Pandit Deendayal Energy University, Gandhinagar

School of Technology

Computer Science & Engineering

Undergraduate Curriculum Handbook

(Academic Year 2020-24)

Ist Semester

PANDIT DEENDAYAL ENERGY UNIVERSITY, GANDHINAGAR

SCHOOL OF TECHNOLOGY

COURSE STRUCTURE FOR B. TECH. IN COMPUTER SCIENCE & ENGINEERING													
Semester I			**B. Tech. in Computer Science & Engineering**										
Sr. No.	**Course/ Lab Code**	**Course/Lab Name**	**Teaching Scheme**					**Examination Scheme**					
								Theory			**Practical**		**Total**
			L	**T**	**P**	**C**	**Hrs/ Wk**	**MS**	**ES**	**IA**	**LW**	**LE/ Viva**	**Marks**
1	20MA101T	Mathematics – I	3	1	0	4	4	25	50	25	--	--	100
2	20CH101T	Engineering Chemistry	3	0	0	3	3	25	50	25	-	-	100
3	20CH101P	Engineering Chemistry Lab	0	0	2	1	2	--	--	--	50	50	100
4	20ME102T	Element of Mechanical Engineering	3	0	0	3	3	25	50	25	-	-	100
5	20ME102P	Element of Mechanical Engineering-Lab	0	0	2	1	2	--	--	--	50	50	100
6	20IC101T	Basic Electronics	2	0	0	2	2	25	50	25	--	--	100
7	20IC101P	Basic Electronics Lab	0	0	2	1	2	--	--	--	50	50	100
8	20CP101T	Computer Programming with C	1	0	0	1	1	25	50	25	--	--	100
9	20CP101P	Computer Programming with C Lab	0	0	2	1	2	--	--	--	50	50	100
10	16HS109T	Professional Ethics and Human Values	1	0	0	1	1	25	50	25	--	--	100
11	16SP101/ 16SP102/ 16SP103	NCC/NSS/Sports	0	0	2	1	2	--	--	--	100		100
12	20HS101P	Communication Skills – I	0	0	2	1	2	--	--	--	50	50	100
		Total	13	1	12	20	26						1200

IA- Internal Assessment, MS-Mid Semester; ES – End Semester Exam

20MA101T					Mathematics - I					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
3	1	0	4	4	25	50	25	--	--	100

COURSE OBJECTIVES

- To be able to evaluate problems related to differential and integral calculus of complex functions.
- To be able to obtain area, volume using integral calculus.
- To be able to formulate and solve various engineering problems using the calculus.
- To study the properties of Matrix algebra and apply them to solve system of algebraic equations.

UNIT 1 DIFFERENTIAL CALCULUS AND ITS APPLICATIONS **08 Hrs.**

Partial derivative and its application, - Euler's theorem - Total derivatives - Jacobians – Maxima and Minima of two variables using Lagrange's multipliers. Convergence of infinite series.

UNIT 2 INTEGRAL CALCULUS AND ITS APPLICATIONS **12 Hrs.**

Definition Evaluation of double integral (Cartesian – Polar form) – Change of orders - Change of variables – Evaluation of triple integral, change of variables (Cartesian to spherical – and cylindrical) – Applications, area – volume – center of mass – center of gravity by double and triple integral.

UNIT 3 MATRIX ALGEBRA AND ITS APPLICATIONS **10 Hrs.**

Solution of system of algebraic equation - Rank of a matrix, consistency of system of equation - Characteristic equation of a square matrix- Eigen values and Eigenvectors of a real matrix - Properties of eigen values and eigen vectors - Cayley-Hamilton theorem (without proof) - finding inverse of a matrix - Diagonalisation of a matrix using orthogonal transformation.

UNIT 4 VECTOR CALCULUS **10 Hrs.**

Gradient, divergence and curl – Directional derivative – Irrotational and Solenoidal vector fields – Vector Integration – Simple problems on line, surface and volume integrals – Green's theorem in a plane, Gauss divergence theorem and Stoke's theorem (without proofs) – Simple application involving cubes and rectangular parallelopipeds.

40 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to
CO1 – Identify the use of convergence of infinite series in engineering aspects.
CO2 – Understand the concept of Directional derivative, Irrotational and Solenoidal vector fields.
CO3 – Develop the ability to apply appropriate tool/method to extract the solutions of engineering problems.
CO4 – Analyze the obtained solution in context with theory.
CO5 – Appraise mathematical problems from real to complex domain.
CO6 – Evaluate problems on Green's, Stoke's and Divergence theorems.

TEXT/REFERENCE BOOKS

1. B. S Grewal, Higher Engineering Mathematics, (43rd Edition), Khanna Pub., Delhi (2014).
2. R. K. Jain and S. R. K. Iyengar, Advanced Engineering Mathematics, Alpha Science, 3rd Ed., 2007.
3. Erwin Kreyszig, Advanced Engineering mathematics, John Wiley, 10th Ed., 2015.
4. G. Strang, Linear Algebra and its applications, 4th Edition, Cengage Learning, 2005.
5. K. Hoffman and R. A. Kunze, Linear Algebra, Prentice Hall of India, 2002.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100	**Exam Duration: 3 Hrs.**
Part A: 10 questions 3 marks each	30 Marks (40 min)
Part B: 5 questions 6 marks each	30 Marks (50 min)
Part C: 5 questions 8 marks each	40 Marks (90 min)

20CH101T					Engineering Chemistry					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
3	0	0	0	3	25	50	25	--	--	100

COURSE OBJECTIVES

- To develop the fundamental understanding about atomic structure and interatomic bonding.
- To provide the knowledge about structural features, synthesis, properties of various categories of materials.
- To develop the skills for phase, microstructural and elemental characterisation of materials.
- To provide the knowledge about the role of chemistry in modern engineering applications.

UNIT 1 ATOMIC STRUCTURE AND INTERATOMIC BONDING 12h

Electrons in atoms, Bohr atomic model, wave mechanical model, introduction to quantum chemistry, wave functions and probability densities, quantum numbers, orbital shapes - *s,p,d,f*- LCAO-MO of H_2, covalent, ionic and metallic bonding, bonding forces and energies, lattice energy and Madelung constant, metallic crystal structure, ceramic crystal structure and influencing factors.

UNIT 2: CHEMISTRY OF MATERIALS 10 h

Introduction and classification of materials; structural features, synthesis, properties of metallic (e.g. noble metal), polymeric (e.g. thermoplastic and thermosetting), glass-ceramic (e.g. silicates, metal oxides) carbonaceous materials (e.g. fullerene, carbon nanotube, graphene); Introduction to nanomaterials, surface area to volume ratio and aspect ratio of nanomaterials, quantum confinement, top-down and bottom up chemical/physical approaches for synthesis of nanomaterials.

UNIT 3: CHEMISTRY OF FUELS AND ENERGY DEVICES 10 h

Fuels – Classification of fuels; Determination of calorific values of solid fuels by bomb calorimeter – Manufacture of synthetic petrol by Fischer-Tropsch method – Knocking in IC engines – Octane and cetane rating of fuels; Petrol and Diesel Engine, chemistry for alternative source and storage of energy (supercapacitor, fuel cell, battery); role of chemistry on in photo-voltaic devices (solar cell).

UNIT 4: INSTRUMENTAL METHODS OF CHEMICAL ANALYSIS 12 h

Characterization of materials using X-ray diffraction (XRD), thermal Analysis (TGA-DTA-DSC), basics and application of Microwave spectroscopy, FTIR, UV-visible spectroscopy; NMR spectroscopy; Chromatographic techniques (GC, HPLC).

Max. 44 h

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Understand the fundamental concept about atomic structure and interatomic bonding.

CO2 - Acquire knowledge about metallic and ceramic crystal structure.

CO3 - Acquire knowledge about structural features, properties of different classes of materials including nanomaterials.

CO4 - Explain the methodologies for the synthesis of different categories of materials.

CO5 - Develop the skill for phase, microstructural and elemental characterisation of materials.

CO6 - Develop the knowledge on the role of chemistry in various modern engineering applications.

TEXT/REFERENCE BOOKS

1. W.d. Callister, An Introduction to Materials Science & Engineering, John Wiley & Sons (2007).
2. MW Barsoum, Fundamental of Ceramics, IOP publishing (2003).
3. T. Pradeep, Text book of Nanoscience and Nanotechnology, Mc. Graw Hill Education (2003).
4. Murty, Shankar, B Raj, Rath, Murday, Textbook of Nanoscience and Nanotechnology, Springer (2013).
5. V. Raghavan, Materials Science and Engineering, Prentice-Hall of India Private Limited (2003).
6. Douglas A. Skoog, Donald M.West, Principles of Instrumental Analysis, 6th Edition, Cengage (2014)

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100	**Exam Duration: 3 Hrs**
Part A/Question: 3 Questions from each unit, each carrying 3 marks	36 Marks
Part B/Question: 2 Questions from each unit, each carrying 8 marks	64 Marks

20CH101P					Engineering Chemistry Lab					
Teaching Scheme					Examination Scheme					
					Theory			Practical		Total
L	T	P	C	Hrs/Week	MS	ES	IA	LW	LE/Viva	Marks
0	0	2	1	2	--	--	--	50	50	100

COURSE OBJECTIVES

- To enhance and develop scientific and analytical skills
- To relate concepts learned in chemistry and engineering to the real-world situations.
- To acquire skills to perform laboratory experiments.
- To demonstrate safe and proper use of standard chemistry glassware and equipment.

LIST OF EXPERIMENTS

1. **External Indicator**–To determine the strength of given solution of ferrous ammonium sulphate by titrating against standard N/40 $K_2Cr_2O_7$ using potassium ferricyanide as an external indicator
2. **Iodometry**– To determine the strength of given copper sulphate solution by titrating against N/20 sodium thiosulphate (hypo) solution
3. **Iodimetry**– To determine the strength of given ascorbic acid by titrating against standard N/10 iodine solution
4. **Complexometric Titration**– To determine the total, permanent and temporary hardness of given water by complexometric titration using standard 0.01M EDTA solution
5. **pH metric titration**– To determine the strength of given HCl solution using a standard NaOH solution by performing a pH-metric titration
6. **Conductometric titration**– To determine the strength of given HCl solution using a standard NaOH solution by performing a conductometric titration
7. **Potentiometric titration**– To determine the strength of given HCl solution potentiometrically
8. **Chemical Kinetics**– To study the kinetics of decomposition of sodium thiosulphate by a mineral acid
9. **Chloride in Water**– Determination of Chloride in the given water sample by Mohr Method
10. **Polymerization**– To prepare a polymer (Nylon 6,10), identify the functional groups by FT-IR
11. **Spectrophotometry**– To determine the λmax and concentration of given unknown potassium permanganate using UV-Visible Spectroscopy technique

Max. 28 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Apply the concepts learned in chemistry and engineering to the real-world situations.

CO2 - Enhanced ability to identify, analyse and interpret the results from the experiments

CO3- Carry out quantitative analysis by instrumental method using Conductometer.

CO4- Analyse compounds by titrimetric, gravimetric and instrumental methods

CO5- Determine the concentration of unknown solutions by Spectrophotometric method.

CO6- Investigate the reaction rate and predict the order and rate constant

TEXT/REFERENCE BOOKS

1. VK Ahluwalia, S Dhingra, A Gulati, College Practical Chemistry, Universities Press
2. JB Baruah, P Gogoi, Foundations of Experimental Chemistry, PharmaMed Press.
3. SS Sawhney, M S Jassal, SP Mittal, A Text Book of Chemistry Practicals Vol I & II, APH Publishing Corp.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 2Hrs**

Part A : Lab Work – Continuous Assessment 50 Marks

Part B : Lab Exam and Viva 50 Marks

20ME102T					Elements of Mechanical Engineering					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
3	0	0	3	3	25	50	25	--	--	100

COURSE OBJECTIVES

- To introduce and define the basics concept of mechanical engineering.
- To familiarize the working principles of IC engines and industrial robotics systems.
- To enable the students to understand the details about the energy systems and its components.
- To demonstrate the various machine elements, materials and its function.
- To help the students acquire knowledge about the various manufacturing process.

UNIT 1 : INTRODUCTION TO THERMODYNAMICS **10 Hrs.**

Definition and applications, systems and control volumes, thermodynamic properties, thermodynamic systems, state and equilibrium processes and cycles, temperature and Zeroth law of thermodynamics, forms of Energy, energy transfer by work and heat, law of conservation of energy, energy conversion efficiencies.

Properties of Pure substances: Definition, examples and phases, phase change of pure substances, property diagrams and property tables. Solution of Numerical Problems through EES Software.

UNIT 2 : LAW OF DEGRADATION OF ENERGY **10 Hrs.**

Limitations of First Law, Thermal Energy reservoirs, heat engines, Refrigerators and Heat pumps, Kelvin Plank and Clausius statement and their equivalence.

Internal Combustion Engines: Introduction, classification and brief description of I.C. engines mechanism, 4-Stroke and 2-Stroke cycles and engines. Otto, Diesel and dual cycles; MEP and air standard efficiencies.

UNIT 3 : ENGINEERING MATERIALS **10 Hrs.**

Stresses, strains and material properties.

Introduction to Manufacturing Processes: Conventional manufacturing process: Lathe Machines, CNC machines, drilling machines, universal Milling machines. Non-conventional manufacturing processes: Additive Manufacturing, 3D printing.

UNIT 4 : INTRODUCTION TO INDUSTRIAL ROBOTICS **10 Hrs.**

Introduction, Industrial and Non-industrial robots, Anatomy and configuration of Industrial Robots, Robot Components, Robot Applications.

Introduction to Industry 4.0.

Max. 40 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1: Define the "fundamentals' and "terminologies" used in Engineering Thermodynamics.
CO2: Explain the energy conservation principles applicable for ideal gas and pure substance applications
CO3: Analyse the performance of thermodynamic cycles.
CO4: Evaluate the performance of power cycles
CO5: Identify the principles of different machining techniques and material properties.
CO6: Understand the anatomy, applications of robots and introduction to industry 4.0.

TEXT/REFERENCE BOOKS

1. Yunus A. Cengel& Bole, Thermodynamics- Engineering Approach by Tata Mcgraw Hill.
2. Sharma PC. A Textbook of Production Enginerring. S. Chand Publishing.
3. P. K. Nag, Engineering Thermodynamics, Tata Mcgraw Hill, New Delhi.
4. Industrial Robotics, Mikell Groover, McGraw-Hill Education (India) Pvt Limited

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 3 Hrs**

Unit 1 and 2: Two question from each unit (Total 4 question with subparts)	40 Marks
Unit 3 and 4: Two question from each unit (Total 4 question with subparts)	60 Marks

20ME102P					Elements of Mechanical Engineering Lab		
Teaching Scheme					Examination Scheme		
L	T	P	C	Hrs/Week	Practical		Total Marks
					Continuous Evaluation	End Semester LE/Viva	
0	0	2	1	2	50	50	100

COURSE OBJECTIVES

- To perform experiments and collect experimental data on thermal and mechanical systems to validate theoretical principles.
- To analyse, differentiate and evaluate Law of conservation of energy on thermal systems.
- To evaluate performance of heat engine and heat pumps.
- To calculate and compare the components, application of the conventional manufacturing machines, non-conventional manufacturing machines and industrial robotic systems.
- To demonstrate the working principle of heat engine and additive manufacturing process.

LIST OF EXPERIMENTS

1. To understand and perform fluid property evaluation using property tables and engineering equation solver software.
2. To perform experimental study and verify 1st law of thermodynamics by energy balance of heat exchanger.
3. To evaluate thermodynamic systems using Engineering Equation Solver.
4. To determine Performance of Heat pump and evaluate its coefficient of performance.
5. To understand and demonstrate components and working cycle of Internal Combustion engine.
6. To understand and demonstrate construction and working of conventional manufacturing machine.
7. To understand and demonstrate construction and working of non-conventional manufacturing machine.
8. To study additive manufacturing process applied for 3D printing.
9. To develop a working model of a simple robotic system.

COURSE OUTCOMES

On completion of the course, students will be able to

CO1 - Understand and evaluate conservation law of thermodynamics through experimentation.
CO2 - Understand and analyse thermal systems data using engineering equation solver.
CO3 – Measure the coefficient of performance of heat pump.
CO4 - Examine the internal combustion engine components and its working.
CO5 - Demonstrate the various components of convention and non-conventional manufacturing machines and elaborate their applications.
CO6 – Classify the components in industrial robots and develop a simple robotic system.

TEXT/REFERENCE BOOKS

1. Solar energy by Prof. Sukhatme.
2. Heat transfer by Yungus A. Cengel.
3. Mikell Groover, Industrial Robotics, McGraw-Hill Education (India) Pvt Limited

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks :100	**Exam Duration: 2 hrs**
Part A : Lab Work – Continuous Assessment	50 Marks
Part B : Lab Exam and Viva	50 Marks

20IC101T					Basic Electronics					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
2	0	0	2	2	25	50	25	-	-	100

COURSE OBJECTIVES

- To understand rectification through p-n junction diode and applications of diode
- To learn different configurations and static characteristics of bipolar junction transistor and MOSFET
- To illustrate the OPAMP application in different real life circuits
- To introduce basic concepts of digital electronics

UNIT 1: DIODES AND RECTIFIERS **8 Hrs.**

Review of p-n junction diode, 1-phase half wave, full wave and bridge rectifier using diode. Calculation of average & rms value, PIV, efficiency, transformer utilization factor and ripple for different diode rectifier circuit. Use of Capacitor Filter for ripple reduction, voltage multipliers, Zener diode in load and line regulation.

UNIT 2: BJT, FET AND MOSFET **07 Hrs.**

Working of a BJT, transistor biasing, different transient circuit configuration (CB, CE and CC), static characteristic for BJT, transistor as switch, amplifier, concept of feedback amplifier and oscillator. Classification of FET, static characteristics of FET, FET biasing and load line, MOSFET, static characteristic of MOSFET and biasing

UNIT 3: OPAMP **04Hrs.**

Introduction, Block Diagram and Characteristics of Ideal Op-Amp, Parameters of an Op-Amp, Inverting and Non- Inverting Amplifier, Virtual Ground, Adder, Subtractor, Comparator, Integrator and Differentiator.

07Hrs.

UNIT 4: DIGITAL ELECTRONICS

Number system, Binary arithmetic, logic gates and combinational logic, Boolean algebra, DeMorgan's Theorems, Logic minimization and Karnaugh maps, full adder, multiplier, multiplexing, Flip Flops, Introductory Sequential Logic, Counters, Registers

Total 26 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 –Demonstrate application of different diode in circuits

CO2 – Evaluate zener diode as voltage regulator

CO3- Apply BJT, FET and MOSFET in different circuits

CO4–Understand static characteristics OPAMP

CO5–Illustrate basic concepts and theorem of digital systems

CO6–Build digital circuits using logic gates and flip flops

TEXT/REFERENCE BOOKS

1. Boylestad and Nashlesky, "Electronic Devices and Circuit Theory", PHI
2. N.N. Bhargava, S.C. Gupta, and D.C. Kulshreshtha, "Basic Electronics And Linear Circuits", McGraw Hill Education (India)
3. R. A. Gaikwad, "Operational Amplfier and Linear Integrated Circuits", PHI
4. Morris Mano, "Digital Design", PHI
5. J. Millman, C. Halkias and C. Parikh, "Integrated Electronics", Tata McGraw Hill.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100	**Exam Duration: 3 Hrs**
Short Questions (such as: MCQ, fill-in-the-gaps, objective or short one-line questions, match the following etc. (1 or 2 marks each)	20 to 40 Marks
Large Questions (such as: problem analysis, numerical solutions, logical/analytical steps and methods, derivations, descriptive answers, tabular solutions, graphical solutions, etc.(10 to 20 marks each)	80 to 60 Marks

20IC101P					Basic Electronics Lab					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
0	0	2	1	2	-	-	-	50	50	100

COURSE OBJECTIVES

- To understand the characteristics of PN junction diodes and their applications
- To Observe properties of BJT, FET and MOSFET
- To illustrate the OPAMP application in different real life circuits
- To introduce basic concepts of digital electronics

LIST OF EXPERIMENTS

1. To study the simulation tool and its features for analog circuit simulation
2. To study the VI characteristic of silicon and germanium diodes.
3. To study reverse characteristics of Zener diode.
4. To study half wave, full wave and bridge rectifiers
5. To study BJT as switch
6. To study common emitter amplifier
7. To study different biasing circuits of BJT
8. To study transfer and drain characteristic of FET and MOSFET
9. To study the simulation of digital circuits
10. To study and verify logic gates
11. To implement X-OR and X-NOR gates using basic gates
12. To study and design adder and subtracter circuits
13. To study and design flip flops
14. To study OPAMP and its properties
15. To study ADC and DAC
16. Design of mini project in a group of 4-5 students

COURSE OUTCOMES

On completion of the course, student will be able to
CO1: Study the fundamentals of electronic components
CO2: Understand the working principle of semiconductor devices
CO3: Apply the analog and digital concept in building real time circuits
CO4: Analyze the behaviour of semiconductor devices, OPAMP, ADC and DAC
CO5: Evaluate different circuit for different device parameters
CO6: Build analog and digital sub-system

TEXT/REFERENCE BOOKS

1. Boylestad and Nashlesky, “Electronic Devices and Circuit Theory”, PHI
2. N.N. Bhargava, S.C. Gupta, and D.C. Kulshreshtha, “Basic Electronics And Linear Circuits”, McGraw Hill Education (India)
3. R. A. Gaikwad, “Operational Amplifier and Linear Integrated Circuits”, PHI
4. Morris Mano, “Digital Design”, PHI
5. J. Millman, C. Halkias and C. Parikh, “Integrated Electronics”, Tata McGraw Hill.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks :100	**Exam Duration: 2 hrs**
Part A : Lab Work – Continuous Assessment	50 Marks
Part B : Lab Exam and Viva	50 Marks

20CP101T					Computer Programming with C					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
1	0	0	1	1	25	50	25	-	-	100

COURSE OBJECTIVES

- To develop a greater understanding of the issues involved in programming language, design and implementation
- To inculcate functional and logical problem-solving skills through programming.
- To understand the basic concepts of C programming

UNIT 1 BASICS OF C PROGRAMMING **4 Hrs.**

Input, Output constructs, different data types, types of Operators, Precedence and associativity of Operators, Control Structure and Loop Structure

UNIT 2 ARRAY AND STRINGS **4 Hrs.**

1-dimensional, 2-dimensional and 3-dimensional arrays, different types of user defined functions, String operations in form of Character arrays, In-built String functions

UNIT 3 POINTERS AND STRUCTURES **3 Hrs.**

Basic pointer arithmetic, arrays and String using Pointer, Structures, call the functions using Call-by reference property

UNIT 4 FILE HANDLING **2 Hrs.**

open the file in write mode and write the data into it, open the file in read mode and read from the file, Open the file in append mode and append the contents in the file, handle the File operations using seek function.

Max. 13 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 – Understand functional and logical problem-solving skills through programming

CO2 - Write, compile and debug programs in C language

CO3 – Use basic and derived data types in C and Operators in C.

CO4 - Design programs involving decision structures, loops, and functions in C.

CO5 - Implement Programs to perform pointer arithmetic and array handling with Pointers.

CO6 - Perform File-handling operations in C.

TEXT/REFERENCE BOOKS

1. E.Balaguruswamy, Programming in ANSI C, McGraw-Hill
2. Jeri R. Hanly and Elli B.Koffman, Problem Solving and Program Design in C.
3. Brain W.Kernighan & Dennis Ritchie, C Programming Language, PHI

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 3 Hrs**

Part A: 10 Questions of 2 marks each-No choice 20 Marks

Part B: 2 Questions from each unit with internal choice, each carrying 80 Marks

20CP101P					Computer Programming with C LAB					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
0	0	2	1	2	-	-	-	50	50	100

COURSE OBJECTIVES

- To understand the basic concepts of C programming
- To understand design and implementation issues involved with variable allocation and binding, control flow, types, subroutines, parameter passing
- To develop understanding of Compilation process.

LIST OF EXPERIMENTS:

Practical list should be prepared based on the content of the subject and following guidelines should be useful. - Computer Programming covering all constructs of C language.
Following list gives some programming examples. Faculty can prepare their own list in same manner keeping above guidelines and syllabus in mind.

1. Add, subtract, multiply, divide two numbers.
2. Convert hours into minutes, minute to hours, etc.
3. Conversion related programs dollars into Rs. Where 1 $ = 48 Rs. , grams to KG, Kilobytes to Megabytes, etc.
4. Convert Celsius into Fahrenheit. F = (9/5 * C) + 32 and Fahrenheit into Celsius. C = 5/9 * (F – 32)
5. Calculate simple and compound interest where I = PRN/100.
6. Calculate area & perimeter of a square, rectangle, circle, triangle.
7. Program to sort N numbers. (Ascending and Descending)
8. Program to calculate string length, reverse the string, etc.
9. Program to check the string and number is palindrome or not.
10. Program to generate sine, cosine, tan series.
11. Program to generate Fibonacci series.
12. Program to calculate factorial using recursion.
13. Program to create a database using array of structures.
14. Programs related to pointers.
15. Programs related to file.

Design based Problems (DP)/Open Ended Problem:

1. Develop a game/Puzzle in C language.
2. Use interrupts to develop programs related to basic operations.

COURSE OUTCOMES

On completion of the course, student will be able to
CO1 – Understand functional and logical problem-solving skills through programming
CO2 - Write, compile and debug programs in C language
CO3 – Use basic and derived data types in C and Operators in C.
CO4 - Design programs involving decision structures, loops, and functions in C.
CO5 - Implement Programs to perform pointer arithmetic and array handling with Pointers.
CO6 - Perform File-handling operations in C.

TEXT/REFERENCE BOOKS

1. E.Balaguruswamy, Programming in ANSI C, McGraw-Hill
2. Jeri R. Hanly and Elli B.Koffman, Problem Solving and Program Design in C.
3. Brain W.Kernighan & Dennis Ritchie, C Programming Language, PHI

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 2 Hrs**

Part A: Evaluation Based on the class performance and Laboratory book 50 Marks
Part B: Viva Examination based conducted experiments 50 Marks

16HS109T					Professional Ethics and Human Value					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
1	0	0	1	1	25	50	25	--	--	100

COURSE OBJECTIVES

- Identify the core values that shape the ethical behaviour of an Engineer
- Awareness on professional ethics and human values
- To know their role in technological development
- To appreciate the rights of others
- Improved communication and learn to work in group
- Learn to understand and discuss on issues of social interest

UNIT 1 HUMAN VALUES [5 hrs]

Morals, Values and Ethics - Integrity - work Ethic - Service Learning - Civic Virtue - Respect for others - Living peacefully - Caring - Sharing - Honesty - Courage - Valuing time - Co-operation - Commitment - Empathy - Self-Confidence - Character - Spirituality

UNIT 2 ENGINEERING ETHICS [4 hrs]

Sense of 'Engineering Ethics' - Variety of moral issued - types of inquiry - moral dilemmas - moral autonomy - Kohlberg's theory - Gilligan's theory - Consensus and controversy - Models of Professional Roles & Professionalism - theories about right action - Self-interest - customs and religion - uses of ethical theories.

UNIT 3 ENGINEERING AS EXPERIMENTATION [4 hrs]

Engineers as responsible experimenters - Research ethics -Codes of ethics - Industrial Standard - Balanced outlook on law - the challenger case study.

UNIT 4 SAFETY, RISK AND GLOBAL ISSUES [5 hrs]

Safety and risk - assessment of safety and risk - Risk benefit analysis and reducing risk - Threat of Nuclear power - Collegiality and loyalty - respect for authority - Confidentiality - conflicts of interest - professional rights - employees' rights - Intellectual Property rights (IPR) - discrimination. Multinational corporations - Business ethics - Environmental ethics - Role in Technological Development - Weapons development - consulting engineers - engineers as expert witnesses and advisors-Ethics.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1: Find the core values that shape the ethical behaviour of an Engineer
CO2: Students will get aware of the professional ethics and human values
CO3: Develop and understand their role in technological development
CO4: Simplify to the rights of others
CO5: Perceive improved communication with activities and learning to work in group
CO6: Discuss on issues of social interest and make opinions based on logical reasoning

TEXT/REFERENCE BOOKS

1. Prof. R. S. Nagaarazan, A Textbook on Professional Ethics and Human Value by New Age International Limited Publisher, Chennai. 2006
2. M. Govindarajan, S. Natarajan, V. S. SenthilkumarA Text book on Professional Ethics and Human Values by, PHI Learning Pvt. Ltd., 2013.
3. Dinesh Babu, A Text book on Professional Ethics and Human Values by Firewall Media, 2007

16SP101/ 16SP102/ 16SP103					NCC/NSS/SPORTS					
Teaching Scheme					Examination Scheme					
					Theory			Practical		
L	T	P	C	Hrs/Week	MS	ES	IA	LW	*Participation and Attendance	Total Marks
0	0	2	1	2	* Continuous Evaluation			--	100	100

COURSE OBJECTIVES

- To develop discipline, character, brotherhood, the spirit of adventure and ideals of selfless service amongst young citizens
- To develop youth leadership in the students.
- To induce social consciousness among students through various camps and 'Shibir' activities.
- To develop skills and physical fitness among students through indoor & outdoor sports, field & track events.

NATIONAL CADET CORPS (NCC):

Introduction to NCC, Aims and objectives, Structure and organization, NCC Song, Incentives, National Integration and Awareness, Drill, saluting, Personality Development & Leadership, Disaster Management, Social Awareness & Community Development, Health & Hygiene, Adventure camps, Environment Awareness and Conservation, Obstacle Training, Armed forces, Map reading, Field Craft & Battle Craft, Introduction to Infantry Weapons & Equipment, Weapon Training (During camps), Participation into Republic and Independence day ceremonial parades,

NATIONAL SERVICE SCHEME (NSS):

Importance and role of youth leadership, Life competencies, Youth development programmes and youth 'shibir', Health, hygiene and sanitation, Youth health, lifestyle, first aid, youth and yoga

SPORTS:

Importance of sports/games in life, Physical fitness, Introduction to various games and sports, field and track events, Physical training, exercises, running, walking, jogging, Teaching of different sports/games, track & field events , demonstration, practice, skills and correction, Introduction to Yoga & Meditation.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 – Understand the importance of Nation building and individual contribution to the same.
CO2 – Integrate physical fitness and mental wellbeing
CO3 – Discover grassroots challenges of community
CO4 – Creating societal impact
CO5 – Maintain discipline and team spirit
CO6 – Upholding the value of one for all and all for one

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: --**

* All registered students will be evaluated based on his/her attendance during the NCC/NSS/Sports sessions and participation to camps and other activities.

Note: Registration to NCC course in semester 01 will be based on availability of vacancy in the unit under which NCC platoon is registered.

Once registered for any of NCC/SPORTS/NSS in first semester, student cannot change to other course in second semester.

20HS101P					Communication Skills – I (Semester I/II) (First Year)					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
0	0	2	0	2 hours per week	--	--	--	50	50	100

COURSE OBJECTIVES

- Understand of the fundamental elements of communication in English language.
- Know and understand different practices of verbal and non-verbal communication with inputs to improve basic language skills.
- Students are expected to be better equipped in the following areas:
  - **Listening:** Understanding basic content in lectures and common everyday situations
  - **Speaking:** Correct expression in the English language at a basic level
  - **Reading:** Understanding, retaining, and critically analyzing technical/non-technical content
  - **Writing:** Using appropriate vocabulary, grammar, effective paragraph construction, writing in day-to-day scenarios, including digital platforms

UNIT 1 **21 hrs**

1. Structure of English Language
2. Academic, Research and Technical Vocabulary
3. Phonetics and Accent

UNIT 2 **3 hrs**

1. Listening Skills
2. Note Taking and Note Making - Collective note-taking and note-making on digital platforms

UNIT 3 **3 hrs**

1. Reading - Reading Comprehension, Speed Reading

UNIT 4 **3 hrs**

1. The art of introducing oneself
2. Public speaking and articulation

Max. 30 hrs.

COURSE OUTCOMES

On completion of the course, student will be able to:
CO1 Confidence to listen, speak, read and write in English
CO2 Being able to produce something new with the help of inputs
CO3 Learning to critically analyze
CO4 Preparing reports/critique with the help of collected data
CO 5 Having a multi-dimensional/disciplinary perspective and approach
CO6 Better improved and sharpened skills to present, convince and persuade to be an effective and successful professional

TEXT/REFERENCE BOOKS

1. Harmer, Jeremy. The Practice of English Language Teaching. Harlow: Pearson Longman, 2007.
2. Kaul, Asha. Business Communication. Delhi: Prentice-Hall of India, 2006.
3. Maley, A. 'Literature in the Language Classroom', The Cambridge Guide to Teaching ESOL, Cambridge University Press, 2001.
4. Richards, Jack C., and Willy A. Renandya, eds. Methodology in Language Teaching: An Anthology of Current Practice. Cambridge University Press, 2002.
5. Sharma, Sangeeta and Binod Mishra. Communication Skills for Engineers and Scientists. New Delhi: PHI Learning Pvt. Ltd., 2009.

Assessment Tool	Marks	Assignments
Lab Work	50	• Listening and Questionnaire – 15, Grammar Worksheet – 20 • Short Story/Essay (750 – 1000 words) – 05 • Reading Comprehension – 10
Lab Exam/Viva	50	• Wordsworth – 10 • Narrating a Story along with Self Introduction/Speech – 15 • Reading Aloud – 05, Vocabulary/Phonetics – 20

IInd Semester

PANDIT DEENDAYAL ENERGY UNIVERSITY, GANDHINAGAR

SCHOOL OF TECHNOLOGY

COURSE STRUCTURE FOR B. TECH. IN COMPUTER SCIENCE & ENGINEERING													
Semester II			**B. Tech. in Computer Science & Engineering**										
Sr. No.	**Course/Lab Code**	**Course/Lab Name**	**Teaching Scheme**					**Examination Scheme**					
								Theory			**Practical**		**Total**
			L	**T**	**P**	**C**	**Hrs/ Wk**	**MS**	**ES**	**IA**	**LW**	**LE/Viva**	**Marks**
1	20MA103T	Mathematics – II	3	1	0	4	4	25	50	25	--	--	100
2	20CE101T	Element of Civil Engineering & Solid Mechanics	4	0	0	4	4	25	50	25	-	-	100
3	20CE101P	Element of Civil Engineering & Solid Mechanics - Lab	0	0	2	1	2	--	--	--	50	50	100
4	20EE101T	Elements of Electrical Engineering	3	0	0	3	3	25	50	25	-	-	100
5	20EE101P	Elements of Electrical Engineering - Lab	0	0	2	1	2	--	--	--	50	50	100
6	20PH101T	Engineering Physics	3	0	0	3	3	25	50	25	--	--	100
7	20PH101P	Engineering Physics Lab	0	0	2	1	2	--	--	--	50	50	100
8	16ME103P	Workshop Practice	0	0	2	1	2	25	50	25	--	--	100
9	20ME101P	Engineering Graphics-Lab	0	0	4	2	4	--	--	--	50	50	100
10	20CP102P	Fundamentals of Python Programming Lab	0	0	2	1	2	--	--	--	50	50	100
11	20HS102T	Environmental Studies	3	0	0	3	3	25	50	25	--	--	100
12	16SP101/ 16SP102/ 16SP103	NCC/NSS/Sports	0	0	2	1	2	--	--	--	100		100
13	16TP110	Civic services and Social Internship (Summer Break)	0	0	0	1	0	--	--	--			100
		Total	16	1	16	26	33						1300

IA- Internal Assessment, MS-Mid Semester; ES – End Semester Exam

20MA103T					MATHEMATICS - II					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
3	1	0	4	4	25	50	25	--	--	100

COURSE OBJECTIVES

- To be able to apply the calculus of complex functions to construct analytic functions.
- To be able to compute residues and apply them to evaluate contour integrals.
- To be able to formulate and solve various engineering problems using the methods of solving ODEs.
- To study the properties of Laplace transforms and apply them to solve ODEs.

UNIT 1 COMPLEX DIFFERENTIATION **10 Hrs.**

Limit, Continuity, Differentiability of function of complex variable, Analytic function, Cauchy-Euler equation (in Cartesian and polar coordinates), Harmonic function and its significance, Singularities, Taylor's series, Mapping (translation, rotation and inversion), bilinear transformation, Conformal mapping, Applications of Conformal mapping.

UNIT 2 COMPLEX INTEGRATION AND APPLICATIONS **10 Hrs.**

Definition of a Complex line integral, Contour integrals, Cauchy- Goursat theorem, Cauchy integral theorem, Cauchy Integral formula (CIF), CIF for derivatives, Calculation of residues, Cauchy Residue theorem, Applications of residues to evaluate real definite integrals.

UNIT 3 ORDINARY DIFFERENTIAL EQUATIONS WITH APPLICATIONS **10 Hrs.**

Differential equations of first order and higher degree, Higher order differential equations with constant coefficients, Rules for finding C.F. and P.I., Method of variation of parameters, Cauchy and Legendre's linear equations, Linear differential equations of second order with variable coefficients; Simultaneous linear equations with constant coefficients, Applications of higher order differential equations in solving engineering problems.

UNIT 4 LAPLACE TRANSFORMS **10 Hrs.**

Piecewise continuous functions and exponential functions, Definition, Existence and Properties of Laplace transforms, Heavyside function, Inverse Laplace transform, Properties of inverse Laplace transforms, Convolution theorem, Applications of Laplace Transforms in solving differential equations.

