GALGOTIAS UNIVERSITY

(Established under Galgotias University Uttar Pradesh Act No. 14 of 2011)

School of Computing Science and Engineering

Program: B. Tech Computer Science and Engineering

Scheme: 2017 – 2021

Curriculum

Semester 1									
Sl. No	**Course Code**	**Name of the Course**					**Assessment Pattern**		
			L	**T**	**P**	**C**	**IA**	**MTE**	**ETE**
1	BCSE1001	Introduction to Computer Science & Engineering	0	0	2	1	20	30	50
2	BCSE1002	Computer Programming and Problem Solving	0	0	4	2	20	30	50
3	PSSO-1001	Psychology and Sociology	2	0	0	2	20	30	50
4	ENVS-1001	Environmental Science	3	0	0	3	20	30	50
5	MATH-1001	Calculus for Engineers	3	0	0	3	20	30	50
6	MATH-1002	Exploration with CAS-I	0	0	2	1	20	30	50
7	PHYS-1001	Engineering Physics	3	0	0	3	20	30	50
8	PHYS-1002	Engineering Physics lab	0	0	2	1	50	-	50
9	CHEM-1001	Engineering Chemistry	3	0	0	3	20	30	50
10	CHEM-1003	Engineering Chemistry lab	0	0	2	1	50	-	50
11	BTME-1002	Product Design using Graphics	0	0	4	2	20	30	50
12	BEEE-1003	Basic Electrical and Electronics Engineering lab	3	0	0	3	50	-	50
13	BTME-1003	Product Manufacturing	0	0	2	1	50	30	50
14	UHVE-1001	Universal Human Values and Ethics	0	0	2	1	20	30	50
15	SLBT-1001	Basic English	0	0	4	2	20	30	50
16		Foreign Language 1 (from Basket)	0	0	4	2	20	30	50
		Total	**17**	**0**	**28**	**30**			
Semester II									
Sl No	**Course Code**	**Name of the Course**					**Assessment Pattern**		
			L	**T**	**P**	**C**	**IA**	**MTE**	**ETE**
1	BCSE1003	Application Oriented Programming using Python	0	0	4	2	50	-	50
2	PSSO-1001	Psychology and Sociology	2	0	0	2	20	30	50
3	ENVS-1001	Environmental Science	3	0	0	3	20	30	50
4	MATH1003	Matrices and Differential Equations.	3	0	0	3	20	30	50
5	MATH-1004	Exploration with CAS-II	0	0	2	1	20	30	50
6	PHYS1004	Physics of Semiconductor Devices for CSE, ECE, EEE	3	0	0	3	20	30	50
7	PHYS 1005	Advance Physics Lab	0	0	2	1	50	-	50
8	CHEM-1001	Engineering Chemistry	3	0	0	3	20	30	50
9	CHEM-1003	Engineering Chemistry LAB	0	0	2	1	50		50
10	BTME-1002	Product Design using Graphics	0	0	4	2	20	30	50
11	BEEE-1002	Basic Electrical and Electronics Engineering	3	0	0	3	20	30	50
12	BEEE-1003	Basic Electrical and Electronics Engineering Lab	0	0	2	1	50	-	50
13	BTME-1003	Product Manufacturing	0	0	2	1	20	30	50
14	UHVE-1001	Universal Human Values and Ethics	0	0	4	2	20	30	50
15	SLBT1002	English Proficiency and Aptitude Building - 1	0	0	4	2	20	30	50
16		Foreign Language 2 (from Basket)	0	0	2	1	20	30	50
		Total	**17**	**0**	**28**	**16**			
Semester III									
Sl No	**Course Code**	**Name of the Course**					**Assessment Pattern**		
			L	**T**	**P**	**C**	**IA**	**MTE**	**ETE**

1	SLBT2001	English Proficiency and Aptitude Building - 2	0	0	4	2	20	30	50
2	BCSE2001	Digital Design and Computer Architecture	3	0	0	3	20	30	50
3	MATH2005	Maths III (from basket) / Discrete Structure / Functions of complex variables and Transforms / Numerical Methods / Discrete Mathematical structures	3	0	0	3	20	30	50
4	BTME2001	Engineering Mechanics	3	0	0	3	20	30	50
5	BCSE2003	Data Structures & Algorithms	3	0	0	3	20	30	50
6	BCSE2004	Object Oriented Programming	3	0	0	3	20	30	50
7	BCSE2005	Theory of Automata & Formal Languages	3	0	0	3	20	30	50
8	BCSE2006	Digital Design and Computer Architecture lab	0	0	2	1	50	-	50
9	BCSE2007	Data Structures & Algorithms lab	0	0	2	1	50	-	50
10	BCSE2008	Object Oriented Programming lab	0	0	2	1	50	-	50
		Total	**18**	**0**	**10**	**23**			
Semester IV									
Sl No	**Course Code**	**Name of the Course**					**Assessment Pattern**		
			L	**T**	**P**	**C**	**IA**	**MTE**	**ETE**
1	SLBT2002	English Proficiency and Aptitude Building – 3	0	0	4	2	20	30	50
2	MATH200X	Maths IV (from basket) / Probability and Statistics / Probability and Stochastic processes / Mathematical foundation for cyber and network security / Advance Statistical Analysis	2	0	2	3	20	30	50
3	BCSE2010	Operating Systems	3	0	0	3	20	30	50
4	BCSE2011	Data Base Management System	3	0	0	3	20	30	50
5	BCSE2012	Data communication & Networking	3	0	0	3	20	30	50
6		Program Elective-1	3	0	0	3	20	30	50
7	BTME2002	Engineering Thermodynamics	3	0	0	3	20	30	50
8	BCSE2013	Operating Systems lab	0	0	2	1	50	-	50
9	BCSE2014	Data Base Management System lab	0	0	2	1	50	-	50
10	BCSE2015	Data communication & Networking lab	0	0	2	1	50	-	50
		Total	**17**	**0**	**12**	**22**			
Semester V									
Sl No	**Course Code**	**Name of the Course**					**Assessment Pattern**		
			L	**T**	**P**	**C**	**IA**	**MTE**	**ETE**
1	SLBT3001	English Proficiency and Aptitude Building - 4	0	0	4	2	20	30	50
2	BCSE3001	Design & Analysis of Algorithms	3	0	0	3	20	30	50
3	BCSE3002	Compiler Design	3	0	0	3	20	30	50
4	BCSE3003	Software Engineering & Testing Methodologies	3	0	0	3	20	30	50
5		Program Elective-2	3	0	0	3	20	30	50
6	BCSE3004	Microprocessor & Interfacing	3	0	0	3	20	30	50
7	BCSE3006	Design & Analysis of Algorithms Lab	0	0	2	1	50	-	50
8	BCSE3007	Compiler Design Lab	0	0	2	1	50	-	50

9	BCSE3008	Software Engineering & Testing Methodologies Lab	0	0	2	1	50	-	50
10	BCSE3009	Microprocessor & Interfacing Lab	0	0	2	1	50	-	50
		Total	**15**	**0**	**12**	**21**			
Semester VI									
Sl No	**Course Code**	**Name of the Course**					**Assessment Pattern**		
			L	**T**	**P**	**C**	**IA**	**MTE**	**ETE**
1	BCSE3012	Web Technologies	0	0	4	2	20	30	50
2	BCSE3011	Computer Graphics	2	0	2	3	20	30	50
3	BCSE9020	Artificial Intelligence and Intelligence System-II	2	0	2	3	20	30	50
4	SLBT3002	Soft Skill - 6 (Campus to Corporate)	0	0	4	2	20	30	50
5	BCSE3073	Industry Oriented Python-III	0	0	2	1	20	30	50
6	BCSE3074	Industry Oriented Java-III	0	0	2	1	20	30	50
7	Elective	BCSE3045: Digital Image Processing	2	0	2	3	20	30	50
		BCSE3043: Pattern Recognition	2	0	2	3	20	30	50
		/BCSE9011: Robotic Process Automation	2	0	2	3	20	30	50
		Total	**10**	**0**	**22**	**15**			
Semester VII									
Sl No	**Course Code**	**Name of the Course**					**Assessment Pattern**		
			L	**T**	**P**	**C**	**IA**	**MTE**	**ETE**
		Program Elective-4	2	0	2	3	20	30	50
		Program Elective-5	3	0	0	3	20	30	50
	BCSE9998	Capstone Design- 1	0	0	6	5	0	0	50
		University Elective	3	0	0	3	20	30	50
		University Elective	3	0	0	3	20	30	50
		Total	**11**	**0**	**8**	**17**			
Semester VIII									
Sl No	**Course Code**	**Name of the Course**					**Assessment Pattern**		
			L	**T**	**P**	**C**	**IA**	**MTE**	**ETE**
	BCSE4881	Capstone Design - 2	0	0	9	16	0	0	50
		Total	**0**	**0**	**9**	**16**			

List of Electives

Program Elective-1

Sl No	**Course Code**	**Name of the Electives**					**Assessment Pattern**		
			L	**T**	**P**	**C**	**IA**	**MTE**	**ETE**
1	PE1	Principles of Programming Languages	3	0	0	3	20	30	50
2	PE2	Data Compression	3	0	0	3	20	30	50
3	PE3	Artificial Intelligence	3	0	0	3	20	30	50
4	PE4	Pattern Recognition	3	0	0	3	20	30	50
5	PE5	Soft Computing	3	0	0	3	20	30	50
6	PE6	Digital Image Processing	3	0	0	3	20	30	50

Program Elective-2

Sl No	Course Code	Name of the Elective					Assessment Pattern		
			L	T	P	C	IA	MTE	ETE
1	PE7	Multimedia System	3	0	0	3	20	30	50
2	PE8	Real Time Systems	3	0	0	3	20	30	50
3	PE9	Distributed Systems	3	0	0	3	20	30	50
4	PE10	Wireless and Mobile Communication	3	0	0	3	20	30	50
5		Data Mining & Predictive Modeling	3	0	0	3	20	30	50

Program Elective-3

Sl No	Course Code	Name of the Elective					Assessment Pattern		
			L	T	P	C	IA	MTE	ETE
1	PE11	Software Project Management	3	0	0	3	20	30	50
2	PE12	Software Quality Engineering	3	0	0	3	20	30	50

Program Elective-4

Sl No	Course Code	Name of the Elective					Assessment Pattern		
			L	T	P	C	IA	MTE	ETE
1	PE13	Bioinformatics	3	0	0	3	20	30	50
2	PE14	Information Technology Infrastructure & its Management	3	0	0	3	20	30	50
3	PE15	IT in Forensic Science	3	0	0	3	20	30	50
4	PE16	Enterprise Resource Planning	3	0	0	3	20	30	50
5	PE17	APP DEVELOPMENT FOR ANDROID	3	0	0	3	20	30	50
6	PE18	VLSI Design	3	0	0	3	20	30	50
7	PE19	Embedded System	3	0	0	3	20	30	50
8		Operation Research & Optimization Technique	3	0	0	3	20	30	50

Program Elective-5

Sl No	Course Code	Name of the Elective					Assessment Pattern		
			L	T	P	C	IA	MTE	ETE
1	PE20	Introduction to Cloud Computing	3	0	0	3	20	30	50
2	PE21	Wireless Sensor Networks	3	0	0	3	20	30	50
3	PE22	Simulation & Modelling	3	0	0	3	20	30	50
4	PE23	Business Analytics	3	0	0	3	20	30	50
5	PE24	Big Data Analytics	3	0	0	3	20	30	50
6	PE25	Distributed computing	3	0	0	3	20	30	50
7	PE26	Mobile Computing	3	0	0	3	20	30	50

Detailed Syllabus

Semester - I

Name of The Course	INTRODUCTION TO COMPUTER SCIENCE & ENGINEERING			
Course Code	BCSE1001			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	**T**	**P**	**C**
	0	0	2	1

Course Objectives

1. Provide an overview of computers and different development areas.
2. Learn and Identify different domains emerging.
3. Develop for student seek and idea about Internet and application.
4. Learn about the Data Analysis, Business Process and other fields.

Course Outcomes

CO1	Understand the Fundamental of Computer and Programming Languages.
CO2	Understand when and how to take decisions, to compare and iterate, to how chose their career and line of action for future studies.
CO3	Recognize the Domain of Computers like grid, distributed, cloud and fogg computing.
CO4	Introduction about Data and Data Analysis with business process.
CO5	Develop idea about Internet of things and its applications.

Text Book (s)

1. Computer Fundamental – By P. K. Sinha.
2. Cloud Computing: Concepts, Technology & Architecture – By ERL.
3. "The Internet of Things: Enabling Technologies, Platforms, and Use Cases", by Pethuru Raj and Anupama C. Raman (CRC Press)
4. Introduction to Information Security and Cyber Law – By Surya Prakash Tripathi, Ritendra Goel, Praveen Kumar Shukla

Reference Book (s)

1. E. Balagurusamy 7th Edition, Programming ANSI C, McGraw-Hill
2. "Internet of Things: A Hands-on Approach", by Arshdeep Bahga and Vijay Madisetti (Universities Press)
3. Cloud Computing: Business Trends and Technologies, Igor Faynberg, Kui-Lan Lu, and Dor Skuler, Wiley, 2015.

Course Content

Unit-1 Computer Fundamental **8 hours**
Block Diagram of Computer System, Component of system, Instruction, Instruction flow. Introduction of Software, Classification of software, Languages and its Generations, Flow Diagram, Algorithm, Pseudo codes. Evolution of Computer hardware and their effect in the fields with relevance of size, speed and output.
Unit-2 Domains of Computing **8 hours**
Computers Application, Different era and field of computation with time, Advancement in computer field, Introduction to computing-grid, distributed, cloud, fog, Virtualization Green Computing , Operating system, difference between windows and Unix family, Basic Linux command-ls, cd, mv, man, mkdir, rmdir, touch, cat. Introduction to open source software.

Unit-3 Information System	**8 hours**
Introduction to Standards, Types of Standards; Open Standard, Closed Standard, Information Technology, Introduction to data communication and networking, standards and protocols. SMTP, POP3, DNS, HTPS, IPV4, IPV6, cyber Security, Viruses	
Unit-4 Data Analysis	**8 hours**
Data, Different types of Data and data Analysis, Business Analysis, Big-Data, Business and healthcare, Banking IT Infrastructure. Demonstration of Web Page analysis using goggle Page speed like pingdoom.com	
Unit-5 Internet of Things	**8 hours**
Internet, Introduction to IOT, Internet technologies, Advancement and applications in IOT, Professional society and association in computing, ethics	

Continuous Assessment Pattern

Internal Assessment (IA)	**Mid Term Test (MTE)**	**End Term Test (ETE)**	**Total Marks**
50		50	100

Name of The Course	Computer Programming and Problem Solving				
Course Code	BCSE1002				
Prerequisite					
Co-requisite					
Anti-requisite					
		L	**T**	**P**	**C**
		3	0	0	3

Course Objectives:

1. Provide an overview of computers and problem solving methods using 'C' language
2. Serve as a foundation for the study of programming languages.
3. Learn to develop program using 'C' language.
4. To develop the software using the concept of 'C' Language.

Course Outcomes

CO1	The student would learn the basic concepts of Computer and acquire various problem solving techniques such as algorithms and flowchart.
CO2	To understand the basic terminology used in programming and able to write, compile and debug programs in 'C' programming language and to develop program logics using decision structures and loop structures.
CO3	To develop program logics using the concept of arrays and arrays of characters.
CO4	To understand the modular techniques such as functions and difference between call by value and call by reference methods.
CO5	Implement and develop small projects using the concept Structures in C programming language.

Text Book (s)

1. Alexis Leon and Mathews Leon (2001), Introduction to Information Technology, Tata McGraw-Hill.
2. R.G. Dromey (2001), How to Solve it by Computer, Prentice Hall of India.
3. Al Kelley and Ira Pohl (1998), A Book on C Programming in C, 4th Edition, Pearson Education.

Reference Book (s):

1. E. Balagurusamy7th Edition, Programming ANSI C, McGraw-Hill
2. Brian W. Kernighan and Dennis M. Ritchie, The C programming Language, Prentice-Hall in 1988
3. Byron Gottfried, Programming with C, Schaum's Outline

Course Content:

Unit I: Introduction to Computers and Algorithms **9 Hours**
Parts of a computer – Overview of operating systems, assembler, compilers, interpreters and programming languages. Algorithms for exchanging the values of two variables, counting, summation of a set of numbers, factorial computation, sine function computation, generation of the Fibonacci sequence, reversing the digits of an integer, flowchart.

Unit II: Constructs of C	**8 Hours**
Lexical elements – Operators - data types – I/O statements – format specifications – control statements – decision making and Loop control structure: while loop, for loop, do-while loop, nested loop, break, continue, case control structure, go to, exit statement	
Unit III: Arrays	**8 Hours**
Array handling in C – declaration – single dimensional arrays, two – dimensional arrays, multi-dimensional arrays, sorting and searching on single and two dimensional arrays. Array order reversal, string handling function, manipulation on strings.	
Unit IV: Functions	**8 Hours**
Prototype – declaration - arguments (formal and actual) – return types – types of functions difference between built-in and user-defined functions.	
Unit V: Structures	**7 Hours**
Declarations - nested structures- array of structures - structure to functions - unions- difference between structure and union.	

Continuous Assessment Pattern

Internal Assessment (IA)	**Mid Term Test (MTE)**	**End Term Test (ETE)**	**Total Marks**
20	30	50	100

Name of The Course	PSYCHOLOGY AND SOCIOLOGY				
Course Code	PSSO-1001				
Prerequisite					
Co-requisite					
Anti-requisite					
	L	**T**	**P**	**C**	
	2	**0**	**0**	**2**	

Course Objectives

Objective of this course is to develop social-psychological skills among the students to meet out the challenges of industry and society**.**

Course Outcomes

CO1	Understanding of the basic facts of psychology and their application
CO2	Develop an ability to work in the work groups and communicate effectively
CO3	Develop sociological understanding of Social process, Social Institutions, Social inequality, stratification, mobility, Social change and Movement.
CO4	Demonstrate scientific understanding of major social themes & social phenomena of industrial society, that impact engineer's various realms of life.
CO5	Develop leadership quality, potential to analyze and address social issues and to transform young engineers as a very good human being and successful technocrat.

Text Book (s)

1. Bottomore, T B .,Sociology: A Guide to Problems and Literature, London: George Allen & Unwin1962
2. Robbins Stephens, Organizational Behaviour. P. Printice Hall International ,Inc. Eaglewood cliffs, 2005,ISBN: 0-13-191435,11th Edition
3. Giddens, A. ., Sociology, Cambridge; Polity ,2000.
4. Horton P B & Hunt C L Sociology, New York: McGraw-Hill Co., 1964.
5. *The Sociology of Social Problems*. Authors, Paul B. Horton, Gerald R. Leslie, Richard F. Larson. Edition, 10, illustrated. Publisher, Prentice Hall, 1991

Reference Book (s)

1. Clifford T. ***Morgan***, Richard A ***King***, John R Weisz and John Schopler; Introduction to Psychology Published: 19/02/2001; Edition: 7; ISBN: 9780074622506
2. Haralambos, M and Holborn., M. Sociology, London: HaperCollins,2000.

Course Content

Unit-1 Industrial Psychology **8 hours**
Psychology: Meaning, Definition, nature and Scope. Relevance for engineers. **Personality:** Definition and types, theories. **Memory:** Types, and models, strategies to improve memory **Motivation:** Motivational theories and job satisfaction, **Learning**: Types, classical conditioning, operand conditioning & observational learning
Unit-2 Group dynamics and leadership **8 hours**
Group dynamics and leadership: skills and various types, **Stress ,Stress management** Definition, types, causes, strategies to cope with stress **Work Environment**: Fatigue and boredom, , accidents and safety

Unit-3 Introduction To Industrial Sociology	**8 hours**
Sociology , Industrial Sociology: Meaning definition, Nature , scope, Importance of Sociology for Engineers, **Basic concepts:** Interaction, Group, community, Society, **Social Processes:** Associative & Dissociative, social process and organizational goals. **Social Institutions:** Family ,Marriage, Religion: Functions and dysfunctions & Impact of Industrialization	
Unit-4 Social and Industrial Concerns	**8 hours**
Social Inequality, Stratification & Mobility, Impact of Industrialization on Sanskritization Urbanization, Westernization, & Modernization, **Social Change and Social Movements:** Meaning Definition, Genesis, Types, Functions, role in Social transformation. **Industrialization in India and Industrial** policy resolution 1956., **Industrial Disputes:** Strikes and lockouts	
Unit-5 Industrial relations machinery	**8 hours**
Bi-partite & Tripartite agreement, Labour courts, Industrial tribunals, code of Discipline, Standing orders., **Social Problems:** - Social Disorganization, Unemployment, Deviance, Delinquent behaviour amongst youth, Crime, , Gender injustice, Child Abuse, Terrorism.	

Continuous Assessment Pattern

Internal Assessment (IA)	**Mid Term Test (MTE)**	**End Term Test (ETE)**	**Total Marks**
20	30	50	100

Name of The Course	ENVIRONMENTAL SCIENCE			
Course Code	ENVS1001			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	3	0	0	3

Course Objectives

1. To develop solid foundation for further study of electrical and electronics courses
2. To develop the analytical skills for solving the electrical and electronics circuits
3. To learn the utility of basic electronics devices and circuits
4. To understand the basic principles of electrical machines

Course Outcomes

CO1	Identify the scope and importance of studying the environment and analyze the problems associated with various natural resources. **(K4)**
CO2	Determine the harmful effects of toxic chemicals on living beings and environment. **(K2)**
CO3	Identify the harmful effects of environmental pollution and apply suitable control methods. **(K4)**
CO4	Analyze the different social issues affecting the society and environment. **(K4)**
CO5	Interpret and utilize the different tools of Green Chemistry towards generating a zero waste environment **(K3)**

Text Book (s)

1. Environmental Studies, Anubha Kaushik, C P Kaushik, New Age International Publishers, 2008, ISBN:978-81-224-2159-0.
2. Environmental Studies, Suresh K. Dhameja, S.K. Kataria and Sons , 2008, ISBN: 81-88458-77-5
3. Text Book of Environmental Studies, Erach Bharucha, University Press (India) Private Limited, 2005, ISBN: 978 81 7371 540 2
4. Environmental Studies (From Crisis to Cure) Second Edition. , R. Rajagopalan, Oxford University Press, 2012, ISBN 0-19-807208-2.
5. Environmental Studies, Ranu Gadi, Sunitta Rattan, Sushmita Mohapatra, S.K. Kataria and Sons, 2008, ISBN: 81-89757-98-9.

Reference Book (s)

1. Environmental Studies, Benny Joseph , Tata McGraw Hill Education Private Limited, 2009, ISBN: 987-0-07-064813-5.
2. Environmental Studies, Anindita Basak, Pearson Education, 2009, ISBN: 978-81-317-2118-6.
3. Principles of Environmental Science (Inquiry and Applications), William P. Cunningham & Mary Ann Cunningham, Tata McGraw Hill Education Private Limited, 2007, ISBN: 987-0-07-064772-0.

Course Contents:

Unit I: Environment and Natural Resources 10 Hours
Definition, scope, importance, need for public awareness, Environmental Management Systems its objectives, components, EIA, Natural Resources – forest resources – use, exploitation, deforestation, construction of multipurpose dams – effect on forests, Water resources – use of surface and subsurface water; effect of floods, drought, water conflicts, Mineral resources –Use and exploitation,

environmental effects of extracting and using mineral resources, Food resources – food problems, advantage and disadvantage of fertilizers & pesticides, effect on environment, Energy resources – need to develop renewable energy, land resources – Land degradation, landslides, soil erosion, desertification & case studies.
Unit II: Chemical Toxicology 7 Hours
Toxic chemicals in the environment, Impact of toxic chemicals on enzymes, biochemical effects of arsenic, cadmium, lead, chromium, mercury, biochemical effects of pesticides
Unit III: Environmental Pollution 10 Hours
Definition – Causes, pollution effects and control measures of Air, Water, Soil, Marine, Noise, Thermal, Nuclear hazards. Solid waste management: causes, effects and control measures of urban and industrial wastes, pollution measures, case studies, Disaster management: floods, earthquake, cyclone and landslides.
Unit IV: Social Issues, Human Population and the Environment 10 Hours
Urban problems related to energy & sustainable development, water conservation, problems related to rehabilitation – case studies, Consumerism and waste products - Environment Protection Act, Air, Water, Wildlife, Forest Conservation Act, Environmental legislation and public awareness. Population growth, variation among nations, Population explosion, Environment and human health, Value Education, Women and Child Welfare, Role of Information Technology – Visit to local polluted site /Case Studies.
Unit V: Green Chemistry 4 Hours
Introduction, Basic principles of green technology, concept of Atom economy, Tools of Green technology, zero waste technology.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
20	30	50	100

Name of The Course	CALCULUS FOR ENGINEERS			
Course Code	MATH-1001			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	3	0	0	3

Course Objectives

1. Perform calculations and algebraic manipulations, particularly differentiation and integration, quickly and accurately.
2. Use the language of mathematics to communicate mathematical ideas, using symbols and notations correctly, and presenting solutions in a clear and organized way
3. Use concepts of calculus to the model real-world problems.
4. Make connections between different mathematical concepts, such as geometric, analytic and numerical interpretations of functions, derivatives and integrals.
5. Develop ability to understand and create rigorous formal mathematical arguments. Apply basic mathematical logic.

Course Outcomes

CO1	Solve partial derivatives for functions of several variables and apply it in series expansion and extreme values and saddle points. (K4)
CO2	Evaluate the multiple integrals and utilize them in finding the area and volume of a region bounded by the given curves/surfaces. (K4)
CO3	Evaluate the derivatives and integrals for vector valued functions. (K4)
CO4	Apply vector analysis to evaluate work done and circulation.(K4)
CO5	Apply Green's, Stokes' and Gauss divergence theorem to evaluate Integrals. (K4)

Text Book (s)

1. Robert T. Smith and Roland B. Minton, Calculus, McGraw Hill education, 4th Edition.
2. George B. Thomas and Ross L. Finney, Calculus, Pearson Education, 9th Edition.

Reference Book (s)

1. K. Jain and S. R. K. Iyenger, Advanced Engineering Mathematics, Narosa Publishers.
2. Michael D. Greenberg, Advanced Engineering Mathematics, Pearson Education, Asia.

Course Content

Unit I: Differential Calculus **10 Hours**
Functions of two and more than two variables, Limits and continuity, Partial derivatives, Total differential, Derivatives of composite and implicit functions, Jacobian, Taylor's series of functions of one and two variables, Extreme values and saddle points, Lagrange's method of undetermined multipliers.
Unit II: Multiple integrals **10 Hours**
Double integrals in Cartesian and Polar coordinates, Change of order of integration, change of variables, Applications of double integrals to find area and volume, Beta and Gamma functions, Triple integrals in Cartesian, cylindrical and spherical coordinates, Change of variables in triple integrals, Applications of triple integrals to find volume **.**
Unit III: Vector Calculus **10 Hours**
Scalar and vector fields, Differentiation of Vector functions, Gradient, divergence, curl and their physical interpretations, line integrals, path independence, potential functions and conservative

fields, surface integrals, Green's theorem, Stokes's theorem and Gauss's divergence theorems (without proof).

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
20	30	50	100

Name of The Course	**EXPLORATION WITH CAS-I**				
Course Code	**MATH-1002**				
Prerequisite					
Co-requisite					
Anti-requisite					
		L	**T**	**P**	**C**
		0	0	2	1

Course Objectives

Familiarization of the syntax, semantics, data-types and library functions of numerical computing languages such as MATLAB and/or SCILAB, and application of such languages for implementation/simulation and visualization of basic mathematical functions relevant to electronics applications.

Course Outcomes

CO1	Have knowledge of SciLab. (**K2)**
CO2	Trace the curve using SciLab. **(K3)**
CO3	Analyze Taylor series expansion. **(K4)**
CO4	Study three dimensional figures and their point of intersections.**(K3)**
CO5	Apply double and triple integral in finding area and volume of a given surface. **(K3)**
CO6	Compute curl, divergence and gradient (**K4**)

Reference Book (s)

1. Perrine Mathieu, Philippe Roux, Scilab, Fundamentals, from theory to practiceScilab.
2. Dr. M. Affouf, Scilab, 2012ISBN: 978-1479203444.

Course Content

S. No	**List of Experiment**
1	Introduction to Scilab and Develop Plots for Exponential, Logarithmic, trigonometric, Hyperbolic functions with shifting and scaling.
2	Develop Plots of circle, parabola, ellipse and hyperbola in Cartesian form
3	Develop plots of 3-D surfaces: Planes, Sphere, Cylinder, Paraboloid, Ellipsoid, Hyperboloid, cone.
4	Expansion of functions in Taylor series.
5	Identifying the critical points of 3-D surface
6	Plotting the curve of intersection of two intersecting surfaces.
7	Computing double integrals in Cartesian coordinates.
8	Computing triple integrals in Cartesian coordinates.
9	Computing grad , div & curl
10	Plotting grad, div & curl

Continuous Assessment Pattern

Internal Assessment (IA)	**Mid Term Test (MTE)**	**End Term Test (ETE)**	**Total Marks**
50		50	100

Name of The Course	ENGINEERING PHYSICS			
Course Code	PHYS-1001			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	3	0	0	3

Course Objectives

To prepare students with fundamental knowledge of physics. To develop skills necessary for higher-level Science and Engineering courses.

Course Outcomes

CO1	Discuss the Origin and basic concepts of Quantum Physics like wave function, Schrodinger wave equations and its application.
CO2	Interpret the phenomenon of Interference and Diffraction of light
CO3	Explain Maxwell's equations and their significance and utilization of these equations in EM wave propagation
CO4	Describe the principle and characteristics of LASER and its Applications.
CO5	Express and Categorize the magnetic materials and their technical aspects.

Text Book (s)

1. Arthur Beiser, S Rai Choudhury, Shobhit Mahajan, (2009), Concepts of Modern Physics, 6th Edition, Tata-McGraw Hill. ISBN- 9780070151550.
2. Neeraj Mehta, (2011), Applied Physics For Engineers, New Arrivals – PHI, ISBN-9788120342422.

Reference Book (s)

1. Robert Kolenkow, David Kleppner (2007), An Introduction to Mechanics, 1st Edition, Tata-McGraw Hill.
2. B.B. Laud, Lasers and Non-Linear Optics (2011), 3rd Edition, New Ages International.
3. William Silfvast (2002), Laser Fundamentals, Cambridge University Press.
4. David. J. Griffiths (2009), Introduction to Electrodynamics, 3rd Edition, PHI Learning.

Course Content

Unit 1 -Quantum Mechanics **8 hours**
Wave-Particle duality, de-Broglie waves, Davisson & Germer Experiment (Experimental verification of de-Broglie waves), Heisenberg Uncertainty Principle and its Applications, Schrodinger's wave equations, Particle in a Box.
Unit 2 –Optics **8 hours**
Interference- Interference of Light, Biprism experiment, interference in thin films, Newton's rings; Diffraction-Single slit, Diffraction grating, Grating spectra, Rayleigh's criterion and resolving power of grating.
Unit 3 -LASER **8 hours**
Einstein's coefficients, Population Inversion, Three level and four level laser, Laser characteristics, He-Ne laser and applications.

Unit 4 –Electromagnetics	**8 hours**
Displacement current, Maxwell's Equations (Intergral and Differential form), Equation of continuity, EM-Wave equations and its propagation characteristics in free space, Poynting theorem and Poynting vectors.	
Unit 5 -Magnetism	**8 hours**
Origin of magnetization, Orbital and spin magnetic moment, Classification and properties of magnetic materials, Hysteresis curve, soft and hard magnetic materials.	

Continuous Assessment Pattern

Internal Assessment (IA)	**Mid Term Test (MTE)**	**End Term Test (ETE)**	**Total Marks**
20	30	50	100

Name of The Course	ENGINEERING PHYSICS LAB			
Course Code	PHYS-1002			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	0	0	2	1

Course Objectives

1. To impart knowledge in basic concepts of physics relevant to engineering applications
2. To introduce advances in technology for engineering applications

Course Outcomes

CO1	Understand the physical principle involve in the various instruments and relate them to new applications.
CO2	Operate CRO and various optical instruments such as- spectrometer, travelling microscope and spherometer.
CO3	Calculate the physical constants by various methods such as- Planck's constant, wavelength of monochromatic light, angle of prism and realize the accuracy in measurements.
CO4	Develop the individual and team work for the performance of scientific works.
CO5	Develop the skill for making scientific graphs, error analysis and measurement technology used in engineering.

Course Content

S. No	List of Experiment
1	To determine the wavelength of He-Ne laser light by diffraction method at a single slit.
2	To study the polarization of light by simple reflection using He-Ne laser
3	To study the variation of magnetic field with distance along the axis of current carrying coil and then to estimate the radius of coil.
4	To verify the Stefan's law by electrical method.
5	To calibrate the ammeter and voltmeter with the help of potentiometer.
6	To determine the resolving power of telescope.
7	To measure the numerical aperture of an optical fiber.
8	Find the angle of a prism and calculate Cauchy's constant.
9	To determine the velocity of ultrasonic wave in liquid.
10	To find the frequency of A.C. mains using sonometer.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
50		50	100

Name of The Course	ENGINEERING CHEMISTRY			
Course Code	**CHEM-1001**			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	**T**	**P**	**C**
	3	0	0	3

Course Objectives

1. To acquire knowledge about desalination of brackish water and treatment of municipal water.
2. To gain the knowledge of conducting polymers, bio-degradable polymers and fiber reinforced plastics.
3. To learn significance of green chemistry and green synthesis and the synthesis of nano materials.
4. To understand mechanism of corrosion and preventive methods.
5. To understand concept of semi conductivity, superconductivity and liquid crystal and solar energy.

