
5. Kanji – introduction and basic kanjis – naka, ue, shita, kawa and yama
6. Greetings, seasons, days of the week and months of the year
7. Conversation – audio
8. Japan – Land and culture. Conversation – audio

UNIT- II **(9)**

1. Hiragana Chart 1 (contd.) and related vocabulary
2. Grammar – usage of kore, sore, are, kono, sono, ano, arimasu and imasu. Particles – ni (location) and ga. Donata and dare.
3. Numbers (up to 99,999)
4. Kanji – numbers (1-10, 100, 1000, 10,000 and yen)
5. Family relationships and colours.
6. Conversation – audio
7. Festivals of Japan. Conversation – audio

UNIT- III **(9)**

Hiragana Charts 2&3, double consonants, vowel elongation and related vocabulary
Lesson 3
Grammar - particles ni (time), kara, made and ne. Koko, soko, asoko and doko.

Time expressions (today, tomorrow, yesterday, day before, day after) Kanji – person, man, woman, child, tree and book Directions – north, south, east and west.	
UNIT- IV	**(9)**
Grammar - directions, -kochira, sochira, achira and dochira. Associated-vocabulary (mae, ushiro, ue, shita, tonari, soba, etc.)-Conversation – audio -Japanese art and culture like ikebana, origami, etc.	
UNIT- V	**(9)**
Kanji – hidari, migi, kuchi Japanese sports and martial arts Adjectives (present/past – affirmative and negative) Conversation – audio	
TOTAL (L: 45) = 45 PERIODS	
TEXT/ REFERENCES BOOKS 1. First lessons in Japanese, ALC Japan	

17EYZ04- EMPLOYABILITY ENHANCEMENT AND ANALYTICAL SKILLS *(Common to All Branches)*					
			L	**T**	**P**	**C**
			0	**0**	**6**	**3**
PREREQUISITE: NIL					
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives		**Course Outcomes**		**Related Program outcomes**	
1.0	To enable learners to achieve linguistic competence in oral and written discourse efficiently.	**1.1**	Write in an effective manner that demonstrates an understanding of the basic concepts of grammar.	**f,i,j,l**	
2.0	To acquire necessary listening and speaking skills in order to comprehend discourse and to express effectively and exchange ideas.	**2.1**	Listen and comprehend lectures and communicate effectively in their area of Specialization and speak fluently.	**f,i,j,l**	
3.0	To learn various active reading and writing strategies in order to comprehend, analyze and communicate ideas.	**3.1**	Read different genres of texts, infer implied meanings and write effectively for a variety of professional and social settings.	**f,i,j,l**	
4.0	To develop students to workout solution for problems that involves mathematical aptitude	**4.1**	Solve aptitude problems with ease	**f,i,j,l**	
5.0	To develop students to workout solutions for problems that involves general reasoning	**5.1**	Solve reasoning problems with ease	**f,i,j,l**	

UNIT I - GRAMMAR	**(18)**
Parts of Speech – Synonyms & Antonyms - Primary Auxiliary Verbs – Modal Auxiliary Verbs - Tenses – Articles– Preposition – Conjunction–Common Errors - Subject Verb Agreement – Error Spotting – One word Substitution – Jumbled Sentences – Confusable word – Idioms and Phrases – Degrees of Comparison – Sentence Completion	
UNIT II – LISTENING AND SPEAKING	**(18)**
LISTENING - Listening Strategies - Listening for Specific Information- Listening to TED & INK Talks - Listening for Signpost Language - Listening to Telephonic Conversations SPEAKING - Group/Pair Presentations - Visume - Interview Skills - GD	
UNIT III – READING AND WRITING	**(18)**
READING - Strategies for Effective Reading - Reading for Specific Information - Speed Reading Techniques - Critical Reading WRITING - Job Application Letter with Resume - E-mail Writing - Paragraph Writing	
UNIT IV – APTITUDE	**(18)**
Number System- Ratio & Proportion-Percentages-Averages-Profit & Loss	
UNIT V – REASONING	**(18)**
Figure Series-Blood Relation-Analogy-Coding and Decoding-Odd one out	
TOTAL (L: 0; P: 90) = 90 PERIODS	

Text / Reference Books:

1. Tickoo, M. L., A. E. & Subramaniam, P. R.,"Intermediate Grammar Usage & Composition" Orient Blackswan, 1976
2. Davis, Jason and Liss, Rhonda, "Effective Academic Writing (Level 3)" Oxford University Press, 2006
3. Koneru, Aruna, "English Language Skills" Tata McGraw-Hill Education, 2011
4. Raman, Meenakshi and Sharma, Sangeeta, "Technical Communication English Skills for Engineers" Oxford University Press, 2008
5. Khattar, Dinesh, "Quantitative Aptitude", 3rd ed. New Delhi: Pearson, 2014.
6. Aggarwal R.S., "A Modern Approach to Verbal & Non Verbal Reasoning", Revised Edition, New Delhi: S.Chand Publishers, 2017

17EYX01 - EFFECTIVE COMMUNICATION *(Common to All Branches)*				
	L	**T**	**P**	**C**
	3	**0**	**0**	**3**
PREREQUISITE : NIL	**QUESTION PATTERN : TYPE -**			

COURSE OBJECTIVES AND OUTCOMES:

Course Objectives		Course Outcomes		Related Program outcomes
1.0	To recognize and understand the meaning of grammatical structures in spoken and written form.	1.1	Interpret the factors that influence the use of grammar and vocabulary in speaking and writing.	**i,j,l**
2.0	To acquire adequate listening skills in order to comprehend and communicate effectively.	2.1	Restate content of a listening passage orally and in writing.	**i,j,k,l**
3.0	To develop speaking skills using communication strategies to participate in group and individual forum.	3.1	Speak comprehensibly and express opinions and support them with examples and facts.	**d,i,j,k,l**
4.0	To equip with necessary reading skills to make inferences and predictions and to develop speed reading.	4.1	Summarize and Paraphrase information in a text.	**i,j,k,l**
5.0	To develop writing skills that will enable to produce scholarly texts.	5.1	Produce coherent and unified paragraphs with adequate support and detail.	**d,i,j,k,l**

UNIT I - GRAMMAR	**(9)**
Noun- Pronoun – Auxiliary Verbs (Primary & Modal) – Adverbs –Adjectives – Articles – Preposition – Conjunction – Tense Forms of Verbs – Subject Verb Agreement.	
UNIT II – LISTENING	**(9)**
Form Completion – Multiple Choice – Short Answer – Sentence Completion – Matching – Plan/Map/Diagram Labelling – Note Completion.	
UNIT III -SPEAKING	**(9)**
Getting to Know – Short Conversation – Describing Personalities – Just a minute Talk – Visual interpretation – Group Discussion.	
UNIT IV – READING	**(9)**
Reading Comprehension – Reading Articles – Story Reading – Reading Newspapers- Reading Autobiography – Reading Interviews	
UNIT V – WRITING	**(9)**
Picture Description – Developing Hints – Story Writing – General Passage Writing – Resume Writing- Spotting Errors and rewriting the Passages.	
TOTAL (L :45) = 45 PERIODS	

TEXT BOOK:

1. Murphy, Raymond, “Essential Grammar in Use”, Cambridge University Press, UK, 2007
2. Whitby, Norman, “Business Benchmark Pre- Intermediate to Intermediate Preliminary” , 2nd ed., Cambridge University Press, 2013.
3. Jakeman, Vanessa. “Insight into IELTS extra with Answers”, Cambridge University Press, 2003.