Max. 40 Hrs.

COURSE OUTCOMES:

On completion of the course, student will be able to

CO1 - Identify the use of various special functions in engineering aspects.
CO2 - Illustrate the ability to handle mathematical models, to describe physical phenomena, using suitable techniques.
CO3 - Develop the ability to apply appropriate tool/method to extract the solutions of engineering problems.
CO4 - Analyze the obtained solution in context with theory.
CO5 - Appraise mathematical problems from real to complex domain.
CO6 - Create a mathematical model of engineering interest.

TEXT/REFERENCE BOOKS:

1. R.V. Churchill and J. W. Brown, Complex variables and applications, McGraw-Hill, 7th Ed., 2003
2. J. M. Howie, Complex analysis, Springer-Verlag, 1st Ed., 2003.
3. R. K. Jain and S. R. K. Iyernagar, Advanced Engineering Mathematics, Alpha Science, 3rd Ed., 2007.
4. Erwin Kreyszig, Advanced Engineering mathematics, John Wiley, 10th Ed., 2015.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 3 Hrs**

Part A : 10 questions of 3 marks each	30 Marks (40 min)
Part B: 5 questions 6 marks each	30 Marks (50 min)
Part C: 5 questions 8 marks each	40 Marks (90 min)

20CE101T					Element of Civil Engineering and Solid Mechanics					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
4	-	-	4	4	25	50	25	--	--	100

COURSE OBJECTIVES.

- To introduce and explain the basics scope of engineering.
- To understand different types of force systems and apply them to practical engineering application.
- To develop understanding of the basic concepts related to tensile, compressive and shear stresses in engineering components.
- To discuss the basic principles of torsion in shafts, shear force and bending moment in beams, Deflection in springs, Columns and Struts.

UNIT 1 INTRODUCTION TO CIVIL ENGINEERING & MECHANICS 14 Hrs.

Basics and scope of Civil Engineering- Introduction to Civil Engineering- Branches of Civil Engineering- Application of Civil Engineering in other domain different types residential of buildings- green building and smart building.

Introduction to Engineering Mechanics- Resolution of forces- Varignon's – couples- Lami's theorem-

Centroid and Moment of Inertia- Determination of moment of inertia of simple planar laminas like rectangle- triangle- quarter-semi-circle and circle. Theorems of perpendicular and parallel axis-polar moment of inertia- radius of gyration.

UNIT 2. SIMPLE AND COMPOUND STRESSES AND STRAIN 14 Hrs.

Introduction to stresses and strain – Stress-strain diagram- Elastic constants -relationship between elastic constants and Poisson's ratio – Generalised Hook's law – Strain energy – Deformation of simple and compound bars – thermal stresses. Biaxial state of stress – Stress at a point – stresses on inclined planes – Principal stresses and Principal strains and Mohr's circle of stress, Theories of failure

UNIT 3 SFD- BMD AND STRESSES IN BEAM 12 Hrs.

Types of beams- Cantilever, Simply supported, Overhanging: Shear Force and Bending Moment Diagrams Theory of simple bending – bending stress and shear stress in beams. Deflection of beams by Double integration method – Macaulay's method – Area moment theorems for computation of slopes and deflections in beams – Conjugate beam method.

UNIT 4 TORSION AND COLUMNS 12 Hrs.

Introduction to Torsion – derivation of shear strain – Torsion formula – stresses and deformations in circular and hollow shafts – Stepped shafts – shafts fixed at the both ends – Stresses in helical springs. Theory of columns – Long column and short column – Euler's formula – Rankine's formula - Secant formula - beam column.

Max. 52 Hrs

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 –Describe the basics and scope of civil engineering, role of civil engineer and subbranches of civil engineering.

CO2 -Compute the stress and strain developed due to applied load in any structural member and solve the principal stress & strain at a point of stressed member.

CO3 – Calculate the shear force & bending moment diagram under various loading & support condition.

CO4 - Analyze bending and shear stresses in the different layers of the beam for various loadings.

CO5 - Determine the torsion equation & pure torsion

CO6 - Explain the loaded structural members for deflection.

TEXT/REFERENCE BOOKS

1. N.H Dubey, Engineering Mechanics-Statics and Dynamics, Tata McGraw Hill Private limited
2. R. S. Khurmi, Engineering Mechanics, S. Chand Publication
3. S.S. Bhavikatti Elements of Civil Engineering (IV Edition) , Vikas Publishing House Pvt. Ltd., New Delhi.
4. Ferdinand P Beer and E Russel Johnson , Mechanics for Engineers (Statics & Dynamics) McGraw
5. Timoshenko and Gere, Mechanics of Materials, CBS Publishers, New Delhi, 1996
6. S. B. Junarkar and Dr. H. J. Shah, Mechanics of Structures, 27th Revised and Enlarged, Charotar Publication.
7. Beer and Johnston, Mechanics of Materials, McGraw Hill International

END SEMESTER EXAMINATION QUESTION PATTERN

Max. Marks: 100	**Exam Duration 3 Hrs.**
Part A: 4 Question from unit-1 – 5 Marks Each	20 Marks
Part B: 8 Numerical Questions from unit 2 to unit 4 – 10 Marks Each	80 Marks

20CE101P					Elements of Civil Engineering & Solid Mechanics Lab					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
-	-	2	1	2	-	-	-	50	50	100

COURSE OBJECTIVES

- To conduct standard tests on construction steel under static load.
- To conduct standard tests on metals under impact load
- To conduct standard tests of flexure and compression on wooden items.
- To conduct standard tests of crushing, impact and abrasion on bricks and tiles.

LIST OF EXPERIMENTS

1. Tension test on mild steel
2. Compression test of ms bar/cost iron
3. Bending test on wooden beam / Steel bars
4. Shear test on steel bar
5. Hardness test
6. Charpy impact test
7. Izod impact test
8. Compression test of on bricks
9. Flexural test on clay roof tiles

COURSE OUTCOMES

On completion of the course, student will be able to
CO1 – Define the standard tests of mild steel under tension, compression & shear.
CO2 – Compute and use the Charpy impact testing machine to evaluate the performance of metal under impact load.
CO3 – Compute Rockwell hardness testing machine to determine the hardness of metals
CO4 – Illustrate modulus of rupture of timber and steel bar.
CO5 – Determine the compressive and bending strength of clay items.
CO6 – Explain the crushing, impact and abrasion values of bricks.

TEXT/REFERENCE BOOKS

1. S. B. Junarkar and Dr. H. J. Shah, Mechanics of Structures, 27th Revised and Enlarged, Charotar Publication.
2. Beer and Johnston, Mechanics of Materials, McGraw Hill International

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 2Hrs**

Part A : Lab Work – Continuous Assessment 50 Marks
Part B : Lab Exam and Viva 50 Marks

20EE101T					Elements of Electrical Engineering					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
3	0	0	3	3	25	50	25	--	--	100

COURSE OBJECTIVES

- To impart knowledge on DC and AC circuits.
- To learn construction, working principles and characteristics of transformer and induction machines.
- To introduce students to various means for electrical safety and protection of electrical installations.
- To impart knowledge on electric wiring and illumination for domestic and industrial applications.

UNIT 1 DC CIRCUITS **10 Hrs.**

Electrical circuit elements (R, L and C), voltage and current sources, dependent and independent sources, Ohms Law, temperature co-efficient of resistance, Kirchhoff current and voltage laws, voltage and current divider circuit, Thevenin and Norton Theorems and their equivalents, maximum power transfer and superposition theorems, nodal and mesh analysis, star-delta transformation, Time domain analysis/natural response of first order RL and RC Circuit

UNIT 2 AC CIRCUITS **10 Hrs.**

Generation of AC voltage, representation of sinusoidal waveforms, rms values of different sinusoidal waveforms, Rectangular and Polar representation of phasor, Sinusoid representation in time and frequency domain. of Analysis of single-phase ac series circuits consisting of R, L, C, RL, RC, RLC combinations, instantaneous, average power and reactive power, complex power and power factor. AC parallel circuit and its solution in admittance form, resonance in AC series circuit and parallel circuit. Polyphase circuits, star and delta representation of polyphase circuit, power measurement in polyphase circuit

UNIT 3 TRANSFORMERS AND INDUCTION MACHINES **10 Hrs.**

Magnetic material and its B-H characteristic, Faraday's Law of Electromagnetic Induction **Transformers:** ideal transformer, emf equation for transformer, working of practical transformer on no-load and load **Induction Machine:** Types of induction motor, production of rotating magnetic field from 3-phase supply, operation of three phase induction motor, starting and running torque, Torque-slip characteristics of induction motor, Power Stages in IM

UNIT 4 ELECTRICAL INSTALLATION, SAFETY AND PROTECTION **10 Hrs.**

Fuse, MCB, ELCB, MCCB, underground cables. Domestic and Industrial Wiring. Types of lamps, illumination schemes and lumen requirement for domestic and industrial applications, Earthing and it schemes. Electrical safety rules, electric shock and first aid, energy conservation methods, elementary calculation of energy consumptions, tariffs

Max Hrs: 40

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 – Analyze electrical circuits using network theorems.
CO2 – Compare the behavior of R, L and C and their combinations in AC circuits.
CO3 – Analyze balanced polyphase systems in star and delta configuration
CO4 – Understand the construction, working and basic characteristics of transformer and induction machines
CO5 – Recognize the importance of protective devices and electrical safety measures
CO6 – Carry out domestic and industrial electrification

TEXT/REFERENCE BOOKS

1. J. Bird, "Electrical Circuit Theory and Technology", Routledge, Tailor and Francis Group, Sixth Edition, 2017.
2. D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 2010.
3. B. L. Theraja, "Electrical Technology", Vol. 1, S. Chand Publication, New Delhi
4. Surjit Singh, "Electrical Estimating and Costing", Dhanpat Rai and Co.

END SEMESTER EXAMINATION QUESTION PATTERN

Max. Marks: 100 **Exam Duration 3 Hrs.**

Part A: 4 Question from unit-1 – 5 Marks Each 20 Marks
Part B: 8 Numerical Questions from unit 2 to unit 4 – 10 Marks Each 80 Marks

20EE101P					Elements of Electrical Engineering Lab					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
0	0	2	1	2	--	--	--	50	50	100

COURSE OBJECTIVES

- To gain practical knowledge on DC and AC circuits
- To learn operation of electrical instruments and electrical machines
- To develop skills to implement electric wiring

LIST OF EXPERIMENTS

1. Introduction to elements of electrical engineering laboratory and to study different electrical measuring instruments
2. To validate Ohm's law with linear resistors and find power dissipation in resistor
3. To implement voltage divider and current divider circuit
4. To validate Thevenin and Norton theorem for DC circuit
5. To validate Superposition and Maximum Power Transfer theorem for DC circuit
6. To obtain transient response of RL and RC circuit
7. To evaluate performance of AC series circuit
8. To evaluate performance of AC parallel circuit
9. To analyse resonance condition in AC circuit
10. To establish relation between line and phase quantities in star and delta connected polyphase system
11. To measure power in polyphase system
12. To perform load test on 1-phase transformer
13. To perform load test on 3-phase transformer
14. To obtain current time characteristic for domestic protective devices
15. To carry out domestic electric wiring

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 – Operate basic electrical measuring instruments

CO2 – Simulate the basic electrical circuits and obtain results based on electrical laws and network theorem

CO3 – Understand the performance of AC circuit with different connection of R, L and C

CO4 – Formulate star and delta configuration of polyphase system and measure power in polyphase system

CO5 – Operate transformer and induction machines and evaluate its performance

CO6 – Understand the basic wiring and operation of protective devices for domestic application

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 2 Hrs**

Part A: Evaluation Based on the class performance and Laboratory book 50 Marks

Part B: Viva Examination based conducted experiments 50 Marks

20PH101T					Engineering Physics					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	Viva	
3	0	0	0	3	25	50	25	--	--	100

COURSE OBJECTIVES

- To understand basic concepts of quantum mechanics and solve the Schrödinger equation for various cases.
- To understand basics concepts of electric and magnetic properties of solids.
- To develop the fundamental understanding of optoelectronic devices.
- To understand the heat transfer mechanism in solids and fluids.

UNIT 1 INTRODUCTION TO QUANTUM MECHANICS **12 Hrs.**

Inadequacies in Classical Physics, Wave Nature of Matter, Heisenberg's Uncertainty Principle and its applications, zero point energy, Basic Postulates and Formalism of QM: Energy, Momentum and Hamiltonian Operators. Time-independent Schrodinger Wave Equation for Stationary States. Properties and interpretation of Wave Function. Probability Density and Probability. Conditions for Physical Acceptability of Wave Functions, Application of time-independent Schrödinger equation for various potentials.

UNIT 2 ELECTRONIC THEORY OF SOLIDS **10 Hrs.**

Elements of crystallography; lattice vibrations of solids; Bloch Theorem and Origin of energy bands, band structure of conductors, type of semiconductors, Free Electron Theory of metals, Wiede-mann Franz Law, Kronig-Penny model, Hall effect. Magnetism and its origin, magnetization and susceptibility, dia-para-ferro-magnetism. Ferromagnetism, Nano magnets and magneto resistance, hard disk drive storage technology. Phenomenology of Superconductors, Meissner effect, BCS theory - high temperature superconductors.

UNIT 3 OPTICS, LASER AND OPTO-ELECTRONICS **08 Hrs.**

Optics: Introduction, division of amplitude, thin film interference, Applications of interference, Laser: The Einstein coefficients, Spontaneous and stimulated emission, Optical amplification and population inversion, meta stable state, optical resonator, the principle of pumping scheme, laser beam characteristics. Types of LASER, Injection Laser Diode (ILD). Quantum Cascade Laser, Comparison between ILD and QCL. Applications of lasers.

UNIT 4 THERMAL PHYSICS **10 Hrs.**

Laws of thermodynamics -basic concepts, closed and open systems-first law. Heat transfer-thermal expansion of solids and liquids –Conduction in solids – the rmal conductivity- Forbe's method, Lees' disc method, conduction through compound media, formation of ice on ponds, thermal insulation and its applications. Thermal Convection - properties of radiant heat, sea and land breeze. Thermal Radiation – emission and absorption radiation, emissive power, black body radiation – Kirchoff's, Stefan's laws, wien's law, Newton's law of cooling.

Max. 40 Hrs.

COURSE OUTCOMES

CO1 – identify and understand the experimental results which require conceptualization of quantum theory.
CO2 – Interpret the solution of Schrödinger equation to obtain physical information about the system.
CO3 - Identify basic concepts in semiconductors, superconductors and magnetism and apply it in engineering applications.
CO4 - To understand concepts of optical interference and LASER, analyse the lasing characteristics to apply in different laser diodes and other applications
CO5 - To understand concepts of thermal physics in terms of laws and modes of heat transfer.
CO6 - To apply knowledge of concepts of engineering physics to solve real world problems.

TEXT/REFERENCE BOOKS

1. N. Zettili, Quantum Mechanics: Concepts and applications, Willey Publications
2. Kittel, Charles. Introduction to Solid State Physics. John Wiley and Sons.
3. W.D. Callister and David Rethwisch, Materials Science & Engineering -An Introduction, 9th edn.,
4. Heat and Thermodynamics BrijLal, N. Subrahmanyam, S. Chand, Limited, 2001.
5. Optics by Ajay Ghatak, Tata macgraw hill publishing.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 3 Hrs**

Part A/Question: 3 Questions from each unit, each carrying 3 marks 36 Marks
Part B/Question: 2 Questions from each unit, each carrying 8 marks 64 Marks

20PH101P					Engineering Physics Practical					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	Viva	
0	0	2	1	2	-	-	-	50	50	100

COURSE OBJECTIVES

- To understand the working of various electrical, mechanical and optical instruments in the laboratory.
- To gain practical knowledge in Physics through experiments.
- To understand basics concepts of Physics and be able to apply in performing the experiments.

LIST OF EXPERIMENTS

1. Introduction to Oscilloscope.
2. Study of Interference using Newton's Ring experiment.
3. Determination of thermal conductivity of different solids.
4. Experiment with solar collector.
5. Experimental to determine linear thermal expansion coefficient of solid bodies.
6. Experiment on reflection of Ultrasonic waves.
7. Experiments with heat pump.
8. Determining Plank's constant and Inverse square law.
9. Experiments on diffraction with He-Ne Laser Kit.
10. Study of Hall Effect.
11. Determining semiconductor energy band gap using four probe method.
12. Experiment to study forced oscillations.
13. Study of charging and discharging of capacitive plates.
14. Study of Bio-Savart's Law
15. Experiments on Fiber Optics.
16. Study of Photoconductivity.
17. Determining e/m by Thomson's method.
18. Study of Polarization of light using LASER.
19. Millikan's oil drop experiment.
20. Study of Holography.

** Any 10 experiments will be conducted relevant to theory course.

COURSE OUTCOMES

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

CO1 - Apply and analyze the concepts of electricity and magnetism.
CO2 - Understand the interaction of light waves and its propagation in different media.
CO3 - Demonstrate and implement the phenomenon of resonance
CO4 - Investigate the electrical properties of a given semiconductor device
CO5 - Examine the charge transport mechanism in different conductors
CO6 - Design and analyze the light propagation for communication application using fibre optics

TEXT/REFERENCE BOOKS

1. Ghatak, Optics, 3rd edition, Tata McGraw Hill (2005).
2. Kittel, Knight and Ruderman, Mechanics - Berkeley Physics Course, Vol. 1, Tata McGraw-Hill.
3. Avadhanulu, A text book of engineering Physics, S. Chand & Company, Ltd.
4. Brij Lal, N. Subrahmanyam, Heat and Thermodynamics, S. Chand & Company, Ltd
5. Halliday, Resnick, Walker, Fundamentals of Physics (Wiley)

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100	**Exam Duration: 2 Hrs**
Continuous evaluation	50 marks
End semester examination and Viva-voce	50 marks

16ME103P					Workshop Practices		
Teaching Scheme					Examination Scheme		
L	T	P	C	Hrs/Week	Practical		Total Marks
					Continuous Evaluation	End Semester	
-	-	2	1	2	50	50	100

COURSE OBJECTIVES

- To impart the machining skills in students
- To develop a skills in precision, safety at work place, team working with right attitude
- To prepare a job by using ability to design and model different prototypes.

METROLOGY

Semi-Precision tools: Rules and scales, try square. Inside/Outside Calipers, Depth gages etc. Precision Tools: Micrometers, Vernier calipers, Bevel Protractor, Dial indicator, Gage blocks, Surface plates etc.

CARPENTRY SHOP

Timber, Seasoning and Preservation, Plywood and Ply boards, Carpentry Tools, Engineering applications. Different Joints

BENCH WORK AND FITTING

Introduction to the familiarization with tools and their uses, Hammers, Hacksaws, choice of blades & sawing techniques, Files with their classification; According to their longitudinal shape & cross section, classification based on cuts; teeth; length of the file, Care of files and hand tool safety rules Vices & their classification, Other hand tools; scribers, chisels, scrapers, center, punch, surface gauge, Universal cribbing block, Trammel, Screw drivers, Drills, Spanners, Pliers, Taps, Dies, Reamers, Screw drivers etc, Fitting Processes : Marking, Chipping, Sawing, Filing, Scrapping, Drilling, Internal Threading (or Trapping), External Threading (or Dieing), Reaming, welding, soldering, brazing

TIN SMITHY – SURFACE DEVELOPMENT

Shearing and Bending of sheets, Making simple products by Tin Smithy practice.

LIST OF EXPERIMENTS

1. Introduction to Workshop and safety.
2. Experiment on measurement of linear, angular and curved dimensions of the object.
3. Fitting job: Detailed drawing of work piece, use of fitting tools and job preparation.
4. Hands on experience on welding, brazing and soldering.
5. Carpentry job: Detailed drawing of work piece, use of carpentry tools and job preparation.
6. Sheet metal job: Detailed drawing of work piece, use of sheet metal working tools and job preparation.
7. Plumbing job: Internal/External threading, piping network using Tees, Elbows, Reducer, Bends etc

COURSE OUTCOMES

CO1: Define fundamentals and principles cutting and enhance the machining skills in students
CO2: Apply principles of machining and develop a skills in dignity of labour, precision, safety at work place, team working and development of right attitude
CO3: Analyse the effect design and model different prototypes in carpentry
CO4: Examine the effect and create and develop ability to design and model different basic prototypes in trade of fitting
CO5: Determine the effect and create and develop ability to design and model different basic prototypes in trade of tin smithy
CO6: Evaluate the performance of different machining and cutting processes such as fitting, carpentry, plumbing etc.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100

Continuous evaluation	50 marks
End semester examination and Viva-voce	50 marks

20ME101P					Engineering Graphics Lab					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
0	0	4	2	4	-	-	-	50	50	100

COURSE OBJECTIVES

- To learn fundamental of engineering drawing and standards used in drawing
- To enable the students with various concepts of projections and standards related to technical drawings.
- To demonstrate and communicate ideas using orthographic (2D) & isometric projection (3D) methods
- To help students to use CAD software to solve engineering problems

UNIT 1 INTRODUCTION TO ENGINEERING GRAPHICS **10 Hrs.**

Importance and applications, drawing instruments & accessories, lettering, types of lines, dimensioning methods, basic geometric drawing.

Computer Aided Engineering Drawing: Introduction to CAD, use of softwares in drawing, CAD software user interface, commands, menus and toolbars.

UNIT 2 ORTHOGRAPHIC PROJECTION **14 Hrs.**

Introduction to projection, types of projection, 1st angle and 3rd angle projection, 2D sketch, sketch entities and tools – origin, points, lines, arcs, polygons, fillets and chamfer, trim, extend and offset, projections from pictorial view, orientation of views, sections and sectional views.

UNIT 3 ISOMETRIC PROJECTION **14 Hrs.**

Construction of isometric views from orthographic projections, approach to modelling, moving from 2D to 3D, creating 3D models using CAD features, assembly of components and exploded views.

Projection of Solids - Classification of solids, projections of solids like cylinder, cone, pyramid and prism with its inclination to reference plane, concept of development of lateral surfaces, intersection of solids.

UNIT 4 DRAFTING **14 Hrs.**

Drafting standards, drawing views, alignment of drawing views, dimensions and tolerances, symbols, comments and annotations, computer aided drafting, drawing sheet and title block.

Tolerance - Introduction to limits, fits and tolerances, standardized representation of threads, fasteners, welds, bearings and springs, dimensional and geometric tolerances, surface finish symbols.

Total 52 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Understand the fundamentals of engineering graphics and remember the basic rules of dimensioning and labelling.

CO2 - Develop the ability to learn fundamental of CAD software and its use to solve engineering problems.

CO3 - Comprehend the concept of projection and use it to represent the views on reference planes.

CO4 - Apply the technical communication skill for 3-dimensional geometries in the form of 3D models using isometric projection.

CO5 - Analyse the orientation of geometrical bodies with respect to reference planes and evaluate the intricate details of solid using sectioning and development of lateral surfaces.

CO6 - Create drawing sheet by organizing drawing views and applying necessary dimensions and tolerances.

TEXT/REFERENCE BOOKS

1. R Hanifan, “Perfecting Engineering and Technical Drawing”, Springer International Publishing Switzerland
2. Bethune, J. D., “Engineering Design and Graphics with SolidWorks 2019, 1st edition”, Macromedia Press
3. K Morling, “Geometric and Engineering Drawing”, Elseveir Insights
4. DM Kulkarni, “Engineering Graphics with AutoCAD”, Easter Economy Edition
5. Agrawal, B. & Agrawal C. M., “Engineering Drawing”, Tata McGraw Hill Publishers
6. P.J. Shah, “Engineering Graphics”, S. Chand Publishing
7. David C Planchard, “Engineering Graphics with SOLIDWORKS 2019: A Step-by-Step Project Based Approach’’, SDC Publications.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100	**Exam Duration: 2 Hrs**
Continuous evaluation	50 marks
End semester examination and Viva-voce	50 marks

20CP102P					Fundamentals of Python Programming Lab					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
0	0	2	1	2	--	--	--	50	50	100

COURSE OBJECTIVES

- To impart the basic concepts of Python Programming language
- To be familiar with data structures available in Python
- To understand testing and debugging in Python
- To draw different kinds of plots using for scientific research

LIST OF EXPERIMENT

Problems related to following topics would be covered by the faculty

INTRODUCTION TO PYTHON

The basic elements of Python, Branching programs, Strings and Input, Iteration

FUNCTION, SCOPING AND ABSTRACTION

Functions and Scoping, Specifications, Recursion, Global variables, Modules, Files

TESTING AND DEBUGGING

Testing, Debugging

STRUCTURED TYPES, MUTABILITY AND HIGHER-ORDER FUNCTIONS

Tuples, Lists and Mutability, Functions as Objects, Strings, Tuples and Lists, Dictionaries

EXCEPTIONS AND ASSERTIONS

Handling exceptions, Exceptions as a control flow mechanism, Assertions

SOME SIMPLE ALGORITHMS AND DATA STRUCTURES

Search Algorithms, Sorting Algorithms, Hashtables

OOPS CONCEPTS

class, objects, inheritance, method overloading, method overriding, encapsulation, etc.

PLOTTING

Plotting using PyLab and extended examples

COURSE OUTCOMES

On completion of the course, student will be able to

CO1- Understand the basic concept of programming with python.
CO2- Understand the basics of creating applications.
CO3- Apply various data structures available in Python in solving computational problems.
CO4- Create robust applications for solving computational problems using the Python.
CO5- Test and debug applications written using the Python.
CO6- Draw different kinds of plots using PyLab and generating series.

TEXT/REFERENCE BOOKS

1. John V Guttag. "Introduction to Computation and Programming Using Python", Prentice Hall of India.
2. Allen Downey, Jeffrey Elkner and Chris Meyers "How to think like a Computer Scientist, Learning with Python", Green Tea Press.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 2 Hrs**

Part A: Evaluation Based on the class performance and Laboratory book 50 Marks
Part B: Viva Examination based conducted experiments 50 Marks

20HS102T					ENVIRONMENTAL STUDIES					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
3	0	0	3	3	25	50	25	--	--	100

COURSE OBJECTIVES

- Understanding about Bird's eye view of Environment,
- Understanding of multidisciplinary aspect of environment
- Understanding of pollutions and their effects on environment
- Understanding about various environment pollution control strategies

UNIT 1 BIRD'S EYE VIEW TO ENVIRONMENT 08Hrs.

Environmental Studies – Its importance and Multidisciplinary nature; Ecosystem and its various types, factors affecting the functioning of an ecosystem; Biodiversity – its importance, threats and conservation; Natural Resources – Forest, Water, Mineral, Energy, Minerals, Food; Review of State of India's Environment.

UNIT 2 MULTI-SCALE ENVIRONMENTAL POLLUTION 10 Hrs.

Concept of Clean Environment, Introduction to various environmental standards – air, water, soil, noise, heat. Causes and Effects of Air Pollution, Water Pollution, Soil Pollution, Solid Waste (organic and Inorganic) Pollution, Hazardous Waste Pollution, Marine Pollution, Noise Pollution, Thermal Pollution, Radioactive Pollution; Pollution across Indian cities – case studies; Introduction to man-made disasters like floods, heat waves, landslides, etc.

UNIT 3 ENVIRONMENTAL POLLUTION CONTROL STRATEGIES 12 Hrs.

Multi-approaches (role of research, technology, policy, planning & implementation, legislation & judiciary, incentives & business) for reducing various types of pollution; Case studies of Pollution control strategies; Review of the Central and State Government's policies and mechanisms for managing various natural resources and controlling the various types of pollutions (including Swacch Bharat Abhiyan), Global Initiatives for environmental management; Indian Culture and Traditional Wisdom for managing environment

UNIT 4 SOCIAL ISSUES AND THE ENVIRONMENT 09 Hrs.

Concept of sustainability and Sustainable Development, Environmental Sustainability Index, Environmental Ethics, Public awareness and people's participation (bottlenecks and solutions), Consumerism and Waste products, Introduction to Carbon Footprint & Water Footprint, Green Buildings, Green Business (profitability in managing environment)

Max 39 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to:
CO1- Understand the various facets of environment,
CO2- Understand of multidisciplinary aspects of environment
CO3- Understand about the different types of pollutions
CO4- Understand the effects of pollution on human health, plants, materials and environment
CO5- Understand about the various environment pollution control strategies
CO6- Understand about various concepts of sustainable development

TEXT/REFERENCE BOOKS:

1. Bharucha Erach, Textbook for Environmental Studies, UGC New Delhi
2. Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd, Ahmedabad 380013, India
3. Clark, R. S., Marine Pollution, Clanderson Press Oxford
4. Daniel B. Botkin & Edwards A. Keller, Environmental Science, Wiley INDIA edition.
5. Hawkins R. E., Encyclopedia of Indian Natural History, Bombay Natural History Society, Bombay
6. Miller T. G. Jr., 2006. Environmental Science, Clengage Learning, India
7. Odum E. P. 1971. Fundamentals of Ecology, W. B. Saunders Co, USA
8. Wagner K. D., 1998. Environmental Management, W. B. Saunders Co, USA

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max Marks: 100 **Exam Duration: 3 Hrs**

Part A	4 Questions of 10 Marks each., 1 Question from every unit.	40
Part B	6 Questions of 10 Marks each. , 3 Questions from Unit 3 & 4 each	60

16SP101/ 16SP102/ 16SP103					NCC/NSS/SPORTS					
Teaching Scheme					Examination Scheme					
					Theory			Practical		
L	T	P	C	Hrs/Week	MS	ES	IA	LW	*Participation and Attendance	Total Marks
0	0	2	1	2	* Continuous Evaluation			--	100	100

COURSE OBJECTIVES

- To develop discipline, character, brotherhood, the spirit of adventure and ideals of selfless service amongst young citizens
- To develop youth leadership in the students.
- To induce social consciousness among students through various camps and 'Shibir' activities.
- To develop skills and physical fitness among students through indoor & outdoor sports, field & track events.

NATIONAL CADET CORPS (NCC):

Introduction to NCC, Aims and objectives, Structure and organization, NCC Song, Incentives, National Integration and Awareness, Drill, saluting, Personality Development & Leadership, Disaster Management, Social Awareness & Community Development, Health & Hygiene, Adventure camps, Environment Awareness and Conservation, Obstacle Training, Armed forces, Map reading, Field Craft & Battle Craft, Introduction to Infantry Weapons & Equipment, Weapon Training (During camps), Participation into Republic and Independence day ceremonial parades,

NATIONAL SERVICE SCHEME (NSS):

Importance and role of youth leadership, Life competencies, Youth development programmes and youth 'shibir', Health, hygiene and sanitation, Youth health, lifestyle, first aid, youth and yoga

SPORTS:

Importance of sports/games in life, Physical fitness, Introduction to various games and sports, field and track events, Physical training, exercises, running, walking, jogging, Teaching of different sports/games, track & field events , demonstration, practice, skills and correction, Introduction to Yoga & Meditation.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 – Understand the importance of Nation building and individual contribution to the same.
CO2 – Integrate physical fitness and mental wellbeing
CO3 – Discover grassroots challenges of community
CO4 – Creating societal impact
CO5 – Maintain discipline and team spirit
CO6 – Upholding the value of one for all and all for one

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: --**

* All registered students will be evaluated based on his/her attendance during the NCC/NSS/Sports sessions and participation to camps and other activities.

16TP110					Civic & Social Service Internship					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
			01	21 days	--	--	--	--	--	100

COURSE OBJECTIVES

- To develop a holistic view of social work and social welfare in the community, with special emphasis on the role of different agencies like Govt. departments and NGOs in human services.
- To enlighten and sensitize students on various types of problems of the people and their diversified cultural background.
- To understand the agency as an organization, its structure, functions, activities and sources of funding.
- To understand and make a commitment to the basic humanistic values and principles of social work practice in a secular democratic society.
- To develop an understanding of the application of the methods of social work practice in the field.
- To develop an understanding of the opportunities in working with diverse populations.
- To develop the self –awareness necessary to assess one's own values, attitudes, feelings, strengths, limitations, and interests and performance.
- To inspire young technocrats to become change makers

UNIT 1: Overview of Civic and Social Service Sector
UNIT 2: Understanding of NGO/Civic Body/Government Body Management and their functioning
UNIT 3: Study of Individual organizational and government projects and schemes where students are interning
UNIT 4: Field visits

COURSE OUTCOMES

On completion of the course, student will be able to

CO1- Become sensitized workforce of enlightened Engineers and Managers who are socially concerned and willing to positively contribute to the society
CO2- Acquire desired work habits and attitudes with the sense of social responsibility and think innovatively to find solutions
CO3- Understand the role of different NGO/civic/government bodies in the service of citizens
CO4- Imbibe basic humanistic values and principles of social work practice in a secular democratic society
CO5- To assess one's own values, attitudes, feelings, strengths, limitations, interests and performance through opportunities of working with diverse populations
CO6- Obtain experiential learning via internship and be sensitive towards issues of modern-day citizenship and democracy

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100

Part A: NGO evaluation 50 Marks
Part B: Internal faculty 50 Marks

IIIrd Semester

PANDIT DEENDAYAL ENERGY UNIVERSITY GANDHINAGAR

SCHOOL OF TECHNOLOGY

COURSE STRUCTURE FOR B TECH IN COMPUTER SCIENCE & ENGINEERING

Semester III	**B. Tech. in Computer Science & Engineering**

Sr. No.	**Course/ Lab Code**	**Course/Lab Name**	**Teaching Scheme**					**Examination Scheme**					
								Theory			**Practical**		**Total**
			L	**T**	**P**	**C**	**Hrs/Wk**	**CE**	**MS**	**ES**	**LW**	**LE/ Viva**	**Marks**
1.	20MA206T	Discrete Mathematical Structures	3	1	0	4	4	25	25	50	-	-	100
2.	20CP201T	Data Structures	3	0	0	3	3	25	25	50	-	-	100
3.	20CP201P	Data Structures LAB	0	0	2	1	2	-	-	-	50	50	100
4.	20CP202T	Microprocessor Programming & Interfacing	2	0	0	2	2	25	25	50	-	-	100
5.	20CP202P	Microprocessor Programming & Interfacing LAB	0	0	2	1	2	-	-	-	50	50	100
6.	20CP203T	Digital Electronics & Computer Organization	3	0	0	3	3	25	25	50	-	-	100
7.	20CP203P	Digital Electronics & Computer Organization LAB	0	0	2	1	2	-	-	-	50	50	100
8.	20CP204T	Object Oriented Programming With JAVA	2	0	0	2	2	25	25	50	-	-	100
9.	20CP204P	Object Oriented Programming With JAVA LAB	0	0	4	2	4	-	-	-	50	50	100
10.		OE-1	3	0	0	3	3	25	25	50	-	-	100
11.	20HS201P	Communication Skills - II	0	0	2	1	2	--	--	--	50	50	100
		TOTAL	16	1	12	23	29						1100

CE- Continuous Evaluation, MS-Mid Semester; ES – End Semester Exam

Open Elective-1 (Anyone to be offered)

Sl. No.	**Course Code**	**Course Name**	**Domain**
1.	20CP205T	Programming Methodology & Data Structures	Programming
2.	20CP212T	Introduction to Programming with Java	Programming

20MA206T					Discrete Mathematical Structures					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
3	1	0	4	4	25	50	25	--	--	100

COURSE OBJECTIVES

- To understand the concept of sets, relations, functions and logic.
- To study Combinatorics as an analytical method for problem solving.
- To apply graph theory based modelling and applying the same to solve real life problems.
- To explain the basics of algebraic structures.

UNIT 1 SETS, RELATIONS, FUNCTIONS AND LOGIC **10 Hrs**

Finite and Infinite sets, Countable and Uncountable sets, Mathematical Induction, Functions and Relations, Types of Relation, Partial Ordered Relations, Hasse diagram and Lattice. Propositions - Simple and Compound. Basic logical operators. Implication. *Truth tables. Tautologies, Contradictions and Contingency. Valid arguments and Fallacy.

UNIT 2 COMBINATORICS **10 HRS**

Recursive functions, Recurrence relations, Solutions of recurrence relations (Direct Method and by using Generating Function), Counting principles, *Permutation, Combination, Derangement, inclusion-exclusion principle, Pigeon hole principle, Extended Pigeon hole principle.

UNIT 3 GRAPH THEORY AND ITS APPLICATIONS **12 HRS.**

Graphs and related definitions, Sub graphs, Homomorphism and Isomorphism, Paths and Connectivity. Bipartite graph. Eulerian graph and Konigsberg Bridge problem. Hamiltonian graph. Labeled and weighted graphs. Graph coloring. *Four color problem. Planar Graphs. Digraphs and related definitions. Trees. Algebraic expressions and Polish notation. Sequential representation. Adjacency matrix. Shortest path Algorithms (Dijkstra), Binary trees, Strongly and weakly connected graphs, Powers of the adjacency matrix, Floyd-Warshall algorithm, Application of Graph theory in real-life applications.

UNIT 4 ALGEBRAIC STRUCTURES **08 HRS.**

Group, Semi group, Monoids, Properties of a Group, Composition table for finite Group, Order of a group, Order of its elements, Cyclic Group, Generator, *Lagrange's Theorem. Ring, Properties of Rings, Integral Domain, Field.

40 Hrs.

COURSE OUTCOMES (COs)

On completion of the course, student will be able to

CO1 – Understand the basic concepts of sets, relations, functions, logic and be able to determine their properties.