Course Outcomes

CO1	Determine the atomic structure and predict the position of element in periodic table. (**K2)**
CO2	Determine the properties and shape of molecules by various theories of chemical bonding. **(K4)**
CO3	Differentiate nuclear reactions and apply nuclear chemistry to calculate age of samples. **(K4)**
CO4	Demonstrate the concepts of thermodynamics and chemical kinetics.**(K3)**
CO5	Correlate the structure and properties of biomolecules and identify the photochemical reactions. **(K2)**

Text Book (s)

1. Darrell *Ebbing*, Steven *Gammon, General Chemistry,* Cengage Learning*, 2012, ISBN* 978-1-285-05137- 6, *10th Edition*
2. William R. *Robinson*, Jerome D. *Odom*, Henry Fuller *Holtzclaw*. General Chemistry, Houghton Mifflin Harcourt Publishing Company, 1996, Edition 10, ISBN 066935483X, 9780669354836.
3. ArunBahl, B. S. Bahl and G.D. Tuli, Essential of Physical Chemistry, S. Chand and Company Ltd., New Delhi, 2009, ISBN 81-219-2978-4, Ed 2009.
4. M. Siberberg, The Molecular Nature of Matter and Change, McGraw-Hill Education; 7 *edition, 2014, ISBN*-10: 0021442541

Reference Book (s)

1. T.W. Graham Solomons and Craig Fryhle, Organic Chemistry, John Wiley and Sons, Inc., 2011, ISBN: 0470556597, 10th Ed.
2. Julio De Paula, Peter Atkins, Physical Chemistry, Oxford University Press, 2011, ISBN-13: 9780199599592
3. Lehninger, Principles of Biochemistry [David L. Nelson, Michael M. Cox] on W H Freeman & Co.,February 1, 2008, *ISBN*-10: 071677108X | *ISBN*-13: 978- 0716771081 Edition: 5th.
4. Mehrotra R. C, Singh Anirudh Organometallic Chemistry: a unified approach, New Age International, New Delhi, 2007, ISBN: 9788122412581.
5. J. House, Inorganic Chemistry, Imprint Academic Press, 2012, ISBN 9780123851109

Course Content

Unit I: Introduction to Atomic Structure	**12 Hours**
Structure of the Atom, Introduction to Periodic Table, Evolution of Atomic Theory, Thomson's plum pudding model, Rutherford's model and Rutherford-Geiger-Marsden Experiment, Black body radiation; Planck-Einstein Relationship, Planck's constant; Bohr's Model; Bohr's postulates; Matter-Energy interactions involving hydrogen atom; Rydberg Equation; Bohr-Sommerfield Model; Hydrogen Spectral Series (Balmer Series); Wave- Particle duality (de-Broglie's rule); Heisenberg's Uncertainty Principle; Quantum-Mechanical Model of the Atom; Quantum numbers; s, p, d, f, orbitals; Stern-Gerlach Experiment; Aufbau Principle; Pauli's Exclusion Principle; Hund's Rule; Electronic configuration based on Quantum States	
Unit II: Introduction to Chemical Bonding	**9 Hours**
Covalent Bond; sigma and pi bond; single, double and triple bonds; Ionic Bond; Octet stability; Lewis dot structure ; VSEPR Theory; LCAO-MO; H2; CO; Valence Bond Theory; Periodic trends of chemical properties; Inter-molecular and Intra-molecular bonding (Hydrogen Bonding, Van Der Waals forces, London Forces, etc); dipole moment; polarizibility of molecules; Metallic bonding. Band theory of solids; conductors; semiconductors; insulators.	
Unit III: Nuclear Chemistry	**6 Hours**
Nuclear Fission, Nuclear Fusion, Half Life, Mass Defect, Astro-chemistry (Reactions in Stars, Mechanism of decay of Stars); Carbon Dating, Related Numerical	
Unit IV: Thermodynamics and Chemical Kinetics	**6 Hours**
First Law, Second Law, Third Law and Zeroeth Law of Thermodynamics, Enthalpy, Entropy, Gibbs Free Energy, First, second and zero order reactions; Arrhenius Equation	
Unit V: Photochemistry and Biochemistry	**8 Hours**
Introduction to Photochemistry; Photochemical reactions of organic molecules (Electrocyclic reactions, Norrish reactions; photoisomerization, Zimmerman's Rearrangement), Introduction to Carbohydrates, Lipids and Proteins. DNA structure.	

Continuous Assessment Pattern

Internal Assessment (IA)	**Mid Term Test (MTE)**	**End Term Test (ETE)**	**Total Marks**
20	30	50	100

Name of The Course	ENGINEERING CHEMISTRY LAB			
Course Code	CHEM-1003			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	0	0	2	1

Course Objectives

This Engineering Chemistry Laboratory is common to first year branches of UG Engineering. At the end of the course the student is expected to provide the students with a solid foundation in Chemistry laboratory required to solve engineering problems. Practical implementation of fundamental concepts

Course Outcomes

CO1	Employ the volumetric titrations techniques used in chemistry laboratory for analysis.(K3)
CO2	Analyse to differentiate between hard and soft water using complexometric titration.(K2)
CO3	Calculate the percentage of dissolved oxygen in water sample.(K3)
CO4	Identify the viscosity of liquid using Ostwald viscometer.(K2)
CO5	Analyse the Carbohydrate and protein in given organic compound.(K3)

Text Book (s)

ArunBahl, B. S. Bahl and G.D. Tuli, Essential of Physical Chemistry, S. Chand and Company Ltd., New Delhi, 2009, ISBN 81-219-2978-4, Ed 2009.

Course Content

S. No	List of Experiment
1	To estimate the total permanent and temporary hardness of the given hard water sample. A standard calcium ion solution (1 mg of $CaCO_3$ in 1 ml) and an approximately 0.01M solution of EDTA are provided.
2	To estimate the amount of Zinc in the given solution by using the standard solution of Potassium Ferrocyanide.
3	To Determine the Alkalinity of a given Water Sample
4	To find out the amount of dissolved oxygen in the given sample of water.
5	To find out relative and absolute viscosity of a given liquid using Ostwald's viscometer.
6	Detection of the elements in given organic compound.
7	To estimate the amount of Copper present in the given solution using a standard solution by provided hypo solution.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
50		50	100

Name of The Course	PRODUCT DESIGN USING GRAPHICS			
Course Code	**BTME-1002**			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	**T**	**P**	**C**
	0	0	4	2

Course Objectives

1. Provide basic foundation in computer aided design / manufacturing
2. Understand the fundamentals used to create and manipulate geometric models
3. Get acquainted with the basic CAD software designed for geometric modelling
4. Learn working principles of NC machines CNC control and part programming
5. Understand concept of Group Technology, FMS and CIM

Course Outcomes

CO1	Understand the concept and principles of engineering graphics in product design (**K2)**
CO2	make isometric and orthographic projection of solids along with free hand sketching. **(K4)**
CO3	Develop a solid model using AutoCAD**(K4)**
CO4	Make a solid modeling for a given assembly.**K3)**
CO5	Apply the concepts and techniques learnt in the course in making hands-on project.**(K2)**

Text Book (s)

1. Asimow, M. (1962). Introduction to design. Englewood Cliffs: Prentice-Hall.
2. K C John (2009), Engineering Graphics for Degree, Prentice Hall of India. ISBN: 978-8-120-33788-3.
3. P N Rao (2010), CAD/CAM Principles and Applications, 3rd Edition, Tata McGraw-Hill Education, ISBN: 978-0-070-68193-4.

Reference Book (s)

1. Course material uploaded on LMS

Course Content

Unit I: Introduction – Understanding the Concept of Product Design 10 Hour
Fundamentals of Design : Design by Evolution and Design by Innovation, Principles that govern any design, Morphology and Process of Design, Application of Graphics in Design, Engineering Graphics: An Overview, Introduction to Computer Aided Drafting , Lettering, Numerals and Dimensioning.
Unit II:Projection of Solids 16 Hour
Concept of Projection, Object in four quadrant, 2-D description of quadrants, Orthographic Projection of Solids, Isometric Projection of Solids, Free-hand sketching
Unit III: Solid Modeling 10 Hour
Division of Engineering Solids- Polyhedra, Regular and Irregular polyhedral, solids of revolution, Geometric Modeling – Wireframe, B-Rep and Solid Modeling, Solid Modelling using AutoCAD
Unit IV:Introduction to Assembly 10 Hour
Types of assembly drawings, Accepted Norms for Assembly Drawings, Sequences of Preparing the Assembly Drawing, Solid Modeling of assembly

Unit V:Application of Design Concepts for Product Design	**10 Hour**
Hands-on Project in Groups: Choose a specific objective for Product Design, Design the Product and Model it using AutoCAD, presentation.	

Continuous Assessment Pattern

Internal Assessment (IA)	**Mid Term Test (MTE)**	**End Term Test (ETE)**	**Total Marks**
20	30	50	100

Name of The Course	BASIC ELECTRICAL AND ELECTRONICS ENGINEERING LAB			
Course Code	**BEEE-1003**			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	**T**	**P**	**C**
	3	0	0	3

Course Objectives

1. An understanding of basic electrical wiring, measurements, and methods
2. Students understand measurement errors and non-ideal electrical devices
3. Students understand wiring and operation or operational amplifiers
4. Students demonstrate effective written communication skills

Course Outcomes

CO1	Apply and verifying basic electrical laws.
CO2	Realize and apply basic theorems in electrical network and circuits.
CO3	Verify the truth tables of logic Gates.
CO4	Analyze characteristics of basic diodes and transistors
CO5	Realize and verify the working of transformer.

Text Book (s)

1. D. P. Kothari and I. J. Nagrath, ―Basic Electrical and Electronics Engineering‖, McGraw Hill, 20016.

Course Content

S. No	List of Experiment
1	To verify (i) Kirchoff's current law (ii) Kirchoff's voltage law
2	Verification of Thevenin's Theorem
3	Verification of Norton's Theorem
4	Verification of Maximum power transfer Theorem
5	Verification of Truth table for logic Gates- AND , OR, NOT, NAND, NOR and XOR and Half adder Circuit.
6	Study of P-N Junction Diode characteristics.
7	Study of ZENER Diode characteristics.
8	Study of CE characteristics of a Bipolar Junction Transistor.
9	Study of characteristics of FET.
10	Study of open circuit and short circuit tests on a single phase transformer and obtaining its equivalent circuit parameters.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
50		50	100

Name of The Course	PRODUCT MANUFACTURING			
Course Code	**BTME-1003**			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	**T**	**P**	**C**
	0	0	2	1

Course Objectives

The focus of Product Design and Development is integration of the marketing, design, and manufacturing functions of the firm in creating a new product. The course is intended to provide you with the following benefits:

- Competence with a set of tools and methods for product design and development.
- Confidence in your own abilities to create a new product.
- Awareness of the role of multiple functions in creating a new product (e.g. marketing, finance, industrial design, engineering, production).
- Ability to coordinate multiple, interdisciplinary tasks in order to achieve a common objective.
- Reinforcement of specific knowledge from other courses through practice and reflection in an action-oriented setting.
- Enhanced team working skills.

Course Outcomes

CO1	Develop a product using Welding Process.
CO2	Develop a product out of a given sheet.
CO3	Assemble a product of wood in carpentry shop.
CO4	Create a product using casting and then machining.
CO5	Assemble different components to get final product with the help of welding.

Text Book (s)

1. Product Manufacturing Manualprepared by faculties of School of Mechanical Engineering.

Reference Book (s)

1. A.K. Hajra Choudhury, S.K. Hajra Choudhury and Nirjhar Roy (2009), Elements of Workshop Technology, Vol. – I, Media Promoters, ISBN: 978-8-185-09914-9.
2. A.K. Hajra Choudhury, S.K. Hajra Choudhury and Nirjhar Roy (2010), Elements of Workshop Technology, Vol. – II, Media Promoters, ISBN: 978-8-185-09915-6.

Course Content

S. No	List of Experiment
1	To prepare a given product using the knowledge gained in Product Manufacturing Lab while working in the lab. (To be submitted at the end of the session and evaluated in the external examination)
2	**Welding Shop** Any two of the following a. Prepare a Lap joint as per drawing using Oxy-Acetylene Gas welding. b. Prepare a T-joint as per drawing using Oxy-Acetylene Gas welding. c. Prepare a Butt-joint as per drawing using Oxy-Acetylene Gas welding.

	d. Prepare L- joint as per drawing using Oxy-Acetylene Gas welding. e. Prepare a Lap joint as per drawing using Electric Arc welding. f. Prepare a T-joint as per drawing using Electric Arc welding. g. Prepare a Butt-joint as per drawing using Electric Arc welding. h. Prepare L- joint as per drawing using Electric Arc welding.
3	**Fitting Shop** Prepare a Male/Female Parts as per drawing
4	**Lathe Machine Shop** Preparation of Job as per drawing.
5	**Sheet metal Shop** Preparation of funnel of given dimension. Use soldering to join lower part with upper and use riveting to join cylinder.
6	**Foundry Shop** Preparation of Job of aluminum as per drawing through casting.
7	**Black Smithy Shop** Any one of the following a. Preparation of S shaped hook of given drawing of MS rod. b. Making of chisel of given drawing of MS rod. c. Making of a wheel of given drawing of MS rod.
8	**Carpentry Shop** Any one of the following a. Preparation of T-Joint of given dimension. b. Preparation of Lap Joint of given dimension. c. Preparation of Cross Joint of given dimension. d. Preparation of Dove Tail Joint of given dimension

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
50		50	100

Name of The Course	UNIVERSAL HUMAN VALUES AND ETHICS			
Course Code	UHVE-1001			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	0	0	2	1

Course Objectives

1. To help students distinguish between values and skills, and understand the need, basic guidelines, content and process of value education.
2. To help students initiate a process of dialog within themselves to know what they 'really want to be' in their life and profession
3. To help students understand the meaning of happiness and prosperity for a human being.
4. To facilitate the students to understand harmony at all the levels of human living, and live accordingly.
5. To facilitate the students in applying the understanding of harmony in existence in their profession and lead an ethical life

Course Outcomes

CO1	Understand the significance of value inputs in a classroom and start applying them in their life and profession
CO2	Distinguish between values and skills, happiness and accumulation of physical facilities, the Self and the Body, Intention and Competence of an individual, etc.
CO3	Understand the value of harmonious relationship based on trust and respect in their life and profession
CO4	Understand the role of a human being in ensuring harmony in society and nature.
CO5	Distinguish between ethical and unethical practices, and start working out the strategy to actualize a harmonious environment wherever they work.

Text Book (s)

1. R R Gaur, R Sangal, G P Bagaria, 2009, A Foundation Course in Human Values and Professional Ethics.

Reference Book (s)

1. Ivan Illich, 1974, Energy & Equity, The Trinity Press, Worcester, and Harper Collins, USA
2. E. F. Schumacher, 1973, Small is Beautiful: a study of economics as if people mattered, Blond & Briggs, Britain.
3. Sussan George, 1976, How the Other Half Dies, Penguin Press. Reprinted 1986, 1991
4. Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972, Limits to Growth – Club of Rome's report, Universe Books.
5. A Nagraj, 1998, Jeevan Vidya Ek Parichay, Divya Path Sansthan, Amarkantak.
6. P L Dhar, RR Gaur, 1990, Science and Humanism, Commonwealth Publishers.
7. A N Tripathy, 2003, Human Values, New Age International Publishers.
8. SubhasPalekar, 2000, How to practice Natural Farming, Pracheen (Vaidik) KrishiTantraShodh, Amravati.
9. E G Seebauer & Robert L. Berry, 2000, Fundamentals of Ethics for Scientists & Engineers , Oxford University Press
10. M Govindrajran, S Natrajan & V.S. Senthil Kumar, Engineering Ethics (including Human Values), Eastern Economy Edition, Prentice Hall of India Ltd.
11. B P Banerjee, 2005, Foundations of Ethics and Management, Excel Books.

12. B L Bajpai, 2004, Indian Ethos and Modern Management, New Royal Book Co., Lucknow. Reprinted 2008.

Course Content

Module I: Course Introduction - Need, Basic Guidelines, Content and Process for Value Education
1. Understanding the need, basic guidelines, content and process for Value Education 2. Self Exploration–what is it? - its content and process; 'Natural Acceptance' and Experiential Validation- as the mechanism for self exploration 3. Continuous Happiness and Prosperity- A look at basic Human Aspirations 4. Right understanding, Relationship and Physical Facilities- the basic requirements for fulfillment of aspirations of every human being with their correct priority 5. Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario. 6. Method to fulfill the above human aspirations: understanding and living in harmony at various levels
Module II: Understanding Harmony in the Human Being - Harmony in Myself
1. Understanding human being as a co-existence of the sentient 'I' and the material 'Body' 2. Understanding the needs of Self ('I') and 'Body' - Sukh and Suvidha 3. Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer) 4. Understanding the characteristics and activities of 'I' and harmony in 'I' 5. Understanding the harmony of I with the Body: Sanyam and Swasthya; correct appraisal of Physical needs, meaning of Prosperity in detail 6. Programs to ensure Sanyam and Swasthya
Module III: Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship
1. Understanding harmony in the Family- the basic unit of human interaction 2. Understanding values in human-human relationship; meaning of *Nyaya* and program for its fulfillment to ensure *Ubhay-tripti*; 3. Trust (*Vishwas*) and Respect (*Samman*) as the foundational values of relationship 4. Understanding the meaning of *Vishwas*; Difference between intention and competence 5. Understanding the meaning of *Samman*, Difference between respect and differentiation; the other salient values in relationship 6. Understanding the harmony in the society (society being an extension of family): *Samadhan, Samridhi*, *Abhay*, *Sah-astitva* as comprehensive Human Goals 7. Visualizing a universal harmonious order in society- Undivided Society (*AkhandSamaj*), Universal Order (*SarvabhaumVyawastha*)- from family to world family!
Module IV: Understanding Harmony in the Nature and Existence - Whole existence as Co-existence
1. Understanding the harmony in the Nature 2. Interconnectedness and mutual fulfillment among the four orders of nature- recyclability and self-regulation in nature 3. Understanding Existence as Co-existence (*Sah-astitva*) of mutually interacting units in all-pervasive space 4. Holistic perception of harmony at all levels of existence
Module V: Implications of the above Holistic Understanding of Harmony on Professional Ethics
1. Natural acceptance of human values 2. Definitiveness of Ethical Human Conduct 3. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order 4. Competence in Professional Ethics: i. Ability to utilize the professional competence for augmenting universal human order ii. Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems, technologies and management models

5. Case studies of typical holistic technologies, management models and production systems
6. Strategy for transition from the present state to Universal Human Order:
   i. At the level of individual: as socially and ecologically responsible engineers, technologists and managers
   ii. At the level of society: as mutually enriching institutions and organizations

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
20	30	50	100

Name of The Course	BASIC ENGLISH			
Course Code	**SLBT-1001**			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	**T**	**P**	**C**
	0	0	4	2

Course Objectives

The main goal of this course is to help you improve your spoken English skills to enable you to communicate more effectively in English.

Course Outcomes

CO1	Able to communicate effectively
CO2	Able to develop neutral accent.

Course Content

Unit I: Soft Skills **16 Hours**
1. Introduction and Ice breaking 2. SWOT Analysis 3. Pronunciation - stress and intonation patterns 4. Listening and Comprehension skills 5. Communication Games
Unit II: English Grammar **8 Hours**
1. Vocabulary 2. Error Detection -error in use of words: Nouns, Pronouns, Verbs, Adjectives, Adverbs, Prepositions, Articles 3. Tenses 4. Antonyms / Synonyms 5. Idioms and Phrases

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
20	30	50	100

Name of The Course	**GERMAN - I**			
Course Code	**GERN1001**			
Prerequisite				
Co-requisite				
Anti-requisite				
L	**T**	**P**	**C**	
0	0	4	2	

Course Objectives

This course focuses on basic linguistic and communicative structures of the German language. Students will be introduced to various aspects of German culture and learn to communicate in simple everyday situations and personal interaction. The module will adopt an integrated approach to language learning and will emphasize equally all four skills of reading, writing, listening and speaking as well as the acquisition of grammar structures and vocabulary. Audio and video materials will also be used to supplement the textbook and to provide students with a better insight into Germany, her culture and the life of her people. The module will also attempt to help students optimize their learning by teaching them vital strategies for language learning and language use. This should, in turn, allow students to develop greater learner autonomy.

Course Outcomes

CO1	Interpret simple sentences, and read short sentences and,paragraphs.(K2)
CO2	Apply simples sentences to discuss about their family members, friends etc.(K3)
CO3	Develop an understanding of German society and culture.(K4)
CO4	Assess all the four skills viz. reading, writing ,listening and speaking. (K5)
CO5	Apply simples sentences to discuss about their family, Verb konjugatio.

Text Book (s)

1. Dengler, Stefanie, Netzwerk A1: 2015
2. Hieber, Wolfgang. Lernziel Deutsch. München: 2005

Reference Book (s)

1. Gick, Cornelia, Momentmal, Grundstufenlehrwerk Deutsch als Fremdsprache.M: 2003
2. Maria Dallapiazza, Eduard von Jan, Til Schonherr.Tangram, Deutsch als Fremdsprache.Berlin: 2005
3. Griesbach, Schulz. Deutsche Sprachlehre für Ausländer. München: 2005.

Course Content

UNIT I	**4 Hours**
Begrüssung / Greeting - Nummern/numbers - Monate, Wochentage/ Name of months, days	
UNIT II	**2 Hours**
Sich vorstellen – Introduction - Interviewspiel mit Fragen und Antworten	
UNIT III	**2 Hours**
Information zu Ländern, Nationalitäten und ihre Sprachen/Name of countries, nationalities and languages.	
UNIT IV	**4 Hours**
W-fragen/ Questions - Nominativ Kasus/ Nominative case - Pronomen / pronouns (Nominative)	
UNIT V	**5 Hours**
Regelmäβige Verben / Regular Verbs - Verbkonjugation/ Verb conjugation (sein und haben) - Landeskunde /History - Film –Spielzeugland	

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
20	30	50	100

Name of The Course	**FRENCH-I**				
Course Code	**FREN1001**				
Prerequisite					
Co-requisite					
Anti-requisite					
		L	**T**	**P**	**C**
		0	0	4	2

Course Objectives

1. Learn about contemporary French and Francophone institutions and mores
2. Communicate and interact with other speakers of French in diverse situations and in conversations involving everyday topics
3. Develop listening skills and understand the gist of a variety of communication modes (TV, video, radio, etc.)
4. Read a broad range of printed materials for general, specific and practical information
5. Write notes, letters and compositions on familiar topics with a good command of vocabulary and sentence structure in a cohesive and organized manner

Course Outcomes

CO1	Interpret simple sentences, and read short sentences and, paragraphs.(K2)
CO2	Apply simples sentences to discuss about their family members, friends etc.(K3)
CO3	Develop an understanding of French society and culture.(K4)
CO4	Assess all the four skills viz. reading, writing, listening and speaking.(K5)
CO5	Interpret simple sentences and Demander et donner l'heure

Text Book (s)

1. Tech French » :Ingrid Le Gargasson, Shariva Naik, Claire Chaize. Goyal Publishers and Distributors Private Ltd, Delhi, 2012. Units 1 & 2.

Reference Book (s)

1. CONNEXIONS 1, Méthode de français, Régine Mérieux, Yves Loiseau, Les Éditions Didier, 2004
2. CONNEXIONS 1, Le cahier d'exercices, Régine Mérieux, Yves Loiseau Les Éditions Didier, 2004
3. ALTER EGO 1, Méthode de français, Annie Berthet, Catherine Hugo, Véronique M. Kizirian, Béatrix Sampsonis, Monique Waendendries Hachette livre 2006
4. ALTER EGO 1, Le cahier d'activités, Annie Berthet, Catherine Hugo, Béatrix Sampsonis, Monique Waendendries Hachette livre 2006

Course Content

Unit I: Saluer **08 Hours**
Saluer - se présenter – demander et dire le prénom et le nom – identifier une personne – demander des nouvelles d'une personne – demander l'age, l'adresse, le numéro de téléphone – Formes de politesse – parler de ses gouts (Audio tape)
Unit II:Nommer des objets **08 Hours**
Nommer des objets – montrer et situer des objets – exprimer la possession – indiquer les couleurs – caractériser un objet – demander et indiquer le prix – montrer et situer des personnes
Unit III:Situer un lieu sur un plan **08 Hours**

Situer un lieu sur un plan – s'informer sur un lieu – demander son chemin – indiquer la direction – indiquer le moyen de transport – situer un lieu sur une carte – donner un conseil – week-end à la mer.(Audio tape)
Unit IV: Demander et donner l'heure **08 Hours**
Demander et donner l'heure – indiquer une date – faire une demande polie – demander la profession de quelqu'un – demander des informations. (Audio tape).

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
20	30	50	100

Name of The Course	**JAPANESE-I**				
Course Code	**JAPA1001**				
Prerequisite					
Co-requisite					
Anti-requisite					
	L	**T**	**P**	**C**	
	0	0	4	2	

Course Objectives

1) To Acquire four skills in the Japanese language:
   a. Listening: Ability to understand simple every day conversations.
   b. Speaking: Ability to handle some survival situations through circumlocutions and repetitions.
   c. Reading: Ability to read simple, short reading material including semi-authentic material.
   d. Writing: Ability to write simple sentences learned in class using the appropriate hiragana, katakana, and kanji.
2) To acquire a fundamental knowledge of Japanese grammatical structures.
3) To acquire some knowledge of the Japanese culture.

Course Outcomes

CO1	Interpret simple sentences, and read short sentences and,paragraphs.(K2)
CO2	Apply simples sentences to discuss about their family members, friends etc.(K3)
CO3	Develop an understanding of Japanese society and culture.(K4)
CO4	Assess all the four skills viz. reading, writing, listening and speaking.(K5)
CO5	Develop an understanding of Japanese society and Isshou ni ikimasen.

Text Book (s)

1. Shokyuu Nihongo, Japanese Language Center for International Students, Tokyo University of foreign Studies, Japan.
2. Nihongo Kana nyuu mon, Japan foundation, Japan.
3. Shin Nihongo no KISO-1, AOTS, 3A Corporation, Japan.

Reference Book (s)

1. Random House Japanese-English Dictionary
2. Japanese for Busy people, Video CD , AJALT, Japan.

Course Content

UNIT I: KANA NYUUMON	**8 Hours**
Introduction to Japanese syllabary - Vowels and Consonants, Hiragana, Katakana,& Romaji. Japanese - Numerals, Demonstrative pronoun, Greetings, Set phrases – Onegaishimasu – Sumimasen, wakarimasen, Parts of body (look and learn)	
Unit II: IIKATA NO NYUUMON	**8 Hours**
Hajimemashite - Hon no Kimochi	
Unit III: OREI TO SHITSUMON	**8 Hours**
kore wo kudasai - Sochira wa nanjikara nanji made desu ka.	
Unit IV: BUNPOO NO KATA	**8 Hours**

Kooshi en e ikimasu ka - Isshou ni ikimasen ka.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
20	30	50	100

Semester - II

Name of The Course	**APPLICATION ORIENTED PROGRAMMING USING PYTHON**			
Course Code	**BCSE1003**			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	**T**	**P**	**C**
	0	0	4	2

Course Objectives

Student will able to understand the basic knowledge of programming using python

Course Outcomes

CO1	Gain knowledge of Basic Programming with Python **(K3)**
CO2	Familiarize with python string handling techniques and user defined functions **(K4)**
CO3	Understand and use data structures like Lists, tuples, and dictionaries **(K3)**
CO4	Understand File handling **(K3)**
CO5	Use object oriented programming techniques **(K3)**

Text Book (s)

1. Tony Gaddis, Starting Out with Python, 3rd edition, Pearson
2. Y. Daniel Liang, Introduction to Programming Using Python, Pearson
3. Budd T A, Exploring Python , 2011, Tata McGraw Hill Education
4. Learning Python, Fourth Edition, Mark Lutz, O'Re illy publication

Reference Book (s)

1. Downey, Allen B., Think Python: How to Think Like a Computer Scientist. O'Reilly, 2012. Obtain free PDF at http://www.greenteapress.com/thinkpython/
2. Python Programming: An Introduction to Computer Science (Second Edition) John Zelle, ISBN 978-1-59028-241-0-9, Franklin, Beedle & Associates Inc., 2004.

Course Content

Unit I: Introduction **8 Lab hours**
History, Features, Working with Python, Installing Python, basic python syntax, interactive shell, editing, saving, and running a script. Tokens: Keywords, , Identifiers, Literals, Operators, data types; variables, assignments; immutable variables; numerical types; Operators and Boolean expressions. Debugging, comments in the program; understanding error messages; Built-in functions – type(), id(), eval(), random, chr(), ord();
Unit II: Condition Control Structures & Input Output **8 Lab hours**
Conditional Statements: If, If-else, Nested if-else; Loops: For, While, Nested loops; Control Statements: Break, Continue, Pass; Input and output: Taking input from user through keyboard, manipulation of input, formatted input, formatted output.
Unit III: Function and Strings **8 Lab hours**
Functions in Python: Defining a function, Calling a function, Types of functions, Function Arguments, Global and local variables. Strings: Single quoted, double quoted & triple quoted, String manipulations:

subscript operator, indexing, slicing a string; strings and number system: converting strings to numbers and vice versa.
Unit IV: Lists, Tuples and Dictionaries **8 Lab hours**
Basic List operators, iterating over a list, replacing, inserting, removing an element; searching and sorting lists, calculating the sum and average of items in a list ; Tuples - sequence of values , immutability, Comparing tuples, Tuple assignment: Dictionary- Store data as key-value pairs in dictionaries, search for values, change existing values, add new, key-value pairs, and delete key-value pairs, nesting objects, sorting, dictionary literals, adding and removing keys, accessing and replacing values; traversing dictionaries.
Unit V: Files, Regular Expressions & Modules **8 Lab hours**
Reading/writing text and numbers from/to a file in text files and csv files; Regular expressions, importing and creating modules: Manipulating files and directories using os module.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
50		50	100

Name of The Course	PSYCHOLOGY AND SOCIOLOGY			
Course Code	PSSO-1001			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	2	0	0	2

Course Objectives

Objective of this course is to develop social-psychological skills among the students to meet out the challenges of industry and society**.**

Course Outcomes

CO1	Understanding of the basic facts of psychology and their application
CO2	develop an ability to work in the work groups and communicate effectively
CO3	Develop sociological understanding of Social process, Social Institutions, Social inequality, stratification, mobility, Social change and Movement.
CO4	Demonstrate scientific understanding of major social themes & social phenomena of industrial society, that impact engineer's various realms of life.
CO5	Develop leadership quality, potential to analyze and address social issues and to transform young engineers as a very good human being and successful technocrat.

Text Book (s)

1. Bottomore, T B .,Sociology: A Guide to Problems and Literature, London: George Allen & Unwin1962
2. .Robbins Stephens, Organizational Behaviour. P. Printice Hall International ,Inc. Eaglewood cliffs, 2005,ISBN: 0-13-191435,11th Edition
3. Giddens, A. ., Sociology, Cambridge; Polity ,2000.
4. Horton P B & Hunt C L Sociology, New York: McGraw-Hill Co., 1964.
5. The Sociology of Social Problems. Authors, Paul B. Horton, Gerald R. Leslie, Richard F. Larson. Edition, 10, illustrated. Publisher, Prentice Hall, 1991

Reference Book (s)

1. Clifford T. ***Morgan***, Richard A ***King***, John R Weisz and John Schopler; Introduction to Psychology Published: 19/02/2001; Edition: 7; ISBN: 9780074622506
2. Haralambos, M and Holborn., M. Sociology, London: HaperCollins,2000.

Course Content

Unit-1
Industrial Psychology

Psychology: Meaning, Definition, nature and Scope. Relevance for engineers. **Personality:** Definition and types, theories. **Memory:** Types, and models, strategies to improve memory. **Motivation:** Motivational theories and job satisfaction, **Learning**: Types, classical conditioning, operand conditioning & observational learning
Unit-2
Group dynamics and leadership: skills and various types, **Stress ,Stress management** Definition, types, causes, strategies to cope with stress **Work Environment**: Fatigue and boredom, , accidents and safety
Unit-3
Introduction To Industrial Sociology: Sociology , Industrial Sociology: Meaning definition, Nature, scope, Importance of Sociology for Engineers, **Basic concepts:** Interaction, Group, community, Society, **Social Processes:** Associative & Dissociative, social process and organizational goals. **Social Institutions:** Family ,Marriage, Religion: Functions and dysfunctions & Impact of Industrialization
Unit-4
Social and Industrial Concerns - Social Inequality, Stratification & Mobility, Impact of Industrialization on Sanskritization Urbanization, Westernization, & Modernization, **Social Change and Social Movements:** Meaning Definition, Genesis, Types, Functions, role in Social transformation. **Industrialization in India and Industrial** policy resolution 1956., **Industrial Disputes:** Strikes and lockouts,
Unit-5
Industrial relations machinery Bi-partite & Tripartite agreement, Labour courts, Industrial tribunals, code of Discipline, Standing orders., **Social Problems:** - Social Disorganization, Unemployment, Deviance, Delinquent behaviour amongst youth, Crime, , Gender injustice, Child Abuse, Terrorism.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
20	30	50	100

Name of The Course	ENVIRONMENTAL SCIENCE			
Course Code	ENVS-1001			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	3	0	0	3

Course Objectives

Determine the harmful effects of toxic chemicals on living beings and environment. Identify the scope and importance of studying the environment and analyze the problems associated with various natural resources.

Course Outcomes

CO1	Identify the scope and importance of studying the environment and analyze the problems associated with various natural resources. **(K4)**
CO2	Determine the harmful effects of toxic chemicals on living beings and environment. **(K2)**
CO3	Identify the harmful effects of environmental pollution and apply suitable control methods. **(K4)**
CO4	Analyze the different social issues affecting the society and environment. **(K4)**
CO5	Interpret and utilize the different tools of Green Chemistry towards generating a zero waste environment **(K3)**

Text Book (s)

1. Environmental Studies, Anubha Kaushik, C P Kaushik, New Age International Publishers, 2008, ISBN:978-81-224-2159-0.
2. Environmental Studies, Suresh K. Dhameja, S.K. Kataria and Sons , 2008, ISBN: 81-88458-77-5
3. Text Book of Environmental Studies, Erach Bharucha, University Press (India) Private Limited, 2005, ISBN: 978 81 7371 540 2
4. Environmental Studies (From Crisis to Cure) Second Edition. , R. Rajagopalan, Oxford University Press, 2012, ISBN 0-19-807208-2.
5. Environmental Studies, Ranu Gadi, Sunitta Rattan, Sushmita Mohapatra, S.K. Kataria and Sons, 2008, ISBN: 81-89757-98-9.

Reference Book (s)

1. Environmental Studies , Benny Joseph , Tata McGraw Hill Education Private Limited, 2009, ISBN: 987-0-07-064813-5.
2. Environmental Studies, Anindita Basak, Pearson Education, 2009, ISBN: 978-81-317-2118-6.
3. Principles of Environmental Science (Inquiry and Applications), William P. Cunningham & Mary Ann Cunningham, Tata McGraw Hill Education Private Limited, 2007, ISBN: 987-0-07-064772-0.