17GYZ01 – BIOLOGY FOR ENGINEERS

(Common to All Branches)

L	T	P	C
3	0	0	3

PREREQUISITE : NIL | **QUESTION PATTERN : TYPE – 1**

Course Objectives and Outcomes

	Course Objectives		Course Outcomes	Related Program outcomes
1.0	To familiarize the students with the origin of universe and Cell biology	**1.1**	The students can be able understand the fundamentals of living things, their classification, cell structure and biochemical constituents.	**a,b,c,k**
2.0	To impart an understanding about the Genetics and Bimolecular concepts	**2.1**	The students can acquire knowledge on inheritance and analysis of chemical decomposition.	**a,b,d,g**
3.0	To provide the concepts of enzymes and transfer of Genetic information.	**3.1**	The students can able to identify the DNA, RNA and flow of genetic information.	**a,e,h,k**
4.0	To understand about the metabolic Reactions	**4.1**	The students can able to describe the biochemical reactions taking place in a Cell.	**a,c,f,g**
5.0	To provide knowledge about microorganisms and their impact on society	**5.1**	The students can able to illustrate the impact of microorganisms over industrial applications.	**a,c,f,g,i**

UNIT I: EVOLUTION OF UNIVERSE AND CELL BIOLOGY **(9)**

Origin of Universe, Life, Life forms, Evidences, Theories, Hardy-Weinberg Principle, Methods of Science-Living Organisms: Cells and Cell theory Cell Structure and Function, Genetic information, protein synthesis, and protein structure, Cell metabolism-Homoeostasis- Cell growth, reproduction, and differentiation.

UNIT II : GENETICS AND BIOMOLECULAR ANALYSIS **(9)**

Mendal‟s Law, Gene Interaction, Multiple Alleles, Chromosomal Theory of Inheritance, Linkage, Recombination, Chromosome Mapping, Genetic Disorders, Chemical Composition of living forms and its analysis, Carbohydrates, Amino Acids, Nucleic Acids, Lipids, Nature of Bonding and Qualitative Tests.

UNIT III: ENZYMES AND TRANSFER OF GENTIC INFORMATION **(9)**

Enzymes: Classifications, Nomenclature, Co-factors and its importance. Information Transfer: Nucleic Acid, Replication of DNA, Types of DNA, Transcription, Genetic Code, Translation, Regulation of Gene Expression

UNIT IV : METABOLISMS **(9)**

Metabolisms: Concepts, Basics of Living, Concept of Non-Equilibrium and steady state, Photosynthesis, Photorespiration, C4 pathways, CAM cycle, Respiration, Glycolysis, Frementation, Aerobic respiration, Respiration process: summary, balance sheet, Role of respiration in biosynthesis, Amphibolic Pathway, Respiratory Quotient

UNIT V : MICROBILOGY AND ITS INDUSTRIAL APPLICATIONS **(9)**

Microorganisms, Growth kinetics, Culture media, Sterilization, Microscopy, Applications of Microbiology, Immunology and Immunity, Cancer Biology, Stem Cells.

TOTAL (L: 45) = 45 PERIODS

TEXT BOOKS:

1. Wiley, "Biology for Engineers", New Delhi, 2018.
2. S. ThyagaRajan, N. Selvamurugan, M. P. Rajesh, R. A. Nazeer, Richard W. Thilagaraj, S. Barathi, and M. K. Jaganathan, "Biology for Engineers," Tata McGraw-Hill, New Delhi, 2012.

REFERENCES:

1. Jeremy M. Berg, John L. Tymoczko and Lubert Stryer, "Biochemistry," 6th ed., W.H. Freeman and Co. Ltd., 2006.
2. Robert Weaver, "Molecular Biology," 5th ed , MCGraw-Hill, , 2012.
3. Jon Cooper, "Biosensors A Practical Approach" Bellwether Books, 2004.
4. Martin Alexander, "Biodegradation and Bioremediation," Academic Press, 1994.
5. Kenneth Murphy, "Janeway's Immunobiology," 8th ed., Garland Science, 2011.
6. Eric R. Kandel, James H. Schwartz, Thomas M. Jessell, "Principles of Neural Science", 5th ed., McGraw-Hill, , 2012.

17BMZ01 - HEALTHCARE TECHNOLOGY				
L	T	P	C
3	0	0	3

PREREQUISITE : NIL	QUESTION PATTERN : TYPE - 1

COURSE OBJECTIVES AND OUTCOMES:

Course Objectives		Course Outcomes		Related Program outcomes
1.0	To learn about the nutritional value of the food intake and it's benefit to health.	1.1	The students can able to explain about the nutritional value of the food intake.	a,e,f,g
2.0	To understand basic knowledge about the working of bio-potential recorders.	2.1	The students can able to analyze the working of various bio-potential recorders.	d,e,g,h
3.0	To understand basic knowledge about the cardiovascular systems.	3.1	The students can able to describe the principles of cardiovascular systems.	a,d,g,h
4.0	To understand basic knowledge about the Nervous systems and respiratory systems.	4.1	The students can able to describe the basics of Nervous systems and respiratory systems.	a,c,e,f
5.0	To provide knowledge about assistive and therapeutic equipments.	5.1	The students can able to explain about various assistive and therapeutic equipments	a,c,e,g,h

UNIT I - INTRODUCTION TO HEALTH	(9)
Introduction to Health Science. Carbohydrates, Vitamins, Minerals, Proteins. Blood and Body Fluids. Maintaining Acid Base Balance. Major Food Adulterants-Effect in Health. –Significance. Adverse Effects of Tobacco and Alcohol Consumption.	
UNIT II - BIOELECTRODES AND BIOCHEMICAL SENSORS	**(9)**
Physiological systems of body, Components of Medical Instrumentation System, Origin of Bio-potential: Action Potential, Nernst Equation, Goldman equation, Propagation of Action Potential, Bio Electrodes: Surface Electrodes, Micro Electrodes, Needle Electrodes, Biochemical Electrodes: pH, pO 2 , pCO2 .	
UNIT III - CARDIOVASCULAR SYSTEM AND MEASUREMENTS	**(9)**
Electrical conduction system of the heart, Cardiac cycle, Blood pressure measuring techniques, Blood flow measuring techniques, Real time ECG system, Cardiac output Measuring techniques, Characteristics and origin of heart sound, Phonocardiography	
UNIT IV - NERVOUS SYSTEM AND RESPIRATORY SYSTEM MEASUREMENTS	**(9)**
Physiology of nervous system, EEG wave types, 10-20 lead system, EEG recorder, Electromyography, Mechanism of respiration, Pulmonary Function Measurement, Spirometry, Respiratory Gas Analyzer	
UNIT V - LIFE ASSISTING AND THERAPEUTIC EQUIPMENTS	**(9)**
Pacemakers, Defibrillators, Ventilators, Nerve and muscle stimulators, Diathermy, Heart Lung machine Audio meters, Dialysers, ICCU patient monitoring system	
TOTAL = 45 PERIODS	

TEXT BOOK:

1. Khandpur R.S, "Handbook of Biomedical Instrumentation", 3rd edition,Tata McGraw-Hill, New Delhi, 2014.
2. Carolyn D. Berdanier, Johanna T. Dwyer, David Heber. "Handbook of Nutrition and Food" Third Edition, CRC Press, July 2013.