CO2 – Defend and point out fallacious reasoning and propositions.

CO3 – Identify and apply the basic techniques of Combinatorics and Counting.

CO4 – Construct and solve recurrence relations that arise in counting problems including problems of determining the time complexity of recursively defined algorithms.

CO5 – Apply Graph theory in related areas such as minimal-path problems and network flow problems.

CO6 – Identify structures of algebraic nature, prove and use their properties.

TEXT/REFERENCE BOOKS

1. Seymor Lipschutz, Marc Lipson, Discrete Mathematics, Schaum's Series, McGraw-Hill Education, 3rd Ed., 2009.
2. Kenneth Rosen, Discrete Mathematics and Its Applications, McGraw Hill Education, 7th Ed., 2017.
3. Bernard Kolman, Robert Busby, Sharon C. Ross, Discrete Mathematical Structures, Pearson, 6th Ed., 2018.
4. Thomas Koshy, Discrete Mathematics with Applications, Academic Press Inc., 2004.
5. Ralph P. Gramaldi, Discrete and Combinatorial Mathematics, 5th Ed, Pearson, 2006.
6. C.L. Liu, D.P. Mohapatra, Elements of Discrete Mathematics: A Computer Oriented Approach, McGraw Hill Education, 4th Ed., 2017.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 3 Hrs**

Part A : 10 questions of 2 marks each	20 Marks (40 mins.)
Part B: 5 questions 6 marks each	30 Marks (50 mins.)
Part C: 5 questions 10 marks each	50 Marks (90 mins.)

*** These topics are for self-study, included in examinations; notes will be provided.**

20CP201T					Data Structures					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
3	0	0	3	3	25	50	25	-	-	100

COURSE OBJECTIVES

- To learn fundamental concepts of Data and File Structures
- To implement various data Structures and Algorithms
- To understand function of linear and non-linear data structures
- **To use suitable data structure in variety of applications**

UNIT 1 INTRODUCTION TO DATA STRUCTURE **10 Hrs.**

Data types: primitive and non-primitive, Linear Data Structures Stack & Queue: Stack-Definitions & Concepts, Polish Expression, Reverse, Polish Expression, Recursion, Representation Of Queue, Circular Queue, Priority Queue, Double Ended Queue.

UNIT 2 LINEAR DATA STRUCTURES **10 Hrs.**

Linear Data Structure Linked List: Singly; Doubly and Circular linked list; Implementation of Stack and Queue using linked list; Performance Analysis and Measurement: Time and space analysis of algorithms; Asymptotic Notations.

UNIT 3 NONLINEAR DATA STRUCTURE **10 Hrs.**

Binary search trees; Conversion of General Trees to Binary Trees; Some balanced tree mechanism; Height Balanced; Weight Balance; Red black tree; Multi-way search tree: B and B+ tree; Graph: Depth First Search & Breadth first Search.

UNIT 4 HASHING AND FILE STRUCTURE **9 Hrs.**

The symbol table, Hashing Functions, Collision Resolution Techniques.

Max. 39 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1. Differentiate linear and non-linear data structures depending upon problem context.
CO2. Extend logical reasoning and programming skills.
CO3. Implement linear and non-linear data structures for real-time applications.
CO4. Choose suitable data structures to solve complex computing problems.
CO5. Apply the algorithms on the small and large data sets.
CO6. Select an appropriate hashing function for an application.

TEXT/REFERENCE BOOKS

1. Tanenbaum, "Data Structures using C & C++", Prentice-Hall International
2. Jean-Paul Tremblay & Paul G. Sorenson, "An Introduction to Data Structures with Applications", Tata McGraw Hill
3 . Sartaj Sahani, "Fundamentals of Data Structures in C++", Galgotia.Publishers

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100	**Exam Duration: 3 Hrs**
Part A: 10 Questions of 2 marks each-No choice	20 Marks
Part B: 2 Questions from each unit with internal choice, each carrying 20 marks	80 Marks

20CP201P					Data Structures LAB					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
0	0	2	1	2	-	-	-	50	50	100

COURSE OBJECTIVES

- To understand function of linear and non-linear data structures
- To learn implementation of linear and non-linear data structures
- To use suitable data structure in variety of applications

LIST OF EXPERIMENTS:

1. Study and implementation of Stack data structure and its applications
2. Study and implementation of various types of Queue data structure and their applications
3. Study and implementation of various types of Linked list data structure and their applications
4. Study and Implementation of binary tree and its traversals
5. Study and Implementation of Threaded binary tree, Binary search tree
6. Memory representation of General trees and their conversion to Binary trees
7. Study and Implementation of Balanced trees: AVL trees, 2-3 trees, Height Balanced, Weight Balance, Red black tree
8. Study and Implementation of B and B+ tree
9. Memory representation of Graph data structure, DFS & BFS traversals
10. Study and implementation of the data Structures for Strings
11. Study and implementation of Hash functions and tables
12. Study and implementation of file structures: indexing and hashing for file organization

COURSE OUTCOMES

On completion of the course, student will be able to
CO1. Differentiate linear and non-linear data structures depending upon problem context.
CO2. Extend logical reasoning and programming skills.
CO3. Implement linear and non-linear data structures for real-time applications.
CO4. Choose suitable data structures to solve complex computing problems.
CO5. Apply the algorithms on the small and large data sets.
CO6. Select an appropriate hashing function for an application.

TEXT/REFERENCE BOOKS

1. Tanenbaum, “Data Structures using C & C++”, Prentice-Hall International, 1998
2. Jean-Paul Tremblay & Paul G. Sorenson, “An Introduction to Data Structures with Applications”, Tata McGraw Hill, 2001

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 2 Hrs**

Part A: Evaluate the continuous performance based on the lab work 50 Marks
Part B: Verify the performance using viva and critical experiment 50 Marks

20CP202T					Microprocessor Programming & Interfacing					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
2	0	0	2	2	25	50	25	-	-	100

COURSE OBJECTIVES

- To impart the basic concepts of microprocessor
- To be familiar with writing assembly language programs
- To understand and implement concepts about interfacing
- To apply the concepts for interfacing different peripherals like keyboard, display, etc.
- Compare different advanced processors.

UNIT 1 8086 ARCHITECTURE **6 Hrs.**

Block diagram of 8086 Architecture, Pins and Signals, Instruction set.

UNIT 2 ASSEMBLY PROGRAMMING **7 Hrs.**

Programs on subroutines, Memory interfacing and programming peripheral interfacing, I/O interfacing and timer, programmable interrupt controller.

UNIT 3 INTERFACING AND ADVANCED MICROPROCESSORS **7 Hrs.**

DMA, USART, Introduction to Advanced Microprocessors Block diagram of 80286,386,486

UNIT 4 MICROCONTROLLER AND MULTI-CORE PROCESSORS **6 Hrs.**

Introduction to Microcontroller 8051, Introduction to Multi-core processors like NVIDIA.

Max. 26 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to
CO1. Describe the various features of microprocessor.
CO2. Explain various elements of 8086 microprocessor architecture.
Co3. Select required instructions by considering the addressing modes.
CO4. Analyse different concepts of programmable interfacing with microprocessor.
CO5. Compare different features of advance microprocessors.
CO6. Use assembly language to program 8086 for Interfacing.

TEXT/REFERENCE BOOKS

1. Ramesh S. Gaonkar Pub: Microprocessor Architecture, Programming, and Applications with the 8085, Penram International.
2. N. Senthil Kumar, M. Saravanan, S. Jeevanathan, S. K. Shah, Microprocessors and Interfacing, Oxford
3. Daniel Tabak, Advanced Microprocessors, McGrawHill
4. Douglas Hall, Microprocessor & Interfacing, TMH
5. K.R.Venugopal, Microprocessor x86 programming, BPB

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 3 Hrs**

Part A: 10 Questions of 2 marks each-No choice 20 Marks
Part B: 2 Questions from each unit with internal choice, each carrying 20 marks 80 Marks

20CP202P					Microprocessor Programming & Interfacing LAB					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
0	0	2	1	2	-	-	-	50	50	100

COURSE OBJECTIVES

- To impart the basic concepts of microprocessor
- To be familiar with writing assembly language programs
- To understand and implement concepts about interfacing
- To apply the concepts for interfacing different peripherals like keyboard, display, etc.
- Compare different advanced processors.

LIST OF EXPERIMENTS:

Following list gives some programming examples. Faculty can prepare their own list in same manner keeping above guidelines and syllabus in mind.

1. Write an 8086 assembly language program for exchanging two 8-bit numbers, add two 8-bit numbers. Store result in a variable, display number on screen.
2. Write an 8086 assembly language program to read a number from keyboard and do addition, subtraction, multiplication and division and display the answer on screen, find the minimum from block of N 8-bit numbers, to check the string is palindrome or not.
3. Write an 8086 assembly language program to sort an array of 8-bit numbers. find the number of 1's binary representation of given 8-bit number, to count the length of string.
4. Write an 8086 assembly language program to covert a number from one base to another base, to compute even parity and insert it as MSB in 8-bit number.
5. Write an 8086 assembly language program in C using ASM directive, to check the number is prime or not, programs related to interfacing with devices.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1. Describe the various features of microprocessor.
CO2. Explain various elements of 8086 microprocessor architecture.
CO3. Select required instructions by considering the addressing modes.
CO4. Analyse different concepts of programmable interfacing with microprocessor.
CO5. Compare different features of advance microprocessors.
CO6. Use assembly language to program 8086 for Interfacing.

TEXT/REFERENCE BOOKS

1. K.R.Venugopal, Microprocessor x86 programming, BPB
2. Ramesh S. Gaonkar Pub: Microprocessor Architecture, Programming, and Applications with the 8085, Penram International.
3. N. Senthil Kumar, M. Saravanan, S. Jeevanathan, S. K. Shah, Microprocessors and Interfacing, Oxford
4. Daniel Tabak, Advanced Microprocessors, McGrawHill
5. Douglas Hall, Microprocessor & Interfacing, TMH

END SEMESTER EXAMINATION PATTERN

Max. Marks: 100 **Exam Duration: 2 Hrs**

Part A: Evaluation Based on the class performance and Laboratory book 50 Marks
Part B: Viva Examination based conducted experiments 50 Marks

20CP203T					Digital Electronics & Computer Organization					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
3	0	0	3	3	25	50	25	-	-	100

COURSE OBJECTIVES

- To introduce the basics involved in data representation and digital logic circuits used in the computer system including logic elements, and their use in combinational and sequential logic circuit design.
- To understand the architecture of processing, memory and I/O organization in a computer system.
- To understand the state transition diagrams to prepare circuits.

UNIT 1 NUMBER SYSTEMS **10 Hrs.**

Introduction to Number Systems, Conversion from one to another, 1's and 2's Complements, Introduction to Boolean Algebra: Addition and Multiplication in Boolean algebra: Binary Logic Functions, Logical Gates and Truth Tables; DEMORGAN's Theorem, Combinational Logic: Forms; Sum of Products Form, Product of Sum Form, K – Map: Plotting a Boolean expression and Logic expression simplification with grouping cells, Quine McClusky Method

UNIT 2: COMBINATIONAL AND SEQUENTIAL CIRCUITS **12 Hrs.**

Analysis and Design of Combinational Logic: Introduction: Binary adders; Half adder, Full adder: Binary Subtractor; Half subtractor, Full subtractor, Decoders; Encoders; Multiplexers, Demultiplexers: Parity Generators and Parity Checkers; Parity, Detecting an Error.

Latches: The S-R Latch (NOR, NAND); Gated Latches; Gated S-R Latches, Gated D-Latch or D-flip-flop: Edge triggered Flip-Flops; Edge triggered S-R Flip-Flop (S-R FF), Edge triggered D-Flip-Flop (D-FF), Edge triggered J-K Flip-Flop (J-K FF), Master-Slave J-K Flip Flop

UNIT 3: CENTRAL PROCESSING UNIT (CPU) **9 Hrs.**

General register organization, the operation of memory stack, variety of addressing modes, instruction format. RISC architecture and CISC architecture. Examples of processors and instruction execution employing RISC and CISC architecture, Introduction to control unit (Hardwired, Microprogrammed).

UNIT 4: INPUT-OUTPUT ORGANIZATION **8 Hrs.**

Computer communication with input and output devices. I/O interface units are presented to show the way that the processor interacts with external peripherals. Memory Organization - The concept of memory hierarchy: cache memory, main memory, auxiliary memory. Virtual memory, Memory Management: physical address and logical address mapping

Max. 39 Hrs

COURSE OUTCOME

CO1: Describe basic gate operations and laws of Boolean algebra.
CO2: Explain basic structure of digital computer, stored program concept and different arithmetic and control unit operations.
CO3: Understand basic structure of different combinational circuits- multiplexer, decoder, encoder.
CO4: Analyze various digital electronic circuits.
CO5: Identify the basic aspects of instruction execution, and examine the sub-operations of computer arithmetic.
CO6: Categorize the organization of memory, and I/O modules.

TEXT/REFERENCE BOOKS

1. V. Rajaraman, T. Radhakrishnan, "Digital Logic and Computer Organization", Prentice Hall India Learning Private Limited; 1 edition (2006)
2. Nikrouz Faroughi, "Digital Logic Design and Computer Organization: With Computer Architecture for Security", 2015 McGraw-Hill Education
3. Yale N. Patt, Sanjay J. Patel, "Introduction to Computing Systems" McGraw Hill
4. C.Hamacher, Z.Vranesic and S.Zaky, Computer Organization, 5th Ed., McGraw-Hill, 2002

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 3 Hrs**

Part A: 10 Questions of 2 marks each-No choice 20 Marks
Part B: 2 Questions from each unit with internal choice, each carrying 20 marks 80 Marks

20CP203P					Digital Electronics & Computer Organization LAB					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
0	0	2	1	2	-	-	-	50	50	100

COURSE OBJECTIVES

- To simulate elementary GATE operations
- To simulate basic combinational circuits (Adder, subtractor, multiplier etc.)
- To simulate different algorithms required memory mapping
- To simulate an ALU comprising addition, subtraction and multiplication capability

LIST OF EXPERIMENTS

1. Implement basic GATE (AND, OR, NOT, NAND, NOR) operations
2. Design of adder
3. Design of carry-look-ahead adder
4. Design of Flip-flops (any two)
5. Design of Registers and counters
6. Design of Combinational multiplier
7. Design of Booth's multiplier
8. Design of ALU
9. Design of Memory (4*4 RAM)
10. Design of K-map Design
11. Design of Quine - Mc Clusky Algorithm

COURSE OUTCOMES

On completion of the course, student will be able to
CO1- Explain various GATE operations.
CO2- Analyse different combinational circuits for different inputs.
CO3- Compare different sequential circuits.
CO4- Construct basic building blocks such as memory and ALU.
CO5- Use different algorithms for multiplication and division.
CO6- Demonstrate circuit minimization.

TEXT/REFERENCE BOOKS:

1. Linda Null, Julia Lobur, The essentials of computer organization and architecture. Jones & Bartlett Publishers. p. 121. ISBN 978-0-7637-3769-6.
2. Donald P Leach, Albert Paul Malvino,Goutam Saha, Digital Principles and Applications, McGraw-Hill publications.
3. Ronald J.Tocci,Neal S Widmer,Gregory L.Moss, Digital Systems Principles and Applications, Pearson Publication.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 2Hrs**

Part A : Lab Work – Continuous Assessment 50 Marks
Part B: Lab Exam and Viva 50 Marks

20CP204T					Object Oriented Programming with Java					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
2	0	0	2	2	25	50	25			100

COURSE OBJECTIVES

- To build an understanding of basic concepts of object-oriented programming techniques
- To develop programming skills in Java programming language
- To implement object-oriented techniques using Java language features.
- To develop software using object-oriented programming paradigms

UNIT 1 BASICS OF JAVA **7 Hrs.**

Features of Object Oriented Programming and Java, Basics of Java programming, Data types, Variables, Operators, Control structures including selection, Looping, Java methods, Overloading, Math class, Arrays in java.

UNIT 2 INHERITANCE **7 Hrs.**

Basics of objects and classes in java, Constructors, Visibility modifiers, Inbuilt classes in Java, this reference; Inheritance in java, Overriding, Object class, Polymorphism, Dynamic binding, Abstract class, Interface in java, Package in java.

UNIT 3 I/O PROGRAMMING, EXCEPTION AND MULTITHREADING **6 Hrs.**

Introduction to Java IO streams, Character and Binary streams, reading data from and writing data to files, Difference between error and exception, Exception handling in Java, Multithreading in Java, Thread life cycle and methods, Runnable interface, Thread synchronization

UNIT 4 EVENT HANDLING AND GUI PROGRAMMING **6 Hrs.**

Event handling in Java, GUI Components and Layouts, Applet and its life cycle.

Max. 26 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1- **Describe** the basic features of Obejct-oriented programming and map them with the Java.
CO2- **Distinguish** Objects and Classes using Java.
CO3- **Demonstrate** Inheritance and Runtime Polymorphism
CO4- **Apply** I/O handling, exception handling for interactive problem.
CO5- **Use** the concepts of Event Handling in GUI Programming.
CO6- **Construct** object-oriented solutions for small systems involving multiple objects.

TEXT/REFERENCE BOOKS

1. Brett D. McLaughlin, Head First Object-Oriented Analysis and Design, O Reilly, 2006
2. Matt Weisfeld, The Object-Oriented Thought Process, Addison-Wesley Professional, 2019
3. Herbert Schild, The Complete Reference, Java 2, McGraw Hill, 2018
4. Balaguruswamy, Programming with Java – A Primer, McGraw Hill, 2019

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 3 Hrs**

Part A: 10 Questions of 2 marks each-No choice 20 Marks
Part B: 2 Questions from each unit with internal choice, each carrying 16 marks 80 Marks

20CP204P					Object Oriented Programming with Java LAB					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
0	0	4	2	4	--	--	--	50	50	100

COURSE OBJECTIVES

- To learn the difference between procedure-oriented and object-oriented approach for designing a software-solution
- To learn the basic features of Java as an object-oriented language.
- To apply the object oriented design and programming skills in realistic applications using Java programming language.

LIST OF EXPERIMENTS

1. Set up and get familiar with Java programming environment;
2. Study language features of Java (variables, data types, declarations, loop and branch constructs, etc.)
3. Class and Objects: study and implement classes based application using Java
4. Inheritance: study and implement various types of inheritance in Java.
5. Polymorphism: study and implement various types of Polymorphism in Java;
6. Study and implement Abstract class and Interfaces in Java;
7. Study and implement Exception handling in Java
8. Study and implement String Handling in Java
9. Study and Implement Collection API in Java
10. Study and implement multi-threaded application in Java
11. Program to demonstrate I/O Operations.
12. GUI programming using Java Applet, Events and Swing Components

COURSE OUTCOMES

On completion of the course, student will be able to

CO1- **Describe** the basic features of Obejct-oriented programming and map them with the Java.
CO2- **Distinguish** Objects and Classes using Java.
CO3- **Demonstrate** Inheritance and Runtime Polymorphism
CO4- **Apply** I/O handling, exception handling for interactive problem.
CO5- **Use** the concepts of Event Handling in GUI Programming.
CO6- **Construct** object-oriented solutions for small systems involving multiple objects.

TEXT/REFERENCE BOOKS

1. Brett D. McLaughlin, Head First Object-Oriented Analysis and Design, O Reilly, 2006
2. Matt Weisfeld, The Object-Oriented Thought Process, Addison-Wesley Professional, 2019
3. Herbert Schild, The Complete Reference, Java 2, McGraw Hill, 2018
4. Balaguruswamy, Programming with Java – A Primer, McGraw Hill, 2019

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 2 Hrs**

Part A: Evaluation Based on the class performance and Laboratory book	50 Marks
Part B: Viva Examination based conducted experiments	50 Marks

Department Open Electives- (III Semester)

20CP205T					Programming Methodology and Data Structures					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
3	0	0	3	3	25	50	25	-	-	100

COURSE OBJECTIVES

- To learn fundamental concepts of Programming Methodologies
- To implement various data Structures
- To understand function of linear and non-linear data structures
- To use suitable data structure in variety of applications

UNIT 1 INTRODUCTION TO PROGRAMMING METHODOLOGIES **10 Hrs.**

Programming Methodology: Basic concepts of C programming, Characters and Strings, structures, Dynamic memory allocation, Sorting, Searching, Problem decomposition by recursion.

UNIT 2 LINEAR DATA STRUCTURES **10 Hrs.**

Data types: primitive and non-primitive, Linear Data Structures Stack & Queue: Stack-Definitions & Concepts, Polish Expression, Queue, Circular Queue, Priority Queue, Double Ended Queue. Linked List: Singly; Doubly and Circular linked list;

UNIT 3 NONLINEAR DATA STRUCTURE **10 Hrs.**

Binary search trees; Conversion of General Trees to Binary Trees; Some balanced tree mechanism; Height Balanced.

UNIT 4 HASHING AND GRAPH **9 Hrs.**

Graph: Depth First Search & Breadth first Search. The symbol table, Hashing Functions, Collision Resolution Techniques

Max. 39 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1- **Differentiate** linear and non-linear data structures.
CO2- **Extend** logical reasoning and programming skills.
CO3- **Apply** linear and non-linear data structures.
CO4- **Identify** suitable data structures to solve complex computing problems.
CO5- **Apply** the algorithms on the small and large data sets.
CO6- **Devise** an appropriate hashing function for an application.

TEXT/REFERENCE BOOKS

1. Tanenbaum, "Data Structures using C & C++", Prentice-Hall International
2. Jean-Paul Tremblay & Paul G. Sorenson, "An Introduction to Data Structures with Applications", Tata McGraw Hill
3 . Sartaj Sahani, "Fundamentals of Data Structures in C++", Galgotia.Publishers

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100	**Exam Duration: 3 Hrs**
Part A: 10 Questions of 2 marks each-No choice	20 Marks
Part B: 2 Questions from each unit with internal choice, each carrying 20 marks	80 Marks

COURSE OBJECTIVES

Pandit Deendayal Energy University School of Technology

20CP212T					Introduction to Programming with Java					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
3	0	0	3	3	25	50	25			100

- To build an understanding of basic concepts of object-oriented programming techniques
- To develop programming skills in C++ programming language
- To implement object-oriented techniques using C++ language features.
- To develop software using object-oriented programming paradigms

UNIT 1 BASICS OF JAVA **10 Hrs.**

Features of Object Oriented Programming and Java, Basics of Java programming, Data types, Variables, Operators, Control structures including selection, Looping, Java methods, Overloading, Math class, Arrays in java.

UNIT 2 INHERITANCE **10 Hrs.**

Basics of objects and classes in java, Constructors, Visibility modifiers, Inbuilt classes in Java, this reference; Inheritance in java, Overriding, Object class, Polymorphism, Dynamic binding, Abstract class, Interface in java, Package in java.

UNIT 3 I/O PROGRAMMING, EXCEPTION AND MULTITHREADING **10 Hrs.**

Introduction to Java IO streams, Character and Binary streams, reading data from and writing data to files, Difference between error and exception, Exception handling in Java, Multithreading in Java, Thread life cycle and methods, Runnable interface, Thread synchronization

UNIT 4 EVENT HANDLING AND GUI PROGRAMMING **9 Hrs.**

Event handling in Java, GUI Components and Layouts, Applet and its life cycle.

Max. 39 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

- CO1 - Understand the principles of Object-Oriented Programming and its applications.
- CO2 - Create Objects and Classes using Java.
- CO3 - Implement Inheritance and Runtime Polymorphism.
- CO4 - Apply the knowledge of I/O handling, exception handling to build solution for the given problem
- CO5 - Apply the concepts of Event Handling and GUI Programming.
- CO6 - Design object-oriented solutions for small systems involving multiple objects

TEXT/REFERENCE BOOKS

1. Brett D. McLaughlin, Head First Object-Oriented Analysis and Design, O Reilly, 2006
2. Matt Weisfeld, The Object-Oriented Thought Process, Addison-Wesley Professional, 2019
3. Herbert Schild, The Complete Reference, Java 2, McGraw Hill, 2018
4. Balaguruswamy, Programming with Java – A Primer, McGraw Hill, 2019

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 3 Hrs**

Part A: 10 Questions of 2 marks each-No choice 20 Marks

Part B: 2 Questions from each unit with internal choice, each carrying 16 marks 80 Marks

20HS201P					Communication Skills – II (Semester – III/IV) (Second Year)					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
0	0	2	0	2 hours per week	--	--	--	50	50	100

COURSE OBJECTIVES

- Understand of the fundamental elements of communication in English language.
- Know and understand different practices of verbal and non-verbal communication with inputs to improve basic language skills.
- Students are expected to be better equipped in the following areas:
  - Listening: Understanding basic content in lectures and common everyday situations
  - Speaking: Correct expression in the English language at a basic level
  - Reading: Understanding, retaining, and critically analyzing technical/non-technical content
  - Writing**:** Using appropriate vocabulary, grammar, effective paragraph construction, writing in day-to-day scenarios, including digital platforms

UNIT 1 **7 hrs**

1. Technical Writing
   - ✓ Report Writing, Creating Lab Journals and Manuals
2. Portfolio of Critical Writing and Creative Writing
   - ✓ Essay, Story-writing, etc.

UNIT 2 **7 hrs**

1. Summarizing, Writing Reviews (Books/Articles/Movies/websites), Reading Skills (Advanced)

UNIT 3 **7 hrs**

1. Digital Literacy
   - ✓ Emails, Creating e-content, Editing and proofreading online, Using grammar and spell check software, Using plagiarism checkers

UNIT 4 9 hrs

- ✓ Group Discussion, Resume Writing, Interview Skills

Max. 30 hrs.

COURSE OUTCOMES

On completion of the course, student will be able to
CO1 -Confidence to listen, speak, read and write in English
CO2 -Being able to produce something new with the help of inputs
CO3 -Learning to critically analyze
CO4 -Preparing reports/critique with the help of collected data
CO 5- Having a multi-dimensional/disciplinary perspective and approach
CO6 - Better improved and sharpened skills to present, convince and persuade to be an effective and successful professional

TEXT/REFERENCE BOOKS

1. Harmer, Jeremy. The Practice of English Language Teaching. Harlow: Pearson Longman, 2007.
2. Kaul, Asha. Business Communication. Delhi: Prentice-Hall of India, 2006.
3. Maley, A. 'Literature in the Language Classroom', The Cambridge Guide to Teaching ESOL, Cambridge University Press, 2001.
4. Richards, Jack C., and Willy A. Renandya, eds. Methodology in Language Teaching: An Anthology of Current Practice. Cambridge University Press, 2002.
5. Sharma, Sangeeta and Binod Mishra. Communication Skills for Engineers and Scientists. New Delhi: PHI Learning Pvt. Ltd., 2009.

Assessment Tool	Marks	Assignments
Lab Work	50	Essay/Journal Writing – 10, Report Writing – 10, Creating e-content – 10, Blog Writing – 10, Review Writing - 10
Lab Exam/Viva	50	Mock Interview – 15, Group Discussion – 15, Cover Letter/Curriculum - 20

IVth Semester

PANDIT DEENDAYAL ENERGY UNIVERSITY GANDHINAGAR

SCHOOL OF TECHNOLOGY

COURSE STRUCTURE FOR B TECH IN COMPUTER SCIENCE & ENGINEERING													
Semester IV			**B. Tech. in Computer Science & Engineering**										
Sr. No.	**Course/ Lab Code**	**Course/Lab Name**	**Teaching Scheme**					**Examination Scheme**					
								Theory			**Practical**		**Total**
			L	**T**	**P**	**C**	**Hrs/ Week**	**CE**	**MS**	**ES**	**LW**	**LP/ Viva**	**Marks**
1	20CP206T	Theory of Computation	2	1	0	3	3	25	25	50	-	-	100
2	20CP207T	Operating System	3	0	0	3	3	25	25	50	-	-	100
3	20CP207P	Operating System LAB	0	0	2	1	2	-	-	-	50	50	100
4	20CP208T	Database Management Systems	3	0	0	3	3	25	25	50	-	-	100
5	20CP208P	Database Management Systems LAB	0	0	2	1	2	-	-	-	50	50	100
6	20CP209T	Design & Analysis of Algorithm	3	0	0	3	3	25	25	50	-	-	100
7	20CP209P	Design & Analysis of Algorithm LAB	0	0	2	1	2	-	-	-	50	50	100
8	20CP210P	Design Pattern/Thinking Lab	0	0	4	2	4	-	-	-	50	50	100
9		OE-2	3	0	0	3	3	25	25	50	-	-	100
10	20IF201T	Industry 4.0	2	0	0	2	2	25	25	50	-	-	100
11	20IF201P	Industry 4.0 LAB	0	0	2	1	2	-	-	-	50	50	100
12	20TP210	Industrial Orientation	0	0	0	1	0	-	-	-	50	50	100
		TOTAL	16	1	12	24	29						1200

CE- Continuous Evaluation, MS-Mid Semester; ES – End Semester Exam

Open Elective-2 (Anyone to be offered)

Sl. No.	**Course Code**	**Course Name**	**Domain**
1.	20CP213T	Web Service & Web Design	Application Development
2.	20CP211T	SQL for Beginners	Application Development

20CP206T					Theory of Computation					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
2	1	0	3	3	25	50	25	-	-	100

COURSE OBJECTIVES

- To understand the central ideas of theoretical computer science from the perspective of formal languages
- To understand the fundamental concepts of formal languages, grammars and automata theory.
- To understand the Classification of machines by their power to recognize languages.
- Employ finite state machines to solve problems in computing.

UNIT 1 FINITE AUTOMATA AND REGULAR LANGUAGE **12 Hrs.**

Introduction to Finite Automata, Regular Expressions, Finite Automata and Regular Expressions, Properties of Regular Languages-Pumping Lemma for Regular Languages

10 Hrs.

UNIT 2 PUSHDOWN AUTOMATA AND CONTEXT-FREE LANGUAGE

Context-Free Grammars, Parse Tress, Ambiguity in Grammars and Languages. Push Down Automata: definition, the Languages of a PDA, Equivalence of PDA's and CFG's.

6 Hrs.

UNIT 3 LINEAR BOUNDED AUTOMATA AND CONTEXT-SENSITIVE LANGUAGE

Normal Forms for Context- Free Grammars, the Pumping Lemma for Context-Free Languages, Chomsky Normal Form. Context–sensitive grammars, linear bounded automata definition.

11 Hrs.

UNIT 4 TURING MACHINE AND FREE LANGUAGE

Turing Machines-Problems That Computers Cannot Solve, Extensions to the basic Turing machine, Restricted Turing Machines, Undecidability and uncountable problems, The Classes P and NP, An NP-Complete Problem.

Max. 39 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to
CO1 Define the basic concepts and application of Theory of Computation
CO2 Understand the concept of abstract machines.
CO3 Demonstrate the finite state machines.
CO4 Analyse context-free grammar to design pushdown automata
CO5 Apply this basic knowledge of Theory of Computation for computational problems.
CO6 Distinguish between decidability and Undecidability problems.

TEXT/REFERENCE BOOKS

1. John E. Hopcroft, Rajeev Motwani, Jeffrey D. Ullman, Introduction to Automata Theory, Languages, and Computation, Pearson Education.
2. Mishra and Chandrashekaran, Theory of Computer Science – Automata languages and computation, PHI.
3. Michael Sipser, Introduction to the Theory of Computation, Cengage Learning.
4. John C Martin, Introduction to Languages and the Theory of Computation, TMH.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100	**Exam Duration: 3 Hrs**
Part A: 10 Questions of 2 marks each-No choice	20 Marks
Part B: 2 Questions from each unit with internal choice, each carrying 20 marks	80 Marks

20CP207T					Operating System					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
3	0	0	3	3	25	50	25	-	-	100

COURSE OBJECTIVES

- To understand the Operating System role in the overall computer system, to study the operations performed by OS as a resource manager
- To understand the scheduling policies of OS, to understand the different memory management techniques and to study different system calls
- To understand Memory management and page replacement algorithms
- To understand the concepts of Deadlock, input/output, storage and file management

UNIT 1 PROCESS MANAGEMENT **9 Hrs.**

Introduction-Operating system, OS Operations, Process Management, Memory Management, Storage Management, Protection and Security, System calls, Process and Threads.

UNIT 2 SYNCHRONIZATION **10 Hrs.**

Process Scheduling-Basic concepts and algorithms, Thread scheduling, Process Synchronization algorithms, Mutual exclusion, Test Set Locks, Semaphores-Binary, Counting.

UNIT 3 DEADLOCKS **10 Hrs.**

Deadlocks- Deadlock Avoidance, Deadlock Detection, and Recovery from Deadlock.

UNIT 4 MEMORY AND FILE MANAGEMENT **10 Hrs.**

Memory Management and Virtual Memory-Contiguous Memory Allocation, Segmentation, Paging. Virtual Memory Management - Background, Demand Paging, Copy-on-Write, Page Replacement, Page Replacement Algorithms, Allocation of Frames, Thrashing. Storage Management-File System- Concept of a File, System calls for file operations.

Max. 39 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to
CO1- Describe concepts of process management for system performance improvement.
CO2- Explain synchronization problems.
CO3- Calculate turnaround time, waiting time and response time.
CO4- Perform Optimal memory utilization.
CO5- Compare between different Page replacement algorithms.
CO6- Apply suitable Approaches for process synchronization, Memory and file management.

TEXT/REFERENCE BOOKS

1. Abraham Silberschatz, Peter B. Galvin, Greg Gagne, Operating System Concepts, Wiley.
2. W. Stallings, Operating Systems – Internals and Design Principles,
3. Sumitabha Das, Unix Concepts and Applications, TMH.
4. Andrew S Tanenbaum, Modern Operating Systems, PHI

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 3 Hrs**

Part A: 10 Questions of 2 marks each-No choice 20 Marks
Part B: 2 Questions from each unit with internal choice, each carrying 20 marks 80 Marks

20CP207P					Operating System LAB					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
0	0	2	1	2	-	-	-	50	50	100

COURSE OBJECTIVES

- To understand the Operating System role in the overall computer system, To study the operations performed by OS as a resource manager
- To understand the scheduling policies of OS, to understand the different memory management techniques and to study different system calls
- To understand Memory management and page replacement algorithms
- To understand the concepts of Deadlock, input/output, storage and file management

LIST OF EXPERIMENTS:

1. Programs to perform different shell scripts in UNIX. (Approx. 10 to 15 shell scripts)
2. Programs based on CPU Scheduling algorithms. (FCFS, SJF, SRTN, Round Robin, HRRN, Priority, etc.)
3. Programs based on System class like fork(), sleep(), join, open, close, malloc, etc.
4. Program on Deadlock avoidance and prevention
5. Programs on Page Replacement algorithms (LRU, FIFO, MRU, Optimal, etc.)
6. Programs on memory allocation (Compaction)
7. Programs based on pipes (Named and Unnamed pipes)
8. Program to implement shared memory and IPC
9. Program to implement Producer Consumer problem using Semaphores
10. Program to implement Dining Philosopher problem using Semaphores

COURSE OUTCOMES

On completion of the course, student will be able to
CO1- Apply concepts of process management for the improvement of system performance.
CO2- Solve synchronization problems.
CO3- Calculate turnaround time, waiting time and response time.
CO4- Analyze important parameters for memory management to handle memory optimally.
CO5- Distinguish between different Page replacement algorithms.
CO6- Construct new approaches for process, synchronization, Memory and file management.

TEXT/REFERENCE BOOKS

1. Abraham Silberschatz, Peter B. Galvin, Greg Gagne, Operating System Concepts, Wiley.
2. W. Stallings, Operating Systems – Internals and Design Principles,
3. Sumitabha Das, Unix Concepts and Applications, TMH.
4. Andrew S Tanenbaum, Modern Operating Systems, PHI

END SEMESTER EXAMINATION PATTERN

Max. Marks: 100 **Exam Duration: 2 Hrs**

Part A: Evaluation Based on the class performance and Laboratory book 50 Marks
Part B: Viva Examination based conducted experiments 50 Marks

20CP208T					Database Management Systems					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
3	0	0	3	3	25	50	25	-	-	100

COURSE OBJECTIVES

- To learn fundamental concepts of Database management system
- To study various Database design models and normalization concepts
- To apply the above concepts to optimal Database design for various applications
- To carry out data retrieval and manipulation using SQL.

UNIT 1 INTRODUCTION TO FILE STRUCTURE AND DATABASE MODELS **10 Hrs.**

File Structure: Concepts of fields, records and files, Sequential, Indexed and Relative/Random File Organization, Indexing structure for index files, hashing for direct files, Multi-Key file organization and access methods, Advantages of Database system applications, Three levels of the architecture. ER-Model, Relational Data Model, Relational algebra operators and syntax.

UNIT 2 SQL **10 Hrs.**

Basics of SQL, DDL, DML, DCL, Primary key, foreign key, unique, not null, check, IN operator, Functions, set operations, sub-queries, correlated sub-queries, Use of group by, having, order by, join and its types, Exist, Any, All , view and its types.

UNIT 3 NORMALIZATION AND FILE PROCESSING **10 Hrs.**

Importance of a good schema design, Problems encountered with bad schema designs, dependency theory - functional dependencies, Armstrong's axioms for FD's, Minimal covers, 1NF, 2NF, 3NF and BCNF. Storage strategies : Indices, B-trees, hashing

UNIT 4 TRANSACTIONS, QUERY PROCESSING, SECURITY, NO SQL **9 Hrs.**

ACID properties, Concurrency control, measures of query cost, selection operation, sorting, join. Security: Discretionary and Mandatory Access Control; Audit Trails; Multi-Level Security; Statistical Databases; Data Encryption. Introduction to NOSQL Databases.