Course Content

Unit I: Environment and Natural Resources **10 Hours**
Definition, scope, importance, need for public awareness, Environmental Management Systems its objectives, components, EIA, Natural Resources – forest resources – use, exploitation, deforestation, construction of multipurpose dams – effect on forests, Water resources – use of surface and subsurface water; effect of floods, drought, water conflicts, Mineral resources –Use and exploitation, environmental

effects of extracting and using mineral resources, Food resources – food problems, advantage and disadvantage of fertilizers & pesticides, effect on environment, Energy resources – need to develop renewable energy, land resources – Land degradation, landslides, soil erosion, desertification & case studies.
Unit II: Chemical Toxicology **7 Hours**
Toxic chemicals in the environment, Impact of toxic chemicals on enzymes, biochemical effects of arsenic, cadmium, lead, chromium, mercury, biochemical effects of pesticides
Unit III: Environmental Pollution **10 Hours**
Definition – Causes, pollution effects and control measures of Air, Water, Soil, Marine, Noise, Thermal, Nuclear hazards. Solid waste management: causes, effects and control measures of urban and industrial wastes, pollution measures, case studies, Disaster management: floods, earthquake, cyclone and landslides.
Unit IV: Social Issues **9 Hours**
Urban problems related to energy & sustainable development, water conservation, problems related to rehabilitation – case studies, Consumerism and waste products - Environment Protection Act, Air, Water, Wildlife, Forest Conservation Act, Environmental legislation and public awareness. Population growth, variation among nations, Population explosion, Environment and human health, Value Education, Women and Child Welfare, Role of Information Technology – Visit to local polluted site /Case Studies.
Unit V: Green Chemistry **4 Hours**
Introduction, Basic principles of green technology, concept of Atom economy, Tools of Green technology, zero waste technology.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
20	30	50	100

Name of The Course	**MATRICES AND DIFFERENTIAL EQUATIONS.**				
Course Code	**MATH1003**				
Prerequisite					
Co-requisite					
Anti-requisite					
	L	**T**	**P**	**C**	
	3	0	0	3	

Course Objectives

Solve a system of linear equations and utilize it to solve Inverse problem, Eigen value problem and diagonalisation problem.

Course Outcomes

CO1	Apply elementary matrix operations to find rank and solve a system of linear equations and Utilize it to solve Inverse problem, Eigen value problem and Diagonalisation problem. (**K3)**
CO2	Solve nth order ordinary differential equation with constant coefficients and apply it to solve Simple electric circuits. **(K3)**
CO3	Produce the Fourier series of a periodic function. **(K3)**
CO4	Apply separation of variable method to solve 1-dim wave equation, 1-dim heat and 2-dim Laplace equation.**(K3)**
CO5	Apply it to solve Simple electric circuits.

Text Book (s)

1. *Erwin Kreyszig,* **Advanced Engineering Mathematics,** 10th Edition, John Wiley &Sons.
2. *Peter V. O'Neil,* **Advanced Engineering Mathematics,** 7th Edition, CengageLearning

Reference Book (s)

1. *R. K. Jain and S. R. K. Iyengar,* **Advanced Engineering Mathematics**, 4th Edition, NarosaPublishers.
2. *Robert T. Smith and Roland B. Minton,* **Calculus**, 4th Edition, McGraw HillEducation.

Course Content

Unit I: Matrices and Eigen value Problem 12 Hours
Matrix algebra, Elementary transformations and Elementary matrices, Inverse of matrix using elementary transformations, Linear dependence and independence of vectors, Rank of a matrix, Solution of system of linear equations, Definition, properties and computation of Eigen values and Eigenvectors, Cayley-Hamilton theorem, Diagonalization.
Unit II:Ordinary Differential Equations 10 Hours
Basic concepts, Exact differential equations, Linear differential equations of second and higher order with constant coefficients, Complementary function and particular integral, Complete solution, Method of variation of parameters, Cauchy-Euler equation, System of linear differential equations with constant coefficients, Applications of linear differential equations.
Unit III: Fourier series 8 Hours
Periodic functions, Fourier expansion of general functions, Fourier expansion of odd and even functions, Fourier expansion of some standard waveforms, Half range sine and cosine series, Harmonic analysis.
Unit IV: Partial Differential Equations 10 Hours

Basic concept, Classification of second order linear PDE, Method of separation of variables and its application to solve Wave equation (one dimension), heat equation (one dimension) and heat equation (two dimension steady state only).
Unit V: Matrices and Eigen value Problem **12 Hours**
Matrix algebra, Elementary transformations and Elementary matrices, Inverse of matrix using elementary transformations, Linear dependence and independence of vectors, Rank of a matrix, Solution of system of linear equations, Definition, properties and computation of Eigen values and Eigenvectors, Cayley-Hamilton theorem, Diagonalization.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
20	30	50	100

Name of The Course	EXPLORATION WITH CAS-II			
Course Code	MATH-1004			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	0	0	2	1

Course Objectives

Students will able to understand the fourier coefficient and plotting the graph of different wave forms.

Course Outcomes

CO1	Find rank, determinant, inverse, trace, echelon form, Eigen value and Eigen vector , diagonalization of matrix and solution of a system of system of linear equations. (**K3)**
CO2	Find numerical and graphical solution of initial value problem of first and second order and system of simultaneous differential equations. **(K4)**
CO3	Find the Fourier coefficient and plotting the graph of different wave forms.. **(K4)**
CO4	Find numerical and graphical solution of complicated 1-dim wave equation, 1-dim heat and 2-dim Laplace equation.**(K4)**

Reference Book (s)

1. A. Vande Wouwer, P. Saucez, C. V. Fernández, : Simulation of ODE/PDE Models with MATLAB®, OCTAVE and SCILAB: Scientific and Engineering Applications, 2014.
2. Dr. M. Affouf, Scilab by example, ISBN: 978-1479203444, 2012.

Course Content

S. No	List of Experiment
1	Operation on Matrices (addition, multiplication, inverse, transpose).
2	Computation of Eigen values and Eigen vectors of a square matrix.
3	Solution of system of linear equations using matrix.
4	Solution of differential equations of order one and two.
5	Solving an initial value problem with different initial conditions.
6	Plotting the graph of the solution for different initial conditions.
7	Fourier series expansion of different wave forms and comparison with the original function.
8	Solving one dimensional wave equation under specified conditions and graphing the solution.
9	Solving one dimensional heat equation under specified conditions and graphing the solution.
10	Solving a Laplace equation to find the steady state temperature in the square plate satisfying specific boundary conditions and graphing isotherms

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
50		50	100

Name of The Course	PHYSICS OF SEMICONDUCTOR DEVICES FOR CSE, ECE, EEE			
Course Code	**PHYS1004**			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	**T**	**P**	**C**
	3	0	0	3

Course Objectives

The students are able to learn fundamental operation of transistors, Field effect transistor, Biasing and applications.

Course Outcomes

CO1	Describe the fundamentals of intrinsic and extrinsic semiconductors.(K2)
CO2	Interpret the Junction theory, and breakdown phenomena of avalanche and Zener processes. (K3)
CO3	Explain the rectifiers, ripple factor , filtering, diode protection and application of diodes. (K2)
CO4	Utilize the fundamental operation of transistors, Field effect transistor, Biasing and applications.(K3)
CO5	Explain the principles of combinational and sequential circuits.(K2)

Text Book (s)

1. Kanaan Kano, Semiconductor Devices, PHI, 2005.
2. S.O. Pillai, Solid State Physics, New Age International Pvt. Ltd,7th Edition 2015.
3. M. Morris Mano, Digital logic and Computer design, Pearson.
4. V.K. Mehta and Rohit Mehta, Principle of Electronics, S. Chand Publication, New Delhi

Reference Book (s)

1. Robert Boylestad, Electronic Devices and Circuit Theory, Pearson (Tenth Edition)2009.
2. Pallab Bhattacharya, Semiconductor Optoelectronic Devices, PHI, 2004.
3. M. S. Tyagi, Introduction to semiconductor materials and devices, John Wiley & Sons, 2004.
4. D. A. Neamen, Semiconductor physics and devices. 3rd Edition, McGraw-Hill, 2003.

Course Content

UNIT-I: Semiconductor Fundamentals **8 Hours**
intrinsic and extrinsic semiconductors, elemental and compound semiconductor, Carrier concentration and Fermi level of intrinsic and extrinsic semiconductor, Thermal Effect, conductivity and carrier mobility in semiconductors, Hall effect
UNIT-II: Junction Theory **8 Hours**
PN Junction, junction potential, biasing of PN Junctions, I-V relationships, Static & dynamic resistances, Breakdown phenomena- avalanche and Zenner processes, Zenner diode.
UNIT–III: Applications of Diode **8 Hours**
Sinusoidal inputs, Rectifiers (half &full wave), ripple factor, Power supply filtering, Circuit applications of diodes, Clippers, Clampers, Inductive loads and diode protection.
UNIT–IV: Transistors **10 Hours**
Bipolar junction transistors, Fundamentals of operation,(CB, CE, CC configuration),Transistors parameters, Leakage current, Biasing, Amplification, Field Effect Transistors (FET).
UNIT–V: Combinational and Sequential Circuits: **12 Hours**

Basic theorems and properties of Boolean algebra, Logic Operation, digital logic gates, Combinational circuits: adder and subtractor, comparator, decoder, encoder, Multiplexer de-multiplexer. Sequential Circuits- Flip flops - SR, D, JK and T

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
20	30	50	100

Name of The Course	**ADVANCE PHYSICS LAB**				
Course Code	**PHYS 1005**				
Prerequisite					
Co-requisite					
Anti-requisite					
	L	**T**	**P**	**C**	
	0	0	2	1	

Course Objectives

Students are able to learn the physical principle involve in the various instruments and relate them to new applications.

Course Outcomes

CO1	Understand the physical principle involve in the various instruments and relate them to new applications.
CO2	Operate CRO and various optical instruments such as- spectrometer, travelling microscope and spherometer.
CO3	Calculate the physical constants by various methods such as- Planck's constant, wavelength of monochromatic light, Hall coefficients, band gap etc. and realize the accuracy in measurements.
CO4	Develop the individual and team work for the performance of scientific works.
CO5	Develop the skill for making scientific graphs, error analysis and measurement technology used in engineering.

Course Content

S. No	List of Experiment
1	To measure the Planck's constant using LED method.
2	To determine the wavelength of monochromatic light using Newton's ring method.
3	To find the wavelength of monochromatic light with the help of a plane transmission diffraction grating and spectrometer.
4	To determine the angle of prism with the help of spectrometer.
5	To draw the characteristics of solar cell and to estimate Fill Factor (FF), and efficiency of solar cell.
6	To determine the specific resistance of given unknown wire using Carey Foster's bridge.
7	To draw the hysteresis curve (B-H curve) of a given sample of Ferromagnetic material and to determine retentivity, coercivity and hysteresis loss.
8	To draw the characteristics of p-n junction diode and to estimate the dynamic and static resistance.
9	To study the Hall Effect and to determine the Hall coefficient, carrier density and hall mobility of a given semiconductor material using Hall set-up.
10	To determine the energy band gap of a given pure semiconductor using four probe method.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
50		50	100

Name of The Course	Engineering Chemistry				
Course Code	CHEM-1001				
Prerequisite					
Co-requisite					
Anti-requisite					
		L	T	P	C
		3	0	0	3

Course Objectives

- To acquire knowledge about desalination of brackish water and treatment of municipal water.
- To gain the knowledge of conducting polymers, bio-degradable polymers and fiber reinforced plastics.
- To learn significance of green chemistry and green synthesis and the synthesis of nano materials.

Course Outcomes

CO1	Determine the atomic structure and predict the position of element in periodic table. (**K2)**
CO2	Determinethe properties and shape of molecules by various theories of chemical bonding. **(K4)**
CO3	Differentiate nuclear reactions and apply nuclear chemistry to calculate age of samples. **(K4)**
CO4	Demonstrate the concepts of thermodynamics and chemical kinetics.**(K3)**
CO5	Correlate the structure and properties of biomolecules and identify the photochemical reactions. **(K2)**

Text Book (s)

1. Darrell *Ebbing*, Steven *Gammon, General Chemistry,* Cengage Learning*, 2012, ISBN* 978-1-285-05137- 6, *10th Edition*
2. William R. *Robinson*, Jerome D. *Odom*, Henry Fuller *Holtzclaw*. General Chemistry, Houghton Mifflin Harcourt Publishing Company, 1996, Edition 10, ISBN 066935483X, 9780669354836.
3. ArunBahl, B. S. Bahl and G.D. Tuli, Essential of Physical Chemistry, S. Chand and Company Ltd., New Delhi, 2009, ISBN 81-219-2978-4, Ed 2009.

Reference Book (s)

1. T.W. Graham Solomons and Craig Fryhle, Organic Chemistry, John Wiley and Sons, Inc., 2011,ISBN: 0470556597, 10th Ed.
2. Julio De Paula, Peter Atkins, Physical Chemistry, Oxford University Press, 2011, ISBN-13: 9780199599592
3. *Lehninger, Principles of Biochemistry* [David L. Nelson, Michael M. Cox] on W H Freeman & Co.,February 1, 2008, | *ISBN*-10: 071677108X | *ISBN*-13: 978-0716771081 | *Edition*: *5th*.
4. **Mehrotra R. C, Singh Anirudh** Organometallic Chemistry: a unified approach, New Age International, New Delhi, 2007, ISBN: 9788122412581.
5. J. House, Inorganic Chemistry, Imprint Academic Press, 2012, ISBN 9780123851109

Course Content

Unit I: Introduction to Atomic Structure **12 Hours**
Structure of the Atom, Introduction to Periodic Table, Evolution of Atomic Theory, Thomson's plum pudding model, Rutherford's model and Rutherford-Geiger-Marsden Experiment, Black body radiation; Planck-Einstein Relationship, Planck's constant; Bohr's Model; Bohr's postulates; Matter-Energy interactions involving hydrogen atom; Rydberg Equation; Bohr-Sommerfield Model; Hydrogen Spectral Series (Balmer Series); Wave- Particle duality (de-Broglie's rule); Heisenberg's Uncertainty Principle; Quantum-Mechanical Model of the Atom; Quantum numbers; s, p, d, f, orbitals; Stern-Gerlach Experiment; Aufbau Principle; Pauli's Exclusion Principle; Hund's Rule; Electronic configuration based on Quantum States.
Unit II: Introduction to Chemical Bonding **9 Hours**
Covalent Bond; sigma and pi bond; single, double and triple bonds; Ionic Bond; Octet stability; Lewis dot structure ; VSEPR Theory; LCAO-MO; H_2; CO; Valence Bond Theory; Periodic trends of chemical properties; Inter-molecular and Intra-molecular bonding (Hydrogen Bonding, Van Der Waals forces, London Forces, etc); dipole moment; polarizibility of molecules; Metallic bonding. Band theory of solids; conductors; semiconductors; insulators.
Unit III: Nuclear Chemistry **6 Hours**
Nuclear Fission, Nuclear Fusion, Half Life, Mass Defect, Astro-chemistry (Reactions in Stars, Mechanism of decay of Stars); Carbon Dating, Related Numerica
Unit IV: Thermodynamics and Chemical Kinetics **6 Hours**
First Law, Second Law, Third Law and Zeroeth Law of Thermodynamics, Enthalpy, Entropy, Gibbs Free Energy, First, second and zero order reactions; Arrhenius Equation
Unit V: Photochemistry and Biochemistry
Introduction to Photochemistry; Photochemical reactions of organic molecules (Electrocyclic reactions, Norrish reactions; photoisomerization, Zimmerman's Rearrangement), Introduction to Carbohydrates, Lipids and Proteins. DNA structure.

Continuous Assessment Pattern

Internal Assessment (IA)	**Mid Term Test (MTE)**	**End Term Test (ETE)**	**Total Marks**
20	30	50	100

Name of The Course	ENGINEERING CHEMISTRY LAB			
Course Code	CHEM-1003			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	0	0	2	1

Course Objectives

1. Provide the students with a solid foundation in Chemistry laboratory required to solve engineering problems.
2. Practical implementation of fundamental concepts

Course Outcomes

CO1	Employ the volumetric titrations techniques used in chemistry laboratory for analysis.
CO2	Analyse to differentiate between hard and soft water using complexometric titration.
CO3	Calculate the percentage of dissolved oxygen in water sample.
CO4	Identify the viscosity of liquid using Ostwald viscometer.
CO5	Analyse the Carbohydrate and protein in given organic compound.

Course Content

S. No	List of Experiment
1	To estimate the total permanent and temporary hardness of the given hard water sample. A standard calcium ion solution (1 mg of $CaCO_3$ in 1 ml) and an approximately 0.01M solution of EDTA are provided.
2	To estimate the amount of Zinc in the given solution by using the standard solution of Potassium Ferrocyanide.
3	To Determine the Alkalinity of a given Water Sample
4	To find out the amount of dissolved oxygen in the given sample of water.
5	To find out relative and absolute viscosity of a given liquid using Ostwald's viscometer**.**
6	Detection of the elements in given organic compound.
7	To estimate the amount of Copper present in the given solution using a standard solution by provided hypo solution.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
50		50	100

Name of The Course	PRODUCT DESIGN USING GRAPHICS			
Course Code	BTME-1002			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	0	0	4	2

Course Objectives

1. Provide basic foundation in computer aided design / manufacturing.
2. Understand the fundamentals used to create and manipulate geometric models.
3. Get acquainted with the basic CAD software designed for geometric modelling
4. Learn working principles of NC machines CNC control and part programming
5. Understand concept of Group Technology, FMS and CIM .

Course Outcomes

CO1	Understand the concept and principles of engineering graphics in product design (**K2)**
CO2	Make isometric and orthographic projection of solids along with free hand sketching **(K4)**
CO3	Develop a solid model using AutoCAD**(K4)**
CO4	Make a solid modeling for a given assembly.**K3)**
CO5	Apply the concepts and techniques learnt in the course in making hands-on project.**(K2)**

Text Book (s)

1. Asimow, M. (1962). Introduction to design. Englewood Cliffs: Prentice-Hall.
2. K C John (2009), Engineering Graphics for Degree, Prentice Hall of India. ISBN: 978-8-120-33788-3.
3. P N Rao (2010), CAD/CAM Principles and Applications, 3rd Edition, Tata McGraw-Hill Education, ISBN: 978-0-070-68193-4.

Reference Book (s)

1. Course material uploaded on LMS

Course Content

Unit I: Introduction – Understanding the Concept of Product Design **10 Hours**
Fundamentals of Design : Design by Evolution and Design by Innovation, Principles that govern any design, Morphology and Process of Design, Application of Graphics in Design, Engineering Graphics: An Overview, Introduction to Computer Aided Drafting , Lettering, Numerals and Dimensioning.
Unit II: Projection of Solids **16 Hours**
Concept of Projection, Object in four quadrant, 2-D description of quadrants, Orthographic Projection of Solids, Isometric Projection of Solids, Free-hand sketching
Unit III: Solid Modeling **10 Hours**
Division of Engineering Solids- Polyhedra, Regular and Irregular polyhedral, solids of revolution, Geometric Modeling – Wireframe, B-Rep and Solid Modeling, Solid Modelling using AutoCAD
Unit IV: Introduction to Assembly **10 Hours**
Types of assembly drawings, Accepted Norms for Assembly Drawings, Sequences of Preparing the Assembly Drawing, Solid Modeling of assembly
Unit V: Application of Design Concepts for Product Design **10 Hours**

Hands-on Project in Groups: Choose a specific objective for Product Design, Design the Product and Model it using AutoCAD, presentation.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
20	30	50	100

Name of The Course	BASIC ELECTRICAL AND ELECTRONICS ENGINEERING			
Course Code	BEEE-1002			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	3	0	0	3

Course Objectives

1. To develop solid foundation for further study of electrical and electronics courses
2. To develop the analytical skills for solving the electrical and electronics circuits
3. To learn the utility of basic electronics devices and circuits
4. To understand the basic principles of electrical machines

Course Outcomes

CO1	Learn and solve different electrical and electronic circuits applying different laws and theorems.
CO2	Develop concepts of the logic circuits, minimize and realize the digital circuits
CO3	Implement electronic circuits involving semiconductor diodes and transistors
CO4	Acquire the knowledge about working of transformers, DC, induction and synchronous machines
CO5	Explain the electrical and electronic circuit theories and verify them through experiments

Text Book (s)

1. D. P. Kothari and I. J. Nagrath, "Basic Electrical and Electronics Engineering", McGraw Hill, 20016.
2. V. Mittle and Arvind Mittle, "Basic Electrical Engineering", McGraw Hill, 2005.
3. Robert L. Boylestad and Louis Nashelsky, "Electronic Devices and Circuit Theory", 9th Edition, Pearson Education, 2007.
4. A. P. Malvino and Donald Leach, "Digital Principles and Applications", 6th Edition, Tata McGraw Hill, 2006.

Reference Book (s)

1. D. C. Kulshreshtha,"Basic Electrical Engineering", Tata McGraw Hill, 2009.
2. J. Edminister and M. Nahvi , "Electric Circuits", 3rd Edition, Tata McGraw-Hill, New Delhi, 2002.
3. Jacob Millman, Christos C. Halkias, Satyabrata Jit, "Electronics Devices and Circuits",
4. 3rd Edition, Tata McGraw Hill, 2008

Course Content

Unit I: Elementary Circuit Analysis **8 Hours**
Ohm's law, KCL, KVL, node voltage analysis, mesh current, circuits with independent sources, Thevenin's & Norton's equivalent, maximum power transfer and superposition theorem.
Unit II: Analysis of DC and AC Circuits **7 Hours**
RL and RC transients in circuits with DC source, RMS values, the use of phasors for constant frequency sinusoidal sources, steady state AC analysis of a series circuit, parallel circuits, AC power calculations.
Unit III: Digital Systems **8 Hours**
Basic logic circuit concepts, Basic Gates and Universal Gates, representation of numerical data in binary form – Binary to decimal, Octal, Hexadecimal, Boolean algebra, combinational logic circuits- Half adder, full adder, synthesis of logic circuits, minimization of logic circuits.

Unit IV: Semiconductor Devices	**7 Hours**
Basic diode concepts, ideal diode model, rectifier and wave-shaping circuits, zener diode voltage regulator concepts, bipolar junction transistors, current and voltage relationship, common emitter characteristics.	
Unit V: Electro-mechanics	**10 Hours**
Transformers-Ideal and real transformers, Construction, Principle of operation of transformer, E.M.F Equation, Phasor diagram of transformer, Losses, efficiency. D.C Machines-Construction, principles of rotating DC machines, Types of Excitations-separately excited and self excited (shunt, series and compound) DC machines. Three phase induction motors-Construction, Principle of operation, synchronous speed, slip, and frequency of rotor emf. Synchronous Machines-construction, principle of operation of synchronous motor and applications.	

Continuous Assessment Pattern

Internal Assessment (IA)	**Mid Term Test (MTE)**	**End Term Test (ETE)**	**Total Marks**
20	30	50	100

Name of The Course	BASIC ELECTRICAL AND ELECTRONICS ENGINEERING LAB			
Course Code	**BEEE-1003**			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	**T**	**P**	**C**
	0	0	2	1

Course Objectives

1. An understanding of basic electrical wiring, measurements, and methods
2. Students understand measurement errors and non-ideal electrical devices
3. Students understand wiring and operation or operational amplifiers
4. Students demonstrate effective written communication skills

Course Outcomes

CO1	Apply and verifying basic electrical laws.
CO2	Realize and apply basic theorems in electrical network and circuits.
CO3	Verify the truth tables of logic Gates
CO4	Analyze characteristics of basic diodes and transistors.
CO5	Realize and verify the working of transformer.

Text Book (s)

1. D. P. Kothari and I. J. Nagrath, ―Basic Electrical and Electronics Engineering, McGraw Hill, 20016.

Reference Book (s)

1.Jacob Millman, Christos C. Halkias, Satyabrata Jit, ―Electronics Devices and Circuits.

S. No	List of Experiments
1	To verify (i) Kirchoff's current law (ii) Kirchoff's voltage law
2	Verification of Thevenin's Theorem
3	Verification of Norton's Theorem
4	Verification of Maximum power transfer Theorem
5	Verification of Truth table for logic Gates- AND , OR, NOT, NAND, NOR and XOR and Half adder Circuit.
6	Study of P-N Junction Diode characteristics.
7	Study of ZENER Diode characteristics.
8	Study of CE characteristics of a Bipolar Junction Transistor.
9	Study of characteristics of FET.
10	Study of open circuit and short circuit tests on a single phase transformer and obtaining its equivalent circuit parameters.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
50		50	100

Name of The Course	PRODUCT MANUFACTURING				
Course Code	BTME-1003				
Prerequisite					
Co-requisite					
Anti-requisite					
		L	T	P	C
		0	0	2	1

Course Objectives

The focus of Product Design and Development is integration of the marketing, design, and manufacturing functions of the firm in creating a new product.

Course Outcomes

CO1	Develop a product using Welding Process.
CO2	Develop a product out of a given sheet.
CO3	Assemble a product of wood in carpentry shop.
CO4	Create a product using casting and then machining.
CO5	Assemble different components to get final product with the help of welding.

Text Book (s)

1. Product Manufacturing Manualprepared by faculties of School of Mechanical Engineering.

Reference Book (s)

1. A.K. Hajra Choudhury, S.K. Hajra Choudhury and Nirjhar Roy (2009), Elements of Workshop Technology, Vol. – I, Media Promoters, ISBN: 978-8-185-09914-9.
2. A.K. Hajra Choudhury, S.K. Hajra Choudhury and Nirjhar Roy (2010), Elements of Workshop Technology, Vol. – II, Media Promoters, ISBN: 978-8-185-09915-6.

Course Content

S. No	List of Experiment
1	To prepare a given product using the knowledge gained in Product Manufacturing Lab while working in the lab. (To be submitted at the end of the session and evaluated in the external examination)
2	**2. Welding Shop** Any two of the following a. Prepare a Lap joint as per drawing using Oxy-Acetylene Gas welding. b. Prepare a T-joint as per drawing using Oxy-Acetylene Gas welding. c. Prepare a Butt-joint as per drawing using Oxy-Acetylene Gas welding. d. Prepare L- joint as per drawing using Oxy-Acetylene Gas welding. e. Prepare a Lap joint as per drawing using Electric Arc welding. f. Prepare a T-joint as per drawing using Electric Arc welding. g. Prepare a Butt-joint as per drawing using Electric Arc welding. Prepare L- joint as per drawing using Electric Arc welding

3	**3. Fitting Shop** a. Prepare a Male/Female Parts as per drawing
4	4**. Lathe Machine Shop** **a.** Preparation of Job as per drawing
5	**5. Sheet metal Shop** a. Preparation of funnel of given dimension. Use soldering to join lower part with upper and use riveting to join cylinder.
6	**6. Foundry Shop** • Preparation of Job of aluminum as per drawing through casting.
7	**6. Black Smithy Shop** Any one of the following a. Preparation of S shaped hook of given drawing of MS rod. b. Making of chisel of given drawing of MS rod. c. Making of a wheel of given drawing of MS rod.
8	**8. Carpentry Shop** Any one of the following a. Preparation of T-Joint of given dimension. b. Preparation of Lap Joint of given dimension. c. Preparation of Cross Joint of given dimension. Preparation of Dove Tail Joint of given dimension

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
50		50	100

Name of The Course	UNIVERSAL HUMAN VALUES AND ETHICS			
Course Code	UHVE-1001			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	0	0	4	2

Course Objectives

1. To help students distinguish between values and skills, and understand the need, basic guidelines, content and process of value education.
2. To help students initiate a process of dialog within themselves to know what they 'really want to be' in their life and profession
3. To help students understand the meaning of happiness and prosperity for a human being.
4. To facilitate the students to understand harmony at all the levels of human living, and live accordingly.
5. To facilitate the students in applying the understanding of harmony in existence in their profession and lead an ethical life

Course Outcomes

CO1	Understand the significance of value inputs in a classroom and start applying them in their life and profession
CO2	Distinguish between values and skills, happiness and accumulation of physical facilities, the Self and the Body, Intention and Competence of an individual, etc.
CO3	Understand the value of harmonious relationship based on trust and respect in their life and profession
CO4	Understand the role of a human being in ensuring harmony in society and nature.
CO5	Distinguish between ethical and unethical practices, and start working out the strategy to actualize a harmonious environment wherever they work.

Text Book (s)

1. R R Gaur, R Sangal, G P Bagaria, 2009, A Foundation Course in Human Values and Professional Ethics.

Reference Book (s)

1. Ivan Illich, 1974, Energy & Equity, The Trinity Press, Worcester, and Harper Collins, USA
2. E. F. Schumacher, 1973, Small is Beautiful: a study of economics as if people mattered, Blond & Briggs, Britain.
3. Sussan George, 1976, How the Other Half Dies, Penguin Press. Reprinted 1986, 1991
4. Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972, Limits to Growth – Club of Rome's report, Universe Books.
5. A Nagraj, 1998, Jeevan Vidya Ek Parichay, Divya Path Sansthan, Amarkantak.
6. P L Dhar, RR Gaur, 1990, Science and Humanism, Commonwealth Publishers.
7. A N Tripathy, 2003, Human Values, New Age International Publishers.
8. SubhasPalekar, 2000, How to practice Natural Farming, Pracheen (Vaidik) KrishiTantraShodh, Amravati.
9. E G Seebauer & Robert L. Berry, 2000, Fundamentals of Ethics for Scientists & Engineers , Oxford University Press
10. M Govindrajran, S Natrajan & V.S. Senthil Kumar, Engineering Ethics (including Human Values), Eastern Economy Edition, Prentice Hall of India Ltd.

11. B P Banerjee, 2005, Foundations of Ethics and Management, Excel Books.
12. B L Bajpai, 2004, Indian Ethos and Modern Management, New Royal Book Co., Lucknow. Reprinted 2008.

Course Content

Course Introduction - Need, Basic Guidelines, Content and Process for Value Education
1. Understanding the need, basic guidelines, content and process for Value Education 2. Self Exploration–what is it? - its content and process; 'Natural Acceptance' and Experiential Validation- as the mechanism for self exploration 3. Continuous Happiness and Prosperity- A look at basic Human Aspirations 4. Right understanding, Relationship and Physical Facilities- the basic requirements for fulfillment of aspirations of every human being with their correct priority 5. Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario 6. Method to fulfill the above human aspirations: understanding and living in harmony at various levels
Understanding Harmony in the Human Being - Harmony in Myself
7. Understanding human being as a co-existence of the sentient 'I' and the material 'Body' 8. Understanding the needs of Self ('I') and 'Body' - Sukh and Suvidha 9. Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer) 10. Understanding the characteristics and activities of 'I' and harmony in 'I' 11. Understanding the harmony of I with the Body: Sanyam and Swasthya; correct appraisal of Physical needs, meaning of Prosperity in detail 12. Programs to ensure Sanyam and Swasthya
Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship
13. Understanding harmony in the Family- the basic unit of human interaction 14. Understanding values in human-human relationship; meaning of Nyaya and program for its fulfillment to ensure Ubhay-tripti; 15. Trust (Vishwas) and Respect (Samman) as the foundational values of relationship 16. Understanding the meaning of Vishwas; Difference between intention and competence 17. Understanding the meaning of Samman, Difference between respect and differentiation; the other salient values in relationship 18. Understanding the harmony in the society (society being an extension of family): Samadhan, Samridhi, Abhay, Sah-astitva as comprehensive Human Goals 19. Visualizing a universal harmonious order in society- Undivided Society (AkhandSamaj), Universal Order (SarvabhaumVyawastha)- from family to world family!
Understanding Harmony in the Nature and Existence - Whole existence as Co-existence
20. Understanding the harmony in the Nature 21. Interconnectedness and mutual fulfillment among the four orders of nature- recyclability and self-regulation in nature 22. Understanding Existence as Co-existence (Sah-astitva) of mutually interacting units in all-pervasive space 23. Holistic perception of harmony at all levels of existence
Implications of the above Holistic Understanding of Harmony on Professional Ethics
24. Natural acceptance of human values 25. Definitiveness of Ethical Human Conduct 26. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order 27. Competence in Professional Ethics: a) Ability to utilize the professional competence for augmenting universal human order, b) Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems, technologies and management models 27. Case studies of typical holistic technologies, management models and production systems 28. Strategy for transition from the present state to Universal Human Order:

a) At the level of individual: as socially and ecologically responsible engineers, technologists and managers

b) At the level of society: as mutually enriching institutions and organizations

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
20	30	50	100

Name of The Course	ENGLISH PROFICIENCY AND APTITUDE BUILDING - 1			
Course Code	SLBT1002			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	0	0	4	2

Course Objectives

1. To help students distinguish between values and skills, and understand the need, basic guidelines, content and process of value education.
2. To help students initiate a process of dialog within themselves to know what they 'really want to be' in their life and profession
3. To help students understand the meaning of happiness and prosperity for a human being.
4. To facilitate the students to understand harmony at all the levels of human living, and live accordingly.
5. To facilitate the students in applying the understanding of harmony in existence in their profession and lead an ethical life

Course Outcomes

CO1	Develop effective communication (listening and speaking) skills - be able to listen carefully and respectfully other's perspective and to express one's own ideas in a group.
CO2	Construct grammatically correct sentences and practicing correct pronunciation of common words in English language for effective communication.
CO3	Develop real-time problem solving skills in quantitative aptitude.
CO4	Develop basic data analyzing techniques which will help in forecasting and decision making.

Text Book (s)

Communication Skills for Engineers, Mishra, Sunita & C.Muralikrishna,, Pearson.

Reference Book (s):

SLLL own text book

Course Content

Unit I: Introduction&	**6 Hours**
• Ice Breaking Activity • Speaking Activity • Pronunciation •	
Unit II: Quantitative Aptitude	**6 Hours**
• Number System • Percentage • Profit and Loss	
Unit III Communication Skills	**6 Hours**
• Listening Skills • Pronouns	

Articles and Prepositions

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
20	30	50	100

Name of The Course	**GERMAN - I**				
Course Code	**GERN1001**				
Prerequisite					
Co-requisite					
Anti-requisite					
	L	**T**	**P**	**C**	
	0	0	4	2	

Course Objectives

This course focuses on basic linguistic and communicative structures of the German language. Students will be introduced to various aspects of German culture and learn to communicate in simple everyday situations and personal interaction. The module will adopt an integrated approach to language learning and will emphasize equally all four skills of reading, writing, listening and speaking as well as the acquisition of grammar structures and vocabulary. Audio and video materials will also be used to supplement the textbook and to provide students with a better insight into Germany, her culture and the life of her people. The module will also attempt to help students optimize their learning by teaching them vital strategies for language learning and language use. This should, in turn, allow students to develop greater learner autonomy.

Course Outcomes

CO1	Interpret simple sentences, and read short sentences and,paragraphs.(K2)
CO2	Apply simples sentences to discuss about their family members, friends etc.(K3)
CO3	Develop an understanding of German society and culture.(K4)
CO4	Assess all the four skills viz. reading, writing, listening and speaking. (K5)

Text Book (s)

1. Dengler, Stefanie, Netzwerk A1: 2015
2. Hieber, Wolfgang. Lernziel Deutsch. München: 2005

Reference Book (s)

1. Gick, Cornelia, Momentmal, Grundstufenlehrwerk Deutsch als Fremdsprache.M: 2003
2. Maria Dallapiazza, Eduard von Jan, Til Schonherr.Tangram, Deutsch als Fremdsprache.Berlin: 2005
3. Griesbach, Schulz. Deutsche Sprachlehre für Ausländer. München: 2005.