REFERENCES :

1. John G. Webster, “Medical Instrumentation Application and Design”, John Wiley and sons,New York, 1998.
2. Leslie Cromwell, Fred J.Weibell, Erich A. Pfeiffer, “Bio-Medical Instrumentation and Measurements”, II edition, Pearson Education, 2005.

17BMZ02 - TELEMEDICINE			
L	T	P	C
3	0	0	3

PREREQUISITE : NIL | **QUESTION PATTERN : TYPE - 1**

COURSE OBJECTIVES AND OUTCOMES:

	Course Objectives		Course Outcomes	Related Program outcomes
1.0	To learn the Fundamentals of telemedicine	1.1	The students can able to explain history and evolution of telemedicine.	a,e,f,g
2.0	To learn principle of Multimedia and their techniques used in Telemedicine technology.	2.1	The students can gain knowledge about Different Multimedia techniques used in Telemedicine technology.	d,e,g,h
3.0	To know about different types of data security standards followed in telemedicine	3.1	The students can gain knowledge about types of data security standards followed in telemedicine.	a,d,g,h
4.0	To understand the principle of Mobile telemedicine.	4.1	The students can able to explain about acquisition and retrieval of data behind the Mobile telemedicine.	a,c,e,f
5.0	To know about some telemedical applications.	5.1	The students can gain knowledge about applications of telemedical technology.	a,c,e,g,h

UNIT I - TELEMEDICINE AND HEALTH **(9)**

History and Evolution of telemedicine, Functional diagram of telemedicine system, Telemedicine, Telehealth, Tele care, Organs of telemedicine, Global and Indian scenario, Ethical and legal aspects of Telemedicine - Confidentiality, Social and legal issues, Safety and regulatory issues, Advances in Telemedicine.

UNIT II - TELEMEDICAL TECHNOLOGY **(9)**

Principles of Multimedia - Text, Audio, Video, data, Data communications and networks, PSTN,POTS, ANT, ISDN, Internet, Air/ wireless communications: GSM satellite, and Micro wave, Modulation techniques, Types of Antenna, Integration and operational issues, Communication infrastructure for telemedicine – LAN and WAN technology. Satellite communication. Mobile hand held devices and mobile communication. Internet technology and telemedicine using world wide web (www). Video and audio conferencing. Clinical data – local and centralized.

UNIT III - BIOMEDICAL DIAGNOSTIC IMAGING EQUIPMENTS **(9)**

Data Security and Standards: Encryption, Cryptography, Mechanisms of encryption, phases of Encryption. Protocols: TCP/IP, ISO-OSI, Standards to followed DICOM, HL7, H. 320 series (Video phone based ISBN) T. 120, H.324 (Video phone based PSTN), Video Conferencing, Real-time Telemedicine integrating doctors / Hospitals, Clinical laboratory data, Radiological data, and other clinically significant biomedical data, Administration of centralized medical data, security and confidentially of medical records and access control, Cyber laws related to telemedicine.

UNIT IV - MOBILE TELEMEDICINE **(9)**

Tele radiology: Definition, Basic parts of tele radiology system: Image Acquisition system Display system, Tele pathology, multimedia databases, color images of sufficient resolution, Dynamic range, spatial resolution, compression methods, Interactive control of color, Medical information storage and management for telemedicine-patient information medical history, test reports, medical images diagnosis and treatment. Hospital information system - Doctors, paramedics, facilities available. Pharmaceutical information system.

UNIT V - TELEMEDICAL APPLICATIONS **(9)**

Telemedicine access to health care services – health education and self care. · Introduction to robotics surgery, telesurgery. Telecardiology, Teleoncology, Telemedicine in neurosciences, Electronic Documentation, e-health services security and interoperability., Telemedicine access to health care services – health education and self care, Business aspects - Project planning and costing, Usage of telemedicine.

TOTAL = 45 PERIODS

TEXT BOOK:

3. Norris, A.C. ―Essentials of Telemedicine and Telecarell, Wiley, 2002.Khandpur R.S, "Handbook of Biomedical Instrumentation", 3rd edition,Tata McGraw-Hill, New Delhi, 2014.
4. Wootton, R., Craig, J., Patterson, V. (Eds.), ―Introduction to Telemedicine. Royal Society of Medicinell Press Ltd, Taylor & Francis, 2006.

REFERENCES :

3. O'Carroll, P.W., Yasnoff, W.A., Ward, E., Ripp, L.H., Martin, E.L. (Eds), ―Public Health Informatics and Information Systemsll, Springer, 2003.
4. Ferrer-Roca, O., Sosa - Iudicissa, M. (Eds.), Handbook of Telemedicine. IOS Press (Studies in Health Technology and Informatics, Volume 54, 2002.
5. Simpson, W. Video over IP. A practical guide to technology and applications. Focal Press Elsevier, 2006.
6. Bemmel, J.H. van, Musen, M.A. (Eds.) Handbook of Medical Informatics. Heidelberg, Germany: Springer, 1997

17BMZ03 – EPIDEMIOLOGY AND PANDEMIC MANAGEMENT					
		L	T	P	C
		3	0	0	3
PREREQUISITE: NIL					
Course Objectives and Outcomes					
Course Objectives		**Course Outcomes**			**Related Program outcomes**
1.0	To familiarize the students with the fundamentals of Epidemiology	**1.1**	The Students can be able describe the characteristic of epidemiologic approach.		a,b,c,k
2.0	To impart knowledge about the population dynamics on community health	**2.1**	The students can acquire knowledge on Clinical Applications, Measures and Mortality		a,d,g,d
3.0	To provide the concept of Descriptive Epidemiology	**3.1**	The students can able to characterize the difference between Descriptive and analytic Epidemiology.		a,b,d,l
4.0	To learn about common disease phenomenon in communities	**4.1**	The students can able to understand the key strategies in prevention and control of Pandemics.		a,b,d,g,l
5.0	To provide basic understanding on Pandemic	**5.1**	The students can able to follow the diagnostic and therapeutic strategies during pandemics.		a,b,f,g,h,l

UNIT I: THE EVOLUTION OF EPIDEMIOLOGY	**(9)**
Epidemiology definition, Foundations of Epidemiology, Historical Antecedents of Epidemiology, Recent practical applications of Epidemiology – Applications for the assessment of the Health Status of populations, Delivery of Health services, Applications relevant to Disease Etiology.	
UNIT II : MEASURES OF MORBIDITY AND MORTALITY IN EPIDEMIOLOGY	**(9)**
Definition of Count , Ratio, Proportion and rate, Risk Versus Rate, Interrelationship between Prevalence and Incidence, Crude rates, Specific rate and Proportion Mortality ratio, Adjusted rates.	
UNIT III: DESCRIPTIVE EPIDEMIOLOGY AND SOURCES OF DATA IN EPIDEMIOLOGY	**(9)**
Descriptive Epidemiology – Characteristics of Persons, Place and Time, Sources of Data – Criteria for Quality and Utility of Epidemiologic data, Confidentiality, Sharing of data and record linkage, Statistics derived from the vital Registration System, Reportable Disease statistics, Screening Surveys, Morbidity Surveys , a case study on Descriptive Epidemiology.	
UNIT IV : PANDEMIC AND INFECTION CONTROL PRACTICES	**(9)**
Pandemic Definition, Pandemic and Epidemic difference, History of Pandemics and Notable Outbreaks, Identifying reasons/events for Pandemic in the past, Role of WHO and ICMR in Pandemic Surveillance, Infection Control Practices.	
UNIT V : PANDEMIC DIAGNOSTICS AND THERAPEUTIC METHODS	**(9)**
Pandemic Risk, Impact and Mitigation, Diagnostic tools – Specimen collection, Handling and Storage, Therapeutic Methods- Importance of routine vaccination, Intensive care management during Pandemics, Mental Health issues during Pandemics, Case studies on different Pandemics.	
TOTAL = 45 PERIODS	
TEXT BOOKS: 1. Robert H.Friis, Thomas A.Sellers, Epidemiology for Public Health Practice, Jones & Bartlett Learning, Fifth Edition 2014 2. https://pubmed.ncbi.nlm.nih.gov/30212163	