Max. 39 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to
CO1- Understand need of database management systems
CO2- Explain database models
CO3- Apply SQL commands in database systems
CO4- Analyzed normalization techniques in database systems
CO5- Determine security levels in database systems
CO6- Create database systems for real time problems

TEXT/REFERENCE BOOKS

1. A Silberschatz, H F Korth and S Sudarshan, “Database System Concepts”, McGRAW Hill.
2. C. J. Date, A. Kennan, and S. Swamynathan, “An Introduction to Database Systems”, Person Education
3. Ramez Elmasri and Shamkant B Navathe, “Fundamentals of Database Systems”, Addison Wesley

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 3 Hrs**

Part A: 10 Questions of 2 marks each-No choice 20 Marks
Part B: 2 Questions from each unit with internal choice, each carrying 20 marks 80 Marks

20CP208P					Database Management Systems LAB					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
0	0	2	1	2	-	-	-	50	50	100

COURSE OBJECTIVES

- To learn fundamental concepts of Database management system
- To study various Database design models and normalization concepts
- To apply the above concepts to optimal Database design for various applications
- To carry out data retrieval and manipulation using SQL.

LAB EXPERIMENTS

1. Installation of relational database management system e.g MYSQL
2. Introduction to SQL, DDL, DML, DCL, database and table creation, alteration, defining constraints, primary key, foreign key, unique, not null, check, IN operator
3. Study and use of inbuilt SQL functions - aggregate functions, Built-in functions numeric, date, string functions
4. Study, write and use the set operations, sub-queries, correlated sub-queries in SQL
5. Study and use of group by, having, order by features of SQL
6. Study different types of join operations, Exist, Any, All and relevant features of SQL
7. Study and implement different types of Views
8. Study and use of Transaction control commands, Commit, Rollback, Save point features of SQL.
9. Introduction to Embedded SQL, PL SQL Concepts
10. Study and Implementation of Cursors, Stored Procedures, Stored Function, Triggers.
11. Analysis of query cost, creating indices and evaluating their effect on query evaluation plans and cost

COURSE OUTCOMES

On completion of the course, student will be able to

CO1- Understand need of database management systems
CO2- Explain database models
CO3- Apply SQL commands in database systems
CO4- Analyzed normalization techniques in database systems
CO5- Determine security levels in database systems
CO6- Create database systems for real time problems

TEXT/REFERENCE BOOKS

1. A Silberschatz, H F Korth and S Sudarshan, “Database System Concepts”, McGRAW Hill.
2. C. J. Date, A. Kennan, and S. Swamynathan, “An Introduction to Database Systems”, Person Education
3. Ramez Elmasri and Shamkant B Navathe, “Fundamentals of Database Systems”, Addison Wesley

END SEMESTER EXAMINATION PATTERN

Max. Marks: 100 **Exam Duration: 2 Hrs**

Part A: Evaluation Based on the class performance and Laboratory book 50 Marks
Part B: Viva Examination based conducted experiments 50 Marks

20CP209T					Design and Analysis of Algorithm					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
3	0	0	3	3	25	50	25	-	-	100

COURSE OBJECTIVES

- Analyze the asymptotic performance of the algorithms
- Implement time and space efficient optimized algorithms.
- Demonstrate a familiarity with major algorithms and data structures.
- Apply important algorithmic design paradigms and methods of analysis.

UNIT 1 INTRODUCTION **10 Hrs.**

Elementary Algorithmic: Efficiency of Algorithms, Average & worst-case analysis, Elementary Operation Analysis Techniques. Analyzing control structures, Amortized analysis

UNIT 2 RECURRANCE AND GREEDY ALGORITHMS **10 Hrs.**

Intelligent guesswork, Homogeneous recurrences, Inhomogeneous Recurrences, Change of variable, Master Theorem, Recurrence Tree. Greedy Algorithms: Graphs: Minimum spanning trees-Kruskal's algorithm, Prim's algorithm, Graphs: Shortest paths.

UNIT 3 DIVIDE & CONQUER AND DYNAMIC PROGRAMMING **10 Hrs.**

Divide-and-Conquer: Multiplying large integers, Binary search, finding the median, Matrix multiplication, Exponentiation. Dynamic Programming: Making Change, The principle of optimality, The Knapsack Problem, Shortest path, Chained matrix multiplication.

UNIT 4 BACKTRACKING, BRANCH & BOUND, NP THEORY **9 Hrs.**

Design of some classical problems using branch and bound and Backtracking approaches. Brief Overview of NP theory, approximation algorithms.

Max. 39 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1- Understand need of complexity analysis of the algorithm
CO2- Solve Homogenous and Inhomogeneous recurrence relations using Master Theorem, Substitution method, and Recurrence tree.
CO3- Apply Dynamic Programming, Divide and Conquer Strategy and greedy method to solve computational and graph problems.
CO4- Compare different algorithmic Strategies on efficiency parameters for optimization problems.
CO5- Evaluate Classical problems through Backtracking and Branch & Bound techniques.
CO6- Create algorithms for real time problems Design algorithms for computational problems of moderate complexity.

TEXT/REFERENCE BOOKS

1. Charles E. Leiserson, Thomas H. Cormen, Ronald L. Rivest, Clifford Stein - Introduction to Algorithms, PHI
2. Gilles Brassard & Paul Bratley, Fundamentals of Algorithmic, PHI
3. Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekharan, Fundamentals of Computer Algorithms, Galgotia.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 3 Hrs**

Part A: 10 Questions of 2 marks each-No choice 20 Marks

Part B: 2 Questions from each unit with internal choice, each carrying 20 marks 80 Marks

20CP209P					Design and Analysis of Algorithm LAB					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
0	0	2	1	2	-	-	-	50	50	100

COURSE OBJECTIVES

- Analyze the asymptotic performance of the algorithms
- Implement time and space efficient optimized algorithms.
- Demonstrate a familiarity with major algorithms and data structures.
- Apply important algorithmic design paradigms and methods of analysis.

LAB EXPERIMENTS

1. Program to solve the fractional knapsack using greedy approach.
2. Program to implement the MST using prim's method and kruskal's method.
3. Program to implement the Huffman coding and shortest path.
4. Program to implement the making change using greedy strategy.
5. Program to implement the binary search.
6. Program to implement the merge, quick and heap sort.
7. Program to implement the strassen's matrix multiplication.
8. Program to implement the assembly line scheduling.
9. Program to implement the chained matrix multiplication and LCS.
10. Program to implement the all pair shortest path algorithm.
11. Program to implement the 0/1 knapsack
12. Program to implement the making change using dynamic programming.
13. Program to implement the TSP using backtracking.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1- Understand need of complexity analysis of the algorithm

CO2- Solve Homogenous and Inhomogeneous recurrence relations using Master Theorem, Substitution method, and Recurrence tree.

CO3- Apply Dynamic Programming, Divide and Conquer Strategy and greedy method to solve computational and graph problems.

CO4- Compare different algorithmic Strategies on efficiency parameters for optimization problems.

CO5- Evaluate Classical problems through Backtracking and Branch & Bound techniques.

CO6- Create algorithms for real time problems Design algorithms for computational problems of moderate complexity.

TEXT/REFERENCE BOOKS

1. Charles E. Leiserson, Thomas H. Cormen, Ronald L. Rivest, Clifford Stein - Introduction to Algorithms, PHI
2. Gilles Brassard & Paul Bratley, Fundamentals of Algorithmic, PHI
3. Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekharan, Fundamentals of Computer Algorithms, Galgotia.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 2 Hrs**

Part A: Evaluation Based on the class performance and Laboratory book 50 Marks

Part B: Viva Examination based conducted experiments 50 Marks

20CP210P					Design Patterns/Thinking LAB					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
0	0	4	2	4	-	-	-	50	50	100

COURSE OBJECTIVES

- To address design related recurring problems in software development.
- To familiarize students with standard design patterns as Creational, Structural, Behavioral and architectural patterns.

LIST OF EXPERIMENTS

Preferred Programming Language: Any object-oriented programming language such as Java, C++, C#.

1.	Creational patterns	• Factory method • Prototype • Singleton	• Abstract Factory • Builder
2.	Structural Patterns	• Façade • Flyweight • Proxy • Decorator	• Adapter • Bridge • Composite
3.	Behavioural Patterns	• Memento • Observer • State • Strategy • Template method	• Chain of Responsibility • Command • Interpreter • Iterator • Mediator
4.	Architectural patterns	• Peer to peer • Model View Controller • Interpreter • Blackboard • Microservice	• Layer • Client Server • Pipe and Filter • Broker •

COURSE OUTCOMES

On completion of the course, student will be able to
CO1- Construct a design consisting of a collection of modules.
CO2- Apply Creational, Structural, Behavioural, and architectural design patterns.
CO3- Distinguish between different categories of design patterns.
CO4- Relate the Creational, structural, behavioural Design patterns.
CO5- Apply Pattern Oriented Architectures to construct software.
CO6- Select suitable design patterns to refine the basic design for given context.

TEXT/REFERENCE BOOKS

1. Erich Gamma, R. Helm, R. Johnson, j. Vlissides, "Design Patterns- Elements of Reusable Object-Oriented Software", Pearson.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 2 Hrs**

Part A: Continuous Evaluation based on lab records and performance. 50 Marks
Part B: 2 Experiment conducted and Viva at final exam. 50 Marks

20IF201T					Industry 4.0					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
2	0	0	2	2	25	50	25	--	--	100

COURSE OBJECTIVES

- To interpret the core elements and basic technologies of Industry 4.0
- To understand how the core elements and technologies of Industry 4.0 are interconnected
- To develop a holistic approach to improve processes and products with Industry 4.0

UNIT I INDUSTRY 4.0 – CONCEPTS & TERMINOLOGIES **07 Hrs.**

Industry 4.0, Smart business model, Technology road-map, Sensing & actuation, Communication, Internet of things (IoT), Cyber Physical Systems and Next Generation Sensors, Visualization, Cloud Computing.

UNIT 2 SMART WORLD & SUSTAINABLE ENVIRONMENT **07 Hrs.**

Sensors and their integration, Renewable Energy System, Hybrid Energy System, Smart Grid, Smart Metering, Communication Protocols, 5G Technology, Smart Agriculture, Smart Infrastructure, Physiological Sensors, Human Machine Interface.

UNIT 3 SMART MANUFACTURING **06 Hrs.**

Automation Systems, Additive Manufacturing, Micro-Electro-Mechanical Systems (MEMS), Smart Factories and Interconnection, Advanced Robotics – Autonomous and Swarm, Self-Propelled Vehicles, Drones–Unmanned Aerial Vehicle (UAV), 3d Printing, Spacecrafts.

UNIT 4 TRANSFORMING TECHNOLOGIES IN BIOENGINEERING **06 Hrs.**

Establishment of Smart Biotechnology Factory, Artificial Intelligence in Bioprocess Technology, 3D Bio Printing for Tissue Engineering, Simulation Tools, RSM and Box Model, Cyber Physical System based Telemedicine, Real Time Biosensors, Bio nanotechnology, biofuel.

Total Hours 26 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 – Understand the core elements and basic technologies for Industry 4.0
CO2 – Apply the different computational techniques and algorithms for realizing Industry 4.0
CO3 – Transform the traditional business approach by integrating the data and intelligence
CO4 – Develop the traditional industries with intelligent and automated machines
CO5 – Utilize data and intelligence for the development of Smart World
CO6 – Understand the concept, significance and means to achieve sustainable development

TEXT/REFERENCE BOOKS

1. Ustundag Alp, and Emre Cevikcan, Industry 4.0: Managing the Digital Transformation, Springer,First Edition, 2018
2. Kaushik Kumar, Divya Zindani, and J. Paulo Davim, Digital Manufacturing and Assembly Systems in Industry 4.0., CRC Press, Taylor & Francis First Edition, 2019.
3. Antonella Petrillo, Raffaele Cioffi, and Fabio De Felice, Digital Transformation in Smart Manufacturing., IntechOpen Publisher, First Edition, 2018.
4. J. Ekanayake, K. Liyanage, J. Wu, A. Yokoyama and N. Jenkins, Smart Grid: Technology and Applications, John Wiley and Sons Ltd., First Edition, 2012

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 3 Hrs**

Part A: 10 Questions of 2 marks each-No choice 20 Marks
Part B: 2 Questions from each unit with internal choice, each carrying 20 marks 80 Marks

20IF201P					Industry 4.0 LAB					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
0	0	2	1	2	--	--	--	50	50	100

COURSE OBJECTIVES

- To interpret the core elements and basic technologies of Industry 4.0
- To understand how the core elements and technologies of Industry 4.0 are interconnected
- To develop a holistic approach to improve processes and products with Industry 4.0

LIST OF EXPERIMENTS

1. Basic computations using Python programming.
2. Use simulations to understand the performance/behavior of a system by (i) creating a computational environment that mimics the real world, (ii) generating (synthetic) or loading data from sources, and (iii) testing the hypothesis
3. Introduction to MATLAB programming and SIMULINK
4. 3D printing of Airfoil through rapid prototyping 3D printer
5. Dynamic simulation of drone (unmanned air vehicle) through MATLAB/SIMULINK
6. ANSYS simulation of bending of a beam in an earthquake resist-building
7. Introduction to Arduino Embedded platform.
8. Design of line follower autonomous vehicle.
9. Design of smart meter for recording the electricity consumption
10. Design of smart lighting with the help of proximity sensors.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 – Understand the concept of Industry 4.0 and its significance
CO2 – Understand the resource requirements for the implementation of Industry 4.0
CO3 – Learn the Simulation Packages for Industry 4.0
CO4 – Explore the concept of Smart Infrastructure through simulation studies
CO5 – Inspect embedded platform applications for Industry 4.0
CO6 – Synthesise the solution for the given Industry 4.0 related problem

TEXT/REFERENCE BOOKS

1. Antonella Petrillo, Raffaele Cioffi, and Fabio De Felice, Digital Transformation in Smart Manufacturing., IntechOpen Publisher, First Edition, 2018.
2. J. Ekanayake, K. Liyanage, J. Wu, A. Yokoyama and N. Jenkins, Smart Grid: Technology and Applications, John Wiley and Sons Ltd., First Edition, 2012
3. Alasdair Gilchrist, Industry 4.0: The Industrial Internet of Things, Apress, First Edition, 2016
4. Ibrahim Garbie, Sustainability in Manufacturing Enterprises: Concepts, Analyses and Assessments for Industry 4.0, Springer, First Edition, 2016

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 2 Hrs**

Part A: Continuous Evaluation based on lab records and performance. 50 Marks
Part B: 2 Experiment conducted and Viva at final exam. 50 Marks

20TP210					Industrial Orientation					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
-	-	-	2	3 weeks summer break	--	--	--	--	100	100

COURSE OBJECTIVES

- To introduce students to the working environment of the industry
- To understand the different departments involved in an industry for developing a product or offering a service
- To learn about the significance of the theoretical knowledge being imparted in the lecture sessions in working of an industry

COURSE OUTCOMES

On completion of the course, student will be able to:

CO1 – Understand the working of industry
CO2 – Acquire knowledge about the different departments involved in the functioning of an industry
CO3 – Learn about the products being developed or services being offered by the industry
CO4 – Understand the safety procedures followed by industry while working on shop floor
CO5 – Learn how the theoretical knowledge is utilized for product development or for services being offered
CO6 – Acquire the necessary skills for technical report writing

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 2 Hrs**

Part A: Presentation 50 Marks
Part B: Report 50 Marks

Department Open Electives- (IV Semester)

20CP213T					Web Design & Web Services					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
3	0	0	3	3	25	50	25	-	-	100

COURSE OBJECTIVES

- To understand the web and web services
- To understand the design webpages using HTML
- To understand the validation of components on webpages
- To understand the application of web services

UNIT 1 HTML AND CSS **9 Hrs.**

Introduction to HTML, HTML tags, Tables, Forms, Radio button, marquee, dropdown, textbox, CSS fundamentals, inline, embedded, external css.

UNIT 2 JAVASCRIPT **13 Hrs.**

JavaScript fundamentals, JavaScript DOM, data types, operators, control statements, loops, function, array, objects, form validation, regular expression in JavaScript, animations and effects in JavaScript.

UNIT 3 JQuery AND XML **11 Hrs.**

JQuery introduction, effects and animation using jQuery, JQuery Widgets, XML fundamentals, XML style sheets, XSL, CSS, XML namespaces, EDI fact, message definition, segments, message structure and electronic enveloping.

UNIT 4 WEB SERVICES **6 Hrs.**

Overview of web services, Web services architecture, architectural process; three tier web based architecture.

Max. 39 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to
CO1- Understand the requirements to build a web portal
CO2- Determine the structure of webpages
CO3- Apply CSS for interactive webpage
CO4- Construct interactive webpages through Java Script.
CO5- Demonstrate server client data communication using XML.
CO6- Select appropriate Web Service Architecture based on Problem Domain.

TEXT/REFERENCE BOOKS

1. Elizabeth Castro, HTML, XHTML, and CSS, 6th Edition
2. Jon Duckett, HTML & CSS: Design and Build Web Sites
3. Jon Duckett, JavaScript and JQuery: Interactive Front-End Web Development
4. Martin Kalin, Java Web Services: Up and Running

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 3 Hrs**

Part A: 10 Questions of 2 marks each-No choice 20 Marks
Part B: 2 Questions from each unit with internal choice, each carrying 20 marks 80 Marks

20CP211T					SQL FOR BEGINNERS					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
3	0	0	3	3	25	50	25	-	-	100

COURSE OBJECTIVES

- To learn fundamental concepts of Database management system
- To carry out data retrieval and manipulation using SQL.
- To create project in relevant domain to be used in real time

UNIT 1 INTRODUCTION **10 Hrs.**

Advantages of Database system applications, Three levels of the architecture, Relational Data Model, Database Users and Administrators, Study of various databases like Mobile, Multimedia, Geographic and so on.

UNIT 2 INTRODUCTION TO SQL **10 Hrs.**

Overview of SQL Query Language, SQL Data Definition, Basic Structure of SQL Queries, Set Operations, Null Values, Aggregate Functions, Nested Subqueries, Modification of the Database

UNIT 3 INTERMEDIATE SQL **10 Hrs.**

Join Expressions, Views, Transactions, Integrity Constraints, SQL Data Types and Schemas, Authorization

UNIT 4 ADVANCED SQL **9 Hrs.**

Accessing SQL From a Programming Language, Functions and Procedures, Triggers, Recursive Queries, Advanced Aggregation Features, Introduction to NoSQL, PL/SQL

Max. 39 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to
CO1- Understand need of database management systems
CO2- Explain relational database model
CO3- Apply SQL statements in database systems
CO4- Analyzed SQL Joins in database systems
CO5- Define constraints in database systems
CO6- Prepare database systems for real time problems

TEXT/REFERENCE BOOKS

1. A Silberschatz, H F Korth and S Sudarshan, “Database System Concepts”, McGRAW Hill.
2. C. J. Date, A. Kennan, and S. Swamynathan, “An Introduction to Database Systems”, Person Education
3. Ramez Elmasri and Shamkant B Navathe, “Fundamentals of Database Systems”, Addison Wesley

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100	**Exam Duration: 3 Hrs**
Part A: 10 Questions of 2 marks each-No choice	20 Marks
Part B: 2 Questions from each unit with internal choice, each carrying 20 marks each.	80 Marks

Vth Semester

COURSE STRUCTURE FOR B TECH IN COMPUTER SCIENCE & ENGINEERING

Semester V			B. Tech. in Computer Science & Engineering										
Sr. No.	Course/ Lab Code	Course/Lab Name	Teaching Scheme					Examination Scheme					
								Theory			Practical		Total
			L	T	P	C	Hrs./ Week	CE	MS	ES	LW	LP/ Viva	Marks
1	20CP301T	Computer Network	3	0	0	3	3	25	25	50	-	-	100
2	20CP301P	Computer Network LAB	0	0	2	1	2	-	-	-	50	50	100
3	20CP302T	System Software & Compiler Design	3	0	0	3	3	25	25	50	-	-	100
4	20CP302P	System Software & Compiler Design LAB	0	0	2	1	2	-	-	-	50	50	100
5	20CP303T	Software Engineering	3	0	0	3	3	25	25	50			100
6	20CP304T	Information Security	2	0	0	2	2	25	25	50	-	-	100
7	20CP304P	Information Security LAB	0	0	2	1	2	-	-	-	50	50	100
8	20CP305P	Introduction to Web Technology LAB	0	0	4	2	4	-	-	-	50	50	100
9		CE-1	2	0	0	2	2	25	25	50	-	-	100
10		CE-1 LAB	0	0	4	2	4	-	-	-	50	50	100
11		OE-3	3	0	0	3	3	25	25	50			100
12	20HS301P	Communication Skills-III	0	0	2	1	2				50	50	100
		TOTAL	16	0	16	24	32						1200

CE- Continuous Evaluation, MS-Mid Semester; ES – End Semester Exam

Professional Core Electives-1

Sl. No.	Course Code	Course Name	Track
1.	20CP306T	Data Mining	Analytics
2.	20CP306P	Data Mining Lab	Analytics
3.	20CP307T	Computer Graphics	Image Processing
4.	20CP307P	Computer Graphics Lab	Image Processing
5.	20CP308T	Distributed Systems	Parallel & Distributed Computing
6.	20CP308P	Distributed Systems Lab	Parallel & Distributed Computing
7.	20CP309T	Software Project Management	Software Engineering
8.	20CP309P	Software Project Management Lab	Software Engineering
9.	20CP310T	Advanced Java	Programming
10.	20CP310P	Advanced Java Lab	Programming

Open Elective-3 (Anyone to be offered)

Sl. No.	Course Code	Course Name	Track
1.	20CP311T	Introduction to Computer Security	Security
2.	20CP312T	Introduction to Data Mining	Analytics

20CP301T					Computer Network					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
3	0	0	3	3	25	50	25	-	-	100

COURSE OBJECTIVES

- To understand the overall communication system from sender to receiver
- To understand the various physical network devices and their working procedure as per OSI and TCP/IP protocols
- To understand the responsibility to each layer of TCP/IP
- To understand the several network applications such as email, peer2peer etc.

UNIT 1 DATA LINK LAYER **11 Hrs.**

Introduction to computer networks and Internet, Layered Architecture (OSI and TCP/IP). Framing, Error Control Media access protocols (ALOHA, CSMA based), Ethernet 802.3, Token ring 802.5, Reliability Issue: sliding window.

UNIT 2 NETWORK LAYER **10 Hrs.**

Internetworking and Routing: Best effort Service, Switching, Virtual Circuits, IP Addressing, Routing Issues, Distance Vector and Link State routing, OSPF, BGP.

UNIT 3 TRANSPORT LAYER **12 Hrs.**

End to end delivery issues, Reliable data transfers, Congestion Control, Traffic engineering and Quality of service, TCP, UDP.

UNIT 4 APPLICATION LAYER **6 Hrs.**

DNS, FTP, HTTP, SMTP, Socket Programming, Peer to Peer file sharing

Max. 39 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to
CO1- Identify the components required to build different types of networks
CO2- Discuss the functionality at each layer for given application
CO3- Illustrate the topological and routing strategies for an IP based networking infrastructure
CO4- Analyze traffic congestion methods in networks.
CO5- Explain the flow of information from one node to other in simple network.
CO6- Discuss various chat application using socket programming.

TEXT/REFERENCE BOOKS

1. Andrew S Tanenbaum, “Computer Networks”, Pearson Education.
2. Behrouz A Forouzan, “Data Communication and Networking”, McGraw Hill
3. William Stallings, “Data and Computer Communication”, Pearson Education
4. James Kurose and Keith Rose, “Computer Networking: A Top Down Approach”, Pearson Education

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 3 Hrs**

Part A: 10 Questions of 2 marks each-No choice 20 Marks
Part B: 2 Questions from each unit with internal choice, each carrying 20 marks 80 Marks

20CP301P					Computer Network LAB					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
0	0	2	1	2	-	-	-	50	50	100

COURSE OBJECTIVES

- To prepare LAN cables for communication between sender and receiver
- To understand the working procedure of various physical network devices
- To visualize the responsibility to each layer of TCP/IP Protocol
- To implement the several network applications such as email, file transfer, peer2peer etc.

LIST OF EXPERIMENTS:

1. Get the Demo of all the network hardware such as Hub, switch, router etc.
2. To study and prepare LAN cables (cross and straight), to configure LAN and perform Static Routing
3. Introduction to Socket Programming- Design and Implement client-server elements of a few network applications e.g. Echo client and server, Time client and server, Online Quiz and Buzzer Application, etc.
4. Configure DHCP in a small LAN and understand its functionality using Wireshark/ Packet Tracer
5. Configure DNS in a small LAN and understand its functionality using Wireshark/ Packet Tracer
6. Understand functionality of HTTP using Wireshark/ Packet Tracer
7. Understand functionality of TCP and UDP using Wireshark/ Packet Tracer
8. Configure virtual LAN and understand its functionality using Wireshark/ Packet Tracer
9. Configure OSPF and BGP in a small LAN
10. Simulation of TCP/UDP connections and performance analysis

COURSE OUTCOMES

On completion of the course, student will be able to

CO1- Choose different networking components as per the applications.
CO2- Use Wireshark tools to analyze network packets.
CO3- Apply the topological and routing strategies for an IP based networking infrastructure.
CO4- Analyze flow control methods in communication.
CO5- Create virtual network using Cisco packet tracer simulation tools.
CO6- Design various chat application using socket programming.

TEXT/REFERENCE BOOKS

1. Andrew S Tanenbaum, “Computer Networks”, Pearson Education.
2. Behrouz A Forouzan, “Data Communication and Networking”, McGraw Hill

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100	**Exam Duration: 2 Hrs**
Part A: Evaluate the continuous performance based on the lab work	50 Marks
Part B: Verify the performance using viva and critical experiment	50 Marks

20CP302T					System Software & Compiler Design					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
3	0	0	3	3	25	50	25	-	-	100

COURSE OBJECTIVES

- Define and learn system Software such as Assemblers, Loaders, Linkers, macro-preprocessors.
- Familiarize with source file, object file and executable file structures and libraries.
- Describe the front-end and back-end phases of compiler and their importance to students.
- Learn Lexical Analysis, Syntax Analysis and Semantic Analysis.
- Learn to generate Intermediate Code and code optimization.

UNIT 1 LEXICAL ANALYSIS **08 Hrs.**

Introduction to different phases of compiler, Alphabets And Tokens In Computer Languages, Representation, Token Recognition And Finite Automata, Implementation, Error Recovery.

UNIT 2 PARSERS, SDT **18 Hrs.**

Syntax Analysis- Introduction, Role Of Parsers, Context Free Grammars Top Down Parsers, Bottom-Up Parsers, Operator-Precedence Parsing, Semantic analysis-Syntax Directed Translation.

UNIT 3 CODE GENERATION AND ASSEMBLER **08 Hrs.**

Intermediate code generation and Code optimization, Introduction to System Software, Machine Architecture and m/c level representation of programs, Assemblers- MOT, Data structures in Pass1 and Pass2 assembler, forward and backward referencing, back-patching, target code generation

UNIT 4 LOADER AND LINKER **05 Hrs.**

Loaders and Linkers: Basic Loader Functions, Machine Dependent Loader Features, Machine Independent Loader Features, Loader Design Options, Implementation Examples.

Max. 39 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1- Explain different phases of compiler.
CO2- Discuss and compare different parsing algorithms.
CO3- Illustrate Intermediate code generation.
CO4- Analyze different types of code optimization techniques.
CO5- Explain the working of linker and loader.
CO6- Compare pass1 and pass2 of assembler algorithm.

TEXT/REFERENCE BOOKS

1. Alfred V Aho, M S. Lam, R Sethi, Jeffrey D. Ullman. Compilers-Principles, Techniques and Tools, Pearson.
2. D. M. Dhamdhere, System software and operating system, TMH

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100	**Exam Duration: 3 Hrs**
Part A: 10 Questions of 2 marks each-No choice	20 Marks
Part B: 2 Questions from each unit with internal choice, each carrying 20 marks	80 Marks

20CP302P					System Software and Compiler Design LAB					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
0	0	2	1	2	-	-	-	50	50	100

COURSE OBJECTIVES

- Define and learn system Software such as Assemblers, Loaders, Linkers, macro-preprocessors.
- Familiarize with source file, object file and executable file structures and libraries.
- Describe the front-end and back-end phases of compiler and their importance to students.
- Learn Lexical Analysis, Syntax Analysis and Semantic Analysis.
- Learn to generate Intermediate Code and code optimization.

LIST OF EXPERIMENT

Lexical analyzer, parser, intermediate code generation, code optimization, Pass1 and Pass2 of assembler.

1. Write a LEX program to recognize valid arithmetic expression. Identifiers in the expression could be only integers and operators could be + and *. Count the identifiers & operators present and print them separately.
2. Write YACC program to evaluate arithmetic expression involving operators: +, -, *, and /
3. Develop, Implement and Execute a program using YACC tool to recognize all strings ending with b preceded by n a's using the grammar an b (note: input n value)
4. Design, develop and implement YACC/ C program to construct Predictive / LL(1) Parsing Table for the expression grammar. Design, develop and implement YACC/C program to demonstrate Shift Reduce Parsing technique for the expression grammar rules and parse the sentence: id + id * id.
5. Design, develop and implement a C/Java program to generate the machine code using Triples for the statement A = -B * (C +D) whose intermediate code in three-address form:
   T1 = -B, T2 = C + D, T3 = T1 + T2, A = T3
6. Write a LEX program to eliminate comment lines in a C program and copy the resulting program into a separate file, Write YACC program to recognize valid identifier, operators and keywords in the given text (C program) file.
7. Implement Pass1 of Assembler and generate the Intermediate code and target code,

COURSE OUTCOMES

On completion of the course, student will be able to

CO1- Identify token in the given input string using any programming language.
CO2- Apply different parsing algorithms to check whether the given string is valid or not.
CO3- Calculate the value of a mathematical expression using parsing algorithms.
CO4- Analyze pass1 and pass2 assembler algorithms.
CO5- Apply optimization techniques related to target code generation.
CO6- Design demo compiler.

TEXT/REFERENCE BOOKS

1. Alfred V Aho, M S. Lam, R Sethi, Jeffrey D. Ullman. Compilers-Principles, Techniques and Tools, Pearson.
2. D. M. Dhamdhere, System software and operating system, TMH

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 2 Hrs**

Part A: Evaluate the continuous performance based on the lab work	50 Marks
Part B: Verify the performance using viva and critical experiment	50 Marks

20CP303T					Software Engineering					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
3	0	0	3	3	25	50	25	0	0	100

COURSE OBJECTIVES

- Understand systematic approach to the development, operation, maintenance, and retirement of software
- Utilize and exhibit strong communication and interpersonal skills, as well as professional and ethical principles when functioning as members and leaders of multi-disciplinary teams
- Apply their foundations in software engineering to adapt to readily changing environments using the appropriate theory, principles and processes

UNIT 1 INTRODUCTION & REQUIREMENT ANALYSIS **10 Hrs.**

Introduction, Characteristics of Software, Software Myths, Software Development Life Cycles: Software Development Process, Requirement Analysis, Functional and non-functional requirements, The software requirements document and SRS standards, Requirements Engineering Process

UNIT 2 MODELLING & DESIGN **10 Hrs.**

Design Concepts, Design Model, Software Architecture, Object oriented design, Design Patterns

UNIT 3 TESTING & QUALITY MANAGEMENT **10 Hrs.**

Software Testing Strategies, Quality Concepts, Software Quality Assurance, The ISO 9000 quality standards, Software process improvement, CMMI Framework

UNIT 4 SOFTWARE MAINTENANCE & RISK MANAGEMENT **9 Hrs.**

Maintenance & Reengineering, Risk management: Reactive vs Proactive Risk strategies, software risks, Risk identification, Risk projection, Risk refinement, RMMM, RMMM Plan.

Max. 39 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to
CO1- Classify procedural, non-procedural and object-oriented programming language.
CO2- Identify software requirement of a project.
CO3- Apply software testing life cycle for software project.
CO4- Construct manual test cases for software project.
CO5- Explain software development process.
CO6- Describe various software maintenance & risk management strategies

TEXT/REFERENCE BOOKS

1. Roger S Pressman, Software engineering A practitioner's Approach, McGraw Hill
2. Ian Sommerville, Software Engineering, Pearson education.
3. Pankaj Jalote, Software Engineering, A Precise Approach, Wiley India.
4. Rajib Mall, Fundamentals of Software Engineering, PHI

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100	**Exam Duration: 3 Hrs**
Part A: 10 Questions of 2 marks each-No choice	20 Marks
Part B: 2 Questions from each unit with internal choice, each carrying 20 marks	80 Marks

20CP304T					Information Security					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
2	0	0	2	2	25	50	25	-	-	100

COURSE OBJECTIVES

- To understand the concept of security requirements, security attacks, and security policy.
- To understand the mathematical concepts for cryptographic algorithms.
- To understand the security mechanisms available to protect the data.
- To understand the security analysis of cryptographic algorithms.

10 Hrs.

UNIT 1 INTRODUCTION AND NUMBER THEORY

Basics of Information Security, Classical Ciphers and Cryptanalysis, Introduction to Steganography. Introduction to Number Theory.

UNIT 2 SYMMETRIC KEY CRYPTOGRAPHY **10 Hrs.**

Feistel Structure, Advanced Encryption Standard, Data Encryption Standard, Modern Block Ciphers, Modes of Operation, Synchronous and Asynchronous Stream Ciphers, Use of Modern Block Ciphers and Stream Ciphers.

UNIT 3 PUBLIC KEY CRYPTOGRAPHY **10 Hrs.**

Introduction to Public Key Cryptography, Diffie-Hellman Key Exchange, RSA Cryptosystem, RSA Cryptanalysis. Elliptic Curve Cryptography.

UNIT 4 HASH FUNCTION AND DIGITAL SIGNATURE **09 Hrs.**

Introduction to Hash Function, MD5, SHA, Message Authentication Code, Digital Signature, Authentication Protocols.

Max. 39 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1- Differentiate between cryptography and cryptanalysis.
CO2- Explain the mathematical concepts for cryptographic algorithms.
CO3- Apply symmetric encryption techniques for data security.
CO4- Analyze the security strength of public key cryptosystem.
CO5- Use Hashing algorithm for Digital signature.
CO6- Express the importance of authentication protocols.

TEXT/REFERENCE BOOKS

1. William Stallings, "Cryptography and Network Security Principles and Practice", Pearson Education
2. Atul Kahate, “Cryptography and Network Security”, Tata McGraw-Hill Education
3. Behrouz A. Forouzan, “Cryptography and Network Security”, McGraw-Hill Education
4. Wenbo Mao, “Modern Cryptography: Theory and Practice”, Prentice Hall.
5. Bruce Schneier, “Applied Cryptography: Protocols, Algorithms, and Source Code in C”, Wiley Computer Publishing.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 3 Hrs**

Part A: 10 Questions of 2 marks each-No choice 20 Marks

Part B: 2 Questions from each unit with internal choice, each carrying 20 marks 80 Marks

20CP304P					Information Security LAB					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory		Practical			Total Marks
					MS	ES	IA	LW	LE/Viva	
0	0	2	1	2	-	-	-	50	50	100

COURSE OBJECTIVES

- To understand the concept of security requirements, security attacks, and security policy.
- To understand the mathematical concepts for cryptographic algorithms.
- To understand the security mechanisms available to protect the data.
- To understand the security analysis of cryptographic algorithms.

LIST OF EXPERIMENT

1. Download and Practice Cryptool.
2. Study and Implement program for Ceaser Cipher with Encryption, Decryption, Brute Force Attack, and Frequency Analysis functions.
3. Study and Implement a program for Transposition (Columnar) Cipher to encrypt and decrypt the message.
4. Study and Implement a program for Rail Fence Transposition Cipher to encrypt and decrypt the message.
5. Study and Implement a program for Vigenère Cipher to encrypt and decrypt the message.
6. Study and Implement a program for 6x6 Playfair Cipher.
7. Study and Implement a program for n-gram Hill Cipher.
8. Use Crypto++ library to implement encryption and decryption functions for different block ciphers.
9. Study and Implement RSA Encryption and Decryption function.
10. Use RSA for generation and verification of digital signature on file.

COURSE OUTCOMES

On completion of the course, student will be able to
CO1- Apply mathematical concepts for cryptographic algorithms.
CO2- Apply symmetric encryption techniques for data security.
CO3- Analyze the security strength of public key cryptosystem.
CO4- Use hash algorithm to implement digital signature.
CO5- Examine the authentication and hash algorithms as per security requirements.
CO6- Evaluate different security attacks on public/private key crypto-system.