Course Content

UNIT I	**4 Hours**
Wiederholung - Unregelmäβige Verben / irregular Verbs - Verbkonjugation/ Verb conjugation (sein und haben)	
UNIT II	**2 Hours**
Hobbys/Hobbies - Beruf/Profession - Gefallen und Missfallen äuβern / Expressing likes and dislikes	
UNIT III	**2 Hours**
Familiebaum/ Family tree - W-fragen/ Questions - über die Familie sprechen/ speak about the family	
UNIT IV	**4 Hours**
Uhrzeit/ Time telling: offiziell (official) und in der Umgangssprache (unofficial)	

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
20	30	50	100

Name of The Course	FRENCH-I			
Course Code	FREN1001			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	0	0	4	2

Course Objectives

1. Learn about contemporary French and Francophone institutions and mores
2. Communicate and interact with other speakers of French in diverse situations and in conversations involving everyday topics
3. Develop listening skills and understand the gist of a variety of communication modes (TV, video, radio, etc.)
4. Read a broad range of printed materials for general, specific and practical information
5. Write notes, letters and compositions on familiar topics with a good command of vocabulary and sentence structure in a cohesive and organized manner

Course Outcomes

CO1	Interpret simple sentences, and read short sentences and,paragraphs.(K2)
CO2	Apply simples sentences to discuss about their family members, friends etc.(K3)
CO3	Develop an understanding of French society and culture.(K4)
CO4	Assess all the four skills viz. reading, writing, listening and speaking.(K5)

Text Book (s)

1. Tech French » :Ingrid Le Gargasson, Shariva Naik, Claire Chaize. Goyal Publishers and Distributors Private Ltd, Delhi, 2012. Units 1 & 2.

Reference Book (s)

1. CONNEXIONS 1, Méthode de français, Régine Mérieux, Yves Loiseau, Les Éditions Didier, 2004
2. CONNEXIONS 1, Le cahier d'exercices, Régine Mérieux, Yves Loiseau Les Éditions Didier, 2004
3. ALTER EGO 1, Méthode de français, Annie Berthet, Catherine Hugo, Véronique M. Kizirian, Béatrix Sampsonis, Monique Waendendries Hachette livre 2006
4. ALTER EGO 1, Le cahier d'activités, Annie Berthet, Catherine Hugo, Béatrix Sampsonis, Monique Waendendries Hachette livre 2006

Course Content

Unit I: Saluer	**08 Hours**
S'informer sur une activité actuelle – s'informer sur une activité habituelle – dire quel sport on fait – une journée avec…	
Unit II:Nommer des objets	**08 Hours**
Demander et exprimer des besoins – s'informer sur des habitudes – indiquer des quantités – rapporter des évènements passés – exprimer une opinion – faire des compliments – interroger sur la durée – s'informer sur des habitudes	
Unit III:Situer un lieu sur un plan	**08 Hours**

Demander, donner et refuser une permission – exprimer des interdictions – exprimer la possibilité, le savoir-faire, la volonté – exprimer l'obligation – faire/ accepter/ refuser des propositions
Unit IV: Demander et donner l'heure **08 Hours**
Exprimer des gouts et des préférences – exprimer la fréquence ou l'intensité – demander et exprimer une opinion – exprimer une contestation – donner des conseils

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
20	30	50	100

Name of The Course	**JAPANESE-I**				
Course Code	**JAPA1001**				
Prerequisite					
Co-requisite					
Anti-requisite					
	L	**T**	**P**	**C**	
	0	0	4	2	

Course Objectives

1. To Acquire four skills in the Japanese language:
   a. Listening: Ability to understand simple every day conversations.
   b. Speaking: Ability to handle some survival situations through circumlocutions and repetitions.
   c. Reading: Ability to read simple, short reading material including semi-authentic material.
   d. Writing: Ability to write simple sentences learned in class using the appropriate hiragana, katakana, and kanji.
2. To acquire a fundamental knowledge of Japanese grammatical structures.
3. To acquire some knowledge of the Japanese culture.

Course Outcomes

CO1	Interpret simple sentences, and read short sentences and,paragraphs.(K2)
CO2	Apply simples sentences to discuss about their family members, friends etc.(K3)
CO3	Develop an understanding of Japanese society and culture.(K4)
CO4	Assess all the four skills viz. reading, writing, listening and speaking.(K5)

Text Book (s)

1. Shokyuu Nihongo, Japanese Language Center for International Students, Tokyo University of foreign Studies, Japan.
2. Nihongo Kana nyuu mon, Japan foundation, Japan.
3. Shin Nihongo no KISO-1, AOTS, 3A Corporation, Japan.

Reference Book (s)

1. Random House Japanese-English Dictionary
2. Japanese for Busy people, Video CD , AJALT, Japan.

Course Content

UNIT I: DAI NANAKA TO HACHIKA	**8 Hours**
Gomen kudasai (audio Practice) - Soro soro shitsurei shimasu. (audio Practice)	
Unit II: DAI KYUKA TO TOOKA	**8 Hours**
Gin-nen de. (audio Practice) - Chiri-- so—su wa arimasuka. (audio Practice)	
Unit III: DAI JYUICHIKA TO JYUNIKA	**8 Hours**
Kore onegai shimasu. (audio Practice) - Omatsuri wa doo deshitaka. (audio Practice)	
Unit IV: DAI JYUSANKA TO	**8 Hours**
Betsu betsu ni onegai shimasu. (audio Practice) - KURIKAESHITE	

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
20	30	50	100

Semester –III

Name of The Course	English Proficiency and Aptitude Building -2				
Course Code	SLBT2001				
Prerequisite	Completion of semester 2				
Corequisite					
Antirequisite					
24 sessions of 100 minutes each, 12 hours of online tests		**L**	**T**	**P**	**C**
		3	0	4	2

Course Objectives:

1. Enhance formal writing skills
2. To understand soft-skills pertaining to industry

Course Outcomes

CO1	To further enhance grammar skills
CO2	To enhance the analytical, logical and quantitative skills of students.
CO3	Get overall personality enhancement

Text Book (s)

SLLL own text book

Reference Book (s):

1. CommunicationSkillsforEngineers, Mishra,Sunita&C.Muralikrishna,,Pearson
2. CorporateSoftskills,SarveshGulati,2006.
3. Effective Communication,JohnAdair,MacmillanLtd.1997.
4. DevelopingCommunication Skills,KrishnaMohanandMeeraBannerji,Macmillan IndiaLtd.1990

Continuous Assessment Pattern

Internal Assessment (IA)	**Mid Term Test (MTE)**	**End Term Test (ETE)**	**Total Marks**
20	30	50	100

Name of The Course	Digital Design and Computer Architecture				
Course Code	BCSE2001				
Prerequisite					
Corequisite					
Antirequisite					
	L	**T**	**P**	**C**	
	3	0	0	3	

Course Objectives:

1. To explore the fundamentals of digital logic design.
2. To understand the concepts of computer architecture.
3. To implement the core concepts in the real scenario.

Course Outcomes

CO1	Understand the basics of logic gates, K-map, various circuit designing models.
CO2	Understand the concepts of designing of combinational circuits.
CO3	Understand the concepts of designing of sequential circuits.
CO4	Understand the architecture of digital system by using machine language.
CO5	Identify core concepts of Memory and I/O systems.

Text Book (s)

1. David Harris, Sarah Harris, Digital Design and Computer Architecture,2nd Edition ISBN: 978-0-12-394424-5, ISBN10:0123944244, Elsevier Science & Technology , 2013.
2. 2. M. Morris Mano and Michael D. Ciletti, “Digital Design”, IV Edition, Pearson Education, 2008.

Reference Book (s):

1. John F. Wakerly, “Digital Design Principles and Practices”, Fourth Edition, Pearson Education, 2007.
2. Charles H. Roth Jr, “Fundamentals of Logic Design”, Fifth Edition – Jaico Publishing House, Mumbai, 2003.
3. Donald D. Givone, “Digital Principles and Design”, Tata MCGraw Hill, 2003.
4. G. K. Kharate, “Digital Electronics”, Oxford University Press, 2010.
5. David A. Patterson and John L. Hennessy, “Computer Organization and Design: The Hardware/Software Interface”, Fourth Edition, Morgan Kaufmann / Elsevier, 2009.
6. Carl Hamacher, Zvonko Vranesic, Safwat Zaky and Naraig Manjikian, “Computer Organization and Embedded Systems”, Sixth Edition, Tata McGraw Hill, 2012.

Course Content:

Unit 1: Introduction	**9 Hours**
Introduction, Logic Gates, Digital Abstraction. Combinational Logic Design-Boolean Equations, Boolean Algebra, From Logic to Gates, Multilevel Combinational Logic, X’s and Z’s, Oh My, Karnaugh Maps .	
Unit 2: Combinational Logic	**9 Hours**

Combinational Circuits – Analysis and Design Procedures – Binary Adder-Subtractor – Decimal Adder – Binary Multiplier – Magnitude Comparator – Decoders – Encoders – Multiplexers – Introduction to HDL – HDL Models of Combinational circuits.
Unit 3: Synchronous Sequential Logic **9 Hours**
Sequential Circuits – Storage Elements: Latches , Flip-Flops – Analysis of Clocked Sequential Circuits – State Reduction and Assignment – Design Procedure – Registers and Counters .
Unit 4: Basic structure of Computer System **9 Hours**
Functional Units – Basic Operational Concepts – Performance – Instructions: Language of the Computer – Operations, Operands – Instruction representation – Logical operations – decision making – MIPS Addressing.
Unit 5: Memory and I/O Systems **9 Hours**
Memory Hierarchy - memory technologies – cache memory – measuring and improving cache performance – virtual memory, TLB‘s – Accessing I/O Devices – Interrupts – Direct Memory Access.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
20	30	50	100

Name of The Course	Discrete Mathematics				
Course Code	MATH2005				
Prerequisite					
Corequisite					
Antirequisite					
	L	**T**	**P**	**C**	
	3	0	0	3	

Course Objectives:

1. This course is aimed at helping students build up an understanding.
2. Cultivate clear thinking and creative problem solving.
3. Thoroughly train in the construction and understanding of mathematical proofs.
4. Exercise common mathematical arguments and proof strategies.
5. Cultivate a sense of familiarity and ease in working with mathematical notation and common concepts in discrete mathematics.
6. Teach the basic results in set theory, logic, combinatorics, and graph theory.
7. Thoroughly prepare for the mathematical aspects of other computer science course.

Course Outcomes

CO1	Explain at high levels concepts and implement basic operations in discrete mathematics.
CO2	Perform combinatorial analysis to solve counting problems.
CO3	Develop mathematical models from computation theory to programming languages through combinatorics, graphs.
CO4	Use mathematical reasoning to comprehend and construct mathematical arguments.
CO5	Develop techniques for counting, permutations and combinations.

Text Book (s)

1. Seymour lipschutz, Marc Lars Lipson, Theory and Problems of Discrete Mathematics Third Edition, Schaum's Outline Series McGRAW-HILL.
2. B. Kolman, R.C. Busby, and S.C. Ross, Discrete Mathematical Structures, PHI
3. Kenneth H. Rosen, Discrete Mathematics and Its Applications, McGraw-Hill

Reference Book (s):

1. Swapan Kumar Sarkar, A Textbook of Discrete Mathematics, S.Chand Publication
2. Jean Paul Trembley, R Manohar, Discrete Mathematical Structures with Application to Computer Science, McGraw-Hill
3. J.L. Mott, A. Kandelad T.P. Baker, Discrete Mathematics for Computer Scientists and Mathematicians, PHI, 2nd Edition, 1999.
4. Liu and Mohapatra, "Elements of Distcrete Mathematics", McGraw Hill

Course Content:

Unit I: MATHEMATICAL LOGIC: 10 Hours
Introduction, Propositions, Connectives, Truth tables, Tautologies and Contradictions, Equivalences implications, Normal forms, Methods of proof rules of inference for quantified propositions, Mathematical induction.
Unit II: COMBINATORICS: 6 Hours
Basics of counting, Combinations of permutations, Enumeration of combination and permutation, Pigeonhole principle, Inclusion, Exclusion principle, Ordered and unordered portions.

Unit III: RECURRENCE RELATIONS:	**8 Hours**
Generating function of sequences, Calculating coefficients of generating functions, Recurrence relations, solving recurrence relations by substitutious and generating functions, Method of characteristic roots, Solution of homogenous recurrence relations	
Unit IV: GRAPH THEORY:	**8 Hours**
Basic concepts of graph theory, Diagraph, Paths, Reachability connectedness, Matrix representation of graphs, Subgraphs, Isomorphisms trees, Properties, Directed tress, Binary trees.	
Unit V: BOOLEAN ALGEBRA:	**8 Hours**
Post, Hasse diagrams, Lattices, Types of Lattices, Boolean Algebra, Basic theorems, Applications.	

Continuous Assessment Pattern

Internal Assessment (IA)	**Mid Term Test (MTE)**	**End Term Test (ETE)**	**Total Marks**
20	30	50	100

Name of The Course	Engineering Mechanics				
Course Code	BTME2001				
Prerequisite					
Corequisite					
Antirequisite					
	L	**T**	**P**	**C**	
	3	0	0	3	

Course Objectives:

1. To calculate the reactive forces and analyse the structures.
2. To know the geometric properties of the different shapes.
3. To learn energy and momentum methods.

Course Outcomes

CO1	Solve the engineering problems involving equilibrium of particles and rigid bodies.
CO2	Solve the problems involving dry friction and virtual work.
CO3	Determine the centroid, centre of gravity and moment of inertia of various surfaces and solids.
CO4	Develop kinematics and kinetic theories of particle motion.
CO5	Solve problem using energy-momentum principle.

Text Book (s)

1. J. V. Rao, D. H. Young, S. Timoshenko, Sukumar Pati (2013), Engineering Mechanics, Tata McGraw Hill Education. ISBN: 978-1-259-06266-7

Reference Book (s):

1. P. Ferdinand, E. Beer and J. Russell (2010), Vector Mechanics for Engineers, 9th Edition, McGraw-Hill International Edition. ISBN: 978-0-079-12637-5
2. Irving H. Shames (2012), Engineering Mechanics – Statics and Dynamics, 4th Edition, Prentice-Hall of India Private limited. ISBN: 978-8-131-72883-3

Course Content:

Unit-1 **Equilibrium of Particle and Rigid body** 9 Hours
Introduction to Mechanics – Fundamental Principles – Coplanar forces – Equilibrium of particles – Free body diagram – Equilibrium of particle in space – Single equivalent force - - Equilibrium of rigid bodies in two dimensions. Analysis of plane trusses – Method of joints – Method of sections – Zero-force member.
Unit-2: Friction and Virtual work 9 Hours
Characteristics of dry friction – Problems involving dry friction – Ladder – Wedges – Square threaded screws. Definition of virtual work – Principle of virtual work – System of connected rigid bodies – Degrees of freedom – Conservative forces – Potential energy – Potential energy criteria for equilibrium.
Unit-3 : Properties of Surfaces and Solids 9 Hours

Centroid – First moment of area – Theorems of Pappus and Guldinus – Second moment of area – Moment and Product of inertia of plane areas – Transfer Theorems – Polar moment of inertia – Principal axes – Mass moment of inertia.
Unit-4 : Kinematic and Kinetics 9 Hours
Position, Velocity and Acceleration – Rectilinear motion – Curvilinear motion of a particle – Tangential and Normal components – Radial and Transverse components – Rotation of rigid bodies about a fixed axis – General plane motion – Absolute and relative motion method – Instantaneous centre of rotation in plane motion. Linear momentum – Equation of motion – Angular momentum of a particle and rigid body in plane motion – D'Alembert's principle.
Unit-5 : Energy and Momentum Methods 9 Hours
Principle of work and energy for a particle and a rigid body in plane motion – Conservation of energy - Principle of impulse and momentum for a particle and a rigid bodies in plane motion – Conservation of momentum – System of rigid bodies – Impact - direct and central impact – coefficient of restitution.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
20	30	50	100

Name of The Course	Data Structures and Algorithms				
Course Code	BCSE2003				
Prerequisite					
Corequisite					
Antirequisite					
	L	**T**	**P**	**C**	
	3	0	0	3	

Course Objectives:

1. Introduce the fundamentals and abstract concepts of Data Structures.
2. Introduce searching, sorting techniques
3. Learn how concepts of data structures are useful in problem solving.

Course Outcomes

CO1	Understand the comparison and use of Recursion and Loops
CO2	Understand the application of linear data structure(s) to solve various problems
CO3	Understand the application of non linear data structure(s) to solve various problems
CO4	Understand the shortest path algorithms involving complicated data structures like Graphs.
CO5	Become expert in calculating and comparing complexities of various searching and sorting algorithms.

Text Books

1. Horowitz and Sahani, "Fundamentals of Data Structures", Galgotia Publication

Reference Books

1 Aaron M. Tenenbaum, Yedidyah Langsam and Moshe J. Augenstein "Data Structures Using C and C++" , PHI
2 Jean Paul Trembley and Paul G. Sorenson, "An Introduction to Data Structures with applications", McGraw Hill
3 R. Kruse etal, "Data Structures and Program Design in C", Pearson Education
4 Lipschutz, "Data Structures" Schaum's Outline Series, TMH
5 G A V Pai, "Data Structures and Algorithms", TMH

Course Content:

Unit I:Introduction: Basic Terminology **9 Hours**
Elementary Data Organization, Algorithm, Efficiency of an Algorithm, Time and Space Complexity, Asymptotic notations: Big-Oh, Time-Space trade-off. Abstract Data Types (ADT)Arrays: Definition, Single and Multidimensional Arrays, Representation of Arrays: Row Major Order, and Column Major Order, Application of arrays, Sparse Matrices and their representations.Linked lists: Array Implementation and Dynamic Implementation of Singly Linked Lists, Doubly Linked List, Circularly Linked List, Operations on a Linked List. Insertion, Deletion, Traversal, Polynomial Representation and Addition, Generalized Linked List
Unit II: Stacks and Queues: Abstract Data Type **8 Hours**

Primitive Stack operations: Push & Pop, Array and Linked Implementation of Stack in C, Application of stack: Prefix and Postfix Expressions, Evaluation of postfix expression, Recursion, Tower of Hanoi Problem, Simulating Recursion, Principles of recursion, Tail recursion, Removal of recursion
Unit III: Trees: Basic terminology **8 Hours**
Binary Trees, Binary Tree Representation: Array Representation and Dynamic Representation, Complete Binary Tree, Algebraic Expressions, Extended Binary Trees, Array and Linked Representation of Binary trees, Tree Traversal algorithms: Inorder, Preorder and Postorder, Threaded Binary trees, Traversing Threaded Binary trees, Huffman algorithm.
Unit IV: Graphs **7 Hours**
Terminology, Sequential and linked Representations of Graphs: Adjacency Matrices, Adjacency List, Adjacency Multi list, Graph Traversal : Depth First Search and Breadth First Search, Connected Component, Spanning Trees, Minimum Cost Spanning Trees: Prims and Kruskal algorithm. Transitive Closure and Shortest Path algorithm: Dijikstra Algorithm
Unit V: Sorting and Searching **8 Hours**
Sequential search, Binary Search, Comparison and Analysis Internal Sorting: Insertion Sort, Selection, Bubble Sort, Shell sort

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
20	30	50	100

Name of The Course	**Object Oriented Programming with C++**				
Course Code	**BCSE2004**				
Prerequisite					
Corequisite					
Antirequisite					
		L	**T**	**P**	**C**
		3	0	0	3

Course Objectives:

The purpose of this course is to provide basic concepts of Object oriented programming with C++. The main goal of the course is to teach the students how to Apply the OOPS concepts in various applications that are appropriate for problems that they might encounter. This course is also to teach constructors, destructors, inheritances, polymorphism, virtual function and control structures. This also provides knowledge of input output stream functions.

Course Outcomes

CO1	Understand an Object Oriented Programming Features.
CO2	Analyze and Apply the role of constructors &destructors in program design.
CO3	Apply the concept of inheritances, polymorphism and virtual function for problem solution.
CO4	Use the control structures of c++ appropriately.
CO5	Apply the different input output streams for problem solution.

Text Book (s)

1. Object Oriented Programming with C++ - Rajiv Sahay, Oxford Mastering C++ - Venugopal, McGraw-Hill Education (India)
2. Herbert Schildt, C++ - The Complete Reference, Third Edition -Tata McGraw Hill - 1999.
3. Bruce Eckel, Thinking in C++, Second Edition, Volume One, Pearson Education Asia, 2000.

Reference Book (s):

1. Object Oriented Programming in C++ by Robert LaforeTechmedia Publication.
2. Object Oriented Programming in C++ SauravSahay Oxford University Press.
3. Object Oriented Programming in C++ R Rajaram New Age International Publishers 2nd.
4. OOPS C++ Big C++ Cay Horstmann Wiley Publication.
5. C++: The Complete Reference- Schildt, McGraw-Hill Education (India)
6. C++ and Object Oriented Programming – Jana, PHI Learning.

Course Content:

Unit I: Introduction: Basic Terminology	**8 Hours**
Introduction to OOP- Overview of C++ - Classes - Structures - Union - Friend Functions - Friend Classes - Inline Functions - Constructors - Destructors - Static Members - Scope Resolution Operator	
Unit II: POINTERS	**8 Hours**

Array of Objects - Pointer to Object - This Pointer - References - Dynamic Memory Allocation - Function Overloading - Default Arguments - Overloading Constructors.
Unit III: OPERATORS **8 Hours**
Operator Overloading - Member Operator Function - Friend Operator Function - Inheritance - Types of Inheritance - Protected Members - Virtual Base Class - Polymorphism - Virtual Functions - Pure Virtual Functions.
Unit IV: CLASS **8 Hours**
Class Templates and Generic Classes - Function Templates and Generic Functions - Overloading a Function Template - Exception Handling - Namespaces
Unit V: I/O STREAMS **8Hours**
I/O Streams - Formations I/O with ios Class Functions and Manipulators - Overloading - File I/O.

Continuous Assessment Pattern

Internal Assessment (IA)	**Mid Term Test (MTE)**	**End Term Test (ETE)**	**Total Marks**
20	30	50	100

Name of The Course	THEORY OF AUTOMATA AND FORMAL LANGUAGES				
Course Code	BCSE2005				
Prerequisite					
Corequisite					
Antirequisite					
	L	**T**	**P**	**C**	
	3	0	0	3	

Course Objectives:

1. Course is designed to make the student familiar with the working of the FSM, PDA and TM.
2. This course helps the student to understand how a high level program is converted into a low level program by the compiler so that it becomes easy to understand the programming capabilities and function of the compiler.
3. To enable the student to differentiate between Regular and Non regular languages.
4. To enable the student to pursue R&D activities in Computational Theory.
5. To prepare the students for career in Software industry and academic

Course Outcomes

CO1	Understand basic principles of compiler.
CO2	Develop Deterministic Finite Automata and Non-Deterministic Finite Automata.
CO3	Develop Regular Expression for regular languages. Analyses difference between regular and non regular languages
CO4	Understand Context Free Grammar and its normalization
CO5	Able to draw and develop working model of Push Down Automata.

Text Book (s)

1 Opcroft, Ullman, “Introduction to Automata Theory, Languages and Computation”,Pearson Education

Reference Book (s):

1. Hopcroft, Ullman, “Introduction to Automata Theory, Languages and Computation”,Pearson Education

2. Languages and Computation”, PHI

3. Martin J. C., “Introduction to Languages and Theory of Computations”, TMH

4. Papadimitrou, C. and Lewis, C.L., “Elements of the Theory of Computation”, PHI.

Course Content:

Unit I: Introduction **9 Hours**
IAlphabets, Strings and Languages; Automata and Grammars, Deterministic finite Automata (DFA)-Formal Definition, Simplified notation: State transition graph, Transition tabl e, Language of DFA, Nondeterministic finite Automata (NFA), NFA with epsilon transit ion, Language of NFA, Equivalence of NFA and DFA, Minimization of Finite Automata, Distinguishing one string from other, Myhill-Nerode Theorem
Module II: Regular expression (RE) **9 Hours**
Regular expression (RE) Definition, Operators of regular expression and their precedence,Algebraic laws for Regular expressions, Kleen’s Theorem, Regular expression to FA, DFA to Regular expression, Arden Theorem, Non Regular Languages, Pumping Lemma for regular Languages .

Application of Pumping Lemma, Closure properties of Regu lar Languages, Decision properti es of Regular Languages, FA with output: Moore and Mealy machine, Equivalence of Moore and Mealy Machine, Applications and Limitation of FA.
Module III:Context free grammar (CFG) and Contex t Freee Languages CFL): **10 Hours**
Definition, Examples, Derivation , Derivation trees, Am biguity in Grammer, Inherent ambiguity, Ambiguous to Unambiguous CFG, Useless sym bols, Simplification of CFGs, Normal forms for CFGs: CNF and GNF, Closure proper ties of CFLs, Decision Properties of CFLs: Emptiness, Finiteness and Memership, Pumping lemma for CFLs,
Module IV: Push Down Automata (PDA): **6 Hours**
TDescription and definition, Instantaneous Description,Language of PDA, Acceptance by Final state, Acceptance by empty stack, Deterministic PDA,Equivalence of PDA and CFG, CFG to PDA and PDA to CFG, Two stack PDA
Module V: Turing machines (TM): **6 Hours**
Basic model, definit ion and representatio n, Instantaneous Description,Language acceptance by TM, Variants of Turing Machine, TM as Computer of Integer functions, Universal TM, Chur ch's Thesis, Recursive and recursively enumerable languages, Halting problem, Introduction to Undecidability, Undecidable problems about TMs.Post correspondence problem (PCP), Modified PCP, Introduction to recursive function theory

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
20	30	50	100

Name of The Course	Digital Design and Computer Architecture Lab			
Course Code	BCSE2006			
Prerequisite				
Corequisite				
Antirequisite				
	L	**T**	**P**	**C**
	0	0	2	1

Course Objectives:

Student will understand the architecture of digital system by using machine language.

Course Outcomes

CO1	Understand the basics of logic gates, K-map, various circuit designing models.
CO2	Understand the concepts of combinational circuits and sequential circuits.
CO3	Understand the concepts of sequential circuits.
CO4	Understand the architecture of digital system by using machine language.
CO5	Identify core concepts of Memory and I/O systems

Text Book (s)

- Morris Mano, Digital Design ,PHI, 5th edition, 2012.

Reference Book (s)

- The x86 processors, Architecture, programming and interfacing. Lyla B Das, Pearson 2010

Title of Lab Experiments

- Introduction to Digital Electronics lab- nomenclature of digital ICS, specifications, studyof the data sheet, concept of vcc and ground, verification of the truth tables of logic gates using TTL ICS.
- To study and verify NAND and NOR as a universal gate.
- Implementation of the given Boolean function using logic gates in both sop and pos forms.
- Design and Implementation of Half Adder and Full Adder circuits using logic gates.
- Design and Implementation of Half Subtractor and Full Subtractor circuits using logic
- gates.
- Design and Implementation of One bit and Two bit Comparators.
- Design and Implementation of 3x8 Decoder.
- Design and Implementation of 8x3 Encoder.
- Verification of state tables of RS, JK, T and D flip-flops using NAND & NOR gates.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
50		50	100

Name of The Course	Data Structures and Algorithms Lab				
Course Code	BCSE2007				
Prerequisite					
Corequisite					
Antirequisite					
		L	T	P	C
		0	0	2	1

Course Objectives:

Student will understand the data structure shortest path algorithms involving complicated data structures like Graphs.

Course Outcomes

CO1	Understand the comparison and use of Recursion and Loops.
CO2	Understand the application of linear data structure(s) to solve various problems.
CO3	Understand the application of non-linear data structure(s) to solve various problems.
CO4	Understand the shortest path algorithms involving complicated data structures like Graphs.
CO5	Become expert in calculating and comparing complexities of various searching and sorting algorithms.

Text Book

1. Cormen T.H., Leiserson, C.E., Rivest, R.L., and C. Stein. Introduction to Algorithms, MIT Press, Second Edition (Indian reprint: Prentice-Hall), 2013.
2. Mark Allen Weiss, Data Structures and Algorithm Analysis in C++, Pearson, 4th Edition, 2014.

References

1. "Aaron M. Tenenbaum, YedidyahLangsam and Moshe J. Augenstein “Data StructuresUsing C and C++” , PHI, 1996."
2. Jean Paul Trembley and Paul G. Sorenson, “An Introduction to Data Structures with applications”, McGraw Hill, 2007.
3. R. Kruse, “Data Structures and Program Design in C++”, Pearson Education, 2000.

List of Experiments
1. a) Write a Program to implement linear search algorithm. b) Write a Program to implement binary search algorithm.
2. Write a Program to Implement Singly Linked List and its operations.
3. a) Write a Program to Implement Stack Operations by using Array. b) Write a Program to Implement Stack Operations by using Linked List.
4. a) Write a program that uses stack operations to convert a given infix expression into its postfix. b) Write a program that uses stack operations to evaluate given postfix expression.
5. a) Write a Program to implement the operations of Queue using array. b) Write a Program to implement the operations of Queue using linked list.
6. Write a Program to Implement Circular Queue Operations by using Array.
7. Write a Program to Sort the set of elements by using

Quick Sort. iii) Merge Sort.
8. Write a Program to Implement All functions of a Dictionary by using Hashing.
9. Write a Program to Implement the Binary Search Tree Operations.
10. Write a Program to Perform the Tree Traversal Techniques by using Iterative Method
11. Write a Program to Perform the Tree Traversal Techniques by using recursion.
12. Write a program to Implement Insertion and Deletion Operations on AVL Trees
13. Write a program for implementing the following graph traversal algorithms: Depth First Search b) Breadth First Search.

Continuous Assessment Pattern

Internal Assessment (IA)	**Mid Term Test (MTE)**	**End Term Test (ETE)**	**Total Marks**
20	30	50	100

Name of The Course	Object Oriented Programming Lab				
Course Code	BCSE2008				
Prerequisite					
Corequisite					
Antirequisite					
	L	**T**	**P**	**C**	
	0	0	2	1	

Course Objectives:

1. Teach efficient storage mechanisms of data for an easy access.
2. Design and implementation of various basic and advanced C++ Programming.
3. Introduce various techniques for representation of the programming in the real world.
4. Learn to design user defined Program.

Course Outcomes

CO1	Understand variety of OOPS characteristic.
CO2	Understand wide variety of keywords and use them appropriately to write program
CO3	Understand and implement of fundamental terminology & their applications, namely function, string and simple pointer etc.
CO4	Design and implementation of various basic and advanced C++ Programming.
CO5	Understand various techniques for representation of the programming in the real world

Text Book (s) / Reference Book (s):

1. Thomas H. Coreman, Charles E. Leiserson and Ronald L. Rivest, "Introduction to Algorithms", Printice Hall of India.

List of Experiment:

1. Write a simple C++ program to print **"Hello World!".**

2. WAP that generates the following table:

1990 135
1991 7290
1992 11300
1993 16200

3. Create a Union called student with the following details as variables within it.

1. Name of the student
2. Age
3. Year of study
4. Semester
5. different subject marks in array

Write a C++ program to create object for the union to access these and print the Name, age, year, semester and grade according to their percentage of marks scored.

90 % and above – S grade
80% to 89% -- A grade
70% to 79% -- B grade
60% to 69% -- C grade
50% to 59% -- D grade

<50% -- F grade

4 . Write a C++ program to perform different arithmetic operation such as addition, subtraction, division, modulus and multiplication using inline function

5. Create a class for counting the number of objects created and destroyed within various block using constructor and destructors.

6. Write a C++ program to calculate the area of triangle and square.

7. Write a program in C++ to check whether the string is palindrome or not.

8. Write a program to evaluate the following investment equation: $V = P(1+r)^n$. Test your program for following values:- P: 1000, 2000, 3000, r: 0.10,0.11,0.12,.....0.20, n=1,2,3.....10.

9. A cricket team has the following table of batting figures. Write a program to read the figures in the given format and calculate the batting averages and print the complete table along with the batting averages.

Player's Name	**Runs Scored**	**Innings Played**	**Times Not Out**
Sachin	8530	230	18
Saurav	4200	130	9
Rahul	3350	105	11

10. An electricity board charges the following rates to domestic users to discourage the wastage of electricity. For the first 100 units: 60 P/unit. For the next 200 units: 80 P/unit. Beyond 300 units: 90 P/units. All users are charged a minimum of Rs.50. If the total amount is more than Rs 300 then additional surcharge of 15% is added. Write a program to read the names of users and number of units consumed and print the total charges with names of consumers.

11. A phone number, such as (212) 767- 8900, can be thought of having three parts: the area code (212), the exchange (767), and the number (8900). Write a program that uses a structure to store these three parts of a phone number separately. Call the structure **phone**. Create two structure variables of type **phone**. Initialize one, and have the user input a number for the other one. Then display both numbers. The interchange might look like this:

Enter your area code, exchange, and number: 415 555 1212

My number is (212) 767-8900

Your number is (415) 555-1212

12. A point in the two-dimensional plane can be represented by two numbers: an X coordinate and a Y coordinate. For example, (4,5) represents a point 4 units to the right of the origin along the X axis, and 5 units up the Y axis. The sum of two points can be defined as a new point whose X coordinate is the sum of X coordinates of the two points, and whose Y coordinate is the sum of their Y coordinates.

WAP that uses a structure called **point** to model a point. Define three points, and have the user input values to two of them. Then set the third point equal to the sum of the other two, and display the value of the new point. Interaction with program might look like this:

Enter coordinates for p1: 3 4

Enter coordinates for p2: 5 7

Coordinate for p1 + p2 are: 8, 11

13. Create a structure called **Volume** that uses three variables of type **Distance** to model the volume of a room. Initialize a variable of type **Volume** to specific dimensions, then calculate the volume it represents and printout the result. To calculate the volume, convert each dimension from a **Distance** variable to a variable of type **float** representing feet and fractions of a foot, and then multiply the resulting three numbers.

FUNCTIONS:

14. Write a function called **circarea()** that finds the area of the circle. It should take an argument of type **float** and return an argument of same type. Write a **main()** function that gets a radius value from the user, calls **circarea()**, and displays the result.

15. Raising a number **n** to a power **p** is the same as multiplying **n** by itself **p** times. Write a function called **power()** that takes a **double** value for **n** and an int value for **p**, and returns the result as **double** value. Use a default argument of 2 for **p**, so that if this argument is omitted, the number will be squared. Write a **main()** function that gets values from the user to test this function.