REFERENCES:

1. Ann Aschengrau, George R.Seage III, Essentials of Epidemiology in Public Health, Jones & Bartlett Learning, Third Edition 2013.
2. Dasgupta, S., & Crunkhorn, R. (2020). A History of pandemics over the ages and the human cost. The Physician, 6(2). https://doi.org/10.38192/1.6.2.1.
3. Kelly-Cirino CD, Nkengasong J, Kettler H, et al**.** Importance of diagnostics in epidemic and pandemic preparedness**.** BMJ Global Health 2019;4: e001179.
4. Park's Textbook of Preventive and social medicine - Banarasidas Bhanot, 25th Edition, 2019.

17BMZ04 – MEDICAL ETHICS				
	L	T	P	C
	3	0	0	3
PREREQUISITE : NIL	**QUESTION PATTERN : TYPE - 1**			

COURSE OBJECTIVES AND OUTCOMES:

Course Objectives		Course Outcomes		Related Program outcomes
1.0	To Achieve familiarity with some basic ethical framework & understand how these ethical frame works can help us to think through contemporary questions in medical ethics.	**1.1**	The Students can able to Identify the fundamental responsibilities of a clinical engineer.	**a,e,f,g**
2.0	To know about the legal and ethical principles and application of these in medical field.	**2.1**	The Students can able to explain the ethical values and moral principles.	**d,e,g,h**
3.0	To gain knowledge about hospital accreditaion	**3.1**	The Students can be able to identify various standards in their work environment	**a,d,g,h**
4.0	To Gain knowledge about the medical standards that to be followed in hospitals.	**4.1**	The Students can be able to classify various ethics in Hospital safety	**a,c,e,f**
5.0	To know about the medical safety measurements	**5.1**	The Students can be able to apply various safety measurements and precautions in handling medical equipments.	**a,c,e,g,h**

UNIT I - INTRODUCTION TO MEDICAL ETHICS	**(9)**
Definition of Medical ethics, Scope of ethics in medicine, American medical Association code of ethics, CMA code of ethics- Fundamental Responsibilities, The Doctor and the Patient, The Doctor and the Profession, Professional Independence, The Doctor and Society.	
UNIT II - ETHICAL THEORIES & MORAL PRINCIPLES	**(9)**
Theories-Deontology& Utilitarianism, Casuist theory, Virtue theory, The Right Theory. Principles - Non-Maleficence, Beneficence, Autonomy, Veracity, Justice. Autonomy & Confidentiality issues in medical practice, Ethical Issues in biomedical research, Bioethical issues in Human Genetics & Reproductive Medicine.	
UNIT III - HOSPITAL ACCREDITATION	**(9)**
Accreditation- JCI Accreditation & its Policies. JCA accreditation, FDA regulations, Patient centered standards, Healthcare Organization management standards, NFPA standards, IRPC standards.	
UNIT IV - ETHICS IN HOSPITAL SAFETY	**(9)**
Life Safety Standards- Protecting Occupants, Protecting the Hospital From Fire, Smoke, and Heat, Protecting Individuals From Fire and Smoke, Providing and Maintaining Fire Alarm Systems, Systems for Extinguishing Fires Environment of Care Standards-Minimizing EC Risks, Smoking Prohibitions, Managing Hazardous Material and Waste, Maintaining Fire Safety Equipment, Features, Testing, Maintaining, and Inspecting Medical Equipment.	
UNIT V - MEDICAL APPLICATION SAFETY	**(9)**
Environmental safety, Interference with the environment, Ecological safety. Electrical Safety, Limitation of Voltages, Macroshock and Microshock- Earth and Protection, Leakage currents, Magnetic fields and compatibility. Medical Standards and Regulations.	
TOTAL = 45 PERIODS	

TEXT BOOKS:

1. Biomedical Ethics: A Canadian Focus. Johnna Fisher (ed.), Oxford University Press Canada, Second edition, 2013
2. Robert M Veatch, “Basics of Bio Ethics”, Second Edition. Prentice- Hall, Inc. 2003
3. Domiel A Vallero, “Biomedical Ethics for Engineers”, Elsevier Pub.1st edition, 2007

REFERENCES :

1. Norbert Leitgeb “Safety of Electro-medical Devices Law – Risks – Opportunities” Springer Verlog, 2010.
2. Richard Fries, “Reliable Design of Medical Devices – Second Edition”, CRC Press, Taylor & Francis Group, 2006.

17CEZ05 WASTE MANAGEMENT (Common to All branches except CIVIL Branch)							
				L	T	P	C
				3	0	0	3
PREREQUISITE : NIL			**QUESTION PATTERN : TYPE-3**				
COURSE OBJECTIVES AND OUTCOMES							
Course Objectives		**Course Outcomes** The students will be able to				**Related Program outcomes**	
1.0	To understand the basic principles of waste and resource management	**1.1**	Understand the different types of waste management challenges			**a,g**	
2.0	To study the storage, collection, recycling and reuse of waste	**2.1**	Realize the collection of waste and recycling			**d,g**	
3.0	To know the concept of waste processing technologies	**3.1**	Understand the fundamental principles of existing and emerging technologies for the treatment of waste			**d,g**	
4.0	To understand the waste disposal techniques	**4.1**	Appreciate the role of decision-making tools in the critical assessment of major waste issues			**e,g**	
5.0	To know the concept of waste management rules and policies	**5.1**	Understand the economy and financial aspects of waste management			**f,k**	

UNIT I - INTRODUCTION AND TYPES OF SOURCES	**(9)**
Problems and need of solid and hazardous waste management - Waste management planning - Toxicology and risk assessment - Legislations on management and handling of different types of wastes - Agriculture Waste - Chemical Waste - E-Waste - Bio Medical Waste - Variety of Industrial wastes - Nuclear and Radio Active Wastes	
UNIT II - WASTE GENERATION RATES	**(9)**
Composition - Hazardous Characteristics - TCLP tests - waste sampling- reduction of wastes at source - Recycling and reuse - Handling and segregation of wastes at source - storage and collection of municipal solid wastes - Analysis of Collection systems - Need for transfer and transport - Transfer stations -labeling and handling of hazardous wastes	
UNIT III - WASTE PROCESSING	**(9)**
Processing technologies - biological and chemical conversion technologies - Composting - thermal conversion technologies - energy recovery - incineration - solidification and stabilization of hazardous wastes - treatment of biomedical wastes.	
UNIT IV - DISPOSALOF WASTE	**(9)**
Site selection - design and operation of sanitary landfills - secure landfills and landfill bioreactors - leachate and landfill gas management - landfill closure and environmental monitoring - landfill remediation - disposal of E-waste	
UNIT V - ECONOMY AND FINANCIAL ASPECTS	**(9)**
Elements of integrated waste management - Economy and financial aspects of waste management - Municipal Budget - Waste Management Rules and Policies	
TOTAL (L: 45) = 45 PERIODS	

TEXT BOOKS:

1. Michael D. LaGrega, Philip L Buckingham, Jeffrey C. E vans and Environmental Resources Management, Hazardous waste Management, Mc-Graw Hill International edition, New York, 2001.
2. Vesilind P.A., Worrell W and Reinhart, Solid waste Engineering, Thomson Learning Inc., Singapore, 2002.