TEXT/REFERENCE BOOKS

1. William Stallings, "Cryptography and Network Security Principles and Practice", Pearson Education
2. Atul Kahate, “Cryptography and Network Security”, Tata McGraw-Hill Education
3. Behrouz A. Forouzan, “Cryptography and Network Security”, McGraw-Hill Education

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 2 Hrs**

Part A: Evaluation Based on the class performance and Laboratory book	50 Marks
Part B: Viva Examination based conducted experiments	50 Marks

20CP305P					Introduction to Web Technology LAB					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
0	0	4	2	4	--	--	--	50	50	100

COURSE OBJECTIVES

- Learn fundamentals of web development.
- Design the front-end of webpages.
- To introduce Client side scripting with Javascript.
- To introduce Server side programming with PHP and JSP.
- Demonstration of the data communication using AJAX, JSON and XML

Experiment Sessions using Programming would be based on following topics:

HTML, CSS, Javascript, PHP, XML Data Handling, AJAX technology, JSON objects, JSP

List of Experiments

1. Design the front pages of a website using HTML and CSS properties
2. Create the interactive webpages using Javascript
3. Install the LAMP stack
4. Implement the server-side scripting using PHP language
5. Create a web page that retrieves and displays information from the XML file.
6. Create a web page that retrieves and displays information from a JSON file.
7. Implement the web applications using PHP and add the AJAX feature into it.
8. Design the webpages using JSP

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 – Learn the Web Design Concepts including WWW, HTTP protocol and Browser.
CO2 – Understand the design and style concepts of webpages using HTML and CSS
CO3 – Implement Javascript functionality to make interactive webpages
CO4 – Illustrate server side scripting with PHP and JSP.
CO5 – Assess the data communication delay between webserver and client using AJAX with XML and JSON.
CO6 – Build a complete web solution for a given problem statement

TEXT/REFERENCE BOOKS

1. Laura Lemay, Rafe Colburn, Jennifer Kyrnin, Teach Yourself HTML, CSS & JavaScript Web publishing, Pearson Education, 2015
2. Steven Holzner, *The Complete Reference PHP*, Tata McGraw-Hill, 2008
3. Lorna Jane Mitchell, *PHP Web Services*, O'Reilly Media, 2013
4. Hans Bergsten, *Java Server Pages*, O'Reilly, 2003

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 2 Hrs**

Part A: Evaluation Based on the class performance and Laboratory book 50 Marks
Part B: Viva Examination based conducted experiments 50 Marks

Department Professional Electives- (V Semester)

20CP306T					Data Mining					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
2	0	0	2	2	25	50	25	-	-	100

COURSE OBJECTIVES

- To be familiar with mathematical foundations of data mining tools.
- Understand and implement classical models and algorithms in data mining
- Characterize the kinds of patterns that can be discovered by association rule mining, classification and clustering.
- To develop skills for using recent data mining software to solve practical problems in a variety of disciplines.

UNIT 1 INTRODUCTION **7 Hrs.**

Introduction: What is Data Mining? Motivating Challenges; The origins of data mining; Data Mining Tasks. Types of Data; Data Pre-processing, Measures of Similarity and Dissimilarity.

UNIT 2 SUPERVISED LEARNING **7 Hrs.**

Classification: Preliminaries; General approach to solving a classification problem; Decision tree induction; Rule-based classifier; Multilinear and Logistic Regression.

UNIT 3 ASSOCIATIION ANALYSIS **6 Hrs.**

Problem definition, Frequent item set generation; Rule Generation; Compact representation of frequent item sets; Alternative methods for generating frequent item sets. FP-Growth algorithm, Evaluation of association patterns, Effect of skewed support distribution, Sequential patterns.

UNIT 4 UNSUPERVISED LEARNING & CLUSTERING **6 Hrs.**

Clustering, KNN, Clustering Review, Outlier Detection, Recent Trends in Data Mining.

Max. 26 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to
CO1- Understand the basic concepts of data mining along.
CO2- Apply measures of similarity and dissimilarity to find the proximity between data objects.
CO3- Analyze the performance of supervised and unsupervised models.
CO4- Choose suitable data mining algorithms to solve real world problems.
CO5- Classify interesting patterns from large amounts of data as information.
CO6- Explain different clustering algorithms.

TEXT/REFERENCE BOOKS

1. Pang-Ning Tan, Michael Steinbach, Vipin Kumar, Introduction to Data Mining- Pearson Education.
2. Jiawei Han and Micheline Kamber, Data Mining–Concepts and Techniques- 2nd Edition, Morgan Kaufmann.
3. K.P. Soman, Shyam Diwakar, V. Ajay, Insight into Data Mining–Theory and Practice- PHI

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 3 Hrs**

Part A: 10 Questions of 2 marks each-No choice 20 Marks
Part B: 2 Questions from each unit with internal choice, each carrying 20 marks 80 Marks

20CP306P					Data Mining LAB					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
0	0	4	2	4	-	-	-	50	50	100

COURSE OBJECTIVES

- To be familiar with mathematical foundations of data mining tools.
- Understand and implement classical models and algorithms in data mining
- Characterize the kinds of patterns that can be discovered by association rule mining, classification and clustering.
- To develop skills for using recent data mining software to solve practical problems in a variety of disciplines.

LIST OF EXPERIMENTS

Practical list should be prepared based on the content of the subject. Preferred Programming Language: Python/R.
Assessment: Rubrics Based

1. Implement a decision tree for performing classification in the programming language of your choice
2. Implement a Rule based classifier for performing classification in the programming language of your choice
3. Implement a k-Nearest Neighbour classifier for performing classification in the programming language of your choice
4. Implement an Apriori algorithm for frequent item set generation using programming language of your choice
5. Implement FP growth algorithm for frequent item set generation using Programming language of your choice
6. Implement k-means clustering algorithm for clustering a group of objects using programming language of your choice
7. Implement Agglomerative Hierarchical clustering algorithm for clustering a group of objects using programming language of your choice
8. Implement DBSCAN clustering algorithm for clustering a group of objects using programming language of your choice
9 COURSE PROJECT: Students are required to submit a course project that involves development of a data-mining application using sample, realistic data sets and modern tools for societal challenges.

COURSE OUTCOMES

On completion of the course, student will be able to
CO1- Develop supervised and un-supervised classification model.
CO2- Choose useful pattern using Market Basket Analysis.
CO3- Evaluate the performance of supervised and un-supervised model
CO4- Apply Apriori algorithm for frequent item set generation
CO5- Design Rule based classifier.
CO6- Develop a data-mining application using sample, realistic data sets and modern tools for societal challenges

TEXT/REFERENCE BOOKS

1. Reference Lab Manual- Data Mining.
2. Robert Layton, Learning Data Mining with Python - Second Edition, Packt Publishing, O'Reilly, 2017.
3. https://nptel.ac.in/courses/106/105/106105174/

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 2 Hrs**

Part A: Continuous Evaluation based on lab records and course project. 50 Marks
Part B: 2 Experiment conducted and Viva at final exam. 50 Marks

20CP307T					Computer Graphics					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
2	0	0	2	2	25	50	25	-	-	100

COURSE OBJECTIVES

- To introduce concept of computer assisted picture generation and manipulation
- To understand an overview of interactive computer graphics, two-dimensional system.
- To understand the most important algorithm for graphical primitives, transformation, clipping and filing for 2D objects
- To study curve generation, 3D picture generation, transformation and animation techniques

UNIT 1 GRAPHICS HARDWARE AND LINE DRAWING ALGORITHMS **7 Hrs.**

Graphics hardware, Line, circle, ellipse, and polygon drawing algorithms, Graphical user interface – Logical classification of input devices.

UNIT 2 TWO-DIMENSIONAL TRANSFORMATION AND VIEWING TRANSFORMATION **7 Hrs.**

Two-dimensional transformation, Viewing transformation, Clipping, Curve.

UNIT 3 THREE DIMENSIONAL OBJECT REPRESENTATIONS AND PROJECTIONS **6 Hrs.**

Three-dimensional object representations, Three-dimensional transformations. Projections, Visible surfaces.

UNIT 4 RENDERING AND COLOR MODELS **6 Hrs.**

Rendering, Colour models, Modelling techniques and fractals, surface and hierarchical modelling. Animation: Computer assisted animation and real time animation techniques.

Max. 26 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1- Understand the design and algorithms for 2D graphics primitives and attributes.
CO2- Apply Geometric transformations on both 2D and 3D objects.
CO3- Apply concepts of clipping and visible surface detection in 2D and 3D viewing, and Illumination Models.
CO4- Analyze the suitable hardware and software for developing graphics packages using OpenGL.
CO5- Demonstrate Interactive games using multimedia contents.
CO6- Discuss the application of computer graphics concepts in the development of computer games, information visualization, and business applications

TEXT/REFERENCE BOOKS

1. John F. Hughes, Andries van Dam, Morgan McGuire, David F. Sklar, James D. Foley, Steven K. Feiner, Kurt Akeley. Computer Graphics: Principles and Practice, 3rd Edition, Pearson education
2. David F. Rogers, Mathematical elements for computer graphics, 2nd edition, Tata McGraw Hill, 2001
3. Donald Hearn, Pauline Baker, Computer graphics with OpenGL, 3rd edition, pearson education, 2004

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 3 Hrs**

Part A: 10 Questions of 2 marks each-No choice 20 Marks

Part B: 2 Questions from each unit with internal choice, each carrying 20 marks 80 Marks

20CP307P					Computer Graphics LAB					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
-	-	4	2	4	-	-	-	50	50	100

COURSE OBJECTIVES

- Understand the need of developing graphics application
- Learn algorithmic development of graphics primitives like: line, circle, polygon etc.
- Learn the representation and transformation of graphical images and pictures.

LIST OF EXPERIMENTS

1. Display 2D line drawing as Raster Graphics Display.
2. Display basic 2D geometric primitives.
3. Display a filled square, Display a series of concentric circles of varying radius.
4. Display line drawing as Raster Graphics Display.
5. Display circle drawing as Raster Graphics Display.
6. Draw a line using Bresenham line drawing algorithm
7. Draw a circle using Midpoint algorithm. Modify the same for drawing an arc and sector.
8. Rotate a point about origin.
9. Rotate a triangle about origin.
10. Scale the triangle using 2D transformation, Translate a triangle using 2D transformation.
11. Reflect a triangle 2D transformation.
12. Polygon filling as Raster Graphics Display, Line clipping and polygon clipping.
13. Display 3D objects as 2D display using perspective transformation
14. Rotation of a 3D object about arbitrary axis.

COURSE OUTCOMES

On completion of the course, student will be able to:
CO1 -Apply mathematics and logic to develop Computer programs for elementary graphic operations
CO2- Separate scene with different clipping methods and its transformation to graphics display device
CO3- Apply projections and visible surface detection techniques for display of 3D scene on 2D screen
CO4- Show projected objects to naturalize the scene in 2D view and use of illumination models
CO5- Apply the logic to develop animation and gaming programs
CO6- Develop the competency to understand the concepts related to Computer Vision and Virtual reality

TEXT/REFERENCES

1. Interactive Computer Graphics A Top-Down Approach with OpenGL, Edward Angel, Pearson, 5 th Edition, 2009
2. Donald Hearn, Pauline Baker, Computer graphics with OpenGL, 3rd edition, pearson education, 2004

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 2 Hrs**

Part A : Lab Work – Continuous Assessment 50 Marks
Part B: Lab Exam and Viva 50 Marks

20CP308T					Distributed Systems					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
2	0	0	2	2	25	50	25	-	-	100

COURSE OBJECTIVES

- Understand foundations of Distributed Systems.
- Introduce the idea of peer to peer services and file system.
- Understand in detail the system level and support required for distributed system.
- Understand current distributed system research literature.

UNIT 1 INTRODUCTION TO DISTRIBUTED SYSTEM **7 Hrs.**

Characterization of Distributed Systems: Introduction, Examples of Distributed Systems, Resource Sharing and the Web, Challenges. Time and Global States: Introduction, Clocks Events and Process States, Synchronizing Physical Clocks, Logical Time and Logical Clocks, Global States, Distributed Debugging

UNIT 2 Distributed System Models **7 Hrs.**

Coordination and Agreement: Introduction, Distributed Mutual Exclusion, Elections, Multicast Communication, Consensus and Related Problems. Inter Process Communication: Introduction, The API for the Internet Protocols, External Data Representation and Marshalling, Client-Server Communication, Group Communication, Case Study: IPC in UNIX.

UNIT 3 Distributed Architectures and File System **6 Hrs.**

Introduction, Communication between Distributed Objects, Remote Procedure Call, Events and Notifications, Case Study: JAVA RMI. Distributed File Systems: Introduction, File Service Architecture, and Case Study 1: Sun Network File System, Case Study 2: The Andrew File System. Name Services: Introduction, Name Services and the Domain Name System, Directory Services, Case Study of the Global Name Services.

UNIT 4 Distributed System Design and Operations **6 Hrs.**

Distributed Shared Memory: Introduction, Design and Implementation Issues, Sequential Consistency and IVY Case study, Release Consistency, Munin Case Study, Other Consistency Models. Transactions and Concurrency Control: Introduction, Transactions, Nested Transactions, Locks, Optimistic Concurrency Control, Timestamp Ordering, Comparison of Methods for Concurrency Control. Distributed Transactions: Introduction, Flat and Nested Distributed Transactions, Atomic Commit Protocols, Concurrency Control in Distributed Transactions, Distributed Deadlocks, Transaction Recovery

Max. 26 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1- Understand design of distributed systems.
CO2- Discuss issues in distributed system such as synchronization, coordination and agreement, etc.
CO3- Analyze distributed shared memory with consistency models.
CO4- Apply remote procedure call mechanism in distributed environment.
CO5- Use various inter-process coordination techniques.
CO6- Understand distributed shared memory and its usage.

TEXT/REFERENCE BOOKS

1. George Coulouris, J Dollimore and Tim Kindberg, Distributed Systems, Concepts and Design, Pearson Education.
2. Andrew S. Tanenbaum, Maarten Van Steen, Distributed Systems, Principles and Paradigms, PHI.
3. Sukumar Ghosh, Chapman&Hall, Distributed Systems, An Algorithm Approach, CRC, Taylor & Fransis Group.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 3 Hrs**

Part A: 10 Questions of 2 marks each-No choice 20 Marks

Part B: 2 Questions from each unit with internal choice, each carrying 20 marks 80 Marks

20CP308P					Distributed Systems LAB					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
0	0	4	1	4	-	-	-	50	50	100

COURSE OBJECTIVES

- To examine the fundamental principles of distributed systems, and provide students hands-on experience in developing distributed protocols.
- To emphasize on communication, process, naming, synchronization.
- To address consistency and replication, and fault tolerance in distributed systems.

LIST OF EXPERIMENTS:

1. Write a Program to implement Concurrent Echo Client Server Application.
2. Write the Programs for Remote Procedure call, Remote Method Invocation
3. Write the Programs for Thread Programming in JAVA.
4. Implementation of Clock Synchronization (logical/physical)
5. Implementation of Mutual Exclusion algorithms
6. Implementation of Election algorithm.
7. Program to demonstrate process/code migration.
8. Write a distributed application using EJB
9. Write a program using CORBA to demonstrate object brokering.
10. Mini Project : e.g. using SOA
11. Study of Web service programming, Study of Grid Services using various Tools.

COURSE OUTCOMES

On completion of the course, student will be able to
CO1- Develop remote procedure call mechanism in distributed environment.
CO2- Apply distributed computing techniques, synchronous and processes management in distributed environment.
CO3- Apply Shared Data access and Files concepts.
CO4- Design a DS that fulfils requirements with regards to key distributed systems properties.
CO5- Understand Distributed File Systems and Distributed Shared Memory.
CO6- Apply Distributed web-based system.

TEXT/REFERENCE BOOKS

1. George Coulouris, J Dollimore and Tim Kindberg, Distributed Systems, Concepts and Design, Pearson Education, 2017
2. Andrew S. Tanenbaum, Maarten Van Steen, Distributed Systems, Principles and Paradigms, PHI, 2016.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 2 Hrs**

Part A: Evaluate the continuous performance based on the lab work 50 Marks
Part B: Verify the performance using viva and critical experiment 50 Marks

20CP309T					Software Project Management					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
2	0	0	2	2	25	50	25	-	-	100

COURSE OBJECTIVES

- To outline the need for Software Project Management.
- To highlight different techniques for software cost estimation
- To make the students to understand activity planning and risk management
- To make the students to manage and control projects

UNIT 1 PROJECT EVALUATION AND PROJECT PLANNING **7 Hrs.**

Importance of Software Project Management – Categorization of Software Projects –Management Principles – Management Control – Project portfolio Management – Cost-benefit evaluation technology– Strategic program Management – Stepwise Project Planning.

UNIT 2 PROJECT LIFE CYCLE AND EFFORT ESTIMATION **7 Hrs.**

Software process and Process Models – Choice of Process models - mental delivery – Rapid Application development – Agile methods – Extreme Programming – SCRUM –Effort and Cost estimation techniques –COCOMO II A Parametric Productivity Model

UNIT 3 ACTIVITY PLANNING AND RISK MANAGEMENT **6 Hrs.**

Objectives of Activity planning –Activities – Sequencing and scheduling –Network Planning models –Critical path (CRM) method– Risk identification – Assessment – Monitoring – PERT technique – Monte Carlo simulation –Creation of critical patterns – Cost schedules.

UNIT 4 PROJECT MANAGEMENT AND CONTROL **6 Hrs.**

Framework for Management and control – Collection of data Project termination – Visualizing progress – Cost monitoring – Earned Value Analysis- Project tracking – Change control- Software Configuration Management – Managing contracts – Contract Management

Max. 26 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to
CO1- Explain software project management and its use in in real time applications
CO2- Estimate cost and efforts required for design and development of software project
CO3- Explain activity planning and risk management
CO4- Compare software project management models.
CO5- Choose appropriate method for a given problem statement
CO6- Apply SDLC model and types of testing design and maintenance.

TEXT/REFERENCE BOOKS

1. Andrew Stellman, Jennifer Greene, Applied Software Project Management, OREILLY
2. Robert T. Futrell et. al. , Quality Software Project Management., OREILLY
3. Microsoft Project Standard 2019 by Microsoft

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration : 3 Hrs.**

Part A: 10 Questions of 2 marks each-No choice 20 Marks
Part B: 2 Questions from each unit with internal choice, each carrying 20 marks 80 Marks

20CP309P					Software Project Management LAB					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
0	0	4	2	4	-	-	-	50	50	100

COURSE OBJECTIVES

- To outline the need for Software Project Management.
- To highlight different techniques for software cost estimation
- To make the students to understand activity planning and risk management
- To make the students to manage and control projects

LIST OF EXPERIMENTS

1. Create Project Plan: Specify project name and start (or finish) date., Identify and define project tasks., Define duration for each project task., Define milestones in the plan, Define dependency between tasks
2. Define Project Parameters: Define project calendar, Define project resources, Specify resource type and resource rates, Assign resources against each task, Baseline the project plan
3. Execute and Monitor Project Plan
4. Generate Dashboard and Reports

COURSE OUTCOMES

On completion of the course, student will be able to
CO1- Apply software project management life cycle in real time applications
CO2- Compare software project management models.
CO3- Identify different project parameters.
CO4- Estimate cost and efforts required for design and development of software project
CO5- Develop an applications of software project management.
CO6- Design dashboard and generates reports of their project.

TEXT/REFERENCE BOOKS

1. Andrew Stellman, Jennifer Greene, Applied Software Project Management OREILLY
2. Robert T. Futrell et. al., Quality Software Project Management. OREILLY
3. Microsoft Project Standard 2019 by Microsoft

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 2 Hrs**

Part A: Evaluation Based on the class performance and Laboratory book 50 Marks
Part B: Viva Examination based conducted experiments 50 Marks

20CP310T					Advanced JAVA					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
2	0	0	2	2	25	50	25	-	-	100

COURSE OBJECTIVES

- Teach the Students for developing interactive user-friendly interfaces using the Swing and JDBC
- Explain the enterprise architectures and networking in Java
- Educate the students for developing web-based applications using Java Server Pages and Java Servlets.
- Demonstrate the use of Advanced Java Frameworks such as Spring and Hibernate.

UNIT 1 GUI PROGRAMMING AND DATABASE CONNECTIVITY **7 Hrs.**

Swing : JFC, MVC Architecture, GUI Components from Swing, Pluggable Look and Feel, JDBC: JDBC Architecture; JDBC Drivers, CURD operation Using JDBC

UNIT 2 JAVA NETWORKING AND J2EE **7 Hrs.**

Network Programming in Java using the java.net package; Establishing two-way communication between Server and Client using TCP and UDP; Features of Java Enterprise Edition; Architecture of Java EE; Working with EJB

UNIT 3 SERVER SIDE WEB PROGRAMMING **6 Hrs.**

Servlets: Servlet Life cycle; Servlet Programming, Session Tracking Mechanisms, Event Handling. Java Server Pages: Architecture of JSP, Life Cycle of JSP Page, Working with basic JSP Basic Tags, Tag Extension API in Java, Introduction to JSTL

UNIT 4 ADVANCED JAVA FRAMEWORKS **6 Hrs.**

Hibernate : Architecture of Hibernate; HQL; Setting up the development environment; Implementing O/R mapping with Hibernate, Spring MVC : Spring Framework Architecture, Spring's Web MVC Framework

Max. 26 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to
CO1- Explain basic architecture of JAVA.
CO2- Illustrate basic concepts of object-oriented programming and apply these concepts with the help of Java Language
CO3- Apply GUI programming and database connectively.
CO4- Simulate the networking in java.
CO5- Explain architecture of Servlets and hibernate.
CO6- Develop application using frameworks/technology such as Spring and Hibernate

TEXT/REFERENCE BOOKS

1. Herbert Schildt, "Java: The Complete Reference, 10th Edition", McGraw-Hill.
2. Java Server Programming Java EE 7 (J2EE 1.7) Black book, DreamTech Publication.
3. M.T. Savaliya, "Advance Java Technology", Kogent Learning Solutions Inc., DreamTech Publication.
4. Uttam Kumar Roy, "Advanced Java Programming", Oxford University Press.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 3 Hrs**

Part A: 10 Questions of 2 marks each-No choice 20 Marks

Part B: 2 Questions from each unit with internal choice, each carrying 16 marks 80 Marks

20CP310P					Advanced JAVA LAB					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
0	0	4	2	4	--	--	--	50	50	100

COURSE OBJECTIVES

- Learn the techniques for developing interactive user-friendly interfaces
- Demonstrate the implementation of networking in Java
- Explain the development of web-based applications using JSP and Java Servlets.
- Provide the knowledge of Advanced Java Frameworks such as Spring and Hibernate.

LIST OF EXPERIMENTS

1. Create a simple calculator application using Swing in Java
2. Create a tic-tack-toe game in Swing GUI.
3. Implement Student information system using JDBC
4. Create chat application using TCP protocol and UDP protocol
5. Write a servlet that counts the number of times that web page is visited and displays the same information on that page.
6. Implement an employee payroll system using servlet technology.
7. Create a Login application using servlet and JSP,
8. Use JSTL to implement following objectives
   a) Create a web page that prints 1 to 10 using JSTL 8.2
   b) Create a custom JSP tag that prints current date and time. Use this tag into JSP page.
9. Create a hibernate application for employee payroll system.
10. Create an online appointment booking application using Spring Web MVC framework

COURSE OUTCOMES

On completion of the course, student will be able to
CO1- Use Java swing package to create user-friendly interfaces.
CO2- Connect database using Java program.
CO3- Develop an enterprise architecture solution using Java technology.
CO4- Execute the networking applications in java.
CO5- Develop web-based applications using Servlet, JSP and JSTL.
CO6- Build application using Java programming frameworks such as Spring and Hibernate

TEXT/REFERENCE BOOKS

1. Herbert Schildt, Java: The Complete Reference, McGraw-Hill. 11th Edition, 2018
2. Kogent Learning Solutions Inc., Java Server Programming Java EE 7 (J2EE 1.7) Black book, DreamTech Publication, 2014
3. M.T. Savaliya, Advance Java Technology, DreamTech Publication, 2011
4. Uttam Kumar Roy, Advanced Java Programming, Oxford University Press, 2015

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 2 Hrs**

Part A: Evaluation Based on the class performance and Laboratory book 50 Marks
Part B: Viva Examination based conducted experiments 50 Marks

Department Open Electives- (V Semester)

20CP311T					Introduction to Computer Security					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
3	0	0	3	3	25	50	25	-	-	100

COURSE OBJECTIVES

- To learn fundamental concepts of Security
- To study Internet Security
- To study Hardware and Software Security
- To study Cyber Security

UNIT 1 INTERNET SECURITY **10 Hrs.**

Overview of Network Security, Security services, attacks, Security Issues in TCP/IP suite- Sniffing, spoofing, ARP poisoning, ICMP Exploits, IP address spoofing, IP fragment attack

UNIT 2 SOFTWARE SECURITY **10 Hrs.**

Protection against Threats, intruders, Viruses and Worms, Malicious Software, Distributed Denial of Service Attacks, Security issues in Operating Systems, Intrusion Detection System Overview, Malware Detection and Prevention, Firewalls. Android, iOSMobile platform security models, Detecting Android malware in Android markets

UNIT 3 HARDWARE SECURITY **10 Hrs.**

Side-channel Attacks on Cryptographic Hardware: Basic Idea, Current-measurement based Side-channel Attacks, Design Techniques to Prevent Side-channel Attacks, Improved Side-channel Attack Algorithms (Template Attack, etc.), and Cache Attacks.

UNIT 4 CYBER SECURITY **9 Hrs.**

Internet Governance – Challenges and Constraints, Cyber Threats-Cyber Warfare-Cyber Crime-Cyber terrorism-Cyber Espionage, Need for a Comprehensive Cyber Security Policy.

Max. 39 Hrs

COURSE OUTCOMES

On completion of the course, student will be able to
CO1- Analyze different types of attacks on computer.
CO2- Apply various methods for securing data and network.
CO3- Apply cyber security solutions.
CO4- Compare various hardware security techniques
CO5- Determine software security problems
CO6- Design security solutions to real time problems.

TEXT/REFERENCE BOOKS

1. William Stallings, "Cryptography and Network Security Principles and Practice", Pearson Education.
2. Debdeep Mukhopadhyay, Rajat Subhra Chakraborty, "Hardware Security: Design, Threats, and Safeguards", CRC Press
3. Nina Godbole, Cyber Security, Wiley Publications

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 3 Hrs**

Part A: 10 Questions of 2 marks each-No choice 20 Marks
Part B: 2 Questions from each unit with internal choice, each carrying 20 marks 80 Marks

20CP312T					Introduction to Data Mining					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
3	0	0	3	3	25	50	25			100

COURSE OBJECTIVES

- To be familiar with mathematical foundations of data mining tools.
- Understand and implement classical models and algorithms in data mining
- Characterize the kinds of patterns that can be discovered by association rule mining, classification and clustering.
- To develop skills for using recent data mining software to solve practical problems in a variety of disciplines.

UNIT 1 INTRODUCTION **10 Hrs.**

Introduction: What is Data Mining? Motivating Challenges; The origins of data mining; Data Mining Tasks. Types of Data; Data Pre-processing, Measures of Similarity and Dissimilarity.

UNIT 2 SUPERVISED LEARNING **10 Hrs.**

Classification: Preliminaries; General approach to solving a classification problem; Decision tree induction; Rule-based classifier; Multilinear and Logistic Regression.

UNIT 3 ASSOCIATION ANALYSIS **10 Hrs.**

Problem definition, Frequent item set generation; Rule Generation; Compact representation of frequent item sets; Alternative methods for generating frequent item sets. FP-Growth algorithm, Evaluation of association patterns, Effect of skewed support distribution, Sequential patterns.

UNIT 4 UNSUPERVISED LEARNING & CLUSTERING **9 Hrs.**

Clustering, KNN, Clustering Review, Outlier Detection, Recent Trends in Data Mining.

Max. 39 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to
CO1- Understand the basic concepts of data mining along.
CO2- Apply measures of similarity and dissimilarity to find the proximity between data objects.
CO3- Analyze the performance of supervised and unsupervised models.
CO4- Choose suitable data mining algorithms to solve real world problems.
CO5- Classify interesting patterns from large amounts of data as information.
CO6- Explain different clustering algorithms.

TEXT/REFERENCE BOOKS

1. Pang-Ning Tan, Michael Steinbach, Vipin Kumar,Introduction to Data Mining- Pearson Education.
2. Jiawei Han and Micheline Kamber, Data Mining–Concepts and Techniques- 2nd Edition, Morgan Kaufmann.
3. K.P. Soman, Shyam Diwakar, V. Ajay, Insight into Data Mining–Theory and Practice- PHI

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 3 Hrs**

Part A: 10 Questions of 2 marks each-No choice 20 Marks

Part B: 2 Questions from each unit with internal choice, each carrying 20 marks 80 Marks

20HS301P					Communication Skills-III					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
0	0	2	0	2 hours per week	--	--	--	50	50	100

COURSE OBJECTIVES

1. Understand of the fundamental elements of communication in English language.
2. Know and understand different practices of verbal and non-verbal communication with inputs to improve basic language skills.
3. Students are expected to be better equipped in the following areas:
   - **Listening:** Understanding basic content in lectures and common everyday situations
   - **Speaking:** Correct expression in the English language at a basic level
   - **Reading:** Understanding, retaining, and critically analyzing technical/non-technical content
   - **Writing:** Using appropriate vocabulary, grammar, effective paragraph construction, writing in day-to-day scenarios, including digital platforms

UNIT 1 Writing research proposals, Writing technical projects **10 hrs**

UNIT 2 **15 hrs**

- The Art of Presentation
  - *Sapiens: A Brief History of Humankind* (2011), Yuval Noah Harari
  - *Thank You for Being Late: An Optimist's Guide to Thriving in the Age of Accelerations* (2016), Thomas L. Friedman
  - (Presentation in teams of 4 students each, not more than two from the same branch, with a view to promote cross-disciplinary research)

UNIT 3 **5 hrs**

Uploading portfolios on SlideShare

- ✓ Uploading Video modules

Max. 30 hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

- CO1 Confidence to listen, speak, read and write in English
- CO2 Being able to produce something new with the help of inputs
- CO3 Learning to critically analyze
- CO4 Preparing reports/critique with the help of collected data
- CO 5 Having a multi-dimensional/disciplinary perspective and approach
- CO6 Better improved and sharpened skills to present, convince and persuade to be an effective and successful professional.

TEXT/REFERENCE BOOKS

1. Kaul, Asha. Business Communication. Delhi: Prentice-Hall of India, 2006.
2. Maley, A. 'Literature in the Language Classroom', The Cambridge Guide to Teaching ESOL, Cambridge University Press, 2001.
3. Richards, Jack C., and Willy A. Renandya, eds. Methodology in Language Teaching: An Anthology of Current Practice. Cambridge University Press, 2002.
4. Sharma, Sangeeta and Binod Mishra. Communication Skills for Engineers and Scientists. New Delhi: PHI Learning Pvt. Ltd., 2009.

Assessment Tool	Marks	Assignments
Lab Work	50	• Business Proposal – 15, Research Project Proposal – 15 • Reviews on the two books – 20
Lab Exam/Viva	50	• Presentation on the reviews of the two books (Intra Branch) – 15 • Presentation on a technical topic (Inter Branch) – 15 • Slideshare/Video Modules (Prescribed Texts) – 20

VIth Semester

PANDIT DEENDAYAL ENERGY UNIVERSITY GANDHINAGAR

SCHOOL OF TECHNOLOGY

COURSE STRUCTURE FOR B TECH IN COMPUTER SCIENCE & ENGINEERING													
Semester VI			**B. Tech. in Computer Science & Engineering**										
Sr. No.	**Course/Lab Code**	**Course/ Lab Name**	**Teaching Scheme**					**Examination Scheme**					
								Theory			**Practical**		**Total**
			L	**T**	**P**	**C**	**Hrs./ Week**	**CE**	**MS**	**ES**	**LW**	**LP/ Viva**	**Marks**
1	20CP313T	Artificial Intelligence	2	0	0	2	2	25	25	50	-	-	100
2	20CP313P	Artificial Intelligence LAB	0	0	4	2	4	-	-	-	50	50	100
3	20CP314P	Advanced Web Technology LAB	0	0	4	2	4	-	-	-	50	50	100
4		CE-2	2	0	0	2	2	25	25	50	-	-	100
5		CE-2 LAB	0	0	4	2	4	-	-	-	50	50	100
6		CE-3	2	0	0	2	2	25	25	50	-	-	100
7		CE-3 LAB	0	0	4	2	4	-	-	-	50	50	100
8		OE-4	3	0	0	3	3	25	25	50			100
9	20TP311	Technical Seminar	0	0	2	1	2				50	50	100
10	20TP310	Industrial Training/ IEP (6 weeks-summer break)	0	0	0	2	0						100
		TOTAL	9	0	18	20	27						1000

CE- Continuous Evaluation, MS-Mid Semester; ES – End Semester Exam

Professional Core Electives-2

Sl. No.	**Course Code**	**Course Name**	**Domain**
1.	20CP315T	Big Data Analytics	Analytics
2.	20CP315P	Big Data Analytics Lab	Analytics
3.	20CP316T	Cyber Security	Security
4.	20CP316P	Cyber Security Lab	Security
5.	20CP317T	Digital Image Processing	Image Processing
6.	20CP317P	Digital Image Processing Lab	Image Processing
7.	20CP318T	Parallel Computing	Parallel & Distributed Computing
8.	20CP318P	Parallel Computing Lab	Parallel & Distributed Computing

Professional Core Electives-3

Sl. No.	**Course Code**	**Course Name**	**Domain**
1.	20CP319T	Semantic Web	Analytics
2.	20CP319P	Semantic Web	Analytics
3.	20CP320T	Cryptography and Network Security	Security
4.	20CP320P	Cryptography and Network Security	Security
5.	20CP321T	Real Time Systems	IoT
6.	20CP321P	Real Time Systems	IoT
7.	20CP322T	Cloud Computing	Parallel & Distributed Computing
8.	20CP322P	Cloud Computing	Parallel & Distributed Computing

Open Elective-4 (Anyone to be offered)

Sl. No.	**Course Code**	**Course Name**	**Domain**
1.	20CP323T	Introduction to Machine learning	Industry 4.0
2.	20CP324T	Foundation of IoT	Industry 4.0

20CP313T					Artificial Intelligence					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
2	0	0	2	2	25	50	25	-	-	100

COURSE OBJECTIVES

- To identify the problems where AI is required and the different methods available.
- To compare and contrast different AI techniques available.
- To define and explain learning algorithms and identify problems in game playing.
- To learn Neural Networks and Expert systems.

UNIT 1 INTRODUCTION TO AI AND SEARCHING **7 Hrs.**

AI Problems, Intelligent Agents, Problem Formulation, Basic Problem Solving Methods. Search strategies, Uniformed Search Strategies, State-Space Search, Bi-Directional Search, BFS, DFS, Heuristic Search Strategies, Local Search Algorithms, Hill Climbing, Greedy Best First Search, A* Search, Simulated Annealing, Measure of performance and analysis of search algorithms.

UNIT 2 KNOWLEDGE REPRESENTATION AND INFERENCE **6 Hrs.**

Game playing, Knowledge representation using-Predicate logic, Introduction to predicate calculus, Resolution, Use of predicate calculus, Knowledge representation using other logic, Structured representation of knowledge, Production based system, Frame based system, First order logic. Inference in first order logic, propositional Vs. first order inference, unification & lifts forward chaining, Backward chaining, Resolution.

UNIT 3 NEURAL NETWORKS **7 Hrs.**

Characteristics of Neural Networks, Historical Development of Neural Networks Principles. Artificial Neural Networks: Terminology, Models of Neuron, Topology, Basic Learning Laws, Pattern Recognition Problem, Basic Functional Units, Pattern Recognition Tasks by the Functional Units.

UNIT 4 EXPERT SYSTEMS **7 Hrs.**

Introduction to Expert systems - Architecture of expert systems, Roles of expert systems - Knowledge Acquisition –Meta knowledge, Heuristics. Example of expert systems - MYCIN, DART, XOON, Expert systems shells, Introduction to Planning.

Max. 26 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1- Explain the basic of AI.
CO2- Apply various search techniques.
CO3- Define learning and explain various learning techniques.
CO4- Understand the basics of Neural Networks.
CO5- Understand expert system and Game playing techniques.
CO6- Apply techniques to solve real world problem using AI.

TEXT/REFERENCE BOOKS

1. Russell, S.J. and Norvig, P., Artificial Intelligence: A Modern Approach, Pearson Education.
2. Kevin Night and Elaine Rich, Nair B., “Artificial Intelligence (SIE)”, McGraw Hill.
3. Dan W. Patterson, “Introduction to AI and ES”, Pearson Education.
4. G.Luger, W.A. Sttubblefield, “Artificial Intelligence”, Addison-Wesley Longman.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 3 Hrs.**

Part A: 10 Questions of 2 marks each-No choice 20 Marks
Part B: 2 Questions from each unit with internal choice, each carrying 20 marks 80 Marks

20CP313P					Artificial Intelligence LAB					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
0	0	4	2	4	--	--	--	50	50	100

COURSE OBJECTIVES

- To understand data structures and learning algorithms
- To understand Neural Networks
- To develop Expert systems

LIST OF EXPERIMENTS:

Practical list should be prepared based on the content of the subject and following guidelines should be useful. The following experiments are suggested:

1. Depth First Search and Best First Search
2. A* algorithm
3. Water Jug problem using Heuristic functions
4. Tic Tac Toe game from 0 and X
5. Expert system using Forward Chaining
6. Hands-on on Matlab/Python for AI related problems: Neural Network, Genetic Algorithm and more.
7. Project work as decided by Tutor. (Tools related to AI can be explored)

COURSE OUTCOMES

On completion of the course, student will be able to
CO1- Apply various search techniques like depth first search, A*, AO* etc.
CO2- Integrate information coming from different sources.
CO3- Construct distributed cognitive systems.
CO4- Apply Neural Network for various real time systems.
CO5- Apply genetic algorithms to optimize the performance of the model.
CO6- Develop AI based solutions to the real-world problem.