Continuous Assessment Pattern

Internal Assessment (IA)	**Mid Term Test (MTE)**	**End Term Test (ETE)**	**Total Marks**
50		50	100

Semester – IV

Name of The Course	**English Proficiency and Aptitude Building -3**			
Course Code	**SLBT2002**			
Prerequisite	Completion of semester 2			
Corequisite				
Antirequisite				
24 sessions of 100 minutes each, 12 hours of online tests	**L**	**T**	**P**	**C**
	3	0	4	2

Course Objectives:

- Enhance formal writing skills
- To understand soft-skills pertaining to industry

Course Outcomes

CO1	Improve arithmetic aptitude
CO2	Learn tricks to solve aptitude questions faster, thereby saving time during competitive exams
CO3	Improve arithmetic aptitude

Text Book (s)

SLLL own text book

Reference Book (s):

1. CommunicationSkillsforEngineers, Mishra,Sunita&C.Muralikrishna,,Pearson
2. CorporateSoftskills,SarveshGulati,2006.
3. Effective Communication,JohnAdair,MacmillanLtd.1997.
4. DevelopingCommunication Skills,KrishnaMohanandMeeraBannerji,Macmillan IndiaLtd.1990

Continuous Assessment Pattern

Internal Assessment (IA)	**Mid Term Test (MTE)**	**End Term Test (ETE)**	**Total Marks**
20	30	50	100

Name of The Course	**Operating Systems**				
Course Code	**BCSE2010**				
Prerequisite	Data structures				
Corequisite	C- Programming				
Antirequisite					
		L	**T**	**P**	**C**
		3	0	0	3

Course Objectives:

1. Learn fundamental operating system abstractions such as processes, threads, files, semaphores, IPC abstractions, shared memory regions, etc.,
2. Learn how the operating system abstractions can be used in the development of application programs, or to build higher level abstractions.
3. Learn the principles of concurrency and synchronization, and apply them to write correct concurrent programs/software,
4. Learn basic resource management techniques (scheduling, time management, space management) and principles and how they can be implemented. These also include issues of performance and fairness objectives, avoiding deadlocks, as well as security and protection to various examples and real life applications.

Course Outcomes

CO1	Remember the classification and diversification of Operating system.
CO2	Understand the classical problems in Concurrent Processes and their solutions.
CO3	Learn and implement different types of CPU Scheduling Algorithm along with the understanding of the concept of Deadlock in system and its methods of handling deadlocks.
CO4	Analyze the concept of memory management and paging concept in operating system.
CO5	Able to apply various scheduling techniques.

Text Book (s)

1. Silberschatz, Galvin and Gagne, “Operating Systems Concepts”, Wiley
2. D M Dhamdhere, “Operating Systems : A Concept based Approach”, 2nd Edition.

Reference Book (s):

1. Sibsankar Halder and Alex A Aravind, “Operating Systems”, Pearson Education
2. Harvey M Dietel, “ An Introduction to Operating System”, Pearson Education
3. D M Dhamdhere, “Operating Systems : A Concept based Approach”, 2nd Edition.

Course Content

Unit I: Introduction **8 Hours**
Operating system and functions, Classification of Operating systems- Batch, Interactive, Time sharing, Real Time System, Multiprocessor Systems, Multiuser Systems, Multi process Systems,

Multithreaded Systems, Operating System Structure- Layered structure, System Components, Operating System services, Reentrant Kernels, Monolithic and Microkernel Systems
Unit II: Concurrent Processes **8 Hours**
Process Concept, Principle of Concurrency, Producer / Consumer Problem, Mutual Exclusion, Critical Section Problem, Dekker's solution, Peterson's solution, Semaphores, Test and Set operation; Classical Problem in Concurrency- Dining Philosopher Problem, Sleeping Barber Problem; Inter Process Communication models and Schemes, Process generation.
Unit III: CPU Scheduling **8 Hours**
Scheduling Concepts, Performance Criteria, Process States, Process Transition Diagram, Schedulers, Process Control Block (PCB), Process address space, Process identification information, Threads and their management, Scheduling Algorithms, Multiprocessor Scheduling. Deadlock: System model, Deadlock characterization, Prevention, Avoidance and detection, Recovery from deadlock.
Unit IV: Memory Management **8 Hours**
Memory Management: Basic bare machine, Resident monitor, Multiprogramming with fixed partitions, Multiprogramming with variable partitions, Protection schemes, Paging, Segmentation, Paged segmentation, Virtual memory concepts, Demand paging, Performance of demand paging, Page replacement algorithms, Thrashing, Cache memory organization, Locality of reference.
Unit V: Input/ Output **8 Hours**
I/O Management and Disk Scheduling: I/O devices, and I/O subsystems, I/O buffering, Disk storage and disk scheduling, RAID. File System: File concept, File organization and access mechanism, File directories, and File sharing, File system implementation issues, File system protection and security.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
20	30	50	100

Name of The Course	Database Management Systems				
Course Code	BCSE2011				
Prerequisite	tructures and Algorithms", "Discrete Mathematics"				
Corequisite	"C-Programming"				
Antirequisite					
	L	**T**	**P**	**C**	
	3	0	0	3	

Course Objectives:

1. Develop the ability to design, implement and manipulate databases.
2. Introduce students to build data base management systems.
3. Able to store and analyze data into normalized format.
4. Apply DBMS concepts to various examples and real life applications

Course Outcomes

CO1	Learn knowledge of ER Modeling.
CO2	Apply programming concepts using DDL and DML commands in SQL.
CO3	Understand the storage system in Relational Database and imposing security.
CO4	Able to remove various anamolies from databses.
CO5	Understanding of transaction process.

Text Book (s)

1 "Database system concepts" Henry F Korth, Abraham Silberschatz, S. Sudurshan, McGraw-Hill

Reference Book (s):

1 T2. Date C J, " An Introduction to Database Systems", Addision Wesley
2 T3. Elmasri, Navathe, " Fudamentals of Database Systems", Addision Wesley
3 T4: O'Neil, Databases, Elsevier Pub.
4 T5: Leon & Leon,"Database Management Systems", Vikas Publishing House
5 T6: Bipin C. Desai, " An Introduction to Database Systems", Gagotia Publications
6 T7: Majumdar & Bhattacharya, "Database Management System", TMH (14)
7 T8: Ramkrishnan, Gehrke, " Database Management System", McGraw Hill

Course Content:

Unit I: Introduction **9 Hours**
Introduction: An overview of database management system, database system Vs file system, Database system concept and architecture, data model schema and instances, data independence and database language and interfaces, data definitions language, DML, Overall Database Structure.
Module II: Relational data Model and Language **9 Hours**
Relational data model concepts, integrity constraints, entity integrity, referential integrity, Keys constraints, Domain constraints, relational algebra, relational calculus, tuple and domain calculus. Introduction on SQL: Characteristics of SQL, advantage of SQL. SQl data type and literals. Types of SQL commands. SQL operators and their procedure. Tables, views and indexes. Queries and sub

queries. Aggregate functions. Insert, update and delete operations, Joins, Unions, Intersection, Minus, Cursors, Triggers, Procedures in SQL/PL SQL
Module III: Data Base Design & Normalization **10 Hours**
Functional dependencies, normal forms, first, second, third normal forms, BCNF, inclusion dependence, loss less join decompositions, normalization using FD, MVD, and JDs, alternative approaches to database design.
Module IV: Transaction Processing Concept **6 Hours**
Transaction system, Testing of serializability, serializability of schedules, conflict & view serializable schedule, recoverability, Recovery from transaction failures, log based recovery, checkpoints, deadlock handling. Distributed Database: distributed data storage, concurrency control, directory system.
Module V: Concurrency Control Techniques **6 Hours**
Concurrency control, Locking Techniques for concurrency control, Time stamping protocols for concurrency control, validation based protocol, multiple granularity, Multi version schemes, Recovery with concurrent transaction, case study of Oracle.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
20	30	50	100

Name of The Course	Data Communication and Networking				
Course Code	BCSE2012				
Prerequisite					
Corequisite					
Antirequisite					
		L	T	P	C
		3	0	0	3

Course Objectives:

1. Understand the fundamental concepts of data communications and networking.
2. Identify the basic components/instrument/equipment and their respective roles in data communication system
3. Understand the structure of computer networks, factors affecting computer network deployment.
4. Describe emerging technology in the net-centric computing area and assess their current capabilities, limitations and potential applications.
5. Program and analyse network protocols, architecture, algorithms and other safety critical issues in real-life scenario.

Course Outcomes

CO1	Understand the different networking sub-systems and their functions in a telecommunication system.
CO2	Understand and configure the different types of network topologies and protocols.
CO3	Understand the different protocols layers of the OSI model.
CO4	Examine and analyze the network-layer concepts like Network-Layer services –Routing -IP protocol -IP addressing
CO5	Examine and analyze the different link-layer and local area network concepts like Link-Layer services –Ethernet -Token Ring -Error detection and correction -ARP protocol

Text Book (s)

1. Forouzan, Data Communications and Networking, McGraw Hill, 4th ed.
2. Tannenbaum, Computer Networks ,Pearsoned Education.

Reference Book (s):

1. William Stallings,Data and Computer Communications, Pearsoned Education
2. Hykins, Analog and Digital Communications, Wiley Publications.

Course Content:

Unit I:Introduction Concepts **8 Hours**
Data and Signal fundamentals, Analog Signals, Digital Signals, Transmission Media: Guided and Unguided Media, Transmission Impairments, Categories of Networks, Network Topology Design - Delay Analysis, Switching methods, ISDN, The OSI reference model ,TCP/IP Protocol Suite, Comparison of OSI and TCP/IP.
Unit II: Digital and Analog Transmission **8 Hours**

Digital Transmission: Digital-to-Digital Conversion, Analog-to-Digital Conversion, Pulse Code Modulation, Delta Modulation, Digital-to-Analog Conversion, ASK,FSK,PSK, Analog-to-Analog Conversion, Modulation Techniques.
Unit III: Medium Access sub layer **8 Hours**
Medium Access sub layer - Channel Allocations, LAN protocols -ALOHA protocols - Overview of IEEE standards - FDDI. Data Link Layer - Elementary DataLink Protocols, Sliding Window protocols,Error Detection and Correction: Block coding, cyclic codes, Linear block codes, checksum.
Unit IV:Network and Transport Layer **8 Hours**
Network Layer - Point - to Pont Networks, routing, Congestion control, Internetworking -TCP / IP, IP packet, IP address, IPv6. Transport Layer - Design issues, connection management, session Layer-Design issues, remote procedure call. Presentation Layer-Design issues, Data compression techniques, cryptography - TCP - Window Management.
Unit V: Application Layer **8 Hours**
Electronic mail, WWW,HTTP,SMTP,POP3,IMAP,FTP,SSH.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
20	30	50	100

Name of The Course	Engineering Thermodynamics				
Course Code	BTME2002				
Prerequisite					
Corequisite					
Antirequisite					
	L	**T**	**P**	**C**	
	3	0	0	3	

Course Objectives:

1. To learn the basic principles of classical thermodynamics.
2. To apply the laws of thermodynamics to various systems and analyze the significance of the results.
3. To analyze the performance of thermodynamic gas and vapour power cycles.

Course Outcomes

CO1	Demonstrate basic understanding and knowledge of thermodynamic properties.
CO2	Demonstrate basic understanding and knowledge of first law of thermodynamics and its application to open and closed systems
CO3	Demonstrate basic understanding and knowledge of the second law of thermodynamic and its application to open and closed systems.
CO4	Demonstrate basic understanding and knowledge of entropy and its application to engineering systems.
CO5	Perform the basic thermal analysis of thermodynamic cycles

Text Book (s)

1. P. K. Nag (2010), Basic and Applied Thermodynamics, Tata McGraw-Hill Publishing Company Ltd., ISBN 978-0-070-15131-4

Reference Book (s):

1. Yunus A. Cengel and Michael A. Boles, Thermodynamics, An Engineering Approach, 8th Ed., McGraw Hill, 20015, ISBN: 978-9-339-22165-2.

Course Content:

Unit-1 Basic Concepts of Thermodynamics 9 Hours
Thermodynamics and Energy, Macroscopic and microscopic viewpoint, Closed and open systems, Thermodynamic properties of a system, State and equilibrium, Processes and cycles, Forms of energy , Temperature and its measurement, Zeroth law of thermodynamics.
Unit-2: First Law of Thermodynamics 9 Hours
Work transfer, pdV work, Types of work transfer, Net work done by a system, heat transfer, path function, Specific heat and latent heat, First law of thermodynamics for a closed system undergoing a cycle and change of state, Energy – a property of the system, enthalpy, specific heat at constant pressure and volume, PMM-I, Control volume, First law applied to steady flow process, Mass and energy balance
Unit-3 : Second Law of Thermodynamics 9 Hour
Limitations of the first law of Thermodynamics, Kelvin-Planck statement of the second law of thermodynamics, Clausius statement, Equivalence of Kelvin- Planck and Clausius statements,

Heat engine, Refrigerators, Heat Pump, COP, Carnot's theorem, Corollary of Carnot's theorem, Reversible and Irreversible process, Efficiency of Reversible Heat engine, PMM-II, Carnot cycle.
Unit-4 : Entropy and properties of pure sustances 9 Hours
Introduction, Clausius theorem, Entropy – property of the system, Clausius inequality, Entropy change in irreversible process, Entropy principle, Reversible adiabatic work in steady flow system, Availability and irreversibility, Second law efficiency, p-v, p-T and T-s diagrams for a pure substance, Quality, Introduction to steam tables.
Unit-5 : Thermodynamic Cycles 9 Hours
Carnot cycle, Otto cycle, Diesel and Dual cycles, Brayton and reversed Brayton Cycle, Rankine cycle

Continuous Assessment Pattern

Internal Assessment (IA)	**Mid Term Test (MTE)**	**End Term Test (ETE)**	**Total Marks**
20	30	50	100

Name of The Course	Operating Systems Lab				
Course Code	BCSE2411				
Prerequisite					
Corequisite					
Antirequisite					
	L	**T**	**P**	**C**	
	3	0	0	3	

Course Objectives:

To understand the services provided by and to design an operating system

To understand what a process is and how processes are scheduled

To understand different approaches to memory management.

Course Outcomes

CO1	Understand process management, concurrent processes and threads, memory management, virtual memory concepts, deadlocks
CO2	Understand the classical problems in Concurrent Processes and their solutions.
CO3	Implement different types of CPU Scheduling Algorithm along with the understanding of the concept of Deadlock in system and its methods of handling deadlocks.
CO4	Produce algorithmic solutions to process synchronization problems
CO5	

Text Book (s)

1.Silberschatz, Galvin and Gagne, “Operating Systems Concepts”, Wiley, Ninth Edition, 2013.

2.D M Dhamdhere, “Operating Systems: A Concept based Approach”, McGraw Hill Education, 3 edition, 2012.

List of Experiments	
1	Introduction to basis Linux commands and application development through C on Linux environment.
2	Program to report the behaviour of the OS to get the CPU type and model, kernel version.
3	Program to get the amount of memory configured into the computer, amount of memory currently available.
4	Create a process using fork, where one parent process generates Fibonacci series for ‘n’ terms and child calculates no of vowels in a file. The values of ‘n’ and file name are taken as command line arguments.
5	Write a program using P-thread, where main thread calculates number of lines in a file and child calculates number of words.

6	Write a program to implement the FCFS, SJRF, Priority, Round – Robin process scheduling algorithms.
7	Write a program to implement Inter Process Communication (IPC) using Message Queues.
8	Write a program to implement IPC using pipes.
9	Implementation of wait and signal using counting semaphores.
10	Implementation of wait and signal using binary semaphores.
11	Implement the solution for reader – writer's problem.
12	Implement the solution for dining philosopher's problem.
13	Implement banker's algorithm.
14	Implement the first fit; best fit and worst fit file allocation strategy.
15	Implementation of page replacement algorithms.

Continuous Assessment Pattern

Internal Assessment (IA)	**Mid Term Test (MTE)**	**End Term Test (ETE)**	**Total Marks**
50		50	100

Name of The Course	Database Management Systems Practicals Lab				
Course Code	BCSE2014				
Prerequisite					
Corequisite					
Antirequisite					
		L	**T**	**P**	**C**
		3	0	0	3

Course Objectives:

To understand design of ER Diagrams and represent using Relational model

To understand the concept of normal forms in the design of databases.

To comprehend the structure of SQL Queries to retrieve data from the databases

Course Outcomes

CO1	Apply ER concepts to design databases.
CO2	Apply programming concepts using DDL and DML commands in SQL.
CO3	Design simple database using a tool and implement it using SQL.
CO4	Apply all constrains to develop a business application using cursors, triggers and stored procedures.
CO5	Design the storage structures and indexed structures

Text Book (s)

"Data base System Concepts", Silberschatz, Korth, McGraw Hill, V editionThe UNIX Programming Environment, B.W. Kernighan & R. Pike, Prentice Hall of India, Sixth Edition, 2013.

List of Experiments
Write the queries for Data Definition and Data Manipulation Language.
Write SQL queries using Comparison operators (=,<,>,etc).
Write SQL queries using Logical operators.
Write SQL query using SQL Operators.
Write SQL queries for relational algebra.
Write SQL queries for extracting data from more than one table.
Write SQL queries for sub queries, nested queries.

Write programme by the use of PL/SQL.
Concepts for ROLL BACK, COMMIT & CHECK POINTS.
Create VIEWS, CURSORS and TRGGERS & write ASSERTIONS.
Create FORMS and REPORTS

Continuous Assessment Pattern

Internal Assessment (IA)	**Mid Term Test (MTE)**	**End Term Test (ETE)**	**Total Marks**
50		50	100

Name of The Course	**Data Communication & Networking Lab**				
Course Code	**BCSE2015**				
Prerequisite					
Corequisite					
Antirequisite					
		L	**T**	**P**	**C**
		0	0	2	1

Course Objectives:

This course is designed to help organizations understand Data communication in computer network and learn working of different networking protocols. Student can also have understanding about various routing protocols and how they used in different types of computer network. This course also describe basic idea about security concern in computer network.

Course Outcomes

CO1	Understand the basics of various transmission media and networks.
CO2	Compare and analyze various types of signals and conversion.
CO3	Analyze the various Data Link layer protocols and IEEE standards.
CO4	Analyze the network-layer, transport layer protocols, compression and security mechanism.
CO5	Use various application layer protocols

Text Book (s)

1	Behrouz A. Forouzan, Data Communications and Networking, McGraw Hill, 4th edition, 2007.
2	Andrew S. Tanenbaum, Computer Networks, Pearson, Fifth Edition, 2011.

Reference Book (s)

1	William Stallings, Data and Computer Communications, Pearson,8th Edition, 2007.
2	Simon Haykin, Michael Moher, Introduction to Analog and Digital Communications, Wiley Publications, Second Edition, 2007.

List of Experiments	
1	Introduction to basic Linux networking commands. (Commands like ipconfig, getmac, tracert, pathping, arp, ping, netstat, finger etc.)
2	Implement bit stuffing and de-stuffing
3	Write a program for hamming code generation for error detection and correction.
4	Implement cyclic redundancy check (CRC).
5	Write a program for congestion control using the leaky bucket algorithm.

6	Implement Dijkstra's algorithm to compute a shortest path through graph.
7	Take a 64-bit plain text and encrypt the same using DES algorithm.
8	Using RSA algorithm encrypts a text data and decrypts the same.
9	Implementation of the link state routing protocols.
10	Implementation of LZW compression and decompression algorithms.

Continuous Assessment Pattern

Internal Assessment (IA)	**Mid Term Test (MTE)**	**End Term Test (ETE)**	**Total Marks**
50	-	50	100

SEMESTER V

Name of The Course	**English Proficiency and Aptitude Building -4**			
Course Code	**SLBT3001**			
Prerequisite				
Corequisite				
Antirequisite				
24 sessions of 100 minutes each, 12 hours of online tests	**L**	**T**	**P**	**C**
	3	0	4	2

Course Objectives:

- Enhance formal writing skills
- To understand soft-skills pertaining to industry

Course Outcomes

CO1	Able to develop a logical thought process related to every aspect of life
CO2	Able to widen the horizon of one's thought process and data analysis skill
CO3	Able to interpret data and convert it into information

Text Book (s)

SLLL own text book

Reference Book (s):

- Communication Skills for Engineers, Mishra, Sunita & C.Muralikrishna, Pearson
- Corporate Soft skills, Sarvesh Gulati, 2006.

Continuous Assessment Pattern

Internal Assessment (IA)	**Mid Term Test (MTE)**	**End Term Test (ETE)**	**Total Marks**
20	30	50	100

Name of The Course	Design & Analysis of Algorithms			
Course Code	BCSE3001			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	3	0	0	3

Course Objectives:

The primary objective of this course is to introduce the topic of algorithms as a precise mathematical concept, and study how to design algorithms, establish their correctness, study their efficiency and memory needs. The course consists of a strong mathematical component in addition to the design of various algorithms.

Course Outcomes

CO1	Analyze the complexity of the algorithms and use technique divide and conquer to solve the problems
CO2	Identify feasible solutions for different problems through greedy method and minimize the solutions space and to solve the problems through dynamic programming.
CO3	Solve the problems through graph algorithms.
CO4	Justify that a certain problem is NP-Complete
CO5	Understand and apply linear programming concepts to real time applications.

Text Book (s)

Micheal T. Goodrich and Roberto Tamassia: Algorithm Design: Foundations, Analysis and Internet examples (John Wiley &Sons, Inc., 2002).

Algorithms Algorithms, MIT Press, Second Edition (Indian reprint: Prentice-Hall), 2008.

Reference Book (s)

Thomas H. Coreman, Charles E. Leiserson and Ronald L. Rivest, "Introduction to Algorithms", The MIT Press, 3rd edition, 2009.

Course Contents:

Unit-1: Introduction **9 hours**
Introduction : Algorithms, Analyzing algorithms, Complexity of algorithms, Growth of functions, Performance measurements, Sorting and order Statistics - Shell sort, Quick sort, Merge sort, Heap sort, Comparison of sorting algorithms, Sorting in linear time.
Unit II: Tree **9 hours**
Advanced Data Structures: Red-Black trees, B – trees, Binomial Heaps, Fibonacci Heaps.
Unit III : Algorithm **9 Hours**
Divide and Conquer with examples such as Sorting, Matrix Multiplication, Convex hull and Searching. Greedy methods with examples Huffman Coding, Knapsack, Minimum Spanning trees – Prim's and Kruskal's algorithms, Single source shortest paths - Dijkstra's and Bellman Ford algorithms.
Unit IV : Dynamic Programming **9 Hours**
Dynamic programming with examples such as Knapsack, All pair shortest paths – Warshal's andFloyd's algorithms, Resource allocation problem. Backtracking, Branch and Bound with examples such as Travelling Salesman Problem, Graph Coloring, n-Queen Problem, Hamiltonian Cycles and Sum of subsets.
Unit V : Computations **9 Hours**

Selected Topics: Algebraic Computation, String Matching, Theory of NP-completeness, Approximation algorithms and Randomized algorithms.

Continuous Assessment Pattern

Internal Assessment (IA)	**Mid Term Test (MTE)**	**End Term Test (ETE)**	**Total Marks**
20	30	50	100

Name of The Course	**Compiler Design**				
Course Code	**BCSE3002**				
Prerequisite					
Corequisite					
Antirequisite					
		L	**T**	**P**	**C**
		3	**0**	0	3

Course Objectives:

The goal of the course is to provide an introduction to the system software like assemblers, compilers, and macros. It provides the complete description about inner working of a compiler. This course focuses mainly on the design of compilers and optimization techniques. It also includes the design of Compiler writing tools. This course also aims to convey the language specifications, use of regular expressions and context free grammars behind the design of compiler.

Course Outcomes

CO1	Use language specifications behind the design of compiler.
CO2	Construct LL, SLR, CLR and LALR parsing table.
CO3	Evaluate different intermediate codes.
CO4	Implement different data structure and allocation schemes for symbol table.
CO5	Apply modern tools and technologies for designing new compiler.

Text Book (s)

Alfred V Aho, Jeffrey D. Ullman, "Principles of Compiler Design", Narosa Publishing House, 2002.

Reference Book (s)

V Raghvan, "Principles of Compiler Design", TMH, 2011.

Contents:

Unit-1: Introduction 9 hours
Introduction to Compiler, Phases and passes, Bootstrapping, Finite state machines and regular expressions and their applications to lexical analysis, Optimization of DFA-Based Pattern Matchers, implementation of lexical analyzers, lexical-analyzer generator, LEX-compiler, Formal grammars and their application to syntax analysis, BNF notation, ambiguity, YACC. The syntactic specification of programming languages: Context free grammars, derivation and parse trees, capabilities of CFG.
Unit II: Basic Parsing Techniques 9 hours
Parsers, Shift reduce parsing, operator precedence parsing, top down parsing, predictive parsers Automatic Construction of efficient Parsers: LR parsers, the canonical Collection of LR (0) items, constructing SLR parsing tables, constructing Canonical LR parsing tables, Constructing LALR parsing tables, using ambiguous grammars, an automatic parser generator, and implementation of LR parsing tables.
Unit III : Syntax Directed Translation 9 Hours
Syntax-directed Translation schemes, Implementation of Syntax directed Translators, Intermediate code, postfix notation, Parse trees & syntax trees, three address code, quadruple & triples, translation of assignment statements, Boolean expressions, statements that alter the flow of control, postfix translation, translation with a top down parser. More about translation: Array references in arithmetic expressions, procedures call, declaration sand case statements.
Unit IV : Symbol Table 9 Hours

Data structure for symbols tables, representing scope information. Run-Time Administration: Implementation of simple stack allocation scheme, storage allocation in block structured language. Error Detection & Recovery: Lexical Phase errors, syntactic phase errors semantic errors.
Unit V : Code Generation 9 Hours
Design Issues, the Target Language. Addresses in the Target Code, Basic Blocks and Flow Graphs, Optimization of Basic Blocks, Code Generator. Code optimization: Machine-Independent Optimizations, Loop optimization, DAG representation of basic blocks, value numbers and algebraic laws, Global Data-Flow analysis.

Continuous Assessment Pattern

Internal Assessment (IA)	**Mid Term Test (MTE)**	**End Term Test (ETE)**	**Total Marks**
20	30	50	100

Name of The Course	Software Engineering & Testing Methodologies			
Course Code	BCSE3003			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	3	0	0	3

Course Objectives:

The scope of the course is concerns with the stages of the software engineering process, including requirements gathering, specification, design, implementation, and testing. Students will learn the various the testing techniques.

Course Outcomes

CO1	Understand the key concerns that are common to all software development processes.
CO2	Able to select appropriate process models, approaches and techniques to manage a given software development process.
CO3	Able to elicit requirements for a software product and translate these into a documented design.
CO4	Recognize the importance of software reliability and how we can design dependable software, and what measures are used.
CO5	Understand the principles and techniques underlying the process of inspecting and testing software and making it free of errors and tolerable.

Text Book (s)

Software Engineering: A practitioner's Approach, Roger S Pressman, Sixth Edition. McGrawHill International Edition, 2005.

Reference Book (s)

Fundamentals of Software Engineering: Rajib Mall, PHI, 2005.

Unit-1: Introduction to Software Engineering **9 hours**
Software Components, Software Characteristics, Software Crisis, Software Engineering Processes, Similarity and Differences from Conventional Engineering Processes, Software Quality Attributes. Software Development Life Cycle (SDLC) Models: Water Fall Model, Prototype Model, Spiral Model, Evolutionary Development Models, Iterative Enhancement Models.
Unit II: Software Requirement Specifications (SRS) and Design 9 hours
Requirement Engineering Process: Elicitation, Analysis, Documentation, Review and Management of User Needs, Feasibility Study, Information Modelling, Basic Concept of Software Design, Architectural Design, Low Level Design: Modularization, Design Structure Charts, Pseudo Codes, Flow Charts, Coupling and Cohesion Measures, Design Strategies: Function Oriented Design, Object Oriented Design, Top-Down and Bottom-Up Design Data Flow Diagrams, Entity Relationship Diagrams.
Unit III : Software Testing Methods and Selection 9 Hours
Testing Objectives ,Faults, Errors, and Failures, Basics of software testing, Testing objectives, Principles of testing, Requirements, behavior and correctness, Testing and debugging, Test metrics and measurements, Verification, Validation and Testing, Types of testing, Software Quality and Reliability, Software defect tracking.
Unit IV : Software Testing Methods and Selection 9 Hours

Structural Testing (White Box Testing), Functional Testing (Black Box Testing), Integration Testing, , Regression Testing, Testing for Functionality and Testing for Performance, Top-Down and Bottom-Up, Acceptance Testing ,Alpha and Beta Testing of Products. Static Testing Strategies: Formal Technical Reviews (Peer Reviews), Walk Through, Regression testing, Regression test process, Initial Smoke or Sanity test, Tools for regression testing, Ad hoc Testing: Pair testing, Exploratory testing, Iterative testing, Defect seeding.
Unit V : Software Project and Test Management 9 Hours
Software as an Evolutionary Entity, Need for Maintenance, Categories of maintenance: Preventive, Corrective and Perfective Maintenance, Cost of Maintenance, Software Re-Engineering, Reverse Engineering. Software Configuration Management Activities, Constructive Cost Models (COCOMO). Test Planning, Management, Execution and Reporting, Software Test Automation: Testing in Object Oriented Systems.

Continuous Assessment Pattern

Internal Assessment (IA)	**Mid Term Test (MTE)**	**End Term Test (ETE)**	**Total Marks**
20	30	50	100

Name of The Course	Microprocessor & Interfacing			
Course Code	BCSE3004			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	3	0	0	3

Course Objectives:

1. To Familiarize the students with the architecture of 8086
2. To introduce the concepts of Assembly language programming of 8086.
3. To make the students familiar with ICs required for interfacing 8086 with I/O devices

Course Outcomes

CO1	To understand architecture of 8086 processor
CO2	To design Assembly language program for 8086
CO3	To use advanced features of 8086
CO4	To interface 8086 with various devices and memory
CO5	To understand the architecture and principles of USART 8245

Text Book (s)

1. D.V. Hall, Microprocessors & Interfacing, TMH, 3rd edition

2. Barry B Brey, The intel microprocessor: architecture, programming and interfacing, Prentice hall of India, New Delhi, 2003.ISBN-0138027455, 4th Edition

Reference Book (s)

1. Alan Clements, "Principles of Computer Hardware", Oxford University Press, 3rd Edition, 2003, ISBN-9780198564539

Course Contents:

Unit-1: Introduction **9 hours**
History of microprocessors, Introduction of 8086, Functional diagram of 8086, Register Organization, Memory Segmentation, Programming Model, Memory addresses. Physical memory organization, signal descriptions of 8086- common function signals. Minimum and Maximum mode signals, Timing diagrams.
Unit II: Assembly Language Programming (Part-I) 9 hours
Instruction formats, addressing modes, instruction set, assembler directives, simple programs involving logical, branch and arithmetic expressions
Unit III : Assembly Language Programming (Part-II) 9 Hours
Procedures: Near and Far procedures, Macros, String Manipulations, searching and sorting programs, Advanced features of Assembly language programming
Unit IV : I/O Interface 9 Hours
8255 PPI, various modes of operation and interfacing to 8086, Interfacing keyboard, display, stepper motor interfacing, D/A and A/D converter, 8251 USART architecture and interfacing, RS-232.

Unit V : Interfacing with memory & Interrupts **Hours**	**9**
Memory interfacing to 8086, Interrupt structure of 8086, Vector interrupt table, Interrupt service routine. Introduction to DOS and BIOS interrupts, Interfacing 8259 Interrupt Controller, DMA Controller 8257.	

Continuous Assessment Pattern

Internal Assessment (IA)	**Mid Term Test (MTE)**	**End Term Test (ETE)**	**Total Marks**
20	30	50	100

Name of The Course	**Design & Analysis of Algorithms Lab**			
Course Code	**BCSE3006**			
Prerequisite				
Corequisite				
Antirequisite				
	L	**T**	**P**	**C**
	0	**0**	2	1

Course Objectives:

To identify & apply the concept complexities of various problems in different domains and computational intractability.

Course Outcomes

CO1	To analyze the running time of asymptotic algorithm.
CO2	To develop algorithms for sorting, searching, insertion and matching.
CO3	To identify and apply the concept of computational intractability.
CO4	Apply the algorithms and design techniques to solve problems
CO5	Analyze the complexities of various problems in different domains.

Text Book (s)

Aho, Hopcraft, Ullman, "The Design and Analysis of Computer Algorithms" Pearson Education, 2008.

Reference Book (s)

1. Thomas H. Coreman, Charles E. Leiserson and Ronald L. Rivest, "Introduction to Algorithms", Printice Hall of India.
2. RCT Lee, SS Tseng, RC Chang and YT Tsai, "Introduction to the Design and Analysis of Algorithms", Mc Graw Hill, 2005.
3. E. Horowitz & S Sahni, "Fundamentals of Computer Algorithms",
4. Berman, Paul," Algorithms", Cengage Learning.

List of Experiments:

1. Write a program to sort given set of numbers in ascending/descending order using Bubble sort and also search a number using binary search.
2. Write a program to sort given set of numbers in ascending/descending order using Insertion sort and also search a number using linear search.
3. Write a program to sort given set of numbers in ascending/descending order using Quick sort and any other sorting algorithm. Also record the time taken by these two programs and compare them.
4. Write a program to sort given set of numbers using Heap sort.
5. Write a program to sort given set of numbers Merge Sort.
6. Write a program to sort given set of numbers Counting Sort.

7. Write a program to implement Strassen's Matrix Multiplication by Divide and Conquer
8. Write a program to implement Knapsack using Greedy technique.
9. Write a program to implement Knapsack using Dynamic programming.
10. Write a program to implement Dijkstra's Algorithm.
11. Write a program to implement n-Queen Problem using backtracking.
12. Write a program to implement String Matching using Rabin-Karp algorithm.

Continuous Assessment Pattern

Internal Assessment (IA)	**Mid Term Test (MTE)**	**End Term Test (ETE)**	**Total Marks**
50		50	100

Name of The Course	**Compiler Design Lab**				
Course Code	**BCSE3007**				
Prerequisite					
Corequisite					
Antirequisite					
	L	**T**	**P**	**C**	
	0	**0**	2	1	

Course Objectives:

The goal of the course is to provide an introduction to the system software like assemblers, compilers, and macros. It provides the complete description about inner working of a compiler. This course focuses mainly on the design of compilers and optimization techniques. It also includes the design of Compiler writing tools. This course also aims to convey the language specifications, use of regular expressions and context free grammars behind the design of compiler.

Course Outcomes

CO 1	Understand how to design a compiler.
CO 2	Construct LL, SLR, CLR and LALR parsing table.
CO 3	Evaluate different intermediate codes.
CO 4	Implement different data structure and allocation schemes for symbol table.
CO 5	Apply modern tools and technologies for designing new compiler.