REFERENCES:

1. Hilary Theisen and Samuel A, Vigil, George Tchobanoglous, Integrated Solid Waste Management, McGraw- Hill, New York, 1993
2. CPHEEO, Manual on Municipal Solid waste management, Central Public Health and Environmental Engineering Organization, Government of India, New Delhi, 2000
3. Charles A. Wentz, Hazardous Waste Management, Second Edition, Pub: McGraw Hill International Edition, New York, 1995

17MEZ06 – SMART SENSOR SYSTEMS				
L	T	P	C	
3	0	0	3	

PREREQUISITE : NIL	QUESTION PATTERN : TYPE – 3

COURSE OBJECTIVES AND OUTCOMES:

Course Objectives		Course Outcomes		Related Program outcomes
1.0	Acquire knowledge on various sensor systems	**1.1**	Explain the principals involved in conversion from one energy domain to electrical signal	**a,b,h,j,k,l**
2.0	Understand different conversion phenomena involved in sensors	2.1	Understand the basic principles of various sensors	**a,b,f,g,h,l**
3.0	Describe construction and function of different sensors	3.1	Utilize the suitable material properties to design a sensor	**a,f,g,h,j,k,l**
4.0	Gain knowledge on the material requirement for different sensing mechanisms	4.1	Implement the biosensors systems with different sensors for real time applications	**a,b,d,e,k,l**
5.0	Understand the basic requirements of basic microsystem technologies and MEMS fabrication processes	5.1	Ability to identify various fabrication techniques and characterization of MEMS.	**a,b,c,d,e,f**

UNIT I : SENSORS **(9)**

Definitions of Sensors and Smart Sensors - Integrated Smart Sensors and Applications - Sensors classifications - Detection means used in sensors and conversion phenomena - Measurements - Units of Measurements - Sensor Characteristics: Transfer Function, Calibration, Static Characteristics - Accuracy, Calibration Error, Hysteresis, Nonlinearity, Resolution, Dynamic Characteristics - Physical principles of sensing: electric charges - Electric fields, and potentials - Capacitance, dielectric constant - Magnetic Principle - Induction Principle - Electrical Resistance - Piezoelectric effect

UNIT II : ACOUSTIC SENSORS **(9)**

Acoustic waves: Fundamentals - Piezoelectric materials for acoustic sensors - Solid state SAW sensors - Applications of SAW sensors - Acoustic Sensors: Resistive Microphones, Condenser Microphones - Piezoelectric Microphones - Magnetic sensors - Magnetic Effects and materials - Integrated Hall sensors - Magnetotransistors - Force, Strain, and Tactile Sensors - Strain Gauges, Piezoelectric Force Sensors - Tactile Sensors - Piezoresistive sensors(Tactile) - Piezoelectric Sensors(Tactile) - Capacitive Touch Sensors (Tactile) - Piezoresistive Pressure Sensors - Capacitive Pressure Sensor

UNIT III : LIGHT DETECTORS AND TEMPERATURE SENSORS **(9)**

Light Detectors - Photodiodes, Photoresistors - HgCdTe infrared sensors - Visible-light color sensors, high-energy photodiodes - Radiation Detectors: Scintillating Detectors - Semiconductor Radiation Detectors - Thermal Sensors: Functional Principle - Heat Transfer Mechanisms - Temperature Sensors - Thermoresistive Sensors - Thermoelectric Contact Sensors, Thermocouple Assemblies - Semiconductor Pn -Junction thermal Sensors, Optical Temperature Sensors - Chemical sensors:

UNIT IV : BIOSENSORS **(9)**

Biosensors definition – Bioreceptors - Construction of different biosensors - Immobilization of biological elements - Transduction principles used in biosensing - Lab-on-chip/Microsystems/MicroTAS - Microfluidics - Microfluidic unit operations - Microsystem Integration - System organization and functions - Interface electronics - Fundamentals of interfacing - Universal transducer interface - Three-Signal Technique - Introduction to microsystems engineering – Microtechnologies - Systems development: methods and tools - Constructive and connective techniques

UNIT V : MINIATURIZED MECHANICAL AND ELECTROMECHANICAL ELEMENTS	(9)
Fundamentals of MEMS/ fabrication: Frequently Used Microfabrication Processes - Lithography, thin film deposition - Oxidation, Etching (wet and dry) - MEMS fabrication technologies: Bulk micromachining and structures - Surface micromachining and structures - High-aspect-ratio technology microfluidics microsystem components - LIGA(Lithographie, Galvanoformung, Abformung) - Microsystem components - Application of different Microsystem components - Nanotechnology - Product prospects - Application trends - Ultra-thin films - Making of ultrathin films - Creation of lateral nanostructures, Creation of clusters and nanocrystalline materials - Principles of self-organization - Future trends	
TOTAL (L: 45) = 45 PERIODS	

TEXT BOOKS:

1. Jacob Fraden, "Handbook of Modern Sensors: Physics, Designs, and Applications", Springer; 4th ed. 2010
2. S. M. Sze, "Semiconductor Sensors", Wiley-Interscience,1994"

REFERENCES :

1. Gerard Meijer, "Smart sensor systems", Wiley, 2008
2. W Gopel, J. Hesse, J. N. Zemel, "Sensors A Comprehensive Survey" Vol. 8, Wiley-VCH, 1995

17EYZ05 - WORKPLACE COMMUNICATION					
		L	T	P	C
		3	0	0	3
PREREQUISITE : NIL					
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives		**Course Outcomes**		**Related Program outcomes**	
1.0	To enable the learners to communicate effectively and appropriately in real life situations	**1.1**	The students will be able to communicate effectively and appropriately in real life situations	**f,g,h,i,j,k,l**	
2.0	To use English efficiently for study purpose across the curriculum	**2.1**	The students will be proficient in using English for academic purposes across the curriculum.	**f,g,h,i,j,k,l**	
3.0	To enhance and integrate the use of language skills	**3.1**	The students will be able to enhance competence in the four modes of literacy: listening , speaking , reading and writing	**f,g,h,i,j,k,l**	
4.0	To acquire linguistic competence required in diverse professions	**4.1**	The students will be able to express thoughts and ideas in all forms of communication	**f,g,h,i,j,k,l**	
5.0	To develop the language skills as a means of communication	**5.1**	The students will be able to employ communicative skills in variety of situations	**f,g,h,i,j,k,l**	