TEXT/REFERENCE BOOKS

1. Russell, S.J. and Norvig, P., Artificial Intelligence: A Modern Approach, Pearson Education.
2. Kevin Night and Elaine Rich, Nair B., “Artificial Intelligence (SIE)”, McGraw Hill.
3. Dan W. Patterson, “Introduction to AI and ES”, Pearson Education.
4. G.Luger, W.A. Sttubblefield, “Artificial Intelligence”, Addison-Wesley Longman.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 2 Hrs**

Part A: Evaluation Based on the class performance and Laboratory book 50 Marks
Part B: Viva Examination based conducted experiments 50 Marks

20CP314P					Advanced Web Technology LAB					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
0	0	4	2	4	-	-	-	50	50	100

Prerequisites : Web Technology with HTML, CSS, JavaScript

COURSE OBJECTIVES

- Introduce the Advanced Javascript runtime environments.
- Learn the Webapp connectivity with noSQL database
- Learn the Webapp design with Django and Flask frameworks.
- Introduce MVC framework with Spring framework.
- Explain the Object Relational Mapping using Hibernate.

Experiment Sessions using Programming would be based on following topics:

NodeJS, ReactJS, AngularJS, MongoDB, Python Django and Flask Framework, Spring, Hibernate.

List of Experiments

1. Implement the NodeJS Programs
2. Implement the ReactJS programs
3. Implement AngularJS programs
4. Create database in MongoDB and connect the webpages with it.
5. Implement a webapp using Django framework
6. Implement a webapp using flask framework
7. Implement webapp using Spring Framwork.
8. Add Database connectivity using Hibernate technology.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 – Explain the features and applicability of NodeJS, ReactJS and AngularJS.
CO2 – Understand the usage of NoSQL database in webapps thru MongoDB.
CO3 – Apply the Django and Flask Framework to implement the webapp.
CO4 – Explain the MVC architecture thru the usage of Spring Framework.
CO5 – Assess the database connectivity with webapp using Hibernate
CO6 – Build a webapp using modern tools and technology

TEXT/REFERENCE BOOKS

1. Brad Dayley, Node.js, MongoDB and Angular Web Development, Addison-Wesley, second addition, 2018
2. David Ashley , *Foundation Dynamic Web Pages with Python: Create Dynamic Web Pages with Django and Flask*, Apress, 2020
3. Paul Fisher , Brian D. Murphy, *Spring Persistence with Hibernate*, Apress, 2016

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100	**Exam Duration: 3 Hrs**
Part A: Evaluation Based on the class performance and Laboratory book	50 Marks
Part B: Viva and practical Examination based on conducted experiments	50 Marks

20TP311					Technical Seminar					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
0	0	2	1	2	-	-	-	50	50	100

COURSE OBJECTIVES

- To develop presentation and writing skills in societal and professional life.
- To identify promising new directions of various cutting edge technologies.
- To Collect, Organize & analyze information about emerging technologies /market demands/current trends.
- To summarize detailed report describing the project and results.

Guidelines for presenting a seminar:

1. The seminar will consist of a typewritten report covering the topic related to emerging technologies, market demands, current trends, etc.
2. It is expected that the candidate prepares a report based on outcomes of literature studies, observations, summary of technologies used, etc., related to a problem in relevant technology area.
3. The report shall be tested for any plagiarism out of books, journals and internet based articles and reports by appropriate web based tool.
4. The candidate shall deliver seminar on the topic to evaluation committee and students of his/her class for peer assessment. Format for assessment should be designed by the faculty with approval of department.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1- Choose promising new directions of various cutting-edge technologies.
CO2- Summarize detailed report describing the project and results.
CO3- Apply listening, speaking, reading and writing skills in societal and professional life.
CO4- Analyze communication behaviors.
CO5- Conclude topic by making an oral presentation before an evaluation committee.
CO6- Develop skills in presentation and discussion of research topics in a public forum.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 3 Hrs**

Part A: Continuous Evaluation Based on Presentation, Report and Viva 50 Marks
Part B: Evaluation Based on Presentation, Report and Viva 50 Marks

20TP310					Industrial Training					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	IA	LE/Viva	
0	0	-	2	6 weeks	-	-	-	50	50	100

COURSE OBJECTIVES

- Understand the products being developed and/or services being offered by the industry
- To provide comprehensive learning platform to students where they can enhance their ability skills and become job ready along with real corporate exposure.
- To increase self-confidence of students and help in finding their own proficiency
- To cultivate students' leadership ability and responsibility to perform or execute the given task
- To provide learners hands on practice within a real job situation and to become industry ready

COURSE OUTCOMES

On completion of the course, student will be able to
CO1- Apply the technical knowledge in IT sector to innovate.
CO2- Compare the academic and industry culture
CO3- Develop the ethical basis of professional practice in relevant industry and become updated with all the emerging technologies.
CO4- Access academic and career goals, lifelong learning skills, make a gradual transition from academia to career
CO5- Summarize detailed report describing the project and results according to the company need.
CO6- Design the solutions to handle real-world problem.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 2 Hrs**

Part A: Evaluate the continuous performance	50 Marks
Part B: Verify the performance using (Report, Efforts and quality of work carried out, Presentation)	50 Marks

Department Professional Electives- (VI Semester)

20CP315T					Big Data Analytics					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
2	0	0	2	2	25	50	25	-	-	100

COURSE OBJECTIVES

- Learn the issues of Big Data.
- Learn to build and maintain reliable, scalable, distributed systems with Hadoop.
- Able to apply Hadoop ecosystem components.
- Working with SPARK for Data Analysis.

UNIT 1 INTRODUCTION **7 Hrs.**

Introduction to Big Data, Big Data Analytics, Data Serialization, Apache Hadoop & Hadoop Ecosystem, Analysing Data with Hadoop, Hadoop Streaming

UNIT 2 DISTRIBUTED FILE SYSTEM **7 Hrs.**

Distributed File System, the Design of HDFS, HDFS Concepts, Interfaces, Data flow, Data Ingest with Flume and Scoop and Hadoop archives, Hadoop I/O, Avro and File-Based Data structures.

UNIT 3 PROCESSING OF BIG DATA **6 Hrs.**

Anatomy of a Map Reduce Job Run, Map Reduce Types and Formats, Map Reduce Features, Failures, Job Scheduling, Shuffle and Sort, Matrix-Vector multiplication by Map-reduce, Task Execution

UNIT 4 DATA ANALYSIS WITH SPARK **6 Hrs.**

SPARK Introduction to Data Analysis with Spark, Downloading Spark and Getting Started, Programming with RDDs, Machine Learning with MLlib

Max. 26 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1- Understand the fundamental concepts of Big Data management and analytics

CO2- Demonstrate distributed systems with Apache Hadoop.

CO3- Analyze the role of business intelligence, data warehousing and visualization in decision making.

CO4- Understand Map Reduce paradigm to identify its applicability in real life problems.

CO5- Apply tools (SPARK) and techniques to analyze Big Data

CO5- Compare different text mining techniques.

TEXT/REFERENCE BOOKS

1. Chris Eaton, Dirk deroos et al., “Understanding Big Data”, McGraw Hill.
2. Tom White, “HADOOP: The definitive Guide”, O Reilly.
3. Boris lublinsky, Kevin t. Smith, Alexey Yakubovich, “Professional Hadoop Solutions”, Wiley.
4. Donald Miner & Adam Shook, “MapReduce Design Patterns”
5. Bill Chambers, Matei Zaharia, “Spark: The Definitive Guide”, O'Reilly Media, Inc

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 3 Hrs**

Part A: 10 Questions of 2 marks each-No choice 20 Marks

Part B: 2 Questions from each unit with internal choice, each carrying 16 marks 80 Marks

20CP315P					Big Data Analytics LAB					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
0	0	4	2	4	--	--	--	50	50	100

COURSE OBJECTIVES

- Identify the challenges of Big Data Management
- Recognize the key concepts of Hadoop framework, MapReduce and SPARK.
- Apply the tools, techniques and algorithms for big data analysis.

LIST OF EXPERIMENT

1. To draw and explain Hadoop Architecture and Ecosystem with the help of a case study using WorkCount example. To define and install Hadoop.
2. To implement the following file management tasks in Hadoop System (HDFS): Adding files and directories, Retrieving files, Deleting files.
3. To run a basic Word Count MapReduce program to understand MapReduce Paradigm: To count words in a given file, To view the output file, and To calculate execution time.
4. To implement Stock count Map reduce program.
5. Write a Map Reduce program that mines weather data. Data available at: https://github.com/tomwhite/hadoopbook/tree/master/input/ncdc/all.
6. Install and Run Hive then use Hive to create, alter, and drop databases, tables, views, functions, and indexes.
7. Install, Deploy & configure Apache Spark Cluster. Run apache spark applications using Scala.
8. Data analytics using Apache Spark on Amazon food dataset, find all the pairs of items frequently reviewed together.

COURSE OUTCOMES

On completion of the course, student will be able to
CO1- Understand Hadoop related tools for big data analytics
CO2- Deploy Hadoop ecosystem components
CO3- Demonstrate basic Hadoop administration.
CO4- Apply Map Reduce paradigm for Big Data Analysis.
CO5- Understand the working of tools (SPARK) and techniques to analyze Big Data
CO5- Build a solution for a given problem using suitable Big Data Techniques

TEXT/REFERENCE BOOKS

1. Chris Eaton et al., *Understanding Big Data*, McGraw Hill, 2011
2. Tom White, *HADOOP: The definitive Guide*, O Reilly, 2009
3. Boris lublinsky et al., *Professional Hadoop Solutions*, Wiley, 2013
4. Donald Miner et al., *MapReduce Design Patterns*, O'Reilly Media, 2012
5. Bill Chambers et al., *Spark: The Definitive Guide*, O'Reilly Media, 2018

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 2 Hrs**

Part A: Evaluation Based on the class performance and Laboratory book 50 Marks
Part B: Viva Examination based conducted experiments 50 Marks

20CP316T					Cyber Security					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
2	0	0	2	2	25	50	25	-	-	100

COURSE OBJECTIVES

- To learn fundamental concepts of Cyber Security
- To study various Cyber Crime models
- To study Cyber Security Vulnerabilities
- To secure web applications using cyberlaws.

UNIT 1 INTRODUCTION

Introduction to Cyber Security, Internet Governance – Challenges and Constraints, Cyber Threats:- Cyber Warfare-Cyber Crime-Cyber terrorism-Cyber Espionage, Need for a Nodal Authority, Need for an International convention on Cyberspace. **7 Hrs.**

UNIT 2 CYBER SECURITY VULNERABILITIES

Overview, vulnerabilities in software, System administration, Complex Network Architectures, Open Access to Organizational Data, Weak Authentication, Unprotected Broadband communications, Cyber Security Safeguards. **7 Hrs.**

UNIT 3 SECURING WEB APPLICATION

Services and Servers Introduction, security for HTTP Applications and Services, Security for SOAP Services, Identity Management and Web Services, Authorization Patterns. **6 Hrs.**

UNIT 4 CYBER LAWS

Cyberspace Law Introduction Computers and its Impact in Society. Roles of International Law, the state and Private Sector in Cyberspace, Cyber Security Standards. Cyber Jurisprudence at International and Indian Level. Issues in Cyberspace Freedom of Speech and Expression in Cyberspace. Introduction to Cyber Forensics **6 Hrs.**

Max 26 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1- Understand the vulnerabilities in the computer and network security and importance of cyber security
CO2- Explain the cybercrime and cyber law and necessity of cyber laws
CO3- Apply the different cyber forensics technique
CO4- Explain and compare various cyber security technique
CO5- Identify cyber security vulnerabilities
CO6- Apply mechanisms to provide secure web services.

TEXT/REFERENCE BOOKS

1. Nina Godbole, Cyber Security, Wiley Publications.
2. Nelson, Phillips, Enfinger, Steuart, “Computer Forensics and Investigations”, Cengage Learning,
3. Man Young Rhee, “Internet Security: Cryptographic Principles, Algorithms and Protocols”, Wiley

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 3 Hrs**

Part A: 10 Questions of 2 marks each-No choice 20 Marks
Part B: 2 Questions from each unit with internal choice, each carrying 20 marks 80 Marks

20CP316P					Cyber Security LAB					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
0	0	4	2	4	-	-	-	50	50	100

COURSE OBJECTIVES

- To learn fundamental concepts of Cyber Security
- To study various Cyber Crime models
- To study Cyber Security Vulnerabilities
- To secure web applications using cyberlaws.

LAB EXPERIMENTS

1. Overview of Cyber Security
2. Comprehensive Cyber Security Policy
3. Cyber Security Safeguards : Ethical Hacking, Firewalls, Intrusion Detection Systems, Response, Scanning, Security policy, Threat Management
4. Study of Email security
5. Study of Social Media Security
6. Study of Web Security
7. Study of Mobile Security
8. Study of Wi-Fi Security
9. Software Hacking, Reverse Engineering Cross site scripting & its Security.
10. Cyber Forensics : Conducting disk-based analysis, Investigating Information-hiding

COURSE OUTCOMES

On completion of the course, student will be able to
CO1- Apply the different cyber forensics technique
CO2- Compare various cyber security techniques
CO3- Analyze the software bugs that pose cyber security threats
CO4- Use the tools for vulnerability assessment.
CO5- Apply different techniques for mobile security.
CO6- Design mechanisms for secure web services

TEXT/REFERENCE BOOKS

1. Nina Godbole, Cyber Security, Wiley Publications.
2. Nelson, Phillips, Enfinger, Steuart, “Computer Forensics and Investigations”, Cengage Learning,
3. Man Young Rhee, “Internet Security: Cryptographic Principles, Algorithms and Protocols”, Wiley

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 2 Hrs**

Part A: Evaluation Based on the class performance and Laboratory book 50 Marks
Part B: Viva Examination based conducted experiments 50 Marks

20CP317T					Digital Image Processing					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
2	0	0	2	2	25	50	25	-	-	100

COURSE OBJECTIVES

- Introduce mathematical modelling of transforms for digital image processing.
- Understand methodology to analyze, design and implement images processing and analysis algorithms.
- Develop understanding for multi-dimensional signal processing.

Unit-1: FUNDAMENTAL AND SPATIAL DOMAIN PROCESSING **7 Hrs.**

Introduction, Image sampling and quantization, Basic relationships in pixels, Basic intensity transformations, Histogram processing, Spatial filtering: smoothing and sharpening, Basic mathematical tools in image processing, Colour models.

UNIT 2 FREQUENCY DOMAIN PROCESSING **7 Hrs.**

Sampling 2D functions, Aliasing, 2D Fourier Transform and properties, Filtering in frequency domain: smoothing, sharpening, selective filtering.

UNIT 3 IMAGE RESTORATION AND MORPHOLOGICAL OPERATIONS **6 Hrs.**

Model of image degradation process, Restoration in presence of noise, estimating degradation function, Inverse filtering, MMSE filtering, Morphological operations: Erosion and dilation, opening and closing, Basic morphological algorithms.

UNIT 4 IMAGE SEGENTATION AND DESCRIPTION **6 Hrs.**

Point, line and edge detection, Thresholding, Basic segmentation algorithms: region based, watershed, Image representation: chain codes, polygonal approximation, Boundary and regional descriptors: textures, moments.

Max. 26 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1- Recall and identify properties of digital images and 2D transforms.
CO2- Explain concepts and complexity of digital image processing techniques and systems.
CO3- Understand various image processing techniques on given image.
CO4- Analyze images and applications in time domain and frequency domain.
CO5- Analyze the performance of image processing algorithms.
CO6- Use image processing algorithms for real world problems.

TEXT/REFERENCE BOOKS

1. Gonzalez, R. C., & Woods, R. E., “Digital image processing”, Pearson.
2. Sonka, Milan, “Image processing, analysis and machine vision”. Cengage Learning Pvt. Ltd.
3. Jayaraman, “Digital Image Processing”. McGrawhill.
4. Gose, Earl, “Pattern recognition and Image Analysis” PHI Learning Pvt. Ltd.
5. Alasdair, McAndrew, “A Computational Introduction to Digital Image Processing”. CRC Press.
6. Artyom M ,Grigoryan, “Image Processing”. Taylor & Francis Ltd.
7. Castleman, Kenneth “Digital Image Processing”. Pearson Education.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 3 Hrs**

Part A: 10 Questions of 2 marks each-No choice 20 Marks

Part B: 2 Questions from each unit with internal choice, each carrying 20 marks 80 Marks

20CP317P					Digital Image Processing LAB					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
0	0	4	2	4	-	-	-	50	50	100

COURSE OBJECTIVES

- To understand the relationship of mathematical transformation for image processing.
- To motivate for selecting appropriate solutions for a practical image processing approach.
- To facilitate the understanding of object recognition in image analysis.

LIST OF EXPERIMENTS:

1. Write a C Program to display header information of 16 color .bmp image.
2. Program to enhance image using image arithmetic and logical operations.
3. Program for an image enhancement using pixel operation.
4. Program for gray level slicing with and without background.
5. Program for image enhancement using histogram equalization.
6. Program to filter an image using averaging low pass filter in spatial domain And median filter.
7. Program for detecting edges in an image using Roberts cross gradient operator and sobel operator.
8. Program for smooth an image using low pass filter in frequency domain .
9. Program for smooth an image using high pass filter in frequency domain .
10. Program for morphological image operations-erosion, dilation, opening & closing.
11. Program for illustrating color image processing.
12. Program for image Watermarking

COURSE OUTCOMES

On completion of the course, student will be able to
CO1- Apply various image processing techniques on given image.
CO2- Apply different image segmentation techniques.
CO3- Evaluate and compare the performance of image processing algorithms
CO4- Implement state of the art object detection technologies
CO5- Develop an application using existing image processing algorithms
CO6- Apply various digital image processing techniques to solve real-world scenarios

TEXT/REFERENCE BOOKS

1. Gonzalez, R. C., & Woods, R. E., “Digital image processing”, Pearson.
2. Alasdair, McAndrew, “A Computational Introduction to Digital Image Processing”. CRC Press, 2016
3. Jayaraman, “Digital Image Processing”. McGrawhill, 2017

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 2 Hrs**

Part A: Evaluate the continuous performance based on the lab work 50 Marks
Part B: Verify the performance using viva and critical experiment 50 Marks

20CP318T					Parallel Computing					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
2	0	0	2	2	25	50	25	-	-	100

COURSE OBJECTIVES

- To introduce the basic concepts and underlying theories of Parallel Processing
- To develop skills of using recent machine learning software for solving practical problems
- To relate a Parallel Solution to the given problem by identifying a hotspot

UNIT 1 INTRODUCTION **7 Hrs.**

Motivating Parallelism, Scope of Parallel Computing, Implicit Parallelism, Limitations of Memory, System Performance, Dichotomy of Parallel Computing Platforms, Physical Organization of Parallel Platforms, Communication Costs in Parallel Machines, Routing Mechanisms for Interconnection Networks.

UNIT 2 PARALLEL ALGORITHMS & MODELS **7 Hrs.**

Principles of Parallel Algorithm Design: Preliminaries, Decomposition Techniques, Characteristics of Tasks and Interactions, Mapping Techniques for Load Balancing, Methods for Containing Interaction Overheads, Parallel Algorithm Models

UNIT 3 COMMUNICATION OPERATION & ANALYTICAL MODELLING **6 Hrs.**

Basic Communication Operations, Analytical Modelling: Sources of Overhead in Parallel Computing, Performance Metrics for Parallel Systems, Effect of Granularity on Performance, Scalability of Parallel Systems, Asymptotic Analysis of Parallel Program, Other Scalability Metrics

UNIT 4 PARALLEL PROGRAMMING **6 Hrs.**

Programming Using the Message-Passing Paradigm: Principles of Message-Passing Programming, building blocks, MPI, Topologies and Embedding, Overlapping Communication with Computation, collective Communication and Computation Operations, Groups and Communicator. Programming Shared Address Space Platforms, The POSIX Thread API, OpenMP: Specifying concurrent tasks, Synchronization constructs in OpenMP, Data Handling in OpenMP, OpenMP library functions.

Max. 26 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1- Explain parallel processing paradigms and architecture.
CO2- Understand principles of parallel algorithms designs and task models.
CO3- Evaluate the performance of parallel computing platforms.
CO4- Analyze routing and communication protocols used in parallel computing
CO5- Apply the core concept of parallel computation using MPI /Pthread/OpenMP programming techniques.
CO6- Construct a parallel solution to the given problem by identifying a hotspot.

TEXT/REFERENCE BOOKS

1. Ananth Grama , George Karypis, Vipin Kumar, Anshul Gupta , Introduction to Parallel Computing, Second edition, Pearson- Addison Wesley.
2. Eric Aubanel, Elements of Parallel Computing, CRC Press, 2016.
3. Michael J. Quinn, Parallel programming in C with MPI and OpenMP, Tata McGraw-Hill Education

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 3 Hrs**

Part A: 10 Questions of 2 marks each-No choice 20 Marks

Part B: 2 Questions from each unit with internal choice, each carrying 20 marks 80 Marks

20CP318P					Parallel Computing LAB					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
0	0	4	2	4	--	-	-	50	50	100

COURSE OBJECTIVES

- To introduce the basic concepts and underlying theories of Parallel Processing
- To develop skills of using recent machine learning software for solving practical problems
- To create a Parallel Solution to the given problem by identifying a hotspot

LIST OF EXPERIMENT

1. Write a MPI Program to that uses a Monte Carlo Simulation method to compute the value of Pi
2. Given an array of integer, Use C & Pthread to write a parallel program to find out the sum of array and the second maximum. Assume the entire array is stored in one location initially and is distributed on different threads for parallel processing.
3. Given an array of integer, Use C & Pthread to write a parallel program to sort the array using Quick Sort.
4. Given a matrix of N X N dimension, perform row wise matrix vector multiplication using MPI programming
5. Given two array of integers, Use C & Pthread to write a parallel program to find out the common elements
6. Write an OpenMP program for floyd's algorithm to solve all pair shortest path problem.
7. Parallelize a prime number generator using OpenMP. The program should take two main parameters which are read in from the command line.
   P: The num of processors (numProcs)
   N: The problem size (size)
   The program should output all the prime number generated either to a file or standard out.
8. COURSE PROJECT: Students are required to submit a course project that involves development of a Parallel solution to the problems given by Course Instructor.
   Sample Problem Statement: Write a parallel program to simulate a three-person rock/scissors/paper game. Each player randomly chooses one of rock, scissors, or paper. Then the players compare their choices to see who \won". Rock smashes scissors, scissors cut paper, and paper covers rock. Award a player 2 points if it beats both the others; award two players 1 point each if they both beat the third; otherwise award no points. Then the players play another game.

COURSE OUTCOMES

On completion of the course, student will be able to
CO1- Apply parallel processing paradigms and architecture.
CO2- Apply the core concept of parallel computation using MPI programming techniques.
CO3- Use Pthread programming techniques to parallel computation.
CO4- Analyze routing and communication protocols used in parallel computing
CO5- Use OpenMP programming language to implement core concept of parallel computation.
CO6- Design a Parallel Solution to the given problem by identifying a hotspot.

TEXT/REFERENCE BOOKS

1. Parallel programming in C with MPI and OpenMP, Michael J. Quinn, Tata McGraw-Hill Education
2. Michael J. Quinn, Parallel programming in C with MPI and OpenMP, Tata McGraw-Hill Education
3. https://nptel.ac.in/courses/106102114/

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 2 Hrs**

Part A: Continuous Evaluation based on lab records and course project. 50 Marks
Part B: 2 Experiment conducted and Viva at final exam. 50 Marks

20CP319T					Semantic Web					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
2	0	0	2	2	25	50	25	-	-	100

COURSE OBJECTIVES

- Describe about the current web development and emergence of social web.
- Design modelling, aggregating and knowledge representation of semantic web
- Learn web ontology language, ontology evolution, and ontology engineering methodologies.
- Describe applications of semantic web.

UNIT 1 FOUNDATION OF SEMANTIC WEB TECHNOLOGIES **7 Hrs.**

The vision of Semantic Web, Semantic Web Architecture, languages and tools for knowledge management - XML, RDF, OIL, DAML, OWL for semantic web. Describing Web Resources – RDF.

UNIT 2 SEMANTIC WEB LANGUAGES **7 Hrs.**

Querying the Semantic Web - SPARQL Infrastructure. Introduction to Ontologies and Ontology Languages. Web Ontology Language – OWL2, Compatibility of OWL2 with RDF/RDFS, OWL2 profiles.

UNIT 3 ONTOLOGY **6 Hrs.**

Logic and Inference Rules, Semantic Web Rules Language (SWRL), Rules in SPARQL: SPIN. Ontology Evolution, Ontology Mediation, Ontologies for Knowledge Management.

UNIT 4 SEMANTIC WEB CASE STUDIES **6 Hrs.**

Ontology Engineering Methodologies. Applications – BBC Artists, Government Data, New York Times. Semantic Web Services - Approaches and Perspectives. Semantic Web: A Legal Case Study.

Max. 26 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to
CO1- Define semantic web Meta data and RDF schema.
CO2- Explain web ontology language.
CO3- Apply logic and interference rules for web modelling.
CO4- Examine Ontology Engineering Methodologies.
CO5- Analyze semantic web applications.
CO6- Prepare ontologies for knowledge modelling for sample web application

TEXT/REFERENCE BOOKS

1. Grigoris Antoniou and Frank van Harmelen, A Semantic Web Primer, MIT Press
2. John Davies, Rudi Studer, and Paul Warren. Semantic Web Technologies: Trends and Research in Ontology-based Systems, Wiley.
3. John Davies, Dieter Fensel, Frank van Harmelen, and Frank van Harmelen. Towards the Semantic Web: Ontology-Driven Knowledge Management, Wiley

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 3 Hrs**

Part A: 10 Questions of 2 marks each-No choice 20 Marks
Part B: 2 Questions from each unit with internal choice, each carrying 20 marks 80 Marks

20CP319P					Semantic Web LAB					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
0	0	4	2	4	-	-	-	50	50	100

COURSE OBJECTIVES

- Describe about the current web development and emergence of social web.
- Design modelling, aggregating and knowledge representation of semantic web
- Learn web ontology language, ontology evolution, and ontology engineering methodologies.
- Describe applications of semantic web.

LIST OF EXPERIMENT

1. Practice with Semantic Web tools.
2. Working with XML Schema.
3. Design of Ontology using RDF.
4. Design of Ontology using RDFS.
5. Design of Ontology using OWL.
6. Practice ontology case study.
7. Querying Ontology using SPARQL.
8. Practice case study – dbpedia, LOD cloud.

COURSE OUTCOMES

On completion of the course, student will be able to
CO1- Use semantic web Meta data and RDF schema.
CO2- Apply logic and interference rules for web modelling.
CO3- Design of Ontology using RDF/RDFS and OWL.
CO4- Evaluate the performance of Semantic Web Applications.
CO5- Formulate ontologies for knowledge modelling for sample web application.
CO6- Use scrum process model and apply it to design real world projects.

TEXT/REFERENCE BOOKS

1. Grigoris Antoniou and Frank van Harmelen, A Semantic Web Primer, MIT Press
2. John Davies, Rudi Studer, and Paul Warren. Semantic Web Technologies: Trends and Research in Ontology-based Systems, Wiley.
3. John Davies, Dieter Fensel, Frank van Harmelen, and Frank van Harmelen. Towards the Semantic Web: Ontology-Driven Knowledge Management, Wiley

END SEMESTER EXAMINATION PATTERN

Max. Marks: 100 **Exam Duration: 2 Hrs**

Part A: Evaluation Based on the class performance and Laboratory book 50 Marks
Part B: Viva Examination based conducted experiments 50 Marks

20CP320T					Cryptography and Network Security					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
2	0	0	2	2	25	50	25	-	-	100

COURSE OBJECTIVES

- To understand the challenges associated with Information and Network Security.
- To understand the principles and practice of elementary number theory.
- To understand the advance level cryptographic algorithms.
- To understand the importance and principal of network security.

UNIT 1 INTRODUCTION AND ADVANCED NUMBER THEORY **7 Hrs.**

Finite Fields, Arithmetic and algebraic algorithms, Primality Testing Algorithms, Chinese Remainder Theorem, Quadratic Congruence, Discrete Logarithm, Factorization Methods.

UNIT 2 PUBLIC KEY CRYPTOGRAPHY **6 Hrs.**

ElGamal Cryptosystem, Pseudorandom Number Generation, Zero-Knowledge Protocols, Multi Party Protocols – Secret Sharing, Verifiable Secret Sharing, Introduction to Digital Signature, Digital Signature Schemes. Identity Based Cryptography, Attribute Based Cryptography.

UNIT 3 NETWORK SECURITY **7 Hrs.**

Overview of Network Security, Software Vulnerabilities: Buffer Overflow, Cross Site Scripting, SQL Injection. Security at - Application Layer, Transport Layer, Network Layer.

UNIT 4 SECURITY THREATS **6 Hrs.**

Protection against Threats, intruders, Viruses and Worms, Malicious Software, Distributed Denial of Service Attacks, Intrusion Detection System Overview, Malware Detection and Prevention, Firewalls.

Max. 26 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1- Define the concepts related to the basics of network security and cryptography.
CO2- Describe private and public key security algorithms used for network security along with its encryption and decryption.
CO3- Solve and relate mathematic concepts behind the cryptographic algorithms.
CO4- Classify the type of attack and type of vulnerability from given application.
CO5- Choose appropriate mechanisms for protecting the network.
CO6- Analyze security solution for a given application.

TEXT/REFERENCE BOOKS

1. William Stallings, "Cryptography and Network Security Principles and Practice", Pearson Education
2. Charlie Kaufman, Radia Perlman, Mike Speciner, “Network Security: Private Communication in a Public World”, Prentice Hall
3. Behrouz A. Forouzan, “Cryptography and Network Security”, McGraw-Hill Education

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 3 Hrs**

Part A: 10 Questions of 2 marks each-No choice 20 Marks

Part B: 2 Questions from each unit with internal choice, each carrying 20 marks 80 Marks

20CP320P					Cryptography and Network Security LAB					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
0	0	4	2	4	-	-	-	50	50	100

COURSE OBJECTIVES

- To understand the challenges associated with Information and Network Security.
- To understand the principles and practice of elementary number theory.
- To understand the advance level cryptographic algorithms.
- To understand the importance and principal of network security.

LIST OF EXPERIMENT

1. Download and Practice Cryptool.
2. Download and Practice Wireshark tool.
3. Study and Implement Public Key Cryptographic algorithms.
4. Study and Demonstrate buffer overflow attack.
5. Study and Demonstrate SQL Injection.
6. Study Email Security tools.
7. Study and Install Intrusion Detection Tools like Snort.
8. Learn intrusion detection techniques using Snort.
9. Learn intrusion prevention technique.

COURSE OUTCOMES

On completion of the course, student will be able to
CO1- Apply various private and public key cryptographic techniques.
CO2- Evaluate the authentication and hash algorithms.
CO3- Develop the understanding of software vulnerabilities exploited for attacks.
CO4- Summarize the intrusion detection and its solutions to overcome the attacks.
CO5- Apply various message authentication functions and secure algorithms.
CO6- Evaluate various scenarios and apply the required type of algorithm for ensuring security.

TEXT/REFERENCE BOOKS

1. William Stallings, Cryptography and Network Security Principles and Practice, Pearson Education
2. Charlie Kaufman, Radia Perlman, Mike Speciner, Network Security: Private Communication in a Public World, Prentice Hall
3. Behrouz A. Forouzan, Cryptography and Network Security, McGraw-Hill Education

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 2 Hrs**

Part A: Evaluation Based on the class performance and Laboratory book 50 Marks
Part B: Viva Examination based conducted experiments 50 Marks

20CP321T					Real Time Systems					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
2	0	0	2	2	25	50	25	-	-	100

COURSE OBJECTIVES

- To study issues related to the design and analysis of systems with real-time constraints.
- To learn the features of Real time OS.
- To study the various Uniprocessor and Multiprocessor scheduling mechanisms.
- To learn about various real time communication protocols.
- To study the difference between traditional and real time databases

UNIT 1 INTRODUCTION TO REAL TIME COMPUTING **7 Hrs.**

Introduction to real time computing - Concepts; Example of real-time applications – Structure of a real time system – Characterization of real time systems and tasks - Hard and Soft timing constraints - Design Challenges - Performance metrics - Prediction of Execution Time : Source code analysis, Micro-architecture level analysis, Cache and pipeline issues- Programming Languages for Real-Time Systems.

UNIT 2 REAL TIME OPERATING SYSTEM **7 Hrs.**

Real time OS – Threads and Tasks – Structure of Microkernel – Time services – Scheduling Mechanisms Communication and Synchronization – Event Notification and Software interrupt

UNIT 3 SCHEDULING **6 Hrs.**

Task assignment and Scheduling - Task allocation algorithms - Single-processor and Multiprocessor task scheduling - Clock-driven and priority-based scheduling algorithms- Fault tolerant scheduling

UNIT 4 REAL TIME COMMUNICATION **6 Hrs.**

Real-Time Communication -Network topologies and architecture issues – protocols – contention based, token based, polled bus, deadline-based protocol, Fault tolerant routing. RTP and RTCP. Real time Databases – Transaction priorities – Concurrency control issues – Disk scheduling algorithms – Two phase approach to improve predictability.

Max. 26 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1- Identify the need of real-time systems.
CO2- Discuss the challenges in the design of hard and soft real time systems.
CO3- Compare different scheduling algorithms and the schedulability criteria.
CO4- Understand the real-time communication and its applications.
CO5- Integrate resource access mechanisms with the scheduling techniques and develop integrated schedulability criteria.
CO6- Choose real time systems according to their need to solve real time problems.

TEXT/REFERENCE BOOKS

1. Jane W.S. Liu, Real-Time Systems, Pearson Education India.
2. Philip A. Laplante and Seppo J. Ovaska, Real-Time Systems Design and Analysis: Tools for the Practitioner, IEEE Press, Wiley.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 3 Hrs**

Part A: 10 Questions of 2 marks each-No choice 20 Marks

Part B: 2 Questions from each unit with internal choice, each carrying 20 marks 80 Marks

20CP321P					Real Time Systems LAB					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
0	0	4	2	4	-	-	-	50	50	100

COURSE OBJECTIVES

- To study issues related to the design and analysis of systems with real-time constraints.
- To study various uniprocessor and multiprocessor scheduling mechanisms.
- To learn various real time communication protocols.

LIST OF EXPERIMENT

1. Experiments related to real time scheduling
2. Experiments related to measuring of performance metrics
3. Experiments related to concurrency control mechanisms
4. Experiments related to communication and network topologies

COURSE OUTCOMES

On completion of the course, student will be able to
CO1- Apply different scheduling algorithms in real time system.
CO2- Compare different scheduling algorithms.
CO3- Choose and compare various network topologies used in real time system
CO4- Apply concurrency control mechanisms in real time system.
CO5- Measure the performance of real time system.
CO6- Use real time systems to solve real world problem.

TEXT/REFERENCE BOOKS

1. Douglas Wilhelm Harder, Jeff Zarnett, Vajih Montaghami and Allyson Giannikouris, “A practical introduction to real-time systems for undergraduate engineering”, https://ece.uwaterloo.ca/~dwharder/icsrts/Lecture_materials/A_practical_introduction_to_real-time_systems_for_undergraduate_engineering.pdf

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100	**Exam Duration 2 Hrs.**
Continuous evaluation	50 marks
End semester examination and Viva-voce	50 marks

20CP322T					Cloud Computing					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
2	0	0	2	2	25	50	25	-	-	100

COURSE OBJECTIVES

- To provide an in-depth and comprehensive knowledge of the Cloud Computing fundamental issues, technologies, applications and implementations.
- To expose the students to the frontier areas of Cloud Computing
- To motivate students to do programming and experiment with the various cloud computing environments
- To shed light on the issues and challenges in Cloud Computing

UNIT 1 CLOUD FOUNDATION AND OVERVIEW **7 Hrs.**

Distributed Computing, Cluster computing, Grid computing. Cloud Service Models

UNIT 2 VIRTUALIZATION AND LOAD BALANCING **7 Hrs.**

Virtualization concepts - Types of Virtualization, Introduction to Various Hypervisors, Moving VMs, Pros and cons of virtualization, Virtualization Technology examples. Distributed Management of Virtual Infrastructures, Scheduling, Capacity Management to meet SLA Requirements, Various load balancing techniques.