Text Book (s) / Reference Book (s)

1	V Raghvan, “Principles of Compiler Design”, TMH, 2011.
2	Kenneth Louden,” Compiler Construction”, Cengage Learning, 2002.
3	Charles Fischer and Ricard LeBlanc,” Crafting a Compiler with C”, Pearson Education,1991.

List of Experiments	
1	Design a Lexical analyzer for identifying different types of token used in C language.
2	Write a program to find first and follow of a given string.
3	Write a program to implement left recursion of a given grammar.
4	Write a program to implement left factoring.

5	Write a program to implement 3 address code.
6	Write a program to implement Predictive Parser. Write a C program
7	Write a Program to Design Lexical Analyzer.
8	Write a program to Design LALR Bottom up Parser.
9	Convert The BNF rules into Yacc form and write code to generate abstract syntax tree.

Continuous Assessment Pattern

Internal Assessment (IA)	**Mid Term Test (MTE)**	**End Term Test (ETE)**	**Total Marks**
50		50	100

Name of The Course	Software Engineering & Testing Methodologies Lab			
Course Code	**BCSE3008**			
Prerequisite				
Corequisite				
Antirequisite				
	L	**T**	**P**	**C**
	0	**0**	2	1

Course Objectives:

Students will understand and knowledge of the foundations, techniques, and tools in the area of software testing and its practice in the industry.

Course Outcomes

CO1	Understanding and knowledge of the foundations, techniques, and tools in the area of software testing and its practice in the industry.
CO2	Discuss the distinctions between validation testing and defect testing.
CO3	Understand the principles and need for various types of testing.
CO4	Describe strategies for generating system test cases.
CO5	Understand the essential characteristics of tool used for test automation.

Text Book (s)

K. K. Aggarwal and Yogesh Singh, "Software Engineering", New Age International Publication.

Reference Book (s)

1. S. Desikan and G. Ramesh, "Software Testing: Principles and Practices", Pearson Education.
2. Aditya P. Mathur, "Fundamentals of Software Testing", Pearson Education.
3. Naik and Tripathy, "Software Testing and Quality Assurance", Wiley

Sr. No.	Title of Lab Experiments
1.	Demonstration on Manual testing a. Write Programs in „C" Language to demonstrate the working of the following constructs: i)do…while ii) while…do iii)if…else iv)switch v)for b. Write a program in "C" language to demonstrate the working of palindrome using do…while.
2.	Demonstration on Unit testing a. Create a test plan document for any application (e.g. Library Management System). b. Study of any testing tool (e.g. Win runner). c. Create a test plan document for cellular phone.
3.	Demonstration on Integration testing Take a mini project (e.g. University admission, Placement Portal) and execute it. During the li the mini project create the various testing documents and final test report document.
4.	Demonstration on System testing a. Take any system (e.g. ATM system) and study its system specifications and report the various bugs. b. Write down the test cases for any known applications (e.g. Banking Application).

5.	Demonstration on Blackbox testing a. Design a usecase diagram for an ATM system. b. Design a class diagram for an ATM system. c. Design a usecase diagram for Library system.
6.	Demonstration on WhiteBox testing a.Create various testing document for robot control system. b."A Program written in „C" Language for Matrix Multiplication fails" Introspect the causes for its failure and write down the possible reasons for its failure. c. Write a Program in „C" Language to demonstrate the working of Addition of diagonal elements in a matrix.
7.	Demonstration on Regression testing a. Study of any web-testing tool (eg. Selenium). b. Study of any bug-tracking tool (eg. Bugzilla, bug bit). c. Study of any test management tool (eg. Test Director). d. Compare different testing tools.
8	Demonstration on Mutation testing Write down the test cases for any known applications (e.g. Banking Application).
9	Demonstration on Alpha testing. Make a Case Based study on the experiment
10.	Demonstration on Beta testing. Make a Case Based study on the experiment
11.	Demonstration on User Acceptance testing. Make a Case Based study on the experiment

Continuous Assessment Pattern

Internal Assessment (IA)	**Mid Term Test (MTE)**	**End Term Test (ETE)**	**Total Marks**
50	-	50	100

Name of The Course	**Microprocessor & Interfacing Lab**				
Course Code	**BCSE3009**				
Prerequisite					
Corequisite					
Antirequisite					
		L	**T**	**P**	**C**
		0	**0**	2	1

Course Objectives:

This course facilitates the students to familiar with Micro Processor (MP) based system design which includes hardware, software and interfacing. After completing this course, the student should be able to design a complete Microprocessor based system for a real-world application. Course covers the introduction to basic digital devices and microcomputer components, Architecture and programming of 8086 Microprocessors, Interrupts, peripheral interfacing and direct memory access.

Course Outcomes

CO1	Write assembly language program for basic mathematical and logical operations.
CO2	Explain the interrupts of 8086 microprocessor
CO3	Explain the 8086 based system with programmable peripheral interface, programmable timer interface and Programmable interrupt controller interface.
CO4	Summarize the concept of peripheral / interfacing
CO5	Analyze the 8086 based system with DMA.

Text Book (s)

1	Brey Barry B. & C R Sarma The Intel Microproc,: Arch, Prog. & Interfacing Pearson Edu.,8thEdition, 2008.

Reference Book (s)

1	The x86 processors, Architecture, programming and interfacing. Lyla B Das, Pearson 2010.
2	Morris Mano, Digital Design ,PHI, 5th edition, 2012.

List of Experiments	
1	Arithmetic operation – Multi byte Addition and Subtraction, Multiplication and Division Signed and unsigned Arithmetic operation, ASCII – arithmetic operation.
2	Logic operations – Shift and rotate – Converting packed BCD to unpacked BCD, BCD to ASCII conversion.
3	By using string operation and Instruction prefix: Move Block, Reverse string, Sorting,
4	Inserting, Deleting, Length of the string, String comparison.
5	Reading and Writing on a parallel port.

6	Timer in different modes.
7	Serial communication implementation.
8	8259 – Interrupt Controller: Generate an interrupt using 8259 timer.
9	8279 – Keyboard Display: Write a small program to display a string of characters.
10	Traffic Controller Interface.
11	ADC & DAC Interface.
12	8255- Interface.
13	8251- UART Interfacing

Continuous Assessment Pattern

Internal Assessment (IA)	**Mid Term Test (MTE)**	**End Term Test (ETE)**	**Total Marks**
50		50	100

Semester VI

Name of The Course	**Web Technologies**			
Course Code	**BCSE3012**			
Prerequisite				
Corequisite				
Antirequisite				
	L	**T**	**P**	**C**
	3	0	0	3

Course Objectives:

Design and implement dynamic websites with good aesthetic sense of designing and latest technical know-how's. Have a Good grounding of Web Application Terminologies, Internet Tools, E – Commerce and other web services.

Course Outcomes

CO1	Understand basic web concepts and Internet protocols.
CO2	Understand CGI Concepts & CGI Programming.
CO3	Analyze Scripting Languages.
CO4	Analyze Scripting Languages.
CO5	Design SERVELETS AND JSP.

Text Book (s)

1	IvanBayross -Web Enabled Commercial Application Development Using HTML, DHTML, Java Script, Perl, CGI-2000
2	Gopalan N.P. and Akilandeswari J., “Web Technology”, Prentice Hall of India, 2011.
3	Paul Dietel and Harvey Deitel,”Java How to Program”, Prentice Hall India Learning Private Limited

Reference Book (s)

1	Mahesh P. Matha, “Core Java A Comprehensive study”, Prentice Hall of India, 2011.
2	UttamK.Roy, “Web Technologies”, Oxford University Press, 2011.

Course Content:

Unit I:	**8 Hours**
Introduction to web, protocols governing the web, web development strategies, web applications, web project, web team.	
Unit II:	**8 Hours**
HTML: list, table, images, frames, forms, CSS;XML: DTD, XML schemes, presenting and using XML	
Unit III:	**8 Hours**
Java script: Introduction, documents, forms, statements, functions, objects; Event and event handling; introduction to AJAX.	
Unit IV:	**8 Hours**
Java server pages (JSP), JSP application design, declaring variables and methods, debugging, sharing data between JSP pages, JSP objects, Session, development of java beans in Jsp, data base action with JSP.	
Unit V:	**8 Hours**
Unit V: PHP (Hypertext Preprocessor): Introduction, syntax, variables, strings, operators, if-else, loop, switch, array, function, form ,mail, file upload, session, error, exception, filter, PHP-ODBC.	

Continuous Assessment Pattern

Internal Assessment (IA)	**Mid Term Test (MTE)**	**End Term Test (ETE)**	**Total Marks**
20	30	50	100

Name of The Course	Computer Graphics			
Course Code	BCSE3011			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	3	0	0	3

Course Objectives:

This course focuses on 2D and 3D interactive and non-interactive graphics. This course studies the principles underlying the generation and display of 2D and 3D computer graphics. In this course topics include geometric modeling, 3D viewing and projection, lighting and shading, color, and the use of one or more technologies and packages such as OpenGL, and Blender. Course requirements usually include exam and several programming or written homework assignments.

Course Outcomes

CO1	To understand the principles, commonly used paradigms and techniques of computer graphics. e.g. the graphics pipeline, and Bresenham's algorithm for speedy line and circle generation.
CO2	Be able to understand 2D graphics concepts in the development of computer games, information visualization, and business applications.
CO3	To develop a facility with the relevant mathematics of 3D graphics like projection, clipping and transformation
CO4	Be able to understand the representation of non linear shapes. E. g. Curves, hidden surfaces.
CO5	Be able to develop animations like motion sequence, morphing and illustrating models for lighting/shading.

Text Book (s)

1	Donald Hearn and M Pauline Baker, "Computer Graphics C Version", Pearson Education, India; 2 edition 2002.
2	Computer Graphics Principles and Practice, Second Edition in C, James D.Foley, Andries Van Dam, Steven K.Feiner, JhonF.Hughes, Addison Wesley, Third Edition, 2014.

Reference Book (s)

1	Steven Harrington, "Computer Graphics: A Programming Approach" , McGraw-Hill Inc.,US; 2nd Revised edition edition, 1983.
2	David Rogers, " Procedural Elements of Computer Graphics", McGraw Hill Education; 2 edition, 2017.

Course Content:

Unit-1 Introduction	**9 hours**
Types of computer graphics, Graphic Displays- Random scan displays, Raster scan displays, Frame buffer and video controller, Points and lines, Line drawing algorithms, Circle generating algorithms, Midpoint circle generating algorithm, and parallel version of these algorithms.	
Unit-2Transformations	**9 hours**

Basic transformation, Matrix representations and homogenous coordinates, Composite transformations, Reflections and shearing. Windowing and Clipping: Viewing pipeline, Viewing transformations, 2-D Clipping algorithms-Line clipping algorithms such as Cohen Sutherland line clipping algorithm, Liang Barsky algorithm, Line clipping against non rectangular clip windows; Polygon clipping – Sutherland Hodgeman polygon clipping, Weiler and Atherton polygon clipping, Curve clipping, Text clipping.
Unit-3Three Dimensional 9 hours
3-D geometric primitives, 3-D Object representation, 3-D Transformation, 3-D viewing, projections, 3-D Clipping.
Unit-4Curves and Surfaces 9 hours
Quadric surfaces, Spheres, Ellipsoid, Blobby objects, Introductory concepts of Spline, Bspline and Bezier curves and surfaces.
Unit-5Hidden Lines and Illumination models 9 hours
Hidden Lines and Surfaces: Back Face Detection algorithm, Depth buffer method, A-buffer method, Scan line method, basic illumination models – Ambient light, Diffuse reflection, Specular reflection and Phong model, Combined approach, Warn model, Intensity Attenuation, Color consideration, Transparency and Shadows.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
20	30	50	100

Name of The Course	Artificial Intelligence and Intelligent Systems-II			
Course Code	BCSE9020			
Prerequisite	Pattern Recognition and Data mining			
Corequisite	NA			
Antirequisite	NA			
	L	T	P	C
	0	0	6	3

Course Objective:

Build awareness of AI facing major challenges and the complexity of typical problems within the field. Develop self-learning and research skills to tackle a topic of interest on his/her own or as part of a team.

Course Outcomes

CO1	Exhibit strong familiarity with a number of important AI techniques, including in particular search, knowledge representation, planning and constraint management.
CO2	Interpret the modern view of AI as the study of agents that receive percepts from the environment and perform actions.
CO3	Build awareness of AI facing major challenges and the complexity of typical problems within the field.
CO4	Assess critically the techniques presented and apply them to real world problems.
CO5	Develop self-learning and research skills to tackle a topic of interest on his/her own or as part of a team.

Text Book (s)

1. Stuart Russel and Peter Norwig, "Artificial Intelligence: A Modern Approach", Prentice Hall thirdedition, 2012.

Reference Book (s)

1. Kevin Night and Elaine Rich, Nair B., "Artificial Intelligence (SIE)", McGraw Hill- 2012.
2. Parag kulkarni and Prachi Joshi, **"**Artificial Intelligence-Building Intelligent Systems", PHI-2015
3. S. Gupta "Artificial Intelligence", Shubham Publications-2014.

Course Content:

Unit-1: Introduction to AI **8 hours**
Brief Overview of AI and Intelligence system, AI Terminlogy: Intelligent Agent, Types of Agent, Backward Chaining, Forward Chaining, Heuristics Search Techniques.
Unit II: Adversarial Search, Planning and Understanding 8 hours
Adversarial Search Methods:Mini-max Algorithm, Alpha-Beta pruning. Planning: Introduction, component of planning, Goal stack planning. Understanding: What is understanding, Complexity of understanding, Understanding as constraint satisfaction.
Unit III : Computational Learning Models 8 Hours
Introduction, Statistical learning, Learning with complete data, Learning with hidden data, Naïve Bayes Models, EM Algorithm, Neural Network-based Learning.

Unit IV : Decision Theory and Pattern Recognition	**8 Hours**
Introduction Decision Theory: Bayesian Network, Decision Network, Introduction of Pattern Recognition, Pattern Recognition System, Design Principles of Pattern Recognition Systems.	
Unit V : Computer Vision	**8 Hours**
Introduction, Phases of computer vision: (Low level processing, Intermediate level image processing, and High level processing), Role of AI in computer vision, Application areas of computer vision.	

Continuous Assessment Pattern

Internal Assessment (IA)	**Mid Term Test (MTE)**	**End Term Test (ETE)**	**Total Marks**
20	30	50	100

Name of The Course	**Industry Oriented Python–III**				
Course Code	**BCSE3073**				
Prerequisite					
Corequisite					
Antirequisite					
		L	**T**	**P**	**C**
		0	**0**	2	1

Course Objectives:

The objective is to introduce to the learner core programming concepts and equip them to write robust codes and solve complex problems by using procedural, object oriented, data structures and database connectivity concepts in Python.

Course Outcomes

CO1	Select decision-making and looping structures in programming, and
CO2	Incorporate object-oriented programming concept in programming.
CO3	Use of python packages in different data structures.
CO4	Design Python application with database connectivity
CO5	Apply Modular programming approach using methods and functions.

Text Book (s) / Reference Book (s)

Python Programming: An Introduction to Computer Science (Second Edition) John Zelle, ISBN 978-1-59028-241-0-9, Franklin, Beedle & Associates Inc., 2004.

List of Exercise (Industrial oriented Python-3)

1. Create a program that asks the user to enter their name and their age. Print out a message addressed to them that tells them the year that they will turn 100 years old.
2. Ask the user for a number. Depending on whether the number is even or odd, print out an appropriate message to the user. *Hint: how does an even / odd number react differently when divided by 2?*
3. Take a list, and write a program that prints out all the elements of the list that are less than 5.
4. Create a program that asks the user for a number and then prints out a list of all the divisors of that number. (If you don't know what a *divisor* is, it is a number that divides evenly into another number. For example, 13 is a divisor of 26 because 26 / 13 has no remainder.)
5. Take two lists, and write a program that returns a list that contains only the elements that are common between the lists (without duplicates). Make sure your program works on two lists of different sizes.
6. Ask the user for a string and print out whether this string is a palindrome or not. (A **palindrome** is a string that reads the same forwards and backwards.)
7. Let's say I give you a list saved in a variable: a = [1, 4, 9, 16, 25, 36, 49, 64, 81, 100]. Write one line of Python that takes this list a and makes a new list that has only the even elements of this list in it.
8. Make a two-player Rock-Paper-Scissors game. (*Hint: Ask for player plays (using input), compare them, print out a message of congratulations to the winner, and ask if the players want to start a new game*)

Remember the rules:

- Rock beats scissors
- Scissors beats paper
- Paper beats rock

9. Generate a random number between 1 and 9 (including 1 and 9). Ask the user to guess the number, then tell them whether they guessed too low, too high, or exactly right.
10. Take two lists, and write a program that returns a list that contains only the elements that are common between the lists (without duplicates). Make sure your program works on two lists of different sizes.
11. Ask the user for a number and determine whether the number is prime or not. (For those who have forgotten, a prime number is a number that has no divisors.).
12. Write a program that takes a list of numbers (for example, a = [5, 10, 15, 20, 25]) and makes a new list of only the first and last elements of the given list. For practice, write this code inside a function.
13. Write a program that asks the user how many Fibonnaci numbers to generate and then generates them. Take this opportunity to think about how you can use functions. Make sure to ask the user to enter the number of numbers in the sequence to generate.(*Hint: The Fibonnaciseqence is a sequence of numbers where the next number in the sequence is the sum of the previous two numbers in the sequence. The sequence looks like this: 1, 1, 2, 3, 5, 8, 13, …*)
14. Write a program (function!) that takes a list and returns a new list that contains all the elements of the first list minus all the duplicates.
15. Write a program (using functions!) that asks the user for a long string containing multiple words.

    Print back to the user the same string, except with the words in backwards order. For example, say

    I type the string:
    My name **is** Michele

    Then I would see the string:
    Michele **is** name My

    shown back to me.
16. Write a password generator in Python. Be creative with how you generate passwords - strong passwords have a mix of lowercase letters, uppercase letters, numbers, and symbols. The passwords should be random, generating a new password every time the user asks for a new password. Include your run-time code in a main method.

17. Create a program that will play the “cows and bulls” game with the user. The game works like this:

    Randomly generate a 4-digit number. Ask the user to guess a 4-digit number. For every digit that the user guessed correctly *in the correct place*, they have a “cow”. For every digit the user guessed correctly *in the wrong place* is a “bull.” Every time the user makes a guess, tell them how many “cows” and “bulls” they have. Once the user guesses the correct number, the game is over. Keep track of the number of guesses the user makes throughout teh game and tell the user at the end.

18. Write a function that takes an ordered list of numbers (a list where the elements are in order from smallest to largest) and another number. The function decides whether or not the given number is inside the list and returns (then prints) an appropriate boolean.
19. Given a .txt file that has a list of a bunch of names, count how many of each name there are in the file, and print out the results to the screen.
20. Given two .txt files that have lists of numbers in them, find the numbers that are overlapping.

Continuous Assessment Pattern

Internal Assessment (IA)	**Mid Term Test (MTE)**	**End Term Test (ETE)**	**Total Marks**
50	-	50	100

Name of The Course	Industry Oriented Java-3			
Course Code	BCSE3074			
Prerequisite	Industry oriented Java 1 EMPS3003			
Corequisite	Industry oriented Java 2 BCSE3071			
Antirequisite				
	L	**T**	**P**	**C**
	0	0	2	1

Course Objectives:

1. Learn logical building with java programming as the application of a set of methodologies and technologies.
2. Learn how the java programmimg can be used in developing user interface design and development .
3. Learn the how java technologies can be used for design and development of application using servlet.
4. Learn the how java technologies can be used for design and development of application using jsp.
5. Learn how to establish database connectivity using JDBC, servlet and JSP technologies.

Course Outcomes

CO1	Implement logical building programmes based on java 2 and java 3.
CO2	Apply user interface design using key technologies in JEE.
CO3	Apply servlet and session handling technologies used for java application development.
CO4	Apply JSP technologies java application development.
CO5	Implement the Database connectivity using JDBC by means of Servlet and JSP.

Text Book (s)

1.JDBC 4.2, Servlet 3.1, and JSP 2.3 Includes JSF 2.2 and Design Patterns, Black Book Wiley India; 2nd edition (January 1, 2016)

2. Kathy Sierra & Bert Bates, “Head First Java”, O’Reilly, 2nd Edition.

3. R. Naughton and H. Schildt –Java2 (The Complete Reference) –Fifth Edition –TMH –2004.

Reference Book (s):

1. Kathy Sierra and Bert Bates- Head First Java-O’Really Publication

2. K. Arnold and J.Gosling –The Java Programming Language –3rd Edition., Pearson Edu,2005.

3. E Balagurusamy, “Programming with Java A Primer”, TMH, 4th edition.

4. David Flanagan –Java in a Nutshell: A Desktop Quick Reference for Java Programmers– O’Reilly & Associates, Inc. 1999.

Course Content:

Unit-1 REVISION OF INDUSTRY ORIENTED JAVA 1 AND INDUSTRY ORIENTED JAVA 2 9 Hours
Basic Programming Concepts Control Statements OOPs String Arrays Exception Handling Assessment IO Serialization Multithreading Collection SQL JDBC Assessment
Unit-2: USER INTERFACE 9 Hours
Introduction to web development. What is JEE, Key technologies in JEE, JEE application architecture Basic code of HTML,CSS Validations with Java scripts Assessment
Unit-3 : Servlet 9 Hours
What is a servlet Servlet Lifecycle classes for handling request and response Simple servlet example Working with form data Initialization in init Initialization through Servlet Config Initialization through Servlet Context send Redirect()Servlet communication forward() and include() Request Attributes Assessment Session Introduction Ways to maintain state HttpSession, Session Destruction Internal working Session tracking API Assessment
Unit-4 : JSP 9 Hours
JSP introduction MVC JSP lifecycle Syntactic Elements of a JSP Page JSP scripting elements Implicit objects JSP directives Assessment Scriptlets JSP JSP Standard Action tags Java Bean , , Assessment
Unit-5 : Database Connectivity using JSP and Servlet 9 Hours
JSP, Servlet, JDBC

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
50	-	50	100

Program Elective-1

Name of The Course	**Principles of Programming Languages**			
Course Code	**PE1**			
Prerequisite				
Corequisite				
Antirequisite				
	L	**T**	**P**	**C**
	3	0	0	3

Course Objectives:

1. Explain the value of declaration models, especially with respect to programming-in-the-large.
2. Identify and describe the properties of a variable such as its associated address, value, scope, persistence, and size.
3. Demonstrate different forms of binding, visibility, scoping, and lifetime management and discuss type incompatibility.
4. Defend the importance of types and type-checking in providing abstraction and safety.
5. Summarize the evolution of programming languages illustrating how this history has led to the paradigms available today.
6. Evaluate the tradeoffs between the different paradigms, considering such issues as space efficiency, time efficiency (of both the computer and the programmer), safety, and power of expression

Course Outcomes

CO1	Evaluate programming languages on a feature-by-feature basis and explain the meaning and use of different features.
CO2	Specify programming language syntax, semantics and translation using high-level formal notations.
CO3	Explain the implementation of a non-trivial software system and demonstrate its correctness using appropriate test cases.
CO4	The student would acquire various problem solving techniques and will be able to implement them in 'C' language

Text Book (s)

1. Concepts of Programming Languages Robert .W. Sebesta 6/e, Pearson Education
2. Programming Languages –Louden, Second Edition, Thomson.

Reference Book (s):

1. Programming languages –Ghezzi, 3/e, John Wiley
2. Programming Languages Design and Implementation – Pratt and Zelkowitz, Fourth Edition PHI/Pearson Education
3. Programming languages –Watt, Wiley Dreamtech

Course Contents:

Unit I: Preliminary Concepts **7 Hours**
concepts of programming languages, Programming domains, Language Evaluation Criteria, influences on Language design, Language categories, Programming Paradigms– Imperative, Object Oriented, functional Programming , Logic Programming. Programming Language Implementation– Compilation and Virtual Machines, programming environments

Module II: Syntax and Semantics	**8 Hours**
General Problem of describing Syntax and Semantics, formal methods of describing syntax - BNF, EBNF for common programming languages features, parse trees, ambiguous grammars, attribute grammars, denotational semantics and axiomatic semantics for common programming language features.	
Module III: Data types, Expressions and Statements	**8 Hours**
Introduction, primitive, character, user defined, array, associative, record, union, pointer and reference types, design and implementation uses related to these types. Names, Variable, concept of binding, type checking, strong typing, type compatibility, named constants, variable initialization. Arithmetic relational and Boolean expressions, Short circuit evaluation mixed mode assignment, Assignment Statements, Control Structures – Statement Level, Compound Statements, Selection, Iteration, Unconditional Statements, guarded commands.	
Module IV: Subprograms and Blocks	**8 Hours**
Fundamentals of sub-programs, Scope and lifetime of variable, static and dynamic scope, Design issues of subprograms and operations, local referencing environments, parameter passing methods, overloaded sub-programs, generic sub-programs, parameters that are sub-program names, design issues for functions user defined overloaded operators, co routines.	
Module V: Abstract Data types	**8 Hours**
Abstractions and encapsulation, introductions to data abstraction, design issues, language examples, C++ parameterized ADT, object oriented programming in small talk, C++, Java, C#, Ada 95.Concurrency: Subprogram level concurrency, semaphores, monitors, massage passing, Java threads, C# threads.	

Continuous Assessment Pattern

Internal Assessment (IA)	**Mid Term Test (MTE)**	**End Term Test (ETE)**	**Total Marks**
20	30	50	100

Name of The Course	**Data Compression**				
Course Code	**PE2**				
Prerequisite					
Corequisite					
Antirequisite					
		L	**T**	**P**	**C**
		3	0	0	3

Course Objectives:

1. Gain a fundamental understanding of data compression methods for text, images, and video, and related issues in the storage, access, and use of large data sets.
2. Select, giving reasons that are sensitive to the specific application and particular circumstance, most appropriate compression techniques for text, audio, image and video information.
3. Illustrate the concept of various algorithms for compressing text, audio, image and video information.

Course Outcomes

CO1	Program, analyze Hoffman coding: Loss less image compression, Text compression, Audio Compression.
CO2	Program and analyze various Image compression and dictionary based techniques like static Dictionary, Diagram Coding, Adaptive Dictionary.
CO3	Understand the statistical basis and performance metrics for lossless compression.
CO4	Understand the conceptual basis for commonly used lossless compression techniques, and understand how to use and evaluate several readily available implementations of those techniques.
CO5	Understand the structural basis for and performance metrics for commonly used lossy compression techniques and conceptual basis for commonly used lossy compression techniques.

Text Book (s)

1. Mark Nelson, "The Data Compression Book".
2. David Salomon, "Data Compression: The Complete Reference", 2nd Edition.

Reference Book (s):

1. Khalid Sayood, Introduction to Data Compression, Morgan Kaufmann Publishers.

Course Contents:

Unit I: Compression Techniques 8 Hours
Loss less compression, Lossy Compression, Measures of prefonnance,Modeling and coding, Mathematical Preliminaries for Lossless compression: A brief introduction to information theory, Models: Physical models, Probability models, Markov models, composite source model, Coding: uniquely decodable codes, Prefix codes.
Module II: The Huffman coding algorithm 8Hours
Minimum variance Huffman codes, Adaptive Huffman coding: Update procedure, Encoding procedure, Decoding procedure. Golomb codes, Rice codes, Tunstall codes, Applications of Hoffman coding: Loss less image compression, Text compression, Audio Compression.
Module III: Coding 10 Hours

Coding a sequence, Generating a binary code, Comparison of Binary and Huffman cding, Applications: Bi-level image compression- The JBIG standard, JBIG2, Image compression. Dictionary Techniques: Introduction, Static Dictionary: Diagram Coding, Adaptive Dictionary. The LZ77 Approach, The LZ78 Approach, Applications: File Compression-UNIX compress, Image Compression: The Graphics Interchange Format (GIF), Compression over Modems: V.42 bits, Predictive Coding: Prediction with Partial match (ppm): The basic algorithm, The ESCAPE SYMBOL, length of context, The Exclusion Principle, The Burrows-Wheeler Transform: Moveto-front coding, CALIC, JPEG-LS, Multi-resolution Approaches, Facsimile Encoding, Dynamic Markoy Compression.
Module IV: Scalar Quantization 7 Hours
Distortion criteria, Models, Scalar Quantization: The Quantization problem, Uniform Quantizer, Adaptive Quantization, Non uniform Quantization**.**
Module V: Vector Quantization 5 Hours
Advantages of Vector Quantization over Scalar Quantization, The Linde-Buzo-Gray Algorithm

Continuous Assessment Pattern

Internal Assessment (IA)	**Mid Term Test (MTE)**	**End Term Test (ETE)**	**Total Marks**
20	30	50	100

Name of The Course	Artificial Intelligence			
Course Code	PE3			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	3	0	0	3

Course Objectives:

1. Learn and possess a firm grounding in the existing techniques and component areas of Artificial Intelligence
2. Apply this knowledge to the development of Artficial Intelligent Systems and to the exploration of research problems.

Course Outcomes

CO1	Understand the principles of problem solving and be able to apply them successfully.
CO2	Be familiar with techniques for computer-based representation and manipulation of complex information, knowledge, and uncertainty.
CO3	Gain awareness of several advanced AI applications and topics such as intelligent agents, planning and scheduling, machine learning, etc.

Text Book (s)

1. Stuart Russell, Peter Norvig, "Artificial Intelligence – A Modern Approach", Pearson Education.
2. Elaine Rich and Kevin Knight, "Artificial Intelligence", McGraw-Hill

Reference Book (s):

1. E Charniak and D McDermott, "Introduction to Artificial Intelligence", Pearson Education
2. Dan W. Patterson, "Artificial Intelligence and Expert Systems", Prentice Hall of India,

Course Contents:

Unit I: Introduction **8 Hours**
Introduction to Artificial Intelligence, Foundations and History of Artificial Intelligence, Applications of Artificial Intelligence, Intelligent Agents, Structure of Intelligent Agents. Computer vision, Natural Language Possessing.
Module II: Introduction to Search **8Hours**
Searching for solutions, Uniformed search strategies, Informed search strategies, Local search algorithms and optimistic problems, Adversarial Search, Search for games, Alpha - Beta pruning.
Module III: Knowledge Representation & Reasoning **8Hours**
Propositional logic, Theory of first order logic, Inference in First order logic, Forward & Backward chaining, Resolution, Probabilistic reasoning, Utility theory, Hidden Markov Models (HMM), Bayesian Networks.
Module IV: Machine Learning **8 Hours**
Supervised and unsupervised learning, Decision trees, Statistical learning models, Learning with complete data - Naive Bayes models, Learning with hidden data – EM algorithm, Reinforcement learning
Module V: Pattern Recognition **8 Hours**
Introduction, Design principles of pattern recognition system, Statistical Pattern recognition, Parameter estimation methods - Principle Component Analysis (PCA) and Linear Discriminant Analysis (LDA), Classification Techniques – Nearest Neighbor (NN) Rule, Bayes Classifier, Support Vector Machine (SVM), K – means clustering.

Continuous Assessment Pattern

Internal Assessment (IA)	**Mid Term Test (MTE)**	**End Term Test (ETE)**	**Total Marks**
20	30	50	100

Name of The Course	Pattern Recognition			
Course Code	PE4			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	3	0	0	3

Course Objectives:

1. Learn the fundamentals of Pattern recognition and to choose an appropriate feature.
2. Classification algorithm for a pattern recognition problems and apply them properly using modern computing tools such as Matlab, C/C++ etc.
3. Analyze, and report the results using proper technical terminology

Course Outcomes

CO1	Understand the nature and inherent difficulties of the pattern recognition problems.
CO2	Understand concepts, trade-offs, and appropriateness of the different feature types and classification techniques such as Bayesian, maximum-likelihood, etc.
CO3	Select a suitable classification process, features, and proper classifier to address a desired pattern recognition problem.
CO4	Demonstrate algorithm implementation skills using available resources and be able to properly interpret and communicate the results clearly and concisely using pattern recognition terminology.

Text Book (s)

1. R.O. Duda, P.E. Hart, D.G. Stork, "Pattern Classification" Second EditionJohn Wiley,2006.

Reference Book (s):

1. C. M. Bishop, "Pattern Recognition and Machine Learning", Springer, 2009.
2. S. Theodoridis and K. Koutroumbas, "Pattern Recognition", 4th Edition, Academic Press,2009.

Course Contents:

Unit I: Introduction **8 Hours**
Basics of pattern recognition, Design principles of pattern recognition system, Learning and adaptation, Pattern recognition approaches, Mathematical foundations – Linear algebra, Probability Theory, Expectation, mean and covariance, Normal distribution, multivariate normal densities, Chi squared test.
Module II: Statistical Patten Recognition **8Hours**
Bayesian Decision Theory, Classifiers, Normal density and discriminant functions.
Module III: Parameter estimation methods **8Hours**
Maximum-Likelihood estimation, Bayesian Parameter estimation, Dimension reduction methods - Principal Component Analysis (PCA), Fisher Linear discriminant analysis, Expectation-maximization (EM), Hidden Markov Models (HMM),Gaussian mixture models.
Module IV: Nonparametric Techniques **8 Hours**
Density Estimation, Parzen Windows, K-Nearest Neighbor Estimation, Nearest Neighbor Rule, Fuzzy classification.

Module V:	**8 Hours**
Unsupervised Learning & Clustering: Criterion functions for clustering, Clustering Techniques: Iterative square - error partitional clustering – K means, agglomerative hierarchical clustering, Cluster validation.	

Continuous Assessment Pattern

Internal Assessment (IA)	**Mid Term Test (MTE)**	**End Term Test (ETE)**	**Total Marks**
20	30	50	100

Name of The Course	Soft Computing			
Course Code	PE5			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	3	0	0	3

Course Objectives:

1. Familiarize with soft computing concepts.
2. Introduce and use the idea of neural networks, fuzzy logic and use of heuristics based on human experience.
3. Introduce and use the concepts of Genetic algorithm and its applications to soft computing using some applications.

Course Outcomes

CO1	Identify and describe soft computing techniques and their roles in building intelligent machines
CO2	Recognize the feasibility of applying a soft computing methodology for a particular problem
CO3	Apply fuzzy logic and reasoning to handle uncertainty and solve engineering problems, genetic algorithms to combinatorial optimization problems and neural networks to pattern classification and regression problems
CO4	Effectively use modern software tools to solve real problems using a soft computing approach and evaluate various soft computing approaches for a given problem

Text Book (s)

1. Jang J.S.R.,Sun C.T and Mizutami E - Neuro Fuzzy and Soft computing Prentice hall New Jersey,1998
2. Timothy J.Ross:Fuzzy Logic Engineering Applications.McGraw Hill,NewYork,1997.
3. Laurene Fauseett:Fundamentals of Neural Networks.prentice Hall India,New Delhi,1994.