UNIT I LANGUAGE ESSENTIALS	**(9)**
Grammar – Vocabulary – Synonyms – Antonyms – Tenses - **Listening** - Listening versus Hearing – Barriers to Listening – **Speaking** – Elements of Verbal Communication – Describing Personalities – **Reading** – Reading Newspaper Articles - Reading Autobiographies - **Writing** – Picture Description - Developing Hints	
UNIT II COMMUNICATION BOOSTERS	**(9)**
Grammar – Subject Verb Agreement – Error Spotting –**Listening –** Types of Listening - IELTS Listening (Listening and Gap Filling) – **Speaking –** Strategies to foster Effective Communication **-** Elements of Non-Verbal Communication – Group Discussion - Do's and Don'ts of GD – **Reading –** Reading Interviews - TOEFL & GRE Reading Comprehension- **Writing –** Drafting a Project Proposal – Passage Writing	
UNIT III TECHNICAL CORRESPONDENCE	**(9)**
Grammar – Conditional Clauses – Voice – idioms and idiomatic expressions– **Listening –** Characteristics of Effective Listening - Listening to TED Talk – **Speaking -** Elements of Non Verbal Communication – Impromptu Speech – **Reading** – Reading Technical Articles – Skimming and Scanning – **Writing –** E mail Writing – TOEFL Writing(Summary Writing)	
UNIT IV RHETORIC ENHANCERS	**(9)**
Grammar – Rearranging Sentences – Reported Speech – Listening – Listening to Autobiographies – Listening to Interviews - Speaking - Role play – Block and Tackle - Reading – Types of Reading– Importance of Reading – Writing – Job Application Letter with Resume – Expansion of Proverbs	

UNIT V LANGUAGE ACUITY	(9)
Grammar – Sentence Completion – Sentence Improvement **– Listening –** Listening and Note Taking – Strategies to Improve Listening – **Speaking** – Technical Presentation – Mock Interview **– Reading** – Different types of Reading Techniques– Cloze Reading – **Writing –** Jumbled Sentences – GRE Analytical Writing	
TOTAL (L :45; P:0) = 45 PERIODS	

REFERENCE BOOKS:

1. Murphy, Raymond, "Essential Grammar in Use", Cambridge University Press, UK, 2007
2. Koneru , Aruna, "English Language Skills for Engineers" Mc Graw Hill, 2020
3. Gupta SC, "General English for all Competitive Examinations" Arihant Publications India Ltd, 2016

17AIZ01-FUNDAMENTALS OF ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING			
L	T	P	C
3	0	0	3

PRE REQUISITE : NIL	QUESTION PATTERN: TYPE - I

COURSE OBJECTIVES AND OUTCOMES:

Course objectives		Course outcomes		Related program outcomes
1.0	To understand the basic concepts of intelligent agents	**1.1**	The students will be able to Understand the foundations of AI and structure of intelligent agents	**a,b,j,k,e**
2.0	To develop general-purpose problem solving agents.	**2.1**	The students will be able to demonstrate the effectiveness of uninformed and informed search methods.	**a,b,j,k**
3.0	To employ ai techniques to solve some of today's real world problems.	**3.1**	The students will be able to apply game playing in problem solving.	**a,b,d,i,j**
4.0	To analyze the agent activities based on knowledge and logical aspects.	**4.1**	The students will be able to make use of propositional logic and first order logic in knowledge-based reasoning.	**a,c,i,j**
5.0	To introduce the most basic concepts, methods, algorithms for planning to achieve the goals.	**5.1**	The students will be able to apply knowledge representation and planning to real world problems.	**a,b,j,k,f,l**

UNIT I - INTELLIGENT AGENT AND UNINFORMED SEARCH	**(9)**
Introduction - Foundations of AI - History of AI - The state of the art - Risks and Benefits of AI - Intelligent Agents - Nature of Environment - Structure of Agent - Problem Solving Agents - Formulating Problems - Uninformed Search - Breadth First Search - Dijkstra's algorithm or uniform-cost search - Depth First Search - Depth Limited Search	
UNIT II -PROBLEM SOLVING WITH SEARCH TECHNIQUES	**(9)**
Informed Search - Greedy Best First - A* algorithm - Adversarial Game and Search - Game theory - Optimal decisions in game - Min Max Search algorithm - Alpha-beta pruning - Constraint Satisfaction Problems (CSP) - Examples - Map Coloring - Job Scheduling - Backtracking Search for CSP	
UNIT III - LEARNING	**(9)**
Machine Learning: Definitions – Classification - Regression - approaches of machine learning models - Types of learning - Probability - Basics - Linear Algebra – Hypothesis space and inductive bias, Evaluation. Training and test sets, cross validation, Concept of over fitting, under fitting, Bias and Variance - Regression: Linear Regression - Logistic Regression	
UNIT IV - SUPERVISED LEARNING	**(9)**
Neural Network: Introduction, Perceptron Networks – Adaline - Back propagation networks - Decision Tree: Entropy – Information gain - Gini Impurity - classification algorithm - Rule based Classification - Naïve Bayesian classification - Support Vector Machines (SVM)	

UNIT V UNSUPERVISED LEARNING	(9)
Unsupervised Learning – Principle Component Analysis - Neural Network: Fixed Weight Competitive Nets - Kohonen Self-Organizing Feature Maps – Clustering: Definition - Types of Clustering – Hierarchical clustering algorithms – k-means algorithm	
TOTAL (L: 45) = 45 PERIODS	

TEXT BOOKS:

1. S. Russell and P. Norvig, "Artificial Intelligence: A Modern Approach", Prentice Hall, Fourth Edition, 2021.
2. S.N.Sivanandam and S.N.Deepa, "Principles of soft computing"-Wiley India.3 rd edition

REFERENCES:

1. "Machine Learning. Tom Mitchell". First Edition, McGraw- Hill, 1997.
2. Bratko, "Prolog: Programming for Artificial Intelligence", Fourth edition, Addison-Wesley Educational Publishers Inc., 2011.
3. C. Muller & Sarah Alpaydin, "Ethem. Introduction to machine learning". MIT press, 2020.

17AIZ02- DATA SCIENCE FUNDAMENTALS				
	L	T	P	C
	3	0	0	3
PRE REQUISITE : NIL	**QUESTION PATTERN: TYPE - I**			

COURSE OBJECTIVES AND OUTCOMES:

Course objectives		Course outcomes		Related program outcomes
1.0	To Familiarize students with the data science process.	**1.1**	The students will be able to gain knowledge on data science process.	**a,b,c,d,e,i,j,k,l**
2.0	To Understand the data manipulation functions in NumPy and Pandas.	**2.1**	The students will be able to perform data manipulation functions using NumPy and Pandas.	**a,b,c,d,e,i,j,k,l**
3.0	To Explore different types of machine learning approaches.	**3.1**	The students will be able to understand different types of machine learning approaches	**a,b,c,d,e,i,j,k,l**
4.0	To Understand and practice visualization techniques using tools.	**4.1**	The students will be able to perform data visualization using tools.	**a,b,c,d,e,i,j,k,l**
5.0	To Learn to handle large volumes of data with case studies.	**5.1**	The students will be able to handle large volumes of data in practical scenarios.	**a,b,c,d,e,i,j,k,l**

UNIT I - INTRODUCTION	**(9)**
Data Science: Benefits and uses – facets of data - Data Science Process: Overview – Defining research goals – Retrieving data – data preparation - Exploratory Data analysis – build the model – presenting findings and building applications - Data Mining - Data Warehousing – Basic statistical descriptions of Data	
UNIT II - DATA MANIPULATION	**(9)**
Python Shell - Jupyter Notebook - IPython Magic Commands - NumPy Arrays-Universal Functions – Aggregations – Computation on Arrays – Fancy Indexing – Sorting arrays – Structured data – Data manipulation with Pandas – Data Indexing and Selection – Handling missing data – Hierarchical indexing – Combining datasets – Aggregation and Grouping – String operations.	
UNIT III - MACHINE LEARNING	**(9)**
The modeling process - Types of machine learning - Supervised learning - Unsupervised learning - Semi-supervised learning- Classification, regression - Clustering – Outliers and Outlier Analysis.	
UNIT IV - DATA VISUALIZATION	**(9)**
Importing Matplotlib – Simple line plots – Simple scatter plots – visualizing errors – density and contour plots – Histograms – legends – colors – subplots – text and annotation – customization – three dimensional plotting - Geographic Data with Basemap - Visualization with Seaborn	