UNIT 3 INDUSTRIAL PLATFORMS AND NEW DEVELOPMENTS **6 Hrs.**

Study of Cloud Computing Systems like Amazon EC2 and S3, Google App Engine, and Microsoft Azure, Build Private/Hybrid Cloud using open source tools. MapReduce and its extensions to Cloud Computing, Cloud Application Programming and the Aneka Platform

UNIT 4 ADVANCED TOPICS IN CLOUD COMPUTING **6 Hrs.**

Energy efficiency in clouds, Market-based management of clouds, Federated clouds/InterCloud, Security in Cloud Computing

Max. 26 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Explain the strengths and limitations of cloud computing and the possible applications for state-of-the-art cloud computing.
CO2 - Identify the architecture and infrastructure of cloud computing.
CO3 - Demonstrate the concept and role of virtualization in cloud computing.
CO4 - Provide the appropriate cloud computing solutions and recommendations as per the applications.
CO5 - Explain various approaches used for load balancing in cloud
CO6 - Analyze authentication, confidentiality and privacy issues in cloud computing

TEXT/REFERENCE BOOKS

1. Rajkumar Buyya, James Broberg,Andrzej M Goscinski, Cloud Computing: Principles and Paradigms, Wiley publication
2. Toby Velte, Anthony Velte, Cloud Computing: A Practical Approach, McGraw-Hill Osborne Media
3. K. Chandrasekaran, Essentials of Cloud Computing
4. Recent publications for case studies

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 3 Hrs**

Part A: 10 Questions of 2 marks each-No choice 20 Marks
Part B: 2 Questions from each unit with internal choice, each carrying 16 marks 80 Marks

20CP322P					Cloud Computing LAB					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
0	0	4	2	4	--	--	--	50	50	100

COURSE OBJECTIVES

- To provide an understanding of the key concepts of Cloud Computing technologies, applications and implementations.
- To expose the students to the frontier areas of Cloud Computing
- To motivate students to do programming and experiment with the various cloud computing environments
- To illustrate the research issues and challenges lied in area of Cloud Computing

LIST OF EXPERIMENT

1. Hands on virtualization using XenServer
2. Hands on containerisation using Docker
3. To create and access VM instances and demonstrate various components such as EC2, S3, Simple DB, DynamoDB using AWS
4. Deployment and Configuration options in Google Cloud
5. Deployment and Configuration options in Microsoft Azure
6. Deploying a web application on Google Cloud/Microsoft Azure
7. Building a 'HelloWorld' app for the cloud
8. Deploying the 'HelloWorld' app for the cloud
9. Case Study: PAAS(Facebook, Google App Engine)

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Analyse the Cloud computing setup with its vulnerabilities and applications using different architectures.
CO2 - Identify problems, and explain, analyse, and evaluate various cloud computing solutions.
CO3 - Apply and design suitable Virtualization concept, Cloud Resource Management and design scheduling algorithms.
CO4 - Analyse the components of open stack & Google Cloud platform.
CO5 - Understand the key components of Amazon web Service.
CO6 - Design new ideas and innovations in cloud computing.

TEXT/REFERENCE BOOKS

1. Rajkumar Buyya et al., *Cloud Computing: Principles and Paradigms*, Wiley publication, 2010
2. Toby Velte et al., *Cloud Computing: A Practical Approach*, McGraw-Hill, 2009
3. K. Chandrasekaran, *Essentials of Cloud Computing,* CRC Press, 2014
4. Recent publications for case studies

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100	**Exam Duration: 2 Hrs**
Part A: Evaluation Based on the class performance and Laboratory book	50 Marks
Part B: Viva Examination based conducted experiments	50 Marks

Department Open Electives- (VI Semester)

20CP323T					Introduction to Machine Learning					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
3	0	0	3	3	25	50	25	-	-	100

COURSE OBJECTIVES

- To introduce the basic concepts and techniques of Machine Learning
- To develop skills of using recent machine learning software for solving practical problems
- To gain experience of doing independent study and research

UNIT 1 INTRODUCTION **8 Hrs.**

Introduction: what is ML; Problems, data, and tools; Visualization, Linear regression; SSE; gradient descent; closed form; normal equations; features engineering, Overfitting and complexity; training, validation, test data

UNIT 2 SUPERVISED MACHINE LEARNING **10 Hrs.**

Classification problems; decision boundaries; nearest neighbour methods, Bayes optimal decisions , Naive Bayes conditional distribution, Logistic regression, online gradient descent, Neural Networks, Decision tree

UNIT 3 UNSUPERVISED MACHINE LEARNING **12 Hrs.**

Unsupervised learning: clustering, k-means, hierarchical agglomeration, Dimensionality Reduction-PCA, VC-dimension, structural risk minimization; margin methods and support vector machines (SVM), Support vector machines and large-margin classifiers

UNIT 4 ENSEMBLE METHODS **9 Hrs.**

Rationale for ensemble method, methods for constructing an Ensemble classifier, Bias-Variance decomposition, Bagging, Boosting, Random forests, Empirical comparison among Ensemble methods.

Max. 39 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1- Understand Key concepts, tools and methods for machine learning using real data sets.
CO2- Compare a range of supervised and un-supervised machine learning algorithms along with their strength & weaknesses.
CO3- Evaluate the performance of the machine learning model.
CO4- Choose appropriate machine learning techniques to solve problems of moderate complexity.
CO5- Apply ensemble to design machine learning model.
CO6- Construct machine learning based solutions to the real-world problem and tune the trained model

TEXT/REFERENCE BOOKS

1. Tom M. Mitchell, “Machine Learning”, McGraw-Hill Education (INDIAN EDITION), 2013
2. Christopher M. Bishop, "Pattern Recognition and Machine Learning", by Springer, 2007
3. Amanda Casari, Alice Zheng, “Feature Engineering for Machine Learning”, O’Reilly, 2018.
4. Andreas Muller, "Introduction to Machine Learning with Python: A Guide for Data Scientists", Shroff/O'Reilly; First edition (2016)

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 3 Hrs**

Part A: 10 Questions of 2 marks each-No choice 20 Marks
Part B: 2 Questions from each unit with internal choice, each carrying 20 marks 80 Marks

20CP324T					Foundation of Internet of Things					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
3	0	0	3	3	25	50	25			100

COURSE OBJECTIVES

- Understand the fundamentals of Internet of Things and its related field
- Explain the components of IoT Architecture and platforms of IoT ecosystem
- Identify difference between M2M and IoT with SDN and NFV
- Developing IoT Systems using Raspberry Pi and Python
- Apply analytics and transform data to draw meaningful conclusions from IoT Data

UNIT 1 INTRODUCTION TO IOT **10 Hrs.**

IoT Basics, Physical and Logical Designs, Elements of IoT, Domain Specific IoTs - Home Automation, Smart Cities, Environment, Energy, Retail, Logistics, Agriculture, Industry, Health and Life Style.

UNIT 2 M2M AND IOT **10 Hrs.**

Introduction to M2M, Software Defined Networking and Network Function Virtualization for IoT, IoT Architecture -State of the Art – Introduction, State of the art, Architecture Reference Model- Introduction, Reference Model and architecture, IoT reference Model, IoT Reference Architecture.

UNIT 3 DEVELOPING IOT **10 Hrs.**

IoT Systems, IoT Physical Devices and Endpoints, Programming Raspberry Pi with Python, IoT Physical Servers and Cloud Offerings. Case Studies Illustrating IoT Design, Data Analytics for IoT, Internet of Things Privacy, Security and Governance. Data Aggregation for the IoT, Business Scope

UNIT 4 IOT AND HARDWRE DEVICES AND PROTOCOL **9 Hrs.**

Introduction to Arduino platform; Actuators, Sensors, Comparisons and use in IoT. Interfacing of camera, ethernet shield, xbee, wifi, bluetooth modules with the Arduino/Raspberry Pi platforms.

Max. 39 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to
CO1- Understand the applications of IoT and different verticals
CO2- Identify the basic components in IoT
CO3- Connect different devices to IoT.
CO4- Use of Devices, Gateways and Data Management in IoT.
CO5- Understand state of the art architecture in IoT and application of IoT in Industry 4.0.
CO6- Design IOT kind of Application for Different Domains.

TEXT/REFERENCE BOOKS

1. Arsheep Bahga and Vijay Madisetti., "Internet of Things: A Hands - on approach" by Orient Blackswan Private Limited - New Delhi
2. Pethuru Raj and Anupama C. Raman. The Internet of Things: Enabling technologies, platforms, and use cases. Auerbach Publications
3. Gaston C. Hillar, Internet of Things with Python, Packt Open Source

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100	**Exam Duration: 3 Hrs**
Part A: 10 Questions of 2 marks each-No choice	20 Marks
Part B: 2 Questions from each unit with internal choice, each carrying 20 marks	80 Marks

VIIth Semester

PANDIT DEENDAYAL ENERGY UNIVERSITY GANDHINAGAR

SCHOOL OF TECHNOLOGY

COURSE STRUCTURE FOR B TECH IN COMPUTER SCIENCE & ENGINEERING													
Semester VII			**B. Tech. in Computer Science & Engineering**										
Sr. No.	**Course/ Lab Code**	**Course/ Lab Name**	**Teaching Scheme**					**Examination Scheme**					
								Theory			**Practical**		**Total**
			L	**T**	**P**	**C**	**Hrs./Week**	**CE**	**MS**	**ES**	**LW**	**LE/ Viva**	**Marks**
1	20CP401T	Machine Learning	2	0	0	2	2	25	25	50	-	-	100
2	20CP401P	Machine Learning LAB	0	0	2	1	2	-	-	-	50	50	100
3	20CP403T	Green Computing	2	0	0	2	2	25	25	50	-	-	100
4	CE-4	Elective - 4	2	0	0	2	2	25	25	50	-	-	100
5	CE-4 LAB	Elective – 4 Lab	0	0	2	1	2	-	-	-	50	50	100
6	CE-5	Elective – 5	2	0	0	2	2	25	25	50	-	-	100
7	CE-5 LAB	Elective – 5 Lab	0	0	2	1	2	-	-	-	50	50	100
8	CE-6	Elective - 6	3	0	0	3	3	25	25	50	-	-	100
9	Project	Mini Project	0	0	4	2	4				50	50	100
		TOTAL	11	0	10	16	21						900

CE- Continuous Evaluation, MS-Mid Semester; ES – End Semester Exam

Professional Core Electives-4

Sl. No.	Course Code	Course Name	Track
1.	20CP405T	Natural Language Processing	Analytics
2.	20CP405P	Natural Language Processing Lab	Analytics
3.	20CP406T	Blockchain Technology	Security
4.	20CP406P	Blockchain Technology Lab	Security
5.	20CP407T	Computer Vision	Image Processing
6.	20CP407P	Computer Vision Lab	Image Processing
7.	20CP408T	Agile Methodology & DevOps	Software Engineering
8.	20CP408P	Agile Methodology & DevOps Lab	Software Engineering
9.	20CP409T	High Performance Computing	Parallel & Distributed Computing
10.	20CP409P	High Performance Computing Lab	Parallel & Distributed Computing

Professional Core Electives-5

Sl. No.	Course Code	Course Name	Track
1.	20CP410T	Wireless Sensor Networks	Network
2.	20CP410P	Wireless Sensor Networks Lab	Network
3.	20CP411T	Digital Forensics	Security
4.	20CP411P	Digital Forensics Lab	Security
5.	20CP412T	Pattern Recognition	Analytics
6.	20CP412P	Pattern Recognition Lab	Analytics
7.	20CP413T	Formal Methods & Verification	Software Engineering
8.	20CP413P	Formal Methods & Verification Lab	Software Engineering

Professional Core Electives-6

Sl. No.	Course Code	Course Name	Track
1.	20CP414	Social Network Analysis	Analytics
2.	20CP415	Service Oriented Architecture	Software Engineering
3.	20CP416	Biometrics	Security
4.	20CP417	Information Retrieval	Image Processing
5.	20CP418	Mobile Computing	Network

<Course Code>					Machine Learning					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
2	0	0	2	2	25	50	25	-	-	100

COURSE OBJECTIVES

- To introduce the basic concepts and techniques of Machine Learning
- To develop skills of using recent machine learning software for solving practical problems
- To gain experience of doing independent study and research

UNIT 1 INTRODUCTION **7 Hrs.**

Introduction: what is ML; Problems, data, and tools; Visualization, Linear regression; SSE; gradient descent; closed form; normal equations; features engineering, Overfitting and complexity; training, validation, test data

UNIT 2 SUPERVISED MACHINE LEARNING **6 Hrs.**

Classification problems; decision boundaries; nearest neighbour methods, Bayes optimal decisions , Naive Bayes conditional distribution, Logistic regression, online gradient descent, Neural Networks, Decision tree

UNIT 3 UNSUPERVISED MACHINE LEARNING **7 Hrs.**

Unsupervised learning: clustering, k-means, hierarchical agglomeration, Dimensionality Reduction-PCA,
VC-dimension, structural risk minimization; margin methods and support vector machines (SVM), Support vector machines and large-margin classifiers

UNIT 4 ENSEMBLE METHODS **6 Hrs.**

Rationale for ensemble method, methods for constructing an Ensemble classifier, Bias-Variance decomposition, Bagging, Boosting, Random forests, Empirical comparison among Ensemble methods.

Max. 26 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1- Describe Key concepts, tools and methods for machine learning using real data sets.
CO2- Explain a range of machine learning algorithms along with their strength & weaknesses
CO3- Associate machine learning problems corresponding to different applications.
CO4- Show appropriate machine learning techniques to solve problems of moderate complexity.
CO5- Compare the machine learning models based on their accuracy.
CO6- Categorize machine learning based solutions to the real-world problem, optimize the models learned and report on the expected accuracy that can be achieved by applying the models

TEXT/REFERENCE BOOKS

1. Tom M. Mitchell, “Machine Learning”, McGraw-Hill Education (INDIAN EDITION), 2013
2. Christopher M. Bishop, "Pattern Recognition and Machine Learning", by Springer, 2007
3. Amanda Casari, Alice Zheng, “Feature Engineering for Machine Learning”, O’Reilly, 2018.
4. Andreas Muller, "Introduction to Machine Learning with Python: A Guide for Data Scientists", Shroff/O'Reilly; First edition (2016)

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 3 Hrs**

Part A: 10 Questions of 2 marks each-No choice 20 Marks
Part B: 2 Questions from each unit with internal choice, each carrying 20 marks 80 Marks

<Course Code>					Machine Learning LAB					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
0	0	2	1	2	-	-	-	50	50	100

COURSE OBJECTIVES

- Learn different libraries support
- To develop skills of using recent machine learning software for solving practical problems
- To gain experience of data analysis and prediction

LIST OF PRACTICAL

Data sets can be taken from standard repositories (https://archive.ics.uci.edu/ml/datasets.html) or constructed by the students.Preferred Programming Language & Platform: Python/R, Tensorflow/ Matlab

1. Measurements of electric power consumption in one household with a one-minute sampling rate over a period of almost 4 years. Different electrical quantities and some sub-metering values are available. Perform 1. Load the data 2. Subset the data from the given dates 3. Create a histogram 4. Create a Time series 5. Create a plot for sub metering 6. Create multiple plot
2. To train and test a binary decision tree to detect breast cancer using real world data using Python /R. Pre whether the cancer is benign or malignant.
3. Implement linear regression with one variable to predict profits for a food truck.
4. Implement linear regression with multiple variables to predict the prices of houses.
5. Build a logistic regression model to predict whether a student gets admitted into a university. Implement 1. Visualize the data. 2. Implement Sigmoid function 3. Implement the cost function and grad for logistic regression 4. Evaluate Logistic Regression 5. Predict the results
6. To model a classifier for predicting whether a patient is suffering from any heart disease or not using Sup Vector Machine.
7. Apply k-Means algorithm to cluster a set of data stored in a .CSV file. Compare the results of these two algorit and comment on the quality of clustering
8. COURSE PROJECT: Students are required to submit a course project that involves development of a ML ba solution to a real world problem using sample, realistic data sets.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1- Analyze data sets, data types and data visualization tools.

CO2- Evaluate a range of machine learning algorithms along with their implementation.

CO3- Formulate machine learning problems corresponding to different applications.

CO4- Apply appropriate machine learning techniques to solve problems of moderate complexity.

CO5- Compare the machine learning models based on their accuracy.

CO6- Develop machine learning based solutions to the real-world problem, optimize the models learned and report on the expected accuracy that can be achieved by applying the models

TEXT/REFERENCE BOOKS

1. Andreas Muller, "Introduction to Machine Learning with Python: A Guide for Data Scientists", First edition (2016) Shroff/O'Reilly;
2. Andrew NG's online Course

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 2 Hrs**

Part A: Continuous Evaluation based on lab records and course project. 50 Marks

Part B: 2 Experiment conducted and Viva at final exam. 50 Marks

<Course Code>					Green Computing			
Teaching Scheme					Examination Scheme			
L	T	P	C	Hrs/Week	Theory			Total Marks
					MS	ES	IA	
2	0	0	2	2	25	50	25	100

COURSE OBJECTIVES

- To study the concepts related to Green IT.
- To understand Green devices and hardware along with software methods.
- To understand green enterprise activities, managing the green IT and various laws, standards, protocols along with outlook of green IT.

UNIT 1 INTRODUCTION TO GREEN COMPUTING **07 Hrs.**

Introduction, Environmental Concerns and Sustainable Development, Environmental Impacts of IT, Holistic Approach to Greening IT. Green Devices and Hardware with Green Software.

UNIT 2 GREEN ENTERPRISE **06 Hrs.**

Green Enterprises and the Role of IT - Introduction, Organization and Enterprise Greening, Information systems in Greening.

UNIT 3 MANAGING AND REGULATING GREEN IT **07 Hrs.**

Strategizing Green Initiatives, Implementation of Green IT, Communication and Social media. Regulating the Green IT: Laws, Standards and Protocols.

UNIT 4 GREEN IT CASE STUDIES **06 Hrs.**

Awareness to implementations, Research and Development directions. Worldwide Green IT Case Studies.

Max. 26 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1- Define Green IT with its different dimensions and Strategies.
CO2- Classify Green devices and hardware along with its green software methodologies.
CO3- Apply the various green enterprise activities, functions and their role with IT.
CO4- Analyze the concepts of how to manage the green IT with necessary components.
CO5- Select the various laws, standards and protocols for regulating green IT.
CO6- Discuss the various key sustainability and green IT trends.

TEXT/REFERENCE BOOKS

1. Toby J. Velete, Anthony T. Velete, Robert Elsenpeter, "Green IT – Reduce Your Information System's Environmental Impact While Adding to the Bottom Line", McGraw-Hill
2. John Lamb, "The Greening of IT – How Companies Can Make a Difference for the Environment", IBM Press
3. San Murugesan, G.R. Gangadharan, "Harnessing Green IT Principles and Practices", Wiley Publication
4. Richard Maltzman and David Shirley, "Green Project Management", CRC Press

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 3 Hrs**

Part A: 10 Questions of 2 marks each-No choice 20 Marks
Part B: 2 Questions from each unit with internal choice, each carrying 20 marks 80 Marks

<Course Code>					MINI PROJECT			
Teaching Scheme					Examination Scheme			
L	T	P	C	Hrs/Week	Review			Total Marks
					MS	ES	IA	
0	0	4	2	4	30	40	30	100

COURSE OBJECTIVES

- To offer students a glimpse into real world problems and challenges that need IT based solutions
- To enable students to define and design the precise IT based solution for a problem definition
- To encourage students to identify the various research challenges in the field of IT from the vast array of literature available
- To create awareness among the students of the characteristics of several domain areas where IT can be effectively used.
- To improve the team building, communication and management skills of the students

SCOPE OF THE WORK:

The students are expected to work on Mini Project in any of the CSE related areas. The different kinds of projects and the associated deliverables that could be accepted as the student's Comprehensive Project are as follows but not limited to:

- Software Development,
- System Design and Simulation,
- Hardware Development/Implementation,
- Embedded System (Software & Hardware combined) Development / Implementation,
- Theoretical Modelling,
- Design and Analysis,
- Technical Study including feasibility and comprehensive evaluation of technologies,
- Technical Survey and Modelling,
- Modules of a research and development project.

Max 52 Hrs

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 – Thoroughly study and analyze the problem definition

CO2 - Think innovatively on the development of components, products, processes or technologies in the engineering field

CO3 – Design and develop new concepts in multidisciplinary area.

CO4 - Apply the class-room learning to solve real world problems in the form of a team

CO5 – Experiment with different tools and technologies to implement the solution

CO6 - Prepare and present the technical reports/research papers.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 40

Part A: Project Report	10 Marks
Part B: Efforts and quality of work carried put	20 Marks
Part C: Presentation	10 Marks

Department Professional Electives- (VII Semester)

<Course Code>					Natural Language Processing					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
2	0	0	2	2	25	50	25	-	-	100

COURSE OBJECTIVES

- To understand the structure and basic operations of Natural Language Processing
- To understand the concepts of linguistic rules and machine learning approaches for classification
- To understand the syntax of Natural languages for grouping local words for parsing
- To study the various applications of NLP- machine translation, sentiment analysis, etc.

UNIT 1 BASIC STAGES OF NLP **6 Hrs.**

Introduction to NLP. Language Structure and Analyser - Overview of language, N-gram model, text classification. Words and their Analysis. Tokenization. Stemming. Morphological Analysis.

UNIT 2 LANGUAGE MODELLING **7 Hrs.**

Linguistics Fundamentals, Classical approaches to NLP with knowledge bases and linguistic rules; Data Driven and Machine Learning Approaches to NLP, Text classification evaluation, relation extraction

UNIT 3 POS TAGGING AND PARSING **7Hrs.**

POS Tagging, Syntax and Parsing, Shallow Parsing, Probabilistic Parsing, dependency parsing, Minimum edit distance, spelling correction, question answering system

UNIT 4 APPLICATIONS of NLP **6 Hrs.**

Machine Translation, Information Retrieval, Sentiment Analysis, Text Summarization

Max. 26 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1- Understand the natural language in the form of text and speech
CO2- Determine the structure of Natural Language
CO3- Evaluate the language model for different language
CO4- Apply information retrieval techniques to build search engine, question answering system
CO5- Develop POS tagger, parsers and shallow parser for different languages
CO6- Design text summarization, sentiment analysis, sarcasm detection

TEXT/REFERENCE BOOKS

1. Jurafsky, Daniel, and James H. Martin, Speech and Language Processing: An Introduction to Natural Language Processing, Speech Recognition, and Computational Linguistics, Prentice Hall, 2000.
2. Christopher D. Manning and Hinrich Schütze, Foundations of Statistical Natural Language Processing.
3. James Allen, Natural Language Understanding, Benjamin/Cummings, 1995.
4. Natural Language Processing: A Paninian Perspective by Akshar Bharati, Vineet Chaitanya and Rajeev Sangal

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 3 Hrs**

Part A: 10 Questions of 2 marks each-No choice 20 Marks
Part B: 2 Questions from each unit with internal choice, each carrying 20 marks 80 Marks

<Course Code>					Natural Language Processing LAB					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
0	0	2	1	2	-	-	-	50	50	100

COURSE OBJECTIVES

- To understand the structure and basic operations of Natural Language Processing
- To understand the concepts of linguistic rules and machine learning approaches for classification
- To understand the syntax of Natural languages for grouping local words for parsing
- To study the various applications of NLP- machine translation, sentiment analysis, etc.

LIST OF EXPERIMENTS:

1. Implementation of simple tokenizer using NLTK, TextBlob, Regular Expression
2. Implement Porter Stemmer
3. Implement Lemmatization
4. Implement POS Tagger
5. Implement Parser
6. Implement Language model
7. Implement minimum edit distance
8. Implement Text Summarizer System
9. Implement Sentiment Analyser system
10. Implement Sarcasm Detection System

COURSE OUTCOMES

On completion of the course, student will be able to
CO1- Understand the natural language in the form of text and speech
CO2- Determine the structure of Natural Language.
CO3- Evaluate the language model for different language
CO4- Apply information retrieval techniques to build search engine, question answering system
CO5- Develop POS tagger, parsers and shallow parser for different languages
CO6- Design text summarization, sentiment analysis, sarcasm detection

TEXT/REFERENCE BOOKS

1. Jurafsky, Daniel, and James H. Martin, Speech and Language Processing: An Introduction to Natural Language Processing, Speech Recognition, and Computational Linguistics, Prentice Hall, 2000.
2. Christopher D. Manning and Hinrich Schütze, Foundations of Statistical Natural Language Processing.
3. James Allen, Benjamin/Cummings, Natural Language Understanding, 1995. ACL

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 2 Hrs**

Part A: Continuous Evaluation based on lab records and course project. 50 Marks
Part B: 2 Experiment conducted and Viva at final exam. 50 Marks

<Course Code>					Blockchain Technology					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
2	0	0	2	2	25	50	25	-	-	100

COURSE OBJECTIVES

- To understand the concepts of distributed consensus and trust management.
- To understand the design principles of the block chains.
- To design and implement the distributed ledger and the smart contracts.

UNIT 1 INTRODUCTION TO BASICS OF BLOCKCHAIN **07 Hrs.**

Introduction to Blockchain, Cryptographic primitives used in Blockchain. Basic Distributed System concepts – distributed consensus and Byzantine fault-tolerant consensus methods.

UNIT 2 TYPES OF BLOCKCHAIN AND CRYPTOCURRENCY **06 Hrs.**

Proof-of-Work based consensus mechanisms, Proof of Stake based Chains, Types of Blockchain. Introduction to Crypto Currency, Crypto Currency as application of blockchain technology.

UNIT 3 SMART CONTRACT AND BLOCKCHAIN PLATFORM **07 Hrs.**

Blockchains with smart contracts - Ethereum platform and its smart contract mechanism.

UNIT 4 BLOCKCHAIN APPLICATIONS **06 Hrs.**

Blockchain Use Cases – Finance, Industry, E-Governance and other contract enforcement mechanisms. Security and Research Aspects in Blockchain.

Max. 26 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to
CO1- Define the role of Blockchain technology in digitization.
CO2- Illustrate the cryptographic concepts, and distributed concepts related to Blockchain technology.
CO3- Experiment with Ethereum framework for Blockchain development.
CO4- Analyze the need of Blockchain for real life system.
CO5- Choose the appropriate type of Blockchain, and framework according to Blockchain usecase.
CO6- Create the smart contracts and Blockchain for suitable system.

TEXT/REFERENCE BOOKS

1. Josh Thompson, 'Blockchain: The Blockchain for Beginnings, Guild to Blockchain Technology and Blockchain Programming', Create Space Independent Publishing Platform
2. Mark Gates, "Blockchain: Ultimate guide to understanding blockchain, bitcoin, cryptocurrencies, smart contracts and the future of money", WiseFox publishing.
3. Debajani Mohanty, "Ethereum for Architects and Developers: With Case Studies and Code Samples in Solidity", Apress.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 3 Hrs**

Part A: 10 Questions of 2 marks each-No choice 20 Marks
Part B: 2 Questions from each unit with internal choice, each carrying 20 marks 80 Marks

<Course Code>					Blockchain Technology LAB					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
0	0	2	1	2	-	-	-	50	50	100

COURSE OBJECTIVES

- To understand the concepts of distributed consensus and trust management.
- To understand the design principles of the block chains.
- To design and implement the distributed ledger and the smart contracts.

LIST OF EXPERIMENT

1. Download and Practice blockchain demonstration Tool.
2. Study various blockchain development platforms.
3. Install, Configure and Study Ethereum.
4. Practice cryptographic primitives required for blockchain development.
5. Install and learn smart contract tool.
6. Learn to create Wallet for blockchain applications.
7. Demonstrate smart contract integration on Ethereum platform.
8. Develop blockchain applications on suitable platform.

COURSE OUTCOMES

On completion of the course, student will be able to
CO1- Define the role of Blockchain technology in digitization.
CO2- Illustrate the cryptographic concepts, and distributed concepts related to Blockchain technology.
CO3- Experiment with Ethereum framework for Blockchain development.
CO4- Analyze the need of Blockchain for real life system.
CO5- Choose the appropriate type of Blockchain, and framework according to Blockchain usecase.
CO6- Create the smart contracts and Blockchain for suitable system.

TEXT/REFERENCE BOOKS

1. Josh Thompson, Blockchain: The Blockchain for Beginnings, Guild to Blockchain Technology and Blockchain Programming, Create Space Independent Publishing Platform, 2017
2. Mark Gates, Blockchain: Ultimate guide to understanding blockchain, bitcoin, cryptocurrencies, smart contracts and the future of money, WiseFox publishing, 2017
3. Debajani Mohanty, Ethereum for Architects and Developers: With Case Studies and Code Samples in Solidity, Apress, 2018

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 2 Hrs**

Part A: Evaluation Based on the class performance and Laboratory book 50 Marks
Part B: Viva Examination based conducted experiments 50 Marks

<Course Code>					Computer Vision					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
2	0	0	2	2	25	50	25	-	-	100

COURSE OBJECTIVES

- Insight into image and video formation design, modelling and analysis.
- Ability to work with features above the pixel level.
- Develop ability to understand the difference in theory and practice of Computer Vision.

UNIT 1 LOW LEVEL VISION **7 Hrs.**

Introduction, Pin hole camera, Intrinsic and extrinsic parameters of a camera, Geometric camera calibration, Color perception and representation, Color model and inference from color, Convolutions, Correlation filter as templates

UNIT 2 MID LEVEL VISION **6 Hrs.**

Segmentation by Clustering pixels, Segmentation by graphs Comparison of segmentation techniques, Hough Transform, Fitting lines and planes, Fitting using probabilistic models: EM algorithm, Motion Segmentation

UNIT 3 HIGH LEVEL VISION **7 Hrs.**

Revision Learning to classify: Error, loss, classification strategies, classifying images: Features, Single subjects, Object detection: Face, detecting humans, State of the art in Object detection: Mask RCNN, Object Recognition, Hidden Markov Model, Fitting an HMM with EM

UNIT 4 COMPUTER VISION USING DEEP LEARNING **6 Hrs.**

Convolutional Neural Networks architectures, Convolution and Pooling, training CNN, Data Augmentation and Transfer Learning, Recurrent Neural Networks, LSTM, GRU, Applications like Image Captioning, Visual Question answering, soft attention

Max. 26 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to
CO1- Define low level to high level vision
CO2- Explain use of computer vision in real time applications
CO3- Develop applications like classification, semantic segmentation, tracking, person identification
CO4- Compare computer vision fundamentals with other domains like natural language processing
CO5- Choose appropriate method for a given problem statement
CO6- Create models based on deep neural networks.

TEXT/REFERENCE BOOKS

1. Forsyth and Ponce, Computer Vision: A Modern Approach, , Pearson Education
2. Simon Prince, Computer Vision: Models, Learning, and Interface, Cambridge University Press,
3. Richard Szeliski, Computer Vision: Algorithms and Applications, Springer,
4. Suetens, P. Fundamentals of Medical Imaging, Cambridge University Press

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 3 Hrs**

Part A: 10 Questions of 2 marks each-No choice 20 Marks
Part B: 2 Questions from each unit with internal choice, each carrying 20 marks 80 Marks

<Course Code>					Computer Vision LAB					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
0	0	2	1	2	-	-	-	50	50	100

COURSE OBJECTIVES

- Insight into image and video formation design, modelling and analysis.
- Ability to work with features above the pixel level.
- Develop ability to understand the difference in theory and practice of Computer Vision.

LIST OF EXPERIMENT

1. Digital Video Stabilization through curve warping techniques
2. Automatic Target Detection and tracking for thermal image sequences
3. Human Activity analysis based on pose detection
4. Action Recognition in Videos
5. Multiple objects tracking using multiple cameras
6. Camera placement and network surveillance
7. Analysis and annotation of cricket videos
8. Foreground extraction and object tracking, Human activity representation, analysis, and recognition, Multi Camera Pan-Tilt Surveillance Networks, Unsupervised Object Categorization from Surveillance Videos, Visual Recognition of Hand Gestures

COURSE OUTCOMES

On completion of the course, student will be able to
CO1- Define low level to high level vision
CO2- Explain use of computer vision in real time applications
CO3- Develop applications like classification, semantic segmentation, tracking, person identification
CO4- Compare computer vision fundamentals with other domains like natural language processing
CO5- Choose appropriate method for a given problem statement
CO6- Create models based on deep neural networks.

TEXT/REFERENCE BOOKS

1. Forsyth and Ponce, Computer Vision: A Modern Approach, , Pearson Education
2. Simon Prince, Computer Vision: Models, Learning, and Interface, Cambridge University Press,
3. Richard Szeliski, Computer Vision: Algorithms and Applications, Springer,
4. Suetens, P. Fundamentals of Medical Imaging, Cambridge University Press

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 2 Hrs**

Part A: Evaluation Based on the class performance and Laboratory book 50 Marks
Part B: Viva Examination based conducted experiments 50 Marks

<Course Code>					Agile Methodology & DevOps					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
2	0	0	2	2	25	50	25	-	-	100

COURSE OBJECTIVES

- To learn the differences between conventional and agile approaches
- To plan increment and release cycles
- To apply agile principles to a range of decision possibilities
- learn DevOps for CI/CD using containers, container orchestration and pipelines

UNIT 1 INTRODUCTION TO AGILE APPROACH **7 Hrs.**

Agile versus traditional method comparisons and process tailoring, Software Process Models – overview, Various Agile methodologies - Scrum, XP, Lean, and Kanban, Agile Manifesto, Scrum: Scrum process, roles, events and artifacts, Product Inception, stakeholders, initial backlog creation

UNIT 2 TOOLS AND FRAMEWORKS **6 Hrs.**

Story mapping, acceptance criteria, sprints, Tools: Agile tracking tools such as JIRA; Scaled agile frameworks: SAFe, Scrum@Scale, Disciplined Agile

UNIT 3 TESTING, PLANNING, MANAGEMENT AND CONTROL **7 Hrs.**

Tools - Selenium Agile Testing: Principles of agile testers; The agile testing quadrants, Test automation pyramid Sprint, Planning and reviews, Create product roadmap Sprints, Planning Meeting, Progress Tracking, Velocity Tracking, Monitoring and Controlling.

UNIT 4 DEVOPS **6 Hrs.**

Continuous Integration and Continuous Delivery, Dockers and Kubernetes for application development and deployment, Checking build status, Fully Automated Deployment; Continuous monitoring with Nagios, Introduction to DevOps on Cloud

Max. 26 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1- compare the differences between Agile and other project management methodologies.
CO2 - interpret and apply various principles, phases and activities of the Scrum methodology.
CO3 - learn the basics of SAFe for scaled agile.
CO4 - Understand Agile Testing principles for real life situations.
CO5 - Identify and use various tools for Agile development and CI/CD.
CO6 - Understand and implement DevOps principles for CI/CD.

TEXT/REFERENCE BOOKS

1. J Highsmith, Agile Project Management: Creating Innovative Products, Addison-Wesley Professional
2. A. Stellman, J. Greene, Learning Agile: Understanding Scrum, XP, Lean, and Kanban, O Reilly
3. S. Vadapalli, DevOps: Continuous Delivery, Integration, and Deployment with DevOps: Dive, Packt
4. L. Crispin, J. Gregory, Agile Testing: A Practical Guide For Testers And Agile Teams, Pearson.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 3 Hrs**

Part A: 10 Questions of 2 marks each-No choice 20 Marks
Part B: 2 Questions from each unit with internal choice, each carrying 16 marks 80 Marks

<Course Code>					Agile Methodology & DevOps LAB					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
0	0	2	1	2	--	--	--	50	50	100

COURSE OBJECTIVES

- To explain the differences between conventional and agile approaches
- To plan increment and release cycles
- To apply agile principles to a range of decision possibilities
- To learn DevOps for CI/CD using containers, container orchestration and pipelines

LIST OF EXPERIMENT

The tools and frameworks related to agile methodology such as scrum, kanaban, XP (eXtreme Programming) and DevOps, will be explained to the students.

1. Understand the background and driving forces for taking an Agile Approach to Software Development. , Understand the business value of adopting agile approach.
2. Understand agile development practices , Drive Development with Unit Test using Test Driven Development.
3. Apply Design principle and Refactoring to achieve agility , To study automated build tool.
4. To study version control tool. , To study Continuous Integration tool.
5. Perform Testing activities within an agile project.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1- Implement the Agile management methodologies.

CO2 - Apply the Scrum methodology for software development

CO3 – Understand the basics of SAFe for scaled agile.

CO4 – Implement the Agile Testing principles in solutions for real life problems.

CO5 – Work with various tools for Agile development and CI/CD.

CO6 - Implement DevOps principles for CI/CD.

TEXT/REFERENCE BOOKS

1. J Highsmith, Agile Project Management: Creating Innovative Products, Addison-Wesley, 2004
2. A. Stellman et al., Learning Agile: Understanding Scrum, XP, Lean, and Kanban, O Reilly, 2014
3. S. Vadapalli et al., DevOps: Continuous Delivery, Integration, and Deployment with DevOps, Packt Publication, 2018
4. L. Crispin, Agile Testing: A Practical Guide For Testers And Agile Teams, Pearson, 2010

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 2 Hrs**

Part A: Evaluation Based on the class performance and Laboratory book 50 Marks

Part B: Viva Examination based conducted experiments 50 Marks

<Course Code>					High Performance Computing					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
2	0	0	2	2	25	50	25	-	-	100

COURSE OBJECTIVES

- Provide systematic and comprehensive treatment of the hardware and the software high performance techniques involved in current day computing.
- Introduce the fundamentals of high performance computing with the graphics processing units and many integrated cores using their architectures and corresponding programming environments.
- Introduce the learner to fundamental and advanced parallel algorithms through the GPU and XEON-Phi programming environments

UNIT 1 PARALLEL PROCESSING CONCEPTS OVERVIEW **7 Hrs.**

Levels of parallelism (instruction, transaction, task, thread, memory, function), Models (SIMD, MIMD, SIMT, SPMD, Dataflow Models, Demand-driven Computation etc.), Architectures: N-wide superscalar architectures, multi-core, multi-threaded

UNIT 2 PARALLEL PROGRAMMING WITH CUDA **7 Hrs.**

Processor Architecture, Interconnect, Communication, Memory Organization, and Programming Models in high performance computing architectures: (Examples: IBM CELL BE, Nvidia Tesla GPU, Intel Larrabee Microarchitecture and Intel Nehalem microarchitecture),

UNIT 3 POWER AWARE COMPUTING AND COMMUNICATION **6 Hrs.**

Introduction to Many Integrated Cores. MIC, Xeon Phi architecture. Memory hierarchy and transaction specific memory design, Thread Organization, Power-aware Processing Techniques, Power-aware Memory Design, Power-aware Interconnect Design, Software Power Management

UNIT 4 GPGPU & XEON PHI PROGRAMMING **6 Hrs.**

Vector Addition, Matrix Multiplication algorithms. 1D, 2D, and 3D, Stencil Operations. Image Processing algorithms – Image Blur, Grayscaling. Histogramming, Convolution, Scan, Reduction techniques

Max. 26 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1- Formulate high performance versions of standard single threaded algorithms
CO2- Demonstrate the architectural features in the GPU and MIC hardware accelerators.
CO3- Design programs to extract maximum performance in a multicore, shared memory execution environment
CO4-Deploy large scale parallel programs on tightly coupled parallel systems using the message passing paradigm.
CO5- Evaluate power, challenges from the perspectives of Programming, Memory, Computational, Processor Architecture.
CO6- Identify the current research work in High performance Computing and Architecture.