Reference Book (s):

1. George J.Klir and Bo Yuan,Fuzzy Sets and Fuzzy Logic,Prentice Hall Inc.,New Jersey,1995
2. Nih.J.Ndssen Artificial Intelligence,Harcourt Asia Ltd.,Singapore,1998

Course Contents:

Unit I: Artificial Neural Networks **8 Hours**
Basic-concepts-single layer perception-Multi layer perception-Supervised and unsupervised learning back propagation networks, Application
Module II: Fuzzy Systems **8Hours**
Fuzzy sets and Fuzzy reasoning-Fuzzy matrices-Fuzzy functions-decomposition-Fuzzy automata and languages- Fuzzy control methods-Fuzzy decision making, Applications
Module III: Neuro-Fuzzy Modeling **8Hours**
Adaptive networks based Fuzzy interfaces-Classification and Representation trees-Data dustemp algorithm –Rule base structure identification-Neuro-Fuzzy controls

Module IV: Genetic Algorithm	**8 Hours**
Survival of the fittest-pictures computations-cross over mutation-reproduction-rank method-rank space method, Application	
Module V: Artificial Intelligence	**8 Hours**
AI Search algorithm-Predicate calculus rules of interface - Semantic networks-frames-objects-Hybrid models, applications	

Continuous Assessment Pattern

Internal Assessment (IA)	**Mid Term Test (MTE)**	**End Term Test (ETE)**	**Total Marks**
20	30	50	100

Name of The Course	Digital Image Processing			
Course Code	PE6			
Prerequisite				
Corequisite				
Antirequisite				
	L	T	P	C
	3	0	0	3

Course Objectives:

1. Imparts knowledge in the area of image and image processing.
2. Understand fundamentals of digital image processing.
3. Provide knowledge of the applications of the theories taught in Digital Image Processing. This will be achieved through the project and some selected lab sessions.
4. Knowledge of advanced topics in digital image processing and skill base that would allow them to carry out further study.

Course Outcomes

CO1	Understand Basics of Image formation and transformation using sampling and quantization.
CO2	Understand different types signal processing techniques used for image sharpening and smoothing.
CO3	Perform and apply compression and coding techniques used for image data.
CO4	Detect and verify an image properly.
CO5	Understand the practical application on implementation of the image.

Text Book (s)

1. Ganzalez and Wood, "Digital Image Processing", Addison Wesley, 1993.
2. Anil K.Jain, "Fundamental of Image Processing", Prentice Hall of India.

Reference Book (s):

1. Rosenfeld and Kak, "Digital Picture Processing" vol.I & vol.II, Academic,1982
2. Ballard and Brown, "Computer Vision", Prentice Hall, 1982
3. Wayne Niblack, "An Introduction to Digital Image Processing", Prentice Hall, 1986
4. Milan Sonka, Vaclav Hlavac, Roger Boyle, "Image Processing, Analysis and Machine Vision",

Course Contents:

Unit I: Introduction to Image processing **8 Hours**
Image formation, image geometry perspective and other transformation, stereo imaging elements of visual perception. Digital Image-sampling and quantization serial & parallel Image processing.
Module II: Signal Processing **8Hours**
Signal Processing - Fourier, Walsh-Hadmard discrete cosine and Hotelling transforms and their properties, filters, correlators and convolvers. Image enhancement-Contrast modification, Histogram specification, smoothing, sharpening, frequency domain enhancement, pseudo-colour
Module III: Image Restoration **8Hours**
Image Restoration-Constrained and unconstrained restoration Wiener filter , motion blur remover, geometric and radiometric correction Image data compression-Huffman and other codes transform

compression, predictive compression two tone Image compression, block coding, run length coding, and contour coding.
Module IV: Segmentation Techniques 8 Hours
Segmentation Techniques-thresh holding approaches, region growing, relaxation, line and edge detection approaches, edge linking, supervised and unsupervised classification techniques, remotely sensed image analysis and applications
Module V: Shape Analysis 8 Hours
Shape Analysis – Gestalt principles, shape number, moment Fourier and other shape descriptors, Skelton detection, Hough transform, topological and texture analysis, shape matching. Practical Applications – Finger print classification, signature verification, text recognition, map understanding, bio-logical cell classification.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
20	30	50	100

Program Elective-2

Name of The Course	**Multimedia System**			
Course Code	**PE7**			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	**T**	**P**	**C**
	3	0	0	3

Course Objectives

1. Present a step-by-step approach to multimedia systems design
2. Introduce multimedia standards, compression and decompression technologies
3. Provide a detailed analysis of the various storage technologies.
4. Understand the fundamental issues and problems in the representation, manipulation, and delivery of multimedia content particularly in a networked environment.

Course Outcomes

CO1	Understand different realizations of multimedia tools and their usage.
CO2	Implement various multimedia standards and compression technologies
CO3	Analyze various storage technologies
CO4	Provide a detailed analysis of the various storage technologies.
CO5	Implement various multimedia standards and technologies

Text Book (s)

1. Tay Vaughan, "Multimedia, Making IT Work", McGraw Hill

Reference Book (s)

1. Buford, "Multimedia Systems", Addison Wesley.
2. Mark Nelson, "Data Compression Hand Book", BPB.
3. Sleinreitz, "Multimedia System", Addison Wesley.

Course Content

Unit I:Introduction **8 Hours**
Introduction to Multimedia, Multimedia Information, Multimedia Objects, Multimedia in business and work. Convergence of Computer, Communication and Entertainment products Stages of Multimedia Projects Multimedia hardware, Memory & storage devices, Communication devices, Multimedia software's, presentation tools, tools for object generations, video, sound, image capturing, authoring tools, card and page based authoring tools.
Unit II: Multimedia Building Blocks **7 Hours**
Text, Sound MIDI, Digital Audio, audio file formats, MIDI under windows environment Audio & Video Capture.
Unit III: Data Compression **9 Hours**
Huffman Coding, Shannon Fano Algorithm, Huffman Algorithms, Adaptive Coding, Arithmetic Coding Higher Order Modeling. Finite Context Modeling, Dictionary based Compression, Sliding Window Compression, LZ77, LZW compression, Compression, Compression ratio loss less & lossy compression
Unit IV: Speech Compression & Synthesis **7 Hours**

Digital Audio concepts, Sampling Variables, Loss less compression of sound, loss compression & silence compression
Unit V: Images **9 Hours**
Multiple monitors, bitmaps, Vector drawing, lossy graphic compression, image file formatic animations Images standards, JPEG Compression, Zig Zag Coding, Multimedia Database. Content based retrieval for text and images, Video: Video representation, Colors, Video Compression, MPEG standards, MHEG Standard Video Streaming on net, Video Conferencing, Multimedia Broadcast Services, Indexing and retrieval of Video Database, recent development in Multimedia.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
20	30	50	100

Name of The Course	Real Time Systems			
Course Code	PE8			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	3	0	0	3

Course Objectives

1. Develop an understanding of various Real Time systems Application
2. Obtain a broad understanding of the technologies and applications for the emerging and exciting domain of real-time systems.
3. Get in-depth hands-on experience in designing and developing a real operational system.

Course Outcomes

CO1	Understand concepts of Real-Time systems and modeling
CO2	Recognise the characteristics of a real-time system.
CO3	Understand and develop document on an architectural design of a real-time system
CO4	Develop and document Task scheduling, resource management, real-time operating systems and fault tolerant applications of of Real-Time Systems.
CO5	Understand concepts of Real-Time systems operating system.

Text Book (s)

1. Real Time Systems by Jane W. S. Liu, Pearson Education Publication.

Reference Book (s)

1. Mall Rajib, “Real Time Systems”, Pearson Education.
2. Albert M. K. Cheng, “Real-Time Systems: Scheduling, Analysis, and Verification”, Wiley

Course Content

Unit I:Introduction **8 Hours**
Definition, Typical Real Time Applications: Digital Control, High Level Controls, Signal Processing etc., Release Times, Deadlines, and Timing Constraints, Hard Real Time Systems and Soft Real Time Systems, Reference Models for Real Time Systems: Processors and Resources, Temporal Parameters of Real Time Workload, Periodic Task Model, Precedence Constraints and Data Dependency.
Unit II: Real Time Scheduling **8 Hours**
Common Approaches to Real Time Scheduling: Clock Driven Approach, Weighted Round Robin Approach, Priority Driven Approach, Dynamic Versus Static Systems, Optimality of Effective-Deadline-First (EDF) and Least-Slack-Time-First (LST) Algorithms, Rate Monotonic Algorithm, Offline Versus Online Scheduling, Scheduling Aperiodic and Sporadic jobs in Priority Driven and Clock Driven Systems.
Unit III: Resources Sharing **8 Hours**
Effect of Resource Contention and Resource Access Control (RAC), Non-preemptive Critical Sections, Basic Priority-Inheritance and Priority-Ceiling Protocols, Stack Based Priority-Ceiling Protocol, Use of Priority-Ceiling Protocol in Dynamic Priority Systems, Preemption

Ceiling Protocol, Access Control in Multiple-Module Resources, Controlling Concurrent Accesses to Data Objects.
Unit IV: Real Time Communication 8 Hours
Basic Concepts in Real time Communication, Soft and Hard RT Communication systems, Model of Real Time Communication, Priority-Based Service and Weighted Round-Robin Service Disciplines for Switched Networks, Medium Access Control Protocols for Broadcast Networks, Internet and Resource Reservation Protocols.
Unit V: Real Time Operating Systems and Databases 8 Hours
Features of RTOS, Time Services, UNIX as RTOS, POSIX Issues, Characteristic of Temporal data, Temporal Consistency, Concurrency Control, Overview of Commercial Real Time databases

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
20	30	50	100

Name of The Course	Distributed Systems				
Course Code	PE9				
Prerequisite					
Co-requisite					
Anti-requisite					
		L	T	P	C
		3	0	0	3

Course Objectives

1. Learn the principles underlying the functioning of distributed systems;
2. Realize the challenges encountered during the design and analysis of a distributed system
3. Identify efficient methods for facing these challenges and designing efficient distributed algorithms and systems
4. Learn to design, implement and evaluate distributed system algorithms

Course Outcomes

CO1	Understand distributed system and its properties.
CO2	Apply the principles and functioning of distributed systems, describe the problems and challenges associated with these principles, and evaluate the effectiveness and shortcomings of their solutions.
CO3	Analyze, how the principles are applied in contemporary distributed systems, explain how they affect the software design.
CO4	Design a distributed system that fulfills requirements with regards to key distributed systems properties (such as scalability, transparency, etc.)
CO5	Analyze, how the principles are applied in contemporary distributed systems, explain how they affect the software design.

Text Book (s)

1. Coulouris, Dollimore, Kindberg, "Distributed System: Concepts and Design", Pearson Education.
2. Tenanuanbaum, Steen," Distributed Systems", PHI

Reference Book (s)

1. Singhal & Shivaratri, "Advanced Concept in Operating Systems", McGraw Hill
2. Ramakrishna,Gehrke," Database Management Systems", Mc Grawhill
3. Gerald Tel, "Distributed Algorithms", Cambridge University Press

Course Content

Unit I:Characterization of Distributed Systems **8 Hours**
Introduction, Examples of distributed Systems, Resourcesharing and the Web Challenges. Architectural models, Fundamental Models. Theoretical Foundation for Distributed System: Limitation of Distributed system, absence ofglobal clock, shared memory, Logical clocks, Lamport's & vectors logical clocks. Concepts in Message Passing Systems: causal order, total order, total causal order, Techniques for Message Ordering, Causal ordering of messages, global state, termination detection.
Unit II: Distributed Mutual Exclusion **8 Hours**

Classification of distributed mutual exclusion, requirement ofmutual exclusion theorem, Token based and non token based algorithms, performance metric fordistributed mutual exclusion algorithms. Distributed Deadlock Detection: system model, resource Vs communication deadlocks, deadlock prevention, avoidance, detection & resolution, centralized dead lock detection, distributed dead lockdetection, path pushing algorithms, edge chasing algorithms.
Unit III: Agreement Protocols 9 Hours
Introduction, System models, classification of Agreement Problem,Byzantine agreement problem, Consensus problem, Interactive consistency Problem, Solution toByzantine Agreement problem, Application of Agreement problem, Atomic Commit in DistributedDatabase system.
Unit IV: Failure Recovery in Distributed Systems 7 Hours
Concepts in Backward and Forward recovery, Recovery in Concurrent systems, Obtaining consistent Checkpoints, Recovery in Distributed Database Systems. Fault Tolerance: Issues in Fault Tolerance, Commit Protocols, Voting protocols, Dynamic voting protocols.
Unit V: Transactions and Concurrency Control 8 Hours
Transactions, Nested transactions, Locks, Optimistic Concurrency control, Timestamp ordering, Comparison of methods for concurrency control. Distributed Transactions: Flat and nested distributed transactions, Atomic Commit protocols, Concurrency control in distributed transactions, Distributed deadlocks, Transaction recovery. Replication: System model and group communication, Fault - tolerant services, highly available services, Transactions with replicated data.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
20	30	50	100

Name of The Course	Wireless and Mobile Communication			
Course Code	PE10			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	3	0	0	3

Course Objectives

1. Introduce of wireless communication and mobile communication standards.
2. Provide understanding of advanced multiple access techniques, Mobile radio Propagation Models and modulation techniques
3. Provide understanding of digital cellular systems (GSM, CDMA, GPRS, W-CDMA etc.)

Course Outcomes

CO1	Understand principles of wireless communication and, various mobile network architecture.
CO2	Understand various Modulation techniques for Mobile Radio.
CO3	Understand the information theoretical aspects (such as the capacity) of wireless channels
CO4	Realize various wireless and mobile cellular communication systems
CO5	Implement practical mobile applications

Text Book (s)

1. T. S. Rappaport, Wireless digital communications; Principles and practice, Prentice Hall, NJ, 1996.
2. Schiller, Mobile Communications; Pearson Education Asia Ltd., 2000.

Reference Book (s)

1. K. Feher, Wireless digital communications, PHI, New Delhi, 1999.
2. W. C. Y. Lee, Mobile communications engineering: Theory and Applications, Second Edition, McGraw Hill, New York.1998.

Course Content

Unit I:Introduction to Wireless Communications 6 Hours
History and evolution of mobile radio systems. Types of mobile wireless services/systems- Cellular, WLL, Paging, Satellite systems, Standards, Future trends in personal wireless systems.
Unit II: Cellular Concepts and System Design Fundamentals 6 Hours
Cellular concept and frequency reuse, Multiple Access Schemes, channel assignment and handoff, Interference and system capacity, Trunking and Erlang capacity calculations.
Unit III: Mobile radio Propagation Models 8 Hours
Radio wave propagation issues in personal wireless systems, Propagation models, Multipath fading and Base band impulse respond models, parameters of mobile multipath channels, Antenna systems in mobile radio.
Unit IV: Modulation Techniques 8 Hours

Overview analog and digital modulation techniques, Performance of various modulation techniques-Spectral efficiency, Error-rate, Power Amplification, Equalizing Rake receiver concepts, Diversity and space-time processing, Speech coding and channel coding.
Unit V: System Examples and Design Issues 6 Hours
Multiple Access Techniques-FDMA, TDMA and CDMA systems, operational systems, Wireless networking, design issues in personal wireless systems

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
20	30	50	100

Name of The Course	DATA MINING & PREDICTIVE MODELING			
Course Code	Elective			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	3	0	0	3

Course Objectives

To learn, how to develop models to predict categorical and continuous outcomes, using such techniques as neural networks, decision trees, logistic regression, support vector machines, and Bayesian network models.

Course Outcomes

CO1	Select appropriate predictive modelling approaches to identify particular cases to progress
CO2	Apply predictive modelling approaches to identify particular cases.s
CO3	Compare and contrast the underlying predictive modeling techniques.
CO4	Select appropriate predictive modelling approaches to identify particular cases to progress
CO5	Apply predictive modelling approaches using a suitable package such as SPSS Modeler

Text Book (s)

1. JamesWuandStephenCoggeshall,FoundationsofPredictiveAnalytics,CRCPress,2012.

Reference Book (s)

2. BruceRatner,StatisticalandMachine-LearningDataMining,CRCPress,2011
3. EricSiegel&ThomasH.Davenport,PredictiveAnalytics,WileyPublications,2013

Course Content

Unit I: Data Understanding & preparation **8 Hours**
Identifyingbusinessobjectives,Translatingbusinessobjectivestodatamininggoals,Readingdatafromvarioussources–Database/Excel/Text/others,datavisualization–tabular&graphic, distributionsandsummarystatistics,fieldreordering,Reclassifydata
Unit II: Data Transformations **9 Hours**
Dataqualityissues,DataAudit,anomalies,relationshipsamongvariables,ExtentofMissingData,Segmentation,Outlierdetection,Variabletransformations,Variablederivation,Variableselection,AutomatedDataPreparation,Combiningdatafiles,datarestructuring,Aggregation,Duplicates removal,Samplingcases,DataCaching,Partitioningdata,MissingValuereplacement
Unit III: Modeling techniques–I **8 Hours**
PartitioningTheData-Training,Validation&Testing,Modelselection,Modeldevelopment techniquesLinearregression,Logisticregression,Discriminantanalysis,Bayesiannetworks,Neuralnetworks, Rle Induction
Unit IV : Modeling techniques-II **7 Hours**
Supportvectormachines,Coxregression,Timeseriesanalysis,Decisiontrees,Clustering, Association Rules, Sequence Detection, Which Technique To Use When

Unit V : Model evaluation & deployment	**8 Hours**
ModelValidation,DeterminingModelAccuracy,RuleInductionUsingCHAID,AutomatingModelsFor CategoricalTargets,AutomatingModelsForContinuousTargets,ComparingAndCombining Models,EvaluationChartsForModelComparison,UsingPropensityScores,Meta-LevelModeling, ErrorModeling,DeployingModel,ExportingModelResults,AssessingModelPerformance,Updating A Model.	

Continuous Assessment Pattern

Internal Assessment (IA)	**Mid Term Test (MTE)**	**End Term Test (ETE)**	**Total Marks**
20	30	50	100

Program Elective-3

Name of The Course	**Software Project Management**			
Course Code	**PE11**			
Prerequisite				
Corequisite				
Antirequisite				
	L	**T**	**P**	**C**
	3	0	0	3

Course Objectives:

1. Define and highlight importance of software project management.
2. Describe the software project management activities
3. Train software project managers and other individuals involved in software project.
4. Planning and tracking and oversight in the implementation of the software project management process

Course Outcomes

CO1	Describe and determine the purpose and importance of project management from the perspectives of planning, tracking and completion of project.
CO2	Compare and differentiate organisation structures and project structures.
CO3	Implement a project to manage project schedule, expenses and resources with the application of suitable project management tools.

Text Book (s)

Clifford F. Gray, Erik W. Larson, "Project Management: The Managerial Process with MS", Mc Graw Hill

Reference Book (s):

1. M. Cotterell, Software Project Management, Tata McGraw-Hill Publication.
2. Royce, Software Project Management, Pearson Education
3. Kieron Conway, Software Project Management, Dreamtech Press
4. S. A. Kelkar, Software Project Management, PHI Publication.

Course Contents:

Unit I: Introduction and Software Project Planning **8 Hours**
Fundamentals of Software Project Management (SPM), Need Identification, Vision and Scope document, Project Management Cycle, SPM Objectives, Management Spectrum, SPM Framework, Software Project Planning, Planning Objectives, Project Plan, Types of project plan, Structure of a Software Project Management Plan, Software project estimation, Estimation methods, Estimation models, Decision process.
Module II: Project Organization and Scheduling **8 Hours**
Project Elements, Work Breakdown Structure (WBS), Types of WBS, Functions, Activities and Tasks, Project Life Cycle and Product Life Cycle, Ways to Organize Personnel, Project schedule, Scheduling Objectives, Building the project schedule, Scheduling terminology and techniques, Network Diagrams: PERT, CPM, Bar Charts: Milestone Charts, Gantt Charts.
Module III: Project Monitoring and Control **8Hours**
Dimensions of Project Monitoring & Control, Earned Value Analysis, Earned Value Indicators: 23 Budgeted Cost for Work Scheduled (BCWS), Cost Variance (CV), Schedule Variance (SV),Cost

Performance Index (CPI), Schedule Performance Index (SPI), Interpretation of Earned Value Indicators, Error Tracking, Software Reviews, Types of Review: Inspections, Deskchecks, Walk through, Code Reviews, Pair Programming.
Module IV: Software Quality Assurance and Testing 8 Hours
Testing Objectives, Testing Principles, Test Plans, Test Cases, Types of Testing, Levels of Testing, Test Strategies, Program Correctness, Program Verification & validation, Testing Automation & Testing Tools, Concept of Software Quality, Software Quality Attributes, Software Quality Metrics and Indicators, The SEI Capability Maturity Model CMM), SQA Activities, Formal SQA Approaches: Proof of correctness, Statistical quality assurance, Clean room process.
Module V: Project Management and Project Management Tools 8 Hours
Software Configuration Management: Software Configuration Items and tasks, Baselines, Plan for Change, Change Control, Change Requests Management, Version Control, Risk Management: Risks and risk types, Risk Breakdown Structure (RBS), Risk Management Process: Risk identification, Risk analysis, Risk planning, Risk monitoring, Cost Benefit Analysis, Software Project Management Tools: CASE Tools, Planning and Scheduling Tools, MS-Project.

Continuous Assessment Pattern

Internal Assessment (IA)	**Mid Term Test (MTE)**	**End Term Test (ETE)**	**Total Marks**
20	30	50	100

Name of The Course	Software Quality Engineering				
Course Code	PE12				
Prerequisite					
Corequisite					
Antirequisite					
		L	T	P	C
		3	0	0	3

Course Objectives:

1. Introduce fundamental notions of software quality and the techniques used to build and check quality in software systems.
2. Provide the quantitative assessment of software quality and quality control using software testing techniques
3. Provide the knowledge to plan, implement and audit a Software Quality Management program for your organization.

Course Outcomes

CO1	Understand the basics of software quality engineering including its benefits, related models and standards, and quality team tools
CO2	Define software engineering life cycles and processes
CO3	Select, define, and apply software measurement, metrics, and analytical techniques to your software products, processes and services
CO4	Participate in peer reviews, and assist in the planning, implementation and evaluation of software testing activities
CO5	Understand the fundamentals of the Configuration management process to include configuration identification, configuration control, status accounting, and audits.

Text Book (s)

Jeff Tian, Software Quality Engineering (SQE), Wiley.

Reference Book (s):

Stephen H. Kan, Metrics and Models in Software Quality Engineering, Addison-Wesley.

Course Contents:

Unit I: Introduction **8 Hours**
Defining Software Quality, Software Quality Attributes and Specification, Cost of Quality, Defects, Faults, Failures, Defect Rate and Reliability, Defect Prevention, Reduction, and Containment, Overview of Different Types of Software Review, Introduction to Measurement and Inspection Process, Documents and Metrics.
Module II: Software Quality Metrics **8 Hours**
Product Quality Metrics: Defect Density, Customer Problems Metric, Customer Satisfaction Metrics, Function Points, In-Process Quality Metrics: Defect Arrival Pattern, Phase-Based Defect Removal Pattern, Defect Removal Effectiveness, Metrics for Software Maintenance: Backlog Management Index, Fix Response Time, Fix Quality, Software Quality Indicators.
Module III: Software Quality Management and Models **8Hours**
Modeling Process, Software Reliability Models: The Rayleigh Model, Exponential Distribution and Software Reliability Growth Models, Software Reliability Allocation Models, Criteria for Model

Evaluation, Software Quality Assessment Models: Hierarchical Model of Software Quality Assessment.
Module IV: Software Quality Assurance 8 Hours
Quality Planning and Control, Quality Improvement Process, Evolution of Software Quality Assurance (SQA), Major SQA Activities, Major SQA Issues, Zero Defect Software, SQA Techniques, Statistical Quality Assurance, Total Quality Management, Quality Standards and Processes.
Module V: Software Verification, Validation & Testing 8 Hours
Verification and Validation, Evolutionary Nature of Verification and Validation, Impracticality of Testing all Data and Paths, Proof of Correctness, Software Testing, Functional, Structural and Error-Oriented Analysis & Testing, Static and Dynamic Testing Tools, Characteristics of Modern Testing Tools

Continuous Assessment Pattern

Internal Assessment (IA)	**Mid Term Test (MTE)**	**End Term Test (ETE)**	**Total Marks**
20	30	50	100

Program Elective-4

Name of The Course	**Bioinformatics**			
Course Code	**PE13**			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	**T**	**P**	**C**
	3	0	0	3

Course Objectives:

1. Impart knowledge on basic techniques of Bioinformatics and on analysis of biological data using computational methods.
2. Investigating problems in molecular and biology from a computational perspective.

Course Outcomes

CO1	Extract information from different types of bioinformatics data (gene, protein, disease, etc.), including their biological characteristics and relationships
CO2	Employ different data representation models and formats used for bioinformatics data representation, including markup languages such as SBML and CellML, and ontologies such as GO ontology
CO3	Apply the different approaches used for data integration and data management, including data warehouse and wrapper approaches
CO4	Analyze processed data with the support of analytical and visualization tool
CO5	Interact with non-bioinformatics professionals, such as biologists and biomedical researchers, to better understand their bioinformatics needs for improved support and service delivery

Text Book (s)

1.D E Krane & M L Raymer, " Fundamental concepts of Bioinformatics", Perason Education.
2. Rastogi, Mendiratta, Rastogi, "Bioinformatics Methods & applications, Genomics, Proteomics & Drug Discovery" PHI, New Delhi

Reference Book (s):

1. Shubha Gopal et.al. " Bioinformatics: with fundamentals of genomics and proteomics", McGraw Hill.
2. O'Reilly, " Developing Bio informatics computer skills", CBS
3. Forsdyke, "Evolutionary Bioinformatics", Springer

Course Content:

Unit I: Bioinformatics	**9 Hours**
Bioinformatics objectives and overviews, Interdisciplinary nature of Bioinformatics, Data integration, Data analysis, Major Bioinformatics databases and tools. Metadata: Summary 40 & reference systems, finding new type of data online.	

Molecular Biology and Bioinformatics: Systems approach in biology, Central dogma of molecular biology, problems in molecular approach and the bioinformatics approach, overview of the bioinformatics applications.
Unit II: Quaternary structure **8 Hours**
Basic chemistry of nucleic acids, Structure of DNA, Structure of RNA, DNA Replication, -Transcription, -Translation, Genes- the functional elements in DNA, Analyzing DNA, DNA sequencing. Proteins: Amino acids, Protein structure, Secondary, Tertiary and Quaternary structure, Protein folding and function, Nucleic acid-Protein interaction.
Unit III: Perl **7 Hours**
Perl Basics, Perl applications for bioinformatics- Bioperl, Linux Operating System, mounting/ unmounting files, tar, gzip / gunzip, telnet, ftp, developing applications on Linux OS, Understanding and Using Biological Databases, Overview of Java, CORBA, XML, Web deployment concepts.
Unit IV: Genomic sequencing **8 Hours**
Genome, Genomic sequencing, expressed sequence tags, gene expression, transcription factor binding sites and single nucleotide polymorphism. Computational representations of molecular biological data storage techniques: databases (flat, relational and object oriented), and controlled vocabularies, general data retrieval techniques: indices, Boolean search, fuzzy search and neighboring, application to biological data warehouses.
Unit V: Macromolecular **8 Hours**
Macromolecular structures, chemical compounds, generic variability and its connection to clinical data. Representation of patterns and relationships: sequence alignment algorithms, regular expressions, hierarchies and graphical models, Phylogenetics BLAST.

Continuous Assessment Pattern

Internal Assessment (IA)	**Mid Term Test (MTE)**	**End Term Test (ETE)**	**Total Marks**
20	30	50	100

Name of The Course	Information Technology Infrastructure & its Management			
Course Code	PE14			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	3	0	0	3

Course Objectives:

1. To provide a roadmap for students why information systems are so important today for business and management.
2. Evaluate the role of the major types of information systems in a business environment and their relationship to each other.
3. Assess the impact of the Internet and Internet technology on business electronic commerce and electronic businesses.
4. Identify the major management challenges to building and using information systems and learn how to find appropriate solutions to those challenges.

Course Outcomes

CO1	Define an IT infrastructure and describe its components. Learn the core activities in the systems development process.
CO2	Cultivate skills and experience in the development and implementation of information systems projects.
CO3	Understand the basic concepts and technologies used in the field of management information systems.
CO4	Understand the processes of developing and implementing information systems and understand the role of information systems in organizations, the strategic management processes, and the implications for the management.
CO5	Develop an understanding of how various information systems work together to accomplish the information objectives of an organization.

Text Book (s)

1. Phuguni Gupta, Surya Prakash, Tata McGraw Hill

Reference Book (s):

1. IT Service Management based on ITIL – Colophon- Van Haren Publishing

Course Contents:

Unit I: INTRODUCTION **8 Hours**
Information Technology, Computer Hardware, Computer Software, Network and Internet, Computing Resources. IT INFRASTRUCTURE- Design Issues, Requirements, IT System Management Process, Service Management Process, Information System Design, IT Infrastructure Library.
Unit II: SERVICE DELIVERY PROCESS **8 Hours**
Service Delivery Process, Service Level Management, Financial Management, Service Management, Capacity Management, Availability Management
Unit III: SERVICE SUPPORT PROCESS **8 Hours**
Service Support Process, Configuration Management, Incident Management, Problem Management, Change Management, Release Management (9).

STORAGE MANAGEMENT- Backup & Storage, Archive & Retrieve, Disaster Recovery, Space Management, Database & Application Protection, Bare Machine Recovery, Data Retention.
Unit IV: SECURITY MANAGEMENT 8 Hours
Security, Computer and internet Security, Physical Security, Identity Management, Access Management. Intrusion Detection, Security Information Management.
Unit V: IT ETHICS 8 Hours
Introduction to Cyber Ethics, Intellectual Property, Privacy and Law, Computer Forensics, Ethics and Internet, Cyber Crimes. EMERGING TRENDS in IT- Electronics Commerce, Electronic Data Interchange, Mobile Communication Development, Smart Card, Expert Systems.

Continuous Assessment Pattern

Internal Assessment (IA)	**Mid Term Test (MTE)**	**End Term Test (ETE)**	**Total Marks**
20	30	50	100

Name of The Course	**IT in Forensic Science**				
Course Code	**PE15**				
Prerequisite					
Co-requisite					
Anti-requisite					
		L	**T**	**P**	**C**
		3	0	0	3

Course Objectives:

1. Define forensic science and criminalistics
2. Describe the major contributors to the development of forensic science.
3. Give examples of typical crime laboratories as they exist on the national, state, and local levels of government in the Moduleed States.
4. Describe the services of a typical comprehensive crime laboratory in the criminal justice system.
5. List other areas of forensic science that require expertise in a specialized area.
6. State Locard's Exchange Principle of transfer of evidence.
7. Analyze the data obtained from a crime scene using deductive reasoning.

Course Outcomes

CO1	Describe the common types of physical evidence encountered at crime scenes & explain the difference between the identification and comparison of physical evidence.
CO2	Define individual and class characteristics and give examples of physical evidence possessing these characteristics.
CO3	Understand the value of class evidence to a criminal investigation.
CO4	Explain the purpose physical evidence plays in reconstructing the events surrounding a crime.
CO5	Describe the proper techniques for packaging common types of physical evidence.

Text Book (s)

1. Peter Wayner, "Disappearing Cryptography: Information Hiding, Steganography and Watermarking 2/e", Elsevier
2. Bolle, Connell et. al., "Guide to Biometrics", Springer

Reference Book (s):

1. Katzendbisser, Petitcolas, " Information Hiding Techniques for Steganography and Digital Watermarking", Artech House.42
2. John Vecca, "Computer Forensics: Crime scene Investigation", Firewall Media

Course Contents:

Unit I: Overview	**8 Hours**
Overview of Biometrics, Biometric Identification, Biometric Verification, Biometric Enrollment, Biometric System Security. Authentication and Biometrics: Secure Authentication Protocols, Access Control Security Services, Matching Biometric Samples, Verification by humans.	

Common biometrics: Finger Print Recognition, Face Recognition, Speaker Recognition, Iris Recognition, Hand Geometry, Signature Verification
Unit II: Introduction to Information Hiding 8 Hours
Technical Steganography, Linguistic Steganography,Copy Right Enforcement, Wisdom from Cryptography. Principles of Steganography: Framework for Secret Communication, Security of Steganography System, Information Hiding in Noisy Data , Adaptive versus non-Adaptive Algorithms, Active and Malicious Attackers, Information hiding in Written Text.
Unit III: A Survey of Steganographic Techniques 8 Hours
Substitution systems and Bit Plane Tools, Transform Domain Techniques: - Spread Spectrum and Information hiding, Statistical Steganography, Distortion Techniques, Cover Generation Techniques. Steganalysis: Looking for Signatures: - Extracting hidden Information, Disabling Hidden Information.
Unit IV: Watermarking and Copyright Protection 9 Hours
Basic Watermarking, Watermarking Applications, Requirements and Algorithmic Design Issues, Evaluation and Benchmarking of Watermarking system. Transform Methods: Fourier Transformation, Fast Fourier Transformation, Discrete Cosine Transformation, Mellin-Fourier Transformation, Wavelets, and Split Images in Perceptual Bands. Applications of Transformation in Steganography.
Unit V: Computer Forensics 7 Hours
Rules of evidence, Evidence dynamics, Evidence collection, Data recovery, Preservation of digital evidence, surveillance tools for future warfare.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
20	30	50	100

Name of The Course	Enterprise Resource Planning			
Course Code	PE16			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	3	0	0	3

Course Objectives:

1. Describe the concept of ERP and the ERP model; define key terms; explain the transition from MRP to ERP; identify the levels of ERP maturity.
2. Explain how ERP is used to integrate business processes; define and analyze a process; create a process map and improve and/or simplify the process; apply the result to an ERP implementation.
3. Describe the elements of a value chain, and explain how core processes relate; identify how the organizational infrastructure supports core business processes; explain the effect of a new product launch on the three core business processes.

Course Outcomes

CO1	Develop model for ERP for large project
CO2	Develop model for E-commerce architecture for any application
CO3	Describe the advantages, strategic value, and organizational impact of utilizing an ERP system for the management of information across the functional areas of a business: sales and marketing, accounting and finance, human resource management, and supply chain.
CO4	Demonstrate a working knowledge of how data and transactions are integrated in an ERP system to manage the sales order process, production process, and procurement process.
CO5	Evaluate organizational opportunities and challenges in the design system within a business scenario.

Text Book (s)

1. Vinod Kumar Garg and Venkitakrishnan N K, "Enterprise Resource Planning – Concepts and Practice", PHI.
2. Joseph A Brady, Ellen F Monk, Bret Wagner, "Concepts in Enterprise Resource Planning", Thompson Course Technology.