UNIT V – HANDLING LARGE DATA	(9)
Problems - techniques for handling large volumes of data - programming tips for dealing with large data sets- Case studies: Predicting malicious URLs, Building a recommender system - Tools and techniques needed - Research question - Data preparation - Model building – Presentation and automation.	
TOTAL (L: 45) = 45 PERIODS	

TEXT BOOKS:
1.David Cielen, Arno D. B. Meysman, and Mohamed Ali, "Introducing Data Science", Manning Publications, 2016.
2. Jake VanderPlas, "Python Data Science Handbook", O'Reilly, 2016.
REFERENCES:
1. Robert S. Witte and John S. Witte, "Statistics", Eleventh Edition, Wiley Publications, 2017.
2. Allen B. Downey, "Think Stats: Exploratory Data Analysis in Python", Green Tea Press,2014.

17AIZ03-INTRODUCTION TO BUSINESS ANALYTICS				
	L	T	P	C
	3	0	0	3
PRE REQUISITE : NIL	**QUESTION PATTERN: TYPE - I**			

COURSE OBJECTIVES AND OUTCOMES:

Course objectives		Course outcomes		Related program outcomes
1.0	To understand the Analytics Life Cycle.	**1.1**	The students will be able to explain the real world business problems and model with analytical solutions.	**a,b,c,d,e,i,j,k,l**
2.0	To comprehend the process of acquiring Business Intelligence	**2.1**	The students will be able to identify the business processes for extracting Business Intelligence	**a,b,c,d,e,i,j,k,l**
3.0	To understand various types of analytics for Business Forecasting	**3.1**	The students will be able to apply predictive analytics for business fore-casting	**a,b,c,d,e,i,j,k,l**
4.0	To model the supply chain management for Analytics.	**4.1**	The students will be able to apply analytics for supply chain and logistics management	**a,b,c,d,e,i,j,k,l**
5.0	To apply analytics for different functions of a business	**5.1**	The students will be able to use analytics for marketing and sales.	**a,b,c,d,e,i,j,k,l**

UNIT I - INTRODUCTION TO BUSINESS ANALYTICS	**(9)**
Analytics and Data Science – Analytics Life Cycle – Types of Analytics – Business Problem Definition – Data Collection – Data Preparation – Hypothesis Generation – Modeling – Validation and Evaluation – Interpretation – Deployment and Iteration.	
UNIT II - BUSINESS INTELLIGENCE	**(9)**
Data Warehouses and Data Mart - Knowledge Management –Types of Decisions - Decision Making Process - Decision Support Systems – Business Intelligence –OLAP – Analytic functions.	
UNIT III - BUSINESS FORECASTING	**(9)**
Introduction to Business Forecasting and Predictive analytics - Logic and Data Driven Models – Data Mining and Predictive Analysis Modeling –Machine Learning for Predictive analytics.	
UNIT IV - HR & SUPPLY CHAIN ANALYTICS	**(9)**
Applying HR Analytics to make a prediction of the demand for hourly employees for a year-Human Resources – Planning and Recruitment – Training and Development - Supply chain network - Planning Demand, Inventory and Supply – Logistics – Analytics applications in HR & Supply Chain .	

UNIT V – MARKETING & SALES ANALYTICS	(9)
Marketing Strategy, Marketing Mix, Customer Behavior –selling Process – Sales Planning – Analytics applications in Marketing and Sales - predictive analytics for customers' behavior in marketing and sales.	
TOTAL (L: 45) = 45 PERIODS	

TEXT BOOKS:
1. R. Evans James, “Business Analytics”, 2nd Edition, Pearson, 2017
2. R N Prasad, Seema Acharya, “Fundamentals of Business Analytics”, 2nd Edition, Wiley, 2016 Education,2018
REFERENCES:
1. Philip Kotler and Kevin Keller, “Marketing Management”, 15th edition, PHI, 2016
2. VSP RAO, “Human Resource Management”, 3rd Edition, Excel Books, 2010.
3. Mahadevan B, “Operations Management -Theory and Practice”,3rd Edition, Pearson

17AIZ04-AUGMENTED REALITY/VIRTUAL REALITY TECHNOLOGIES					
		L	T	P	C
		3	0	0	3
PRE REQUISITE : NIL		**QUESTION PATTERN: TYPE - I**			
COURSE OBJECTIVES AND OUTCOMES:					
Course objectives		**Course outcomes**		**Related program outcomes**	
1.0	To impart the fundamental aspects and principles of AR/VR technologies.	**1.1**	The students will be able to understand the basic concepts of AR and VR	**a,b,c,d,e,i,j,k, l**	
2.0	To know the internals of the hardware and software components involved in the development of AR/VR enabled applications	**2.1**	The students will be able to understand the tools and technologies related to AR/VR	**a,b,c,d,e,i,j,k, l**	
3.0	To learn about the graphical processing units and their architectures.	**3.1**	The students will be able to know the working principle of AR/VR related Sensor devices	**a,b,c,d,e,i,j,k, l**	
4.0	To gain knowledge about AR/VR application development.	**4.1**	The students will be able to design of various models using modeling techniques	**a,b,c,d,e,i,j,k, l**	
5.0	To know the technologies involved in the development of AR/VR based applications.	**5.1**	The students will be able to Develop AR/VR applications in different domains	**a,b,c,d,e,i,j,k, l**	

UNIT I - INTRODUCTION	**(9)**
Introduction to Virtual Reality and Augmented Reality – Definition – Introduction to Trajectories and Hybrid Space- Three I's of Virtual Reality – Virtual Reality Vs 3D Computer Graphics – Benefits of Virtual Reality – Components of VR System – Introduction to AR-AR Technologies-Input Devices – 3D Position Trackers – Types of Trackers – Navigation and Manipulation Interfaces – Gesture Interfaces – Types of Gesture Input Devices – Output Devices – Graphics Display – Human Visual System – Personal Graphics Displays – Large Volume Displays – Sound Displays – Human Auditory System.	
UNIT II -VR MODELING	**(9)**
Modeling – Geometric Modeling – Virtual Object Shape – Object Visual Appearance – Kinematics Modeling – Transformation Matrices – Object Position – Transformation Invariants –Object Hierarchies – Viewing the 3D World – Physical Modeling – Collision Detection – Surface Deformation – Force Computation – Force Smoothing and Mapping – Behavior Modeling – Model Management.	
UNIT III- VR PROGRAMMING	**(9)**
VR Programming – Toolkits and Scene Graphs – World Toolkit – Java 3D – Comparison of World Toolkit and Java 3D	

UNIT IV - APPLICATIONS	(9)
Human Factors in VR – Methodology and Terminology – VR Health and Safety Issues – VR and Society-Medical Applications of VR – Education, Arts and Entertainment – Military VR Applications – Emerging Applications of VR – VR Applications in Manufacturing – Applications of VR in Robotics – Information Visualization – VR in Business – VR in Entertainment – VR in Education.	
UNIT V - AUGMENTED REALITY	**(9)**
Introduction to Augmented Reality-Computer vision for AR-Interaction-Modeling and Annotation Navigation-Wearable devices.	
TOTAL (L: 45) = 45 PERIODS	

TEXT BOOKS:

1 . Charles Palmer, John Williamson, "Virtual Reality Blueprints: Create compelling VR experiences for mobile", Packt Publisher, 2018

2. Dieter Schmalstieg, Tobias Hollerer, "Augmented Reality: Principles & Practice", Addison Wesley, 2016

REFERENCES:

1 John Vince, "Introduction to Virtual Reality", Springer-Verlag, 2004.

2. William R. Sherman, Alan B. Craig: "Understanding Virtual Reality – Interface, Application, Design", Morgan Kaufmann, 2003

17ITZ06 - DATASTRUCTURES USING C					
		L	T	P	C
		3	0	0	3
PRE REQUISITE : NIL					
COURSE OBJECTIVES AND OUTCOMES:					
Course objectives		**Course outcomes**		**Related program outcomes**	
1.0	To learn on the manipulation of pointers, structure, union and files.	**1.1**	The students will be able to Understand the dynamics of memory by the use of pointers.	**a,c,g**	
2.0	To understand the different methods of organizing large amounts of data.	**2.1**	The students will be able to Exemplify and implement how abstract data types such as stack, queue and linked list can be implemented to manage the memory using static and dynamic allocations.	**a,b,g,l,k**	
3.0	To efficiently abstract data types for linear and non-linear data structures.	**3.1**	The students will be able to Understand and distinguish the conceptual and applicative differences in trees.	**a,b,c,g,i**	
4.0	To efficiently implement solutions for specific problems.	**4.1**	The Students will be able to Design various routing algorithms using appropriate data structures.	**a,b,c,g**	
5.0	To Critically analyse the various algorithms	**5.1**	The students will be able to Understand complex data structures like graph and its traversal	**a,d,k,l**	
UNIT-I: ADVANCED C					**(9)**
Pointer concepts-Pointers & Arrays, Structure concepts - Defining, Declaring, Accessing Member Variables, Structure within Structure - Union - File Management in C- Dynamic Memory Allocation					
UNIT-II: LINEAR DATA STRUCTURES - LIST					**(9)**
Abstract Data Types (ADTs) – List ADT – array-based implementation – linked list implementation – singly linked lists- circularly linked lists- doubly-linked lists – applications of lists – Polynomial Manipulation					
UNIT-III: LINEAR DATA STRUCTURES – STACK, QUEUE					**(9)**
Stack ADT – Evaluating arithmetic expressions- other applications- Queue ADT – circular queue implementation – Double ended Queues – applications of queues					
UNIT-IV: NON LINEAR DATA STRUCTURES - TREE					**(9)**
Definitions - Binary Trees - The Search tree ADT – Binary Search Trees – AVL Tree – Tree Traversals – Priority Queues (Heap) – Model – simple implementations – Binary Heap.					

UNIT V- GRAPHS	(9)
Definitions – Representation of graph – Graph traversal: Depth first search –Breadth first search – Topological Sort - Shortest Path Algorithm: Unweighted Shortest paths – Dijkstra‟s Algorithm- Minimum Spanning Tree: Prim‟s Algorithm – Kruskal‟s Algorithm	
TOTAL (L: 45) = 45 PERIODS	

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TEXT BOOKS:

1. Ashok.N.Kamthane, “Programming in C”, Pearson Education (India), 3 rd Ed., 2015. (Unit I).
2. M. A. Weiss, “Data Structures and Algorithm Analysis in C”, 2nd ed., Pearson education Asia, 2002 (Unit II To Unit IV)

REFERENCES:

1 . F Richard, Gilberg and Behrouz A. Forouzan, “Data Structures – A Pseudo code Approach with C”, Thomson Brooks / COLE, 2001.

. 2. Y. Langsam, M. J. Augenstein and A. M. Tenenbaum, “Data Structures using C”, Pearson Education Asia, 2015.

3. Yashavant Kanetkar, “Let us C”, BPB publications, New Delhi, 18th Ed., 2021

I7ITZ07 PRODUCT LIFECYCLE MANAGEMENT FOR ENGINEERS					
			L	T	P	C
			3	0	0	3
PREREQUISITE : NIL					
COURSE OBJECTIVES AND OUTCOMES:					
Course Objectives		**Course Outcomes At the end of this course, students will be able to**			**Related Program Outcomes**
1.0	To understanding its objectives, phases, activities, and documenting a practical implementation plan.	**1.1**	Apply PLM concepts to product life cycle phases and implementing plans.		**a**
2.0	To understanding PLM systems across different organizational verticals, supporting product development.	**2.1**	Implement PLM systems in different organization verticals		**b,c**
3.0	To help students apply integration methods for PLM systems using file transfer, database connectivity, ERP.	**3.1**	Integrate PLM system in different ways for various applications		**d**
4.0	To develop students ability to apply PLM strategies to service businesses.	**4.1**	Apply modularization techniques and productize services using PLM principles to meet service business challenges.		**e**
5.0	To understanding the Industry 4.0 technologies like additive manufacturing processes.	**5.1**	Implement Industry 4.0 technologies to enhance PLM performance and efficiency.		**f, h, l**

UNIT I – INTRODUCTION TO PRODUCT LIFECYCLE MANAGEMENT	**(9)**
Fundamentals of PLM- High level Objective of PLM - Activities of PLM - Joined-up and Holistic Approach - Generic Product Lifecycle Phases, PLM Grid, Components of Grid-The PLM Initiative-Documenting the PLM Implementation Plan	
UNIT II - PRODUCT LIFECYCLE MANAGEMENT SYSTEMS	**(9)**
Functionality of the systems, Use of product lifecycle management systems in different organization verticals, Product development and engineering, Production, After sales, Sales and marketing, Sub-contracting.	
UNIT III - INTEGRATION OF THE PLM SYSTEM FOR VARIOUS APPLICATIONS	**(9)**
Different ways to integrate PLM systems, Transfer file, Database integration, System roles, ERP, CAD, Configurators, EAI, Benefits of the PLM system in product lifecycle management	

UNIT IV – SERVICE INDUSTRY AND PLM	(9)
Introduction to service, Further productization, Making a service, PLM in service business - PLM challenges in service business, Services modularized, Making items out of product functions, IT specifically variable product	
UNIT V - INDUSTRY 4.0 TECHNOLOGIES FOR ENHANCING PLM	**(9)**
Technologies of Industry 4.0, Additive Manufacturing or 3D Printing, Additive Manufacturing Greets PLM, BoT, RPA Elevates PLM, Cobots, Simulation, Cloud Computing.	

TEXT BOOKS:

1. John Stark, "Product Lifecycle Management: 21st Century Paradigm for Product Realisation", Springer Publisher, 2011 (2nd Edition).
2. Antti Saaksvuori and Anselmi Immonen, "Product Lifecycle Management", Springer Publisher, 2008 (3rd Edition)

REFERENCES:

1. Elangovan, Uthayan. Product Lifecycle Management (PLM): A Digital Journey Using Industrial Internet of Things (IIoT). United States, CRC Press, 2020.
2. Ivica Crnkovic, Ulf Asklund and Annita Persson Dahlqvist, "Implementing and Integrating Product Data Management and Software Configuration Management", Artech House Publishers, 2003.