Reference Book (s):

1. Alexis Leon, "ERP Demystified", Tata McGraw Hill
2. Rahul V. Altekar "Enterprise Resource Planning", Tata McGraw Hill,
3. Vinod Kumar Garg and Venkitakrishnan N K, "Enterprise Resource Planning – A Concepts and Practice", PHI.

Course Contents:

Unit I: **8 Hours**
ERP Introduction, Benefits, Origin, Evolution and Structure: Conceptual Model of ERP, the Evolution of ERP, the Structure of ERP.
Unit II: **8 Hours**
Business Process Reengineering, Data ware Housing, Data Mining, Online Analytic Processing (OLAP), Product Life Cycle Management (PLM), LAP, Supply chain Management.

Unit III:	**8 Hours**
ERP Marketplace and Marketplace Dynamics: Market Overview, Marketplace Dynamics, the Changing ERP Market. ERP- Functional Modules: Introduction, Functional Modules of ERP Software, Integration of ERP, Supply chain and Customer Relationship Applications.	
Unit IV:	**8 Hours**
ERP Implementation Basics, ERP Implementation Life Cycle, Role of SDLC/SSAD, Object Oriented Architecture, Consultants, Vendors and Employees.	
Unit V:	**8 Hours**
ERP & E-Commerce, Future Directives- in ERP, ERP and Internet, Critical success and failure factors, Integrating ERP into organizational culture. Using ERP tool: either SAP or ORACLE format to case study.	

Continuous Assessment Pattern

Internal Assessment (IA)	**Mid Term Test (MTE)**	**End Term Test (ETE)**	**Total Marks**
20	30	50	100

Name of The Course	**APP DEVELOPMENT FOR ANDROID**				
Course Code	**PE17**				
Prerequisite					
Co-requisite					
Anti-requisite					
		L	**T**	**P**	**C**
		3	0	0	3

Course Objectives:

- Develop Basic and advance Android Apps
- Publishing and Monetizing the app
- To learn the Architecture of Android.

Course Outcomes

CO1	Understand about Android OS and its Development Environment.
CO2	Learn Basic and advance android app development for android devices.
CO3	To apply from app development
CO4	To learn the how to provide Security to Android devices.
CO5	To be able to gain knowledge on how to create activities and fragments

Text Book (s)

1. OSS Mobile Platform (IBM ICE Publication)

Reference Book (s):

1 Beginning Android 4 Application Development, Wei-Meng Lee
2 Burnette, Ed, Hello, Android: Introducing Google's Mobile Development Platform.
3 Mobile Computing: Concepts Methodologies, Tools & Applications – David Tainar.
4 Mobile technology consumption – Barbara L Ciaramtaro

Course Contents:

Unit I: Introduction and Architecture of Android 5 Hours
History of Android, Features of Android, Android Devices, Android Versions, Open Handset Alliance (OHA) , Advantages of Android, Comparing Android with other platform, Architecture of Android. Android Directory Structure, Structure of Manifest files, Android Development Tools.
Unit II: Component s of Android 10 Hours
Activities, Activity life cycle, Fragment, fragment lifecycle, Services, service life cycle, Broadcast receivers, Content providers, Intents, types of intents, Intent Filter, Starting a new activity, Sending and Receiving of data, Notifications
Unit III: User Interfaces 10 Hours

Views, Views Group, Widgets - Button, EditText, CheckBox, ToggleButton, Spinner, Picker, Layouts, Styles, Themes, Events, Event listener, Orientation, Screen Size and Density, Unit of measurement - px, dp, sp and dpi,pt, conversion of dp to px .
Unit IV: Advance App Development 10 Hours
SQLite database, SQLiteOpenHelper, Cursors and content values, Opening and closing Database, Sensors, Bluetooth, GeoLocation, SMS & MMS, Graphics and Animation.
Unit V: Security, Publishing, Monetizing 5 Hours
Security Creating a signing certificate, Signing your applications for distribution, Publishing on Google Play, Monetization strategies, Application promotion strategies, Using Google Analytics.

Continuous Assessment Pattern

Internal Assessment (IA)	**Mid Term Test (MTE)**	**End Term Test (ETE)**	**Total Marks**
20	30	50	100

Name of The Course	VLSI Design			
Course Code	PE18			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	3	0	0	3

Course Objectives:

1. Study the fundamentals of CMOS circuits and its characteristics.
2. Learn the design and realization of combinational & sequential digital circuits.
3. Architectural choices and performance tradeoffs involved in designing and realizing the circuits in CMOS technology are discussed
4. Learn the different FPGA architectures and testability of VLSI circuits.

Course Outcomes

CO1	Realize the concepts of digital building blocks using MOS transistor
CO2	Design combinational MOS circuits and power strategies.
CO3	Design and construct Sequential Circuits and Timing systems.
CO4	Design arithmetic building blocks and memory subsystems.
CO5	Apply and implement FPGA design flow and testing.

Text Book (s)

1. Neil H.E. Weste, David Money Harris "CMOS VLSI Design: A Circuits and Systems Perspective", 4th Edition, Pearson , 2017.(UNIT I,II,V)

2. Jan M. Rabaey ,AnanthaChandrakasan, Borivoje. Nikolic, "Digital Integrated Circuits:A Design perspective", Second Edition , Pearson , 2016.(UNIT III,IV)

Reference Book (s):

1. M.J. Smith, "Application Specific Integrated Circuits", Addisson Wesley, 1997

2. Sung-Mo kang, Yusuf leblebici, Chulwoo Kim "CMOS Digital Integrated Circuits:Analysis& Design",4th edition McGraw Hill Education,2013

3. Wayne Wolf, "Modern VLSI Design: System On Chip", Pearson Education, 2007

4. R.Jacob Baker, Harry W.LI., David E.Boyee, "CMOS Circuit Design, Layout and Simulation", Prentice Hall of India 2005.

Course Contents:

Unit I: INTRODUCTION TO MOS TRANSISTOR **9 Hours**
MOS Transistor, CMOS logic, Inverter, Pass Transistor, Transmission gate, Layout Design Rules, Gate Layouts, Stick Diagrams, Long-Channel I-V Charters tics, C-V Charters tics, Nonideal I-V

Effects, DC Transfer characteristics, RC Delay Model, Elmore Delay, Linear Delay Model, Logical effort, Parasitic Delay, Delay in Logic Gate, Scaling.
Unit II:COMBINATIONAL MOS LOGIC CIRCUITS 9 Hours
Circuit Families: Static CMOS, Ratioed Circuits, Cascode Voltage Switch Logic, Dynamic Circuits, Pass Transistor Logic, Transmission Gates, Domino, Dual Rail Domino, CPL, DCVSPG, DPL, Circuit Pitfalls.
Unit III:SEQUENTIAL CIRCUIT DESIGN 9 Hours
Static latches and Registers, Dynamic latches and Registers, Pulse Registers, Sense Amplifier Based Register, Pipelining, Schmmit Trigger, Monostability Sequential Circuits, Astability Sequential Circuits. Timing Issues : Timing Classification Of Digital System, Synchronous Design.
Unit IV:DESIGN OF ARITHMETIC BUILDING BLOCKS AND SUBSYSTEM 9 Hours
Arithmetic Building Blocks: Data Paths, Adders, Multipliers, Shifters, ALUs, power and speed tradeoffs, Case Study: Design as a tradeoff. Designing Memory and Array structures: Memory Architectures and Building Blocks, Memory Core, Memory Peripheral Circuitry.
Unit V: IMPLEMENTATION STRATEGIES AND TESTING 9 Hours
FPGA Building Block Architectures, FPGA Interconnect Routing Procedures. Design for Testability: Ad Hoc Testing, Scan Design, BIST, IDDQ Testing, Design for Manufacturability, Boundary Scan.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
20	30	50	100

Name of The Course	EMBEDDED SYSTEMS			
Course Code	PE19			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	3	0	0	3

Course Objectives:

- Various Embedded Development Strategies
- Bus Communication in processors, Input/output interfacing.
- Various processor scheduling algorithms.
- Basics of Real time operating system and example tutorials to discuss on one real time operating system tool.

Course Outcomes

CO1	Ability to understand and analyze Embedded systems.
CO2	Ability to suggest an embedded system for a given application.
CO3	Ability to operate various Embedded Development Strategies
CO4	Ability to study about the bus Communication in processors.
CO5	Ability to acquire knowledge on various processor scheduling algorithms.

Text Book (s)

1. Peckol, “Embedded system Design”, John Wiley & Sons,2010

2. Lyla B Das,” Embedded Systems-An Integrated Approach”, Pearson, 2013

3. Shibu. K.V, “Introduction to Embedded Systems”, 2e, Mc graw Hill, 2017.

Reference Book (s):

1. Raj Kamal, ‘Embedded System-Architecture, Programming, Design’, Mc Graw Hill, 2013.

2. C.R.Sarma, “Embedded Systems Engineering”, University Press (India) Pvt. Ltd, 2013.

3. Tammy Noergaard, “Embedded Systems Architecture”, Elsevier, 2006.

4. Han-Way Huang, “Embedded system Design Using C8051”, Cengage Learning, 2009.

5. Rajib Mall “Real-Time systems Theory and Practice” Pearson Education, 2007.

Course Contents:

Unit I: INTRODUCTION TO EMBEDDED SYSTEMS	**8 Hours**

Introduction to Embedded Systems –Structural units in Embedded processor , selection of processor & memory devices- DMA – Memory management methods- Timer and Counting devices, Watchdog Timer, Real Time Clock, In circuit emulator, Target Hardware Debugging.
Unit II:EMBEDDED NETWORKING 8 Hours
Embedded Networking: Introduction, I/O Device Ports & Buses– Serial Bus communication protocols RS232 standard – RS422 – RS 485 - CAN Bus -Serial Peripheral Interface (SPI) – Inter Integrated Circuits (I2C) –need for device drivers.
Unit III:EMBEDDED FIRMWARE DEVELOPMENT 8 Hours
ENVIRONMENT Embedded Product Development Life Cycle- objectives, different phases of EDLC, Modelling of EDLC; issues in Hardware-software Co-design, Data Flow Graph, state machine model, STUDENTSFOCUS.COM 78 Sequential Program Model, concurrent Model, object oriented Model.
Unit IV:RTOS BASED EMBEDDED SYSTEM DESIGN 8 Hours
Introduction to basic concepts of RTOS- Task, process & threads, interrupt routines in RTOS, Multiprocessing and Multitasking, Preemptive and non-preemptive scheduling, Task communication shared memory, message passing-, Inter process Communication – synchronization between processes-semaphores, Mailbox, pipes, priority inversion, priority inheritance.
Unit V:EMBEDDED SYSTEM APPLICATION AND DEVELOPMENT 8 **Hours**
Case Study of Washing Machine- Automotive Application- Smart card System Application-ATM machine –Digital camera

Continuous Assessment Pattern

Internal Assessment (IA)	**Mid Term Test (MTE)**	**End Term Test (ETE)**	**Total Marks**
20	30	50	100

Name of The Course	Operation Research & Optimisation Technique			
Course Code	Elective			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	3	0	0	3

Course Objectives:

1. To learn fundamental applications of optimization, probability, statistics, simulation, and engineering economic analysis in industry and the public sector in contexts involving uncertainty and scarceor expensive resources.
2. To understand use of mathematical and computational modeling in real decision-making problems.

Course Outcomes

CO1	Understand approaches, tools & applications of Operational Research
CO2	Provide the ability to analyze operational problems from various industries characterized by number of decision variables
CO3	Ability to apply knowledge of various OR methods and techniques using package software like iLog to resolve resource optimization issues in business.
CO4	To analyze operational problems from various industries characterized by number of decision variables
CO5	To apply knowledge of various OR methods and techniques using package software like iLog to resolve resource optimization issues in business.

Text Book (s)

1. Operations Research & Optimization by IBM ICE Publications

Reference Book (s):

1. Hamdy A. Taha, Operations Research: An Introduction (9th Edition), Prentice Hall, 2010
2. Frederick S. Hillier & Gerald J. Lieberman, Introduction to Operations Research, McGraw-Hill, 2009
3. Ronald L. Rardin, Optimization in Operations Research, Prentice Hall, 1998
4. Richard Bronson &GovindasamiNaadimuthu, Schaum's Outline of Operations Research, McGrawHill Professional, 1997 2009.

Course Contents:

Unit I: Introduction to OR **7 Hours**
Terms & definitions, Origin, nature & development of OR, phases & processes of OR study, modelingin OR, modeling approach, scientific method in OR, methodology & applications of OR, opportunities& shortcomings of OR, Mathematical problem formulations
Unit II: Programming techniques – I **7 Hours**
Linear Programming, Graphical method, Simplex method, duality in linear programming, reverse simplex method, linear fractional programming, Applications of LP, Post-optimal analysis, Transportation problem, LP method, MODI method, Stepping stone method, Tran shipment problem, Assignment problem, Travelling Salesman problem, Sequencing problem.
Unit III: Programming techniques – II **7 Hours**

Integer programming, Fractional cut method, Gomory's method, Branch & Bound method, Applications of IP, Goal programming, Simplex method, Graphical goal attainment method, dynamic programming, recursive equation approach, DP Algorithm, Non-linear programming, Kuhn-Tucker conditions, geometric programming, applications.
Unit IV: Inventory & Waiting line models **9 Hours**
Terms & definitions, Inventory decisions, EOQ, Inventory control – deterministic models, Inventory control – probabilistic models, Queuing theory & models, elements of queuing system, statistical methods, MMI/MMC/MEI system
Unit V: Decision Analysis **10 Hours**
Uncertainty and probability, Algebra of events, probability distributions, Markov processes, transition diagram, n-step transition probabilities, markov analysis algorithm, Decision making problems, decisions under risk & uncertainty, decision tree analysis, Game theory, Maximin-Minimax principle,2xN, Mx2 &MxN games, Simulation methodology, Monte-Carlo Simulation, advantages & limitations, Applications of simulation.

Continuous Assessment Pattern

Internal Assessment (IA)	**Mid Term Test (MTE)**	**End Term Test (ETE)**	**Total Marks**
20	30	50	100

Program Elective-5

Name of The Course	**Introduction to Cloud Computing**			
Course Code	**PE20**			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	**T**	**P**	**C**
	3	0	0	3

Course Objectives:

1. Understand the Importance of Virtualization in Cloud.
2. Gain knowledge on Cloud Computing
3. Understands Cloud Delivery and Cloud Deployment models

Course Outcomes

CO1	To Understand the Importance of Virtualization in Cloud.
CO2	To Introduce the Cloud deployment models and Cloud delivery models.
CO3	To Learn the stepping stones for the development of cloud.
CO4	To Learn the Decision Factors for Cloud Implementations.
CO5	To Understands the Public, Private and Hybrid Cloud.

Text Book (s)

1. IntroductiontoVirtualizationandCloudComputingbyIBMICEPublication
2. IBM Redbooks Systemx Virtualization Strategies
3. Power VM Virtualizationon IBM Systemp: Introduction and Configuration FourthEd.

Reference Book (s):

1 Gruman, Galen (2008-04-07). "What cloud computing really means". InfoWorld.
2 "What is Cloud Computing?". Amazon Web Services. 2013-03-19.
3 "Baburajan, Rajani, "The Rising Cloud Storage Market Opportunity Strengthens Vendors," infoTECH, August 24, 2011". It.tmcnet.com. 2011-08-24. Retrieved 2011-12-02.

Course Content

Unit I: Introduction to Virtualization **7 Hours**
Traditional_ITInfrastructure,BenefitsofVirtualization,TypesofVirtualization,Historyof Virtualization.
Unit II: Server, Storage, Network and Application Virtualization 8 Hours
TypesofServerVirtualization,Hypervisors,Anatomyof,ServerVirtualization,BenefitsofStorageVirtualization,TypesofStorageVirtualization,VPN,VLAN,BenefitsofApplicationVirtualization .
Unit III: Introduction to Cloud 8 Hours
History,ImportanceofVirtualizationinCloud,_AnatomyofCloud,Clouddeployment models,Clouddeliverymodels,Steppingstonesforthedevelopmentofcloud,GridComputing,CloudComputing.
Unit IV: Cloud Implementations/Cloud Deployment Models 9 Hours

Cloud_DeliveryModel_DecisionFactorsforCloud_Implementations,Public,PrivateandHybridCloud, Overview,InfrastructureasaService(IaaS)_CloudDeliveryModel,PlatformasaService(PaaS)CloudDelivery Model, Software as a Service(SaaS) Cloud Delivery Model
Unit V:Case Study On Virtualization, Cloud Workloads 8 Hours
CustomerITLandscape,TriggersofVirtualization,PreparationforVirtualization,TransitionToolsfor Virtualization,Costsavings,CloudworkloadOverview,WorkloadsmostsuitableforCloud, Workloads not suitable for Cloud.

Continuous Assessment Pattern

Internal Assessment (IA)	**Mid Term Test (MTE)**	**End Term Test (ETE)**	**Total Marks**
20	30	50	100

Name of The Course	Wireless Sensor Networks			
Course Code	PE21			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	3	0	0	3

Course Objectives:

1. To learn about the issues and challenges in the design of wireless ad hoc networks.
2. To understand the working of MAC and Routing Protocols for ad hoc and sensor networks
3. To learn about the Transport Layer protocols and their QoS for ad hoc and sensor networks.
4. To understand various security issues in ad hoc and sensor networks and the corresponding solutions.

Course Outcomes

CO1	Identify different issues in wireless ad hoc and sensor networks .
CO2	To analyze protocols developed for ad hoc and sensor networks .
CO3	To identify and understand security issues in ad hoc and sensor networks.
CO4	To analyze protocols developed sensor networks .
CO5	To identify and understand various security issues in ad hoc and sensor networks and the corresponding solutions.

Text Book (s)

1. Holger Karl & Andreas Willig, " Protocols And Architectures for Wireless Sensor Networks" , John Wiley, 2005.
2. Feng Zhao & Leonidas J. Guibas, “Wireless Sensor Networks- An Information Processing Approach", Elsevier, 2007.

Reference Book (s):

1. Kazem Sohraby, Daniel Minoli, & Taieb Znati, “Wireless Sensor Networks- Technology, Protocols, And Applications”, John Wiley, 2007.
2. Anna Hac, “Wireless Sensor Network Designs”, John Wiley, 2003.

Course Content:

Unit I: OVERVIEW OF WIRELESS SENSOR NETWORKS **8 Hours**
Challenges for Wireless Sensor Networks, Enabling Technologies For Wireless Sensor Networks
Unit II:ARCHITECTURES **8 Hours**
Single-Node Architecture - Hardware Components, Energy Consumption of Sensor Nodes , Operating Systems and Execution Environments, Network Architecture - Sensor Network Scenarios, Optimization Goals and Figures of Merit, Gateway Concepts.
Unit III: NETWORKING SENSORS **8 Hours**
Physical Layer and Transceiver Design Considerations, MAC Protocols for Wireless Sensor Networks, Low Duty Cycle Protocols And Wakeup Concepts - S-MAC , The Mediation Device Protocol, Wakeup Radio Concepts, Address and Name Management, Assignment of MAC Addresses, Routing Protocols- Energy-Efficient Routing, Geographic Routing.
Unit IV:INFRASTRUCTUREESTABLISHMENT **8 Hours**

Topology Control, Clustering, Time Synchronization, Localization and Positioning, Sensor Tasking and Control.
Unit V: SENSOR NETWORK PLATFORMS AND Tools **8 Hours**
Sensor Node Hardware – Berkeley Motes, Programming Challenges, Node-level software platforms, Node-level Simulators, State-centric programming.

Continuous Assessment Pattern

Internal Assessment (IA)	**Mid Term Test (MTE)**	**End Term Test (ETE)**	**Total Marks**
20	30	50	100

Name of The Course	**Simulation & Modelling**				
Course Code	**PE22**				
Prerequisite	Java, C				
Co-requisite					
Anti-requisite					
	L	**T**	**P**	**C**	
	3	0	0	3	

Course Objectives

Introduce computer simulation technologies and techniques, provides the foundations for the student to understand computer simulation needs, and to implement and test a variety of simulation and data analysis libraries and programs. This course focusses what is needed to build simulation software environments, and not just building simulations using preexisting packages.

Course Outcomes

CO1	Basic Model Forms for simulation.
CO2	Understand the Simulation Approaches dynamical and complex model simulations.
CO3	Handling Stepped and Event-based Time in Simulations converting
CO4	Discrete versus Continuous Modelling Probability and Statisics
CO5	Numerical Techniques analysis and Viewing Tools

Text Book (s)

1. Averill M. Law and W. David Kelton, "Simulation Modeling and Analysis, Third Edition, McGraw Hill, 2006.

Reference Book (s)

2. Jerry Banks and John Carson, "Discrete Event System Simulation", Fourth Edition, PHI, 2005.
3. Geoffrey Gordon, "System Simulation", Second Edition, PHI, 2006 (Unit – V).
4. Frank L. Severance, "System Modeling and Simulation", Wiley, 2001.

Course Content

Unit I: Simulation Basics **8 Hours**
Handling Stepped and Event-based Time in Simulations - Discrete versus Continuous Modelling - Numerical Techniques - Sources and Propagation of Error
Unit II: Dynamical and Complex Model Simulations **8 Hours**
Graph or Network Transitions Based Simulations - Actor Based Simulations - Mesh Based Simulations - Hybrid Simulations
Unit III: Converting to Parallel and Distributed **8 Hours**
Partitioning the Data - Partitioning the Algorithms - Handling Inter-partition Dependencies
Unit IV: Probability and Statisics for Simulations and Analysis **8 Hours**
Introduction to Queues and Random -NoiseRandom- Variates- Generation-Sensitivity Analysis
Unit V: Simulations Results Analysis and Viewing Tools **8 Hours**
Display Forms: Tables, Graphs, and Multidimensional Visualization - Terminals, X and MS Windows, and Web Interfaces Validation of Model Results

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
20	30	50	100

Name of The Course	Business Analytics			
Course Code	PE23			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	3	0	0	3

Course Objectives:

1. The problems faced by decision makers in today's competitive business environment are often extremely complex and can be addressed by numerous possible courses of action.
2. Evaluating these alternatives and gaining insight from past performance is the essence of business analytics.
3. While business intelligence focuses on data handling, queries and reports to discover patterns and generate information associated with products, services and customers, business analytics uses data and models to explain the performance of a business and how it can be improved.

Course Outcomes

CO1	Identify the business problems that require decision-making support from business analytics.
CO2	Establish the best search strategy to acquire evidence relevant to the business problem.
CO3	Establish the business analytics method relevant to the business process and the reliability and validity of evidence.
CO4	Summarize the relevant evidence in view of finding analytics solutions to business questions.
CO5	Recognize social and ethical implications of analytics solutions to the business problem.

Text Book (s)

1. Halady P, "Business Analytics: An Application Focus", Prentice Hall India Learning Private Limited (2013) ISBN No:978-8120348196
2. Randy Bartlett "A PRACTITIONER'S GUIDE TO BUSINESS ANALYTICS: Using Data Analysis Tools to Improve Your Organization's Decision Making and Strategy", McGraw-Hill Education; 1 edition (February 5, 2013) ISBN No: 978-0071807593
3. Jay Liebowitz "Business Analytics: An Introduction", Auerbach Publications; 1 edition (December 19, 2013), ISBN No: 978-1466596092

Reference Book (s):

1. Beller, Michael J.; Alan Barnett (2009-06-18). "Next Generation Business Analytics". Lightship Partners LLC. Retrieved 2009-06-20.
2. Galit Schmueli and Otto Koppius. "Predictive vs. Explanatory Modeling in IS Research" (PDF). Archived from the original (PDF) on 2010-10-11.

Course Contents:

Unit I: Introduction **8 Hours**
Introduction to Analytics, Introduction to Business Analytics: Definition, Wisdom Hierarchy, Data sources, Terms, Applications, History, Uses. Role of Business Analyst, what makes a Business Analyst Successful, Tools, Project outcomes, Analytical Process.
Unit II: Business Analytics work flow and Technologies **8 Hours**
Technologies and Tools for Business analytics, Types of Business analytics process: descriptive analytics, Predictive analytics, prescriptive analytics, Business Analytics Personnel. Business Analytics Data: Categorizing Data, Data Issues, Business Analytics Technology, What Resource Considerations Are Important to Support Business Analytics
Unit III: Decision Modeling **8 Hours**
Types of problems: inventory management, capital investment analysis, market share estimation, sensitivity analysis. Optimization: Use of Excel to solve business problems: e.g. marketing mix, capital budgeting, portfolio optimization Aggregation, Union and Joins, Contingency, Chi-Square Distribution, Decision Making under Uncertainty Simulation.
Unit IV: Visualization/ Data Issues **8 Hours**
Organization/sources of data, Importance of data quality, Dealing with missing or incomplete data, Data Classification, Davenport and Harris article - "The Dark Side of Customer Analytics"
Unit V: A Final Business Analytics Case Problem **8 Hours**
Case Study: Problem Background and Data, Descriptive Analytics Analysis, Predictive Analytics Analysis: Developing the Forecasting Models, Validating the Forecasting Models, Resulting Warehouse Customer Demand Forecasts, Prescriptive Analytics Analysis: Selecting and Developing an Optimization, Shipping Model, Determining the Optimal Shipping Schedule, Summary of BA Procedure for the Manufacturer, Demonstrating Business Performance Improvement.

Continuous Assessment Pattern

Internal Assessment (IA)	**Mid Term Test (MTE)**	**End Term Test (ETE)**	**Total Marks**
20	30	50	100

Name of The Course	Big Data Analytics				
Course Code	PE24				
Prerequisite					
Co-requisite					
Anti-requisite					
		L	T	P	C
		3	0	0	3

Course Objectives

This course provides practical foundation level training that enables immediate and effective participation in big data projects. The course provides grounding in basic and advanced methods to big data technology and tools, including spark and MongoDB and its ecosystem.

Course Outcomes

CO1	Learn tips and tricks for Big Data use cases and solutions.
CO2	Learn to build and maintain reliable, scalable, distributed systems with Apache Hadoop and spark.
CO3	Able to apply MongoDB ecosystem components.
CO4	Learn to build and maintain reliable, for Big Data Analytics using Spark.
CO5	Learn to build and maintain reliable, scalable, distributed systems with MongoDB.

Text Book (s)

1. Boris lublinsky, Kevin t. Smith, Alexey Yakubovich, “Professional Hadoop Solutions”, Wiley, ISBN: 9788126551071, 2015.
2. Tom Plunkett, Brian Macdonald et al, “Oracle Big Data Handbook”, Oracle Press, 2014.

Reference Book (s)

1. Chris Eaton, Dirk deroos et al. , “Understanding Big data ”, McGraw Hill, 2012.
2. Tom White, “HADOOP: The definitive Guide” , O Reilly 2012. Tom Plunkett, Brian Macdonald et al, “Oracle Big Data Handbook”, Oracle Press, 2014.
3. Vignesh Prajapati, “Big Data Analytics with R and Haoop”, Packet Publishing 2013.
4. http://www.bigdatauniversity.com/
5. Jy Liebowitz, “Big Data and Business analytics”,CRC press, 2013

Course Contents:

Unit I: Big Data Modeling **8 Hours**
Introduction of Big Data, Big Data: Ingestion, Storage, Data Quality, Data Operations, Data Scalability and Security, Big Data Design Criteria, Introduction to Data Models, Data Models: Structure, Operations and Constraints, Exploring different Data Models
Unit II: Working With Data Models **8 Hours**
Static and Streaming data, Data Models and Data Formats, Data Stream: Definition and application, Data lakes: Definition and application, Exploring streaming sensor data, Exploring streaming twitter data, DBMS and non DBMS approaches to Big Data, From DBMS to BDMS, Redis: An Enhanced Key-Value Store, Aerospike: a New Generation KV Store, Semistructured Data – AsterixDB, Solr: Managing Text,Relational Data – Vertica
Unit III: Big Data Integration and Processing **8 Hours**
Why Big Data Processing is Different, Various aspects of data retrieval and relational querying: What is data retrieval, Querying relational data with postgres, data retrieval for NoSQL data, data aggregation and working with data frames, how to use Pandas to retrieve data from them, Big Data

Processing Pipelines: Aggregation and analytical operations, Big Data processing systems, Big Data workflow management, Big Data integration and Processing layer
Unit IV: Big Data Analytics using Spark 8 Hours
Introduction to Apache Spark, Programming In Spark using RDDs in Pipelines, Transformations, Actions, Spark SQL, Spark Streaming, Spark MLLib, Spark GraphX, Discussion; The Spark Ecosystem, Configuring VirtualBox for Spark Streaming, Analyzing Sensor Data with Spark Streaming
Unit V: Putting MongoDB and Spark to Work 8 Hours
Word Count in Spark, Discussion on word count in spark, Analyze tweets of a domain, Expressing Analytical Questions as MongoDB Queries, Exporting Data from MongoDB to a CSV File.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
20	30	50	100

Name of The Course	Distributed computing			
Course Code	PE25			
Prerequisite				
Co-requisite				
Anti-requisite				
	L	T	P	C
	3	0	0	3

Course Objectives

1. Familiarize the students with the basics of distributed computing systems.
2. To introduce the concepts of distributed file systems, shared memory and message passing systems, synchronization and resource management

Course Outcomes

CO1	Verify and analyze the time complexity of the algorithms related to distributed computing.
CO2	Design and develop various algorithms for problems in distributed computing
CO3	Compare various resource allocation stratagies.
CO4	Familiarize the students with the basics of distributed computing systems.
CO5	Design and develop various algorithms for problems in distributed computing

Text Book (s)

1. George Colouris, Jean Dollimore and Tim Kindberg, "Distributed Systems – Concepts and Design", Pearson Education Private Limited, New Delhi, 2001
2. Pradeep K Sinha, "Distributed Operating Systems: Concepts and Design", Prentice Hall of India, New Delhi, 2003.

Reference Book (s)

1. Gerard Tel, "Introduction to Distributed algorithms", Cambridge University Press, USA, 2000.
2. Andrzej Goscinski, "Distributed Operating Systems, the logical Design", Addison Wesley Publishing Company, USA, 1991.
3. Tanenbaum, "Modern Operating Systems", Prentice Hall of India, New Delhi, 1999.

Course Contents:

Unit I: Introduction **8 Hours**
Definition - Evolution- Goals of distributed systems, system models- Issues in the design of distributed systems- Distributed computing environment.
Unit II: COMMUNICATION 8 Hours
Message Passing – Features and Issues -Synchronization-Buffering - Process Addressing - Failure Handling - Remote procedure call (RPC): Model – Implementation - Stub generation - RPC messages – Marshaling - server Management - Call semantics - communication protocols for RPC-Client server binding – RMI.
Unit III: DISTRIBUTED SHARED MEMORY 8 Hours
Distributed shared memory- Design and implementation issues- Sequential consistency - Release consistency, Process migration Features & Mechanism
Unit IV:SYNCHRONIZATION 8 Hours

Synchronizing physical clocks - Logical clocks - Distributed coordination – Event Ordering – Mutual Exclusion – Deadlock - Election algorithms.
Unit V: DISTRIBUTED FILE SYSTEMS 8 Hours
Introduction – File Models – File accessing, sharing and caching - File Replication – Atomic transactions Case Study HADOOP.: Resource and process management - Task assignment approach - Load balancing approach - Load sharing approach

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
20	30	50	100

Name of The Course	Mobile Computing				
Course Code	PE26				
Prerequisite					
Co-requisite					
Anti-requisite					
		L	T	P	C
		3	0	0	3

Course Objectives

1. To introduce the basic concepts and principles in mobile computing. This includes the major techniques involved, and networks & systems issues for the design and implementation of mobile computing systems and applications.
2. To explore both theoretical and practical issues of mobile computing.
3. To provide an opportunity for students to understand the key components and technologies involved in building mobile applications.
4. To Understand the concept of Wireless LANs, PAN, Mobile Networks.

Course Outcomes

CO1	Grasp the concepts and features of mobile computing technologies and applications.
CO2	Understand of how the underlying wireless and mobile communication networks work, their technical features, and what kinds of applications they can support.
CO3	Identify the important issues of developing mobile computing systems and applications.
CO4	Develop mobile computing applications by analyzing their characteristics and requirements, selecting the appropriate computing models and software architectures, and applying standard programming languages and tools.
CO5	Acquire the knowledge to administrate and to maintain a Wireless LAN.

Text Book (s)

1. Jochen, M Schiller, "Mobile Communications, 2nd Edition Pearson Education, India, 2009

Reference Book (s)

4 Charles Perkins, Ad hoc Networks, Addison Wesley.
5 Upadhyaya, "Mobile Computing", Springer
6 Kurnkum Garg "Mobile Computing",Pearson 2010

Course Content

Unit I:Introduction **8 Hours**
Introduction of mobile computing, overview of wireless telephony: cellular concept, location management: HLR-VLR, hierarchical, handoffs, channel allocation in cellular systems, Multiple access techniques like Frequency division multiple access (FDMA), Time division multiple access (TDMA), Code division multiple access (CDMA), Space division multiple access (SDMA).
Unit II: Wireless Networking **8 Hours**
Wireless Networking, Wireless LAN Overview: MAC issues, IEEE 802.11, Blue Tooth, Wireless multiple access protocols, TCP over wireless, Wireless applications, data broadcasting, Mobile IP, WAP: Architecture, protocol stack, application environment, applications.
Unit III: Global System for Mobile Communications **8 Hours**
GSM Architecture, GSM Entities ,Call Routing in GSM, GSM Addresses and Identifiers ,Network Aspects in GSM , GSM Frequency Allocation, Authentication and Security, Mobile Computing

over SMS, Short Message (SMS) , Value Added Services through, MS, Accessing the SMS Bearer, GPRS and packet Architecture GPRS Network Architecture, GPRS Network Operations, Data Services in GPRS ,Application for GPRS, Limitation of GPRS, Billing and Charging in GPRS, WAP , MMS , GPRS Applications, Spread – Spectrum Technology.
Unit IV: Data Management 8 Hours
Data management issues, data replication for mobile computers, adaptive clustering for mobile wireless networks, file system, disconnected operations. Mobile Agents computing, security and fault tolerance, transaction processing in mobile computing environment.
Unit V: Routing Adhoc Network & Security Issues 8 Hours
Routing Protocols: Adhoc Network Routing Protocols, Destination Sequenced Distance Vector Algorithm, Cluster Based Gateway Switch Routing, Dynamic Source Routing, Adhoc on-demand Routing, Location Aided Routing, Zonal Routing Algorithm. Mobile Computing Security Issues, Authentication, Encryption, Cryptographic Tools: Hash, Message Authentication Code (MAC), Digital Signature, Certificate. Secure Socket Layer (SSL). Characteristics of SIM, Equipment Identification.

Continuous Assessment Pattern

Internal Assessment (IA)	Mid Term Test (MTE)	End Term Test (ETE)	Total Marks
20	30	50	100