TEXT/REFERENCE BOOKS

1. George S. Almasi and Alan Gottlieb, Highly Parallel Computing,
2. Rezaur Rahman, Intel Xeon Phi Coprocessor Architecture and Tools, Apress Open, 2013
3. Wen-Mei W Hwu, David B Kirk, Programming Massively Parallel Processors A Hands-on Approach, Morgann Kaufmann, 3e
4. Kai Hwang,Advanced, Computer Architecture: Parallelism, Scalability, Programmability, McGraw Hill 1993

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 3 Hrs**

Part A: 10 Questions of 2 marks each-No choice 20 Marks
Part B: 2 Questions from each unit with internal choice, each carrying 20 marks 80 Marks

<Course Code>					High Performance Computing LAB					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
0	0	2	1	2	-	-	-	50	50	100

COURSE OBJECTIVES

- Understand the working of high-performance computing with the graphics processing units and many integrated cores using their architectures and corresponding programming environments.
- Implement parallel algorithms through the GPU and XEON Phi programming environments.
- Understand about clusters

LIST OF PRACTICAL

Practical list should be prepared by Course Instructor based on the content of the subject.
Preferred Programming Language & Platform**:** CUDA, Xeon Phi, OpenMP, and MPI programming.

Sl. No.	Title	Contents
1.	**GPU Programming**	Device Query, Vector Addition, Matrix Multiplication, Tiled Matrix Multiplication, Picture Scaling, Image Blur, Image Grayscaling. 1D, 2D, and 3D Stencil Operations. Histogramming, Convolution, Scan, Reduction.
2.	**Xeon Phi Programming**	Vector Addition, Matrix Multiplication, Tiled Matrix Multiplication, Picture Scaling, Image Blur, Image Grayscaling. 1D, 2D, and 3D Stencil Operations. Histogramming, Convolution, Scan, Reduction.
3.	**OpenMP programming**	Matrix Multiply, Calculation of pi using worksharing and reduction, Producer consumer problem,
4.	**MPI programming**	DAXPY, Calculation of π - MPI Bcast and MPI Reduce, Ocean Kernel, Reduction example, Collective Communication - Scatter – Gather, MPI Derived Datatypes, Matrix Multiplication on a Cartesian Grid (2D Mesh) using Cannon's Algorithm, Martix Multiplication using Cannon's Algorithm for Large Matrices.

COURSE OUTCOMES

On completion of the course, student will be able to
CO1- Formulate high performance versions of standard single threaded algorithms
CO2- Demonstrate the architectural features in the GPU and MIC hardware accelarators.
CO3- Design programs to extract maximum performance in a multicore, shared memory execution environment processor.
CO4- Deploy large scale parallel programs on tightly coupled parallel systems using the message passing paradigm.
CO5- Compare performance metrics from the perspectives of Programming, Memory, Computational, Processor Architecture.
CO6- Deploy Components -off-the-shelf (COTS) to enable High performance computing environment.

TEXT/REFERENCE BOOKS

1. Rezaur Rahman, Intel Xeon Phi Coprocessor Architecture and Tools, Apress Open, 2013
2. Wen-Mei W Hwu, David B Kirk, Programming Massively Parallel Processors A Hands-on Approach, Morgann Kaufmann, 3e

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 2 Hrs**

Part A: Continuous Evaluation based on lab records and course project. 50 Marks
Part B: 2 Experiment conducted and Viva at final exam. 50 Marks

<Course Code>					Wireless Sensor Networks					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/ Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
2	0	0	2	2	25	50	25	-	-	100

COURSE OBJECTIVES

- To understand the concepts of sensor networks.
- To understand the MAC and transport protocols for Ad Hoc networks.
- To understand the various routing protocols in sensor networks.
- To understand the applications and security of Adhoc and sensor networks.
- To critique protocol designs in terms of their energy-efficiency.

UNIT 1 INTRODUCTION **7 Hrs.**

Key definitions of sensor networks, Advantages of sensor Networks, Unique constraints an challenges, Driving Applications, Enabling Technologies for Wireless Sensor Networks.

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 2 MAC PROTOCOLS **7 Hrs.**

Issues in Designing a MAC protocol for Ad Hoc Wireless Networks, Design goals of a MAC Protocol for Ad Hoc Wireless Networks, Classifications of MAC Protocols, Contention-Based Protocols, Contention-Based Protocols with reservation Mechanisms, Contention-Based MAC Protocols with Scheduling Mechanisms, MAC Protocols that use Directional Antennas, Other MAC Protocols.

UNIT 3 ROUTING PROTOCOLS **6 Hrs.**

Introduction, Issues in Designing a Routing Protocol for Ad Hoc Wireless Networks, Classification of Routing Protocols, Table-Driven Routing Protocols, On- Demand Routing Protocols, Hybrid Routing Protocols, Routing Protocols with Efficient Flooding Mechanisms, Hierarchical Routing Protocols, Power-Aware Routing Protocols, Proactive Routing.

UNIT 4 TRANSPORT LAYER AND SECURITY CHALLENGES **6 Hrs.**

Introduction to transport layer protocols, Issues in Designing a Transport Layer Protocol for Ad Hoc Wireless Networks, Design Goals of a Transport Layer Protocol for Ad Hoc Wireless Networks, Classification of Transport Layer Solutions, TCP Over Ad Hoc Wireless Networks, Other Transport Layer Protocol for Ad Hoc Wireless Networks. Security in Ad Hoc Wireless Networks, Network Security Requirements, Issues and Challenges in Security Provisioning, Network Security Attacks, Key Management, Secure Routing in Ad Hoc Wireless Networks.

Max. 26 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1- Understand and explain the concept of wireless sensor networks and their applications.
CO2- Understand typical node and network architectures.
CO3- Critique protocol design in terms of their energy-efficiency.
CO4- Design and implement sensor network protocol in different environment.
CO5- Setup and evaluate measurements of protocol performance in wireless sensor networks.
CO6- Understand security issues in wireless sensor networks.

TEXT/REFERENCE BOOKS

1. C. Siva Ram Murthy and B.S.Manoj, Ad-Hoc Wireless Networks: Architectures and Protocols- PHI.
2. Jagannathan Sarangapani, Wireless Ad-hoc and Sensor Networks: Protocols, Performance and Control- CRC Press.
3. Holger Karl & Andreas Willig, "Protocols And Architectures for Wireless Sensor Networks", John Wiley.
4. Kazem Sohraby, Daniel Minoli, & Taieb Znati, "Wireless Sensor Networks- Technology, Protocols, and Applications", John Wiley.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 3 Hrs**

Part A/Question: 10 Questions of 2 marks each-No choice 20 Marks

Part B/Question: 2 Questions from each unit with internal choice, each carrying 20 marks 80 Marks

<Course Code>					Wireless Sensor Networks LAB					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
0	0	2	1	2	-	-	-	50	50	100

COURSE OBJECTIVES

- To understand the concepts of sensor networks.
- To apply the protocols for sensor networks.
- To develop various applications adhoc and sensor networks.

LIST OF EXPERIMENT

Practical list should be prepared based on the content of the subject and following guidelines should be useful. Experiment Sessions using Programming would be based on following topics:

1. Wireless sensor network simulation.
2. Network Simulator installation.
3. Script for transmission between mobile nodes.
4. Script for sensor nodes with different parameters.
5. Script for UDP and CBR traffic in WSN nodes.
6. Script for TCP and CBR traffic in WSN nodes.
7. Study and modification of routing protocol in NS2 for AODV protocol.
8. Study and modification of routing protocol in NS2 for DSR protocol.
9. Study and modification of routing protocol in NS2 for TORA protocol.
10. Study other wireless sensor network simulators.
11. Other experiments, if necessary.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1- Understand the wireless sensor networks through simulations.
CO2- Understand typical network architectures through simulations.
CO3- Critique protocol design in terms of their energy-efficiency.
CO4- Design and implement sensor network protocol in different environments.
CO5- Setup and evaluate measurements of protocol performance in wireless sensor networks.
CO6- Address security issues in wireless sensor networks.

TEXT/REFERENCE BOOKS

1. C. Siva Ram Murthy and B.S.Manoj, Ad-Hoc Wireless Networks: Architectures and Protocols- PHI.
2. Jagannathan Sarangapani, Wireless Ad-hoc and Sensor Networks: Protocols, Performance and Control- CRC Press.
3. Holger Karl & Andreas Willig, “Protocols And Architectures for Wireless Sensor Networks”, John Wiley.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100	**Exam Duration: 2 Hrs**
Continuous evaluation	50 marks
End semester examination and Viva-voce	50 marks

<Course Code>					Digital Forensics					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
2	0	0	2	2	25	50	25	-	-	100

COURSE OBJECTIVES

- To learn fundamental concepts of Digital Forensics
- To study various acquisition concepts
- To apply the above concepts to crime incidents
- To utilize various digital resources for identification purpose

UNIT 1 INTRODUCTION **7 Hrs.**

Computer forensics fundamentals, Benefits of forensics, computer crimes, computer forensics evidence and courts. Understanding Computing Investigations. Sources of Digital/Electronic Evidence: Storage devices, Mobile phones, Ipods, internet, wifi networks

6 Hrs.

UNIT 2 DATA ACQUISITION

Understanding storage formats and digital evidence, determining the best acquisition method, acquisition tools, validating data acquisitions, remote network acquisition tools.

UNIT 3 CRIME AND EVIDENCE PROCESSING **7 Hrs.**

Processing crimes and incident scenes, securing a computer incident or crime, seizing digital evidence at scene, storing digital evidence, obtaining digital hash, reviewing case.

UNIT 4 CURRENT COMPUTER FORENSIC TOOLS **6 Hrs.**

Software, hardware tools, validating and testing forensic software, addressing data-hiding techniques, performing remote acquisitions, E-Mail investigations- investigating email crime and violations, understanding E-Mail servers, specialized E-Mail forensics tool.

Max. 26 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to
CO1- Understand need of digital forensics
CO2- Explain various digital investigation devices.
CO3- Apply digital forensics solutions
CO4- Compare various forensics tools
CO5- Determine cyber laws for the given problem
CO6- Create digital forensic solutions to real time problems

TEXT/REFERENCE BOOKS

1. Warren G. Kruse II and Jay G. Heiser, "Computer Forensics: Incident Response Essentials", Addison Wesley
2. Nelson, B, Phillips, A, Enfinger, F, Stuart, C., "Guide to Computer Forensics and Investigations, 2nd ed., Thomson Course Technology
3. Vacca, J, Computer Forensics, Computer Crime Scene Investigation, Charles River Media

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 3 Hrs**

Part A: 10 Questions of 2 marks each-No choice 20 Marks
Part B: 2 Questions from each unit with internal choice, each carrying 20 marks 80 Marks

<Course Code>					Digital Forensics LAB					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
0	0	2	1	2	-	-	-	50	50	100

COURSE OBJECTIVES

- To learn fundamental concepts of Digital Forensics
- To study various acquisition concepts
- To apply the above concepts to crime incidents
- To utilize various digital resources for identification purpose

LAB EXPERIMENT

1. Study of a software application which will analyze CDR, Cell Tower Dump & IPDR/CDR in VoIP data in different file formats like (.xlsx/.csv/.txt etc.) as input
2. Study of a software tool/framework for tracking and tracing the source of VOIP calls
3. Study of a Digital Solution(s) to identify Proxy/VPN enabled systems along with source IP (IPV4/IPV6) address tracking and tracing features
4. Study of a Identification of Morphed/Edited/Fabricated portion from given Video/Audio/Image files as investigation input
5. Study of a Solutions for Handling of Anti Forensic Issues
6. Study of a Data Recovery from Computer Systems, Mobile Devices and other electronic peripherals
7. Study of a Profile Generation using OSINT Techniques
8. Study of a Tracking & Tracing Fake Profile(s) & Fake News
9. Study of a Deep and Darknet Monitoring Capabilities

COURSE OUTCOMES

On completion of the course, student will be able to
CO1- Understand need of digital forensics
CO2- Explain various digital investigation devices.
CO3- Apply digital forensics solutions
CO4- Compare various forensics tools
CO5- Determine cyber laws for the given problem
CO6- Create digital forensic solutions to real time problems

TEXT/REFERENCE BOOKS

1. Warren G. Kruse II and Jay G. Heiser, "Computer Forensics: Incident Response Essentials", Addison Wesley
2. Nelson, B, Phillips, A, Enfinger, F, Stuart, C., "Guide to Computer Forensics and Investigations, 2nd ed., Thomson Course Technology
3. Vacca, J, Computer Forensics, Computer Crime Scene Investigation, Charles River Media

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 2 Hrs**

Part A: Evaluation Based on the class performance and Laboratory book 50 Marks
Part B: Viva Examination based conducted experiments 50 Marks

<Course Code>					Pattern Recognition					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
2	0	0	2	2	25	50	25	-	-	100

COURSE OBJECTIVES

- To equip students with basic mathematical and statistical techniques commonly used in pattern recognition.
- To introduce a variety of pattern recognition algorithms
- To develop skills of using pattern recognition methods on real world data

UNIT 1 INTRODUCTION TO PATTERN RECOGNITION **7 Hrs.**

Mathematical Foundations, Tree Classifiers: Decision Trees: CART, C4.5, ID3, Random Forests, Bayes Decision Theory

6 Hrs.

UNIT 2 LINEAR DISCRIMINANT

Separability, Perceptrons, Support Vector Machines, surfaces. Normal density and discriminant functions. Discrete features. Non-metric methods for pattern classification

6 Hrs.

UNIT 3 UNSUPERVISED METHODS

Principal component analysis - it relationship to eigen analysis. Fisher discriminant analysis, Local linear Embeddings, Clustering, Classifier Ensemble Methods: Bagging, Boosting/AdaBoost

7 Hrs.

UNIT 4 GRAHPHICAL MODEL

Bayesian Network, Sequential Models- Hidden Markov Models (HMMs). Discrete HMMs. Continuous HMMs.
Algorithm Independent Topics: No Free Lunch Theorem, Ugly Duckling Theorem, Bias-Variance Dilemma, Jacknife and Bootstrap Methods

Max. 28 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to
CO1- Understand the mathematical and statistical techniques commonly used in pattern recognition
CO2- Understand the concept of a pattern and the basic approach to the development of pattern recognition.
CO3- Apply both supervised and unsupervised classification methods to detect and characterize patterns in real-world data.
CO4- Interpret relevant information to design a simple pattern recognition systems.
CO5- Evaluate the result from a simple pattern recognition system.
CO6- Develop prototype pattern recognition algorithms that can be used to study algorithm behavior and performance against real-world multivariate data

TEXT/REFERENCE BOOKS

1. R.O.Duda, P.E.Hart and D.G.Stork, Pattern Classification, John Wiley, 2001 S.Wasserman, K.Faust: Social Network Analysis: Methods and Applications, Cambridge Univ
2. S.Theodoridis and K.Koutroumbas, Pattern Recognition, 4th Ed., Academic Press, 2009
3. C.M.Bishop, Pattern Recognition and Machine Learning, Springer, 2006

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 3 Hrs**

Part A: 10 Questions of 2 marks each-No choice 20 Marks
Part B: 2 Questions from each unit with internal choice, each carrying 20 marks 80 Marks

<Course Code>					Pattern Recognition LAB					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
0	0	2	1	2	-	-	-	50	50	100

COURSE OBJECTIVES

- To equip students with basic mathematical and statistical techniques commonly used in pattern recognition.
- To introduce a variety of pattern recognition algorithms
- To develop skills of using pattern recognition methods on real world data

List of Practical:
Practical list should be prepared by Course Instructor based on the content of the subject. Data sets can be taken from standard repositories (https://archive.ics.uci.edu/ml/datasets.html) or constructed by the students.

Preferred Programming Language & Platform: MATLAB and Scientific Python (SciPy, NumPy)

1. Implementation of Edge Detection, Boundary Detection, Feature Extraction.
2. Implementation of Clustering and Classification Techniques.
3. Implementation of Bayesian Learning, Parameter Estimation, Pattern Matching.
4. Implementation of Supervised and Un-supervised Learning using Neural Network

COURSE OUTCOMES
On completion of the course, student will be able to
CO1- Understand the mathematical and statistical techniques commonly used in pattern recognition
CO2- Understand the concept of a pattern and the basic approach to the development of pattern recognition.
CO3- Apply both supervised and unsupervised classification methods to detect and characterize patterns in real-world data.
CO4- Interpret relevant information to design a simple pattern recognition system.
CO5- Evaluate the result from a simple pattern recognition system.
CO6- Develop prototype pattern recognition algorithms that can be used to study algorithm behaviour and performance against real-world multivariate data

TEXT/REFERENCE BOOKS

1. Lab Manual-Pattern Recognition Laboratory
2. R.O.Duda, P.E.Hart and D.G.Stork, Pattern Classification, John Wiley, 2001
3. S.Wasserman, K.Faust: Social Network Analysis: Methods and Applications, Cambridge University Press
4. https://nptel.ac.in/courses/117108048/

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 2 Hrs**

Part A: Continuous Evaluation based on lab records and course project.	50 Marks
Part B: 2 Experiment conducted and Viva at final exam.	50 Marks

<Course Code>					Formal Methods and Verification					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
2	0	0	2	2	25	50	25	-	-	100

COURSE OBJECTIVES

- Understand how formal methods (FM) help produce high-quality software.
- Learn about formal modelling and specification languages.
- Write and understand formal requirement specifications
- Use automated and interactive tools to validate models and code.

UNIT 1 BASICS OF FORMAL VERIFICATION **07 Hrs.**

Introduction to propositional and predicate logic as formal language. Introduction to Finite State Machines, Linear time properties, Linear Temporal Logic, Computation Tree Logic. Introduction to different tools/techniques

UNIT 2 MODEL CHECKING **06 Hrs.**

Introduction to Model Checking. Techniques for Model Checking. Bounded Model Checking, Equivalence and Abstraction, Partial Order Reduction.

UNIT 3 HYBRID SYSTEM MODELLING **07 Hrs.**

Satisfiability Solvers and satisfiability Modulo Theories. Modelling of concurrent systems, timed systems, hybrid systems and probabilistic systems.

UNIT 4 SEMANTIC WEB CASE STUDIES **06 Hrs.**

Verification tools - implementations and case-studies. Software Tools: Popular formal methods tools such as SPIN, and PRISM.

Max. 26 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1- Define the logic as formal language for system modelling and system specification.
CO2- Translate the system and system specification into formal model for verification.
CO3- Develop the model of deterministic and probabilistic system for verification.
CO4- Analyze the correctness of given system for verification.
CO5- Evaluate the reachability and coverability of asynchronous systems.
CO6- Choose the appropriate techniques and tool for system verification.

TEXT/REFERENCE BOOKS

1. M. Huth and M. Ryan, "Logic in Computer Science: Modeling and Reasoning about Systems", Cambridge University Press.
2. C. Baier and J.-P. Katoen. Principles of Model Checking. The MIT Press.
3. Gerard Holzmann, The SPIN Model Checker: Primer and Reference Manual, The SPIN Model Checker: Primer and Reference Manual.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 3 Hrs**

Part A: 10 Questions of 2 marks each-No choice 20 Marks
Part B: 2 Questions from each unit with internal choice, each carrying 20 marks 80 Marks

<Course Code>					Formal Methods and Verification LAB					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
0	0	2	1	2	-	-	-	50	50	100

COURSE OBJECTIVES

- Understand how formal methods help produce high-quality software.
- Learn about formal modelling and specification languages.
- Write and understand formal requirement specifications
- Use automated and interactive tools to validate models and code.

LIST OF EXPERIMENT

1. Study and practice predicate logic.
2. Learn to write property specification with the help of temporal logic.
3. Download and Practice Formal Verification tool SPIN.
4. Learn modelling of system in SPIN model checker.
5. Verify authentication protocols with SPIN.
6. Practice with Formal Verification tool PRISM.
7. Learn modelling of system in PRISM probabilistic model checker.
8. Perform probabilistic model checking of hybrid systems with PRISM.

COURSE OUTCOMES

On completion of the course, student will be able to
CO1- Define the logic as formal language for system modelling and system specification.
CO2- Translate the system and system specification into formal model for verification.
CO3- Develop the model of deterministic and probabilistic system for verification.
CO4- Analyze the correctness of given system for verification.
CO5- Evaluate the reachability and coverability of asynchronous systems.
CO6- Choose the appropriate techniques and tool for system verification.

TEXT/REFERENCE BOOKS

1. M. Huth and M. Ryan, Logic in Computer Science: Modeling and Reasoning about Systems, Cambridge University Press.
2. C. Baier and J.-P. Katoen. Principles of Model Checking. The MIT Press.
3. Gerard Holzmann, The SPIN Model Checker: Primer and Reference Manual, Addision Wesley

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 2 Hrs**

Part A: Evaluation Based on the class performance and Laboratory book 50 Marks
Part B: Viva Examination based conducted experiments 50 Marks

<Course Code>					Social Network Analysis					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
3	0	0	3	3	25	50	25	-	-	100

COURSE OBJECTIVES

- To know basic notation and terminology used in network science
- To Understand basic principles behind social network analysis algorithms
- To develop skills of using social network analysis software on real world data
- Be capable of analysing real work networks

UNIT 1 INTRODUCTION **8 Hrs.**

Social Networks: An Introduction; Types of Networks**:** General Random Networks, Small World Networks, Scale-Free Networks; Examples of Information Networks; Network Centrality Measures; Strong and Weak ties; Homophily, **Walks:** Random walk-based proximity measures, Other graph-based proximity measures. Clustering with random-walk based measures

10 Hrs.

UNIT 2 COMMUNITY DETECTION

Community Detection Algorithms: The Kernighan-Lin algorithm, Agglomerative/Divisive algorithms, Spectral Algorithms, Multi-level Graph partitioning, Markov Clustering; Community Discovery in Directed Networks , Community Discovery in Dynamic Networks, Community Discovery in Heterogeneous Networks, Evolution of Community.

12 Hrs.

UNIT 3 LINK PREDICTION

Feature based Link Prediction, Bayesian Probabilistic Models, Probabilistic Relational Models, Linear Algebraic Methods: Network Evolution based Probabilistic Model, Hierarchical Probabilistic Model, Relational Bayesian Network. Relational Markov Network.

9 Hrs.

UNIT 4 EVENT DETECTION AND INFLUENCE ANALYSIS

Event Detection: Classification of Text Streams, Event Detection and Tracking: Bag of Words, Temporal, location, ontology based algorithms. Evolution Analysis in Text Streams, Sentiment analysis, SNA in real world: FB/VK and Twitter analysis, **Social Influence Analysis:** Influence measures, Social Similarity - Measuring Influence, Influencing actions and interactions. Influence maximization.

Max. 39 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1- Understand Key concepts of social network, types of network and Walks.
CO2- Describe community detection algorithms in dynamic, directed and heterogeneous network.
CO3- Apply linear algebraic methods for link prediction.
CO4- Perform sentiment analysis on text Streams.
CO5- Compare the social influence measures based on actions and interactions.
CO6- Analyse real network to solve real world problem

TEXT/REFERENCE BOOKS

1. David Easley, Jon Kleinberg: Networks, Crowds and Markets: Reasoning about a highly connected world, Cambridge University Press 2010
2. S. Wasserman, K. Faust: Social Network Analysis: Methods and Applications, Cambridge University

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 3 Hrs**

Part A: 10 Questions of 2 marks each-No choice 20 Marks

Part B: 2 Questions from each unit with internal choice, each carrying 20 marks 80 Marks

<Course Code>					INFORMATION RETRIEVAL SYSTEM					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
3	0	0	3	3	25	50	25	-	-	100

COURSE OBJECTIVES

- To provide an overview of Information Retrieval.
- To provide comprehensive details about various Evaluation methods of IR System.
- To understand Crawling system of web search.
- To understand commercial application of web and retrieval system

UNIT 1 INTRODUCTION OF IR **10 Hrs.**

History and components of IR, Characterizing the web, Information retrieval process, Indexing, Information retrieval model, Boolean retrieval model, Ranked retrieval model

UNIT 2 DICTIONARY AND POSTINGS **14 Hrs.**

Tokenization, Stop words, Stemming, Inverted index, Skip pointers, Phrase queries Tolerant Retrieval Wild card queries, Permuterm index, Bigram index, Jaccard coefficient, Soundex, Distributed inverted index, Inverted index compression.

UNIT 3 EVALUATION MEASURE AND LATENT SEMANTIC INDEXING **6 Hrs.**

Precision, Recall, F-measure, Evaluation problems, Eigen vectors, Singular value decomposition, Lowrank approximation, Problems with Lexical Semantics

UNIT 4 QUERY EXPANSION **9 Hrs.**

Relevance feedback, Rocchio algorithm, Probabilistic relevance feedback, Query Expansion and its types, Query drift, web crawler

Max. 39 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to
CO1- Identify the different Information retrieval model.
CO2- Understand the issues in web search.
CO3- Demonstrate the retrieval of textual documents using appropriate models
CO4- Analyse the various retrieval utilities for improving search
CO5- Evaluate the information retrieval model.
CO6- Design the better method of indexing and compression to improve space and time efficiency

TEXT/REFERENCE BOOKS

1. C. Manning, P. Raghavan, and H. Schutze, Introduction to Information Retrieval, Cambridge University Press, 2008.
2. Ricardo Baeza -Yates and Breathier Ribeiro - Neto, Modern Information Retrieval: The Concepts and Technology behind Search 2nd Edition, ACM Press Books 2011.
3. Bruce Croft, Donald Metzler and Trevor Strohman, Search Engines: Information Retrieval in Practice, 1st Edition Addison Wesley, 2009.
4. Mark Levene, An Introduction to Search Engines and Web Navigation, 2nd Edition Wiley, 2010.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 3 Hrs**

Part A: 10 Questions of 2 marks each-No choice 20 Marks
Part B: 2 Questions from each unit with internal choice, each carrying 20 marks 80 Marks

<Course Code>					Service Oriented Architecture					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
3	0	0	3	3	25	50	25	-	-	100

COURSE OBJECTIVES

- Comprehend the need for SOA and its evolution
- To develop skills of creating web services, standards related to Web services, approaches for the description, discovery, and composition of Web services
- Review the emerging techniques for addressing challenges that are unique to services architecture

UNIT 1 SERVICE ORIENTED ARCHITECTURE (SOA) BASICS **8 Hrs.**

Introduction to XML, Roots of SOA, Characteristics of SOA, Primitive SOA vs Contemporary SOA, Comparing SOA to other internet architectures, Anatomy of SOA, How components in an SOA interrelate, Principles of service orientation, Business-centric SOA, Deriving business services, service modelling, Service-Oriented Design

10 Hrs.

UNIT 2 WEB SERVICES (WS) AND STANDARDS

WSDL basics, SOAP basics, SOAP Vs Restful API, SOA composition guidelines, Web Service and Primitive SOA: WSDL, Messaging with SOAP, MESPs in SOA, Service Activity, Atomic Transaction, Business Activity Orchestration vs Choreography.

12 Hrs.

UNIT 3 WEB SERVICES EXTENSIONS

WS-Addressing – WS-Reliable Messaging – WS-Policy – WS-Coordination – WS -Transactions – WS-Security – Examples, Business Process Design: WS-BPEL language basics; WS Coordination overview; Service oriented business process design; WS addressing language basics; WS Reliable Messaging

9 Hrs.

UNIT 4 ENTERPRISE PLATFORMS AND SOA

SOA platform basics; Enterprise Service Bus basics (including basic and complex patterns); SOA support in J2EE; SOA support in .NET; SOA Reference Architecture, SOA Vs Microservice

Max. 39 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to
CO1- Understand software oriented architectures.
CO2- Create SOAP Web Services and restful web services.
CO3- Develop SOA messages from business use cases.
CO4- Compare SOA and SOA-specific methodologies, Micro services.
CO5- Create composite services by applying composition style.
CO6- Design medium scale software project development using SOA principles

TEXT/REFERENCE BOOKS

1. Thomas Erl, Service-Oriented Architecture: Concepts, Technology, and Design,, Pearson , 2006
2. David S. Linthicum, Software Architecture in Practice (3rd Edition) (SEI Series in Software Engineering), Pearson , 2005
3. E. Newcomer and Greg Lomow, Understanding SOA with Web Services:, Addison Wesley , 2004
4. Bosch. J, Web Services, Service-Oriented Architectures and Cloud Computing, Elsevier , 2006

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 3 Hrs**

Part A: 10 Questions of 2 marks each-No choice 20 Marks
Part B: 2 Questions from each unit with internal choice, each carrying 20 marks 80 Marks

<Course Code>					Mobile Computing					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
3	0	0	3	3	25	50	25	--	--	100

COURSE OBJECTIVES

- To understand the basic concepts of mobile computing.
- To be familiar with the network layer protocols and Ad-Hoc networks.
- To know the basis of transport and application layer protocols.
- To gain knowledge about different mobile platforms and application development.

09 Hrs.

UNIT 1 INTRODUCTION

Introduction to Mobile Computing – Applications of Mobile Computing- Generations of Mobile Communication Technologies- Multiplexing – Spread spectrum -MAC Protocols – SDMA- TDMA- FDMA- CDMA

UNIT 2 MOBILE TELECOMMUNICATION SYSTEM **10 Hrs.**

Introduction to Cellular Systems – GSM – Services & Architecture – Protocols – Connection Establishment – Frequency Allocation – Routing – Mobility Management – Security – GPRS- UMTS – Architecture – Handover – Security

UNIT 3 MOBILE NETWORK LAYER **10 Hrs.**

Mobile IP – DHCP – AdHoc– Proactive protocol-DSDV, Reactive Routing Protocols – DSR, AODV , Hybrid routing –ZRP, Multicast Routing- ODMRP, Vehicular Ad Hoc networks (VANET) –MANET Vs VANET – Security.

UNIT 4 MOBILE TRANSPORT AND APPLICATION LAYER **10 Hrs.**

Mobile TCP– WAP – Architecture – WDP – WTLS – WTP –WSP – WAE – WTA Architecture – WML

Max. 39 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1. Explain the basics of mobile telecommunication systems.
CO2. Illustrate the generations of telecommunication systems in wireless networks.
CO3. Identify a routing protocol for a given Ad hoc network.
CO4. Evaluate the efficiency of mobile IP architectures.
CO5. Design and analyze the existing routing protocols for multi-hop wireless networks.
CO6. Explain the functionality of Transport and Application layers.

TEXT/REFERENCE BOOKS

1. Jochen Schiller, —Mobile Communications, PHI.
2. Prasant Kumar Pattnaik, Rajib Mall- Fundamentals of Mobile Computing, PHI.
3. Dharma Prakash Agarval, Qing and An Zeng- Introduction to Wireless and Mobile systems,Thomson Asia Pvt Ltd, 2005.
4. Uwe Hansmann, Lothar Merk, Martin S. Nicklons and Thomas Stober- Principles of Mobile Computing, Springer.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 3 Hrs**

Part A/Question: 10 Questions of 2 marks each-No choice 20 Marks

Part B/Question: 2 Questions from each unit with internal choice, each carrying 20 marks 80 Marks

<Course Code>					Biometrics					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
3	0	0	3	3	25	50	25	--	--	100

COURSE OBJECTIVES

- To quantitatively and qualitatively evaluate the strength and weaknesses of several biometric modalities from measures
- To measure error metrics, usability, and public perception,
- Apply these skills to emerging biometric technologies.

09 Hrs.

UNIT 1 INTRODUCTION

Introduction of Biometric traits and its aim, image processing basics, basic image operations, filtering, enhancement, sharpening, edge detection, smoothening, enhancement, thresholding, localization. Fourier Series, DFT, inverse of DFT.

UNIT 2 MOBILE TELECOMMUNICATION SYSTEM **10 Hrs.**

Biometric system, identification and verification. FAR/FRR, system design issues. Positive/negative identification. Biometric system security, authentication protocols, matching, score distribution, ROC curve, DET curve, FAR/FRR curve. Expected overall error, EER

UNIT 3 MOBILE NETWORK LAYER **10 Hrs.**

Biometric myths and misrepresentations. Selection of suitable biometric. Biometric attributes, Zephyr charts, types of multi biometrics. Verification on multimodel system, normalization strategy, Fusion methods, Multimodel identification.

UNIT 4 MOBILE TRANSPORT AND APPLICATION LAYER **10 Hrs.**

Biometric system security, Biometric system vulnerabilities, circumvention, covert acquisition, quality control, template generation, interoperability, data storage. Recognition systems: Face, Signature, Fingerprint, Ear, Iris etc.

Max. 39 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1: Understand theoretical knowledge about biometrics and biometric systems and about their utilization in information technology and about standardization activities in this area
CO2: Utilize mathematical apparatus of pattern recognition in biometrics
CO3: Gain knowledge about different traits and their processing
CO4: Asses different performance evaluation metrics
CO5: Investigate privacy issue associate to each modality
CO6: Asses multibiometric system for secrecy and performance improvement

TEXT/REFERENCE BOOKS

(1) Ratha, N K. -- Govindaraju, V. Advances in Biometrics: Sensors, Algorithms and Systems. London: Springer Verlag, 2008. 503 p. ISBN 978-1-84628-920-0.
(2) Vacca, J R. Biometric Technologies and Verification systems. Burlington: Elsevier, 2007. 625 p. ISBN 978-0-7506-7967-1.
(3) Jain, A. Handbook of Biometrics. London: Springer-Verlag, 2008. ISBN 978-0-387-71040-2.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 3 Hrs**

Part A/Question: 10 Questions of 2 marks each-No choice 20 Marks

Part B/Question: 2 Questions from each unit with internal choice, each carrying 20 marks 80 Marks

VIIIth Semester

PANDIT DEENDAYAL ENERGY UNIVERSITY GANDHINAGAR

SCHOOL OF TECHNOLOGY

COURSE STRUCTURE FOR B TECH IN COMPUTER SCIENCE & ENGINEERING											
Semester VIII			**B. Tech. in Computer Science & Engineering**								
Sr. No.	**Course/Lab Code**	**Course/Lab Name**	**Teaching Scheme**					**Examination Scheme**			
								Review			**Total**
			L	**T**	**P**	**C**	**Hrs./ Week**	**MS**	**ES**	**IA**	**Marks**
1	Project	Comprehensive Project	0	0	20	10	20	30	40	30	100
		TOTAL	0	0	20	10	20				100

CE- Continuous Evaluation, MS-Mid Semester; ES – End Semester Exam

<Course Code>					COMPREHENSIVE PROJECT			
Teaching Scheme					Examination Scheme			
L	T	P	C	Hrs/Week	Review			Total Marks
					MS	ES	IA	
0	0	20	10	20	30	40	30	100

COURSE OBJECTIVES

- To give the students an experience of carrying out an individual project and sense of accomplishment associated with such an undertaking.
- To encourage the students to make a meaningful intellectual commitment to an engineering problem.
- To help in the development of one of the most important attributes of an engineer - self-discipline.
- To emphasize the use of fundamental concepts, and use of texts and references rather than rely on staff members for all of the answers.
- To emphasize the presentation of technical material by informal summary reports, drawings, formal reports and presentations.
- To help the students to critically evaluate their own work

Comprehensive Project could be performed either in Industry or at University with same credits.

Scope of Comprehensive Project:

The students are expected to work on Comprehensive Project in any of the CSE related areas. The different kinds of projects and the associated deliverables that could be accepted as the student's Comprehensive Project are as follows but not limited to: Software Development, System Design and Simulation, Hardware Development / Implementation, Embedded System (Software & Hardware combined) Development / Implementation, Theoretical Modelling, Design and Analysis, Technical Study including feasibility and comprehensive evaluation of technologies, Technical Survey and Modelling, Modules of a research and development project.

Approximate Total: 300 Hrs

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Comprehensively investigate/study and development of software and/or algorithms in the related area.
CO2 - Think innovatively on the development of components, products, processes or technologies in the engineering field
CO3 - Learn and implement new concepts in multidisciplinary area.
CO4 - Use the class-room learning to solve real world problems in the form of a team
CO5 - Design and apply different tools.
CO6 - Prepare and present the technical reports/research papers.
CO7 - Communicate with engineers and the community at large in written and oral forms.
CO8 - Demonstrate the knowledge, skills and attitudes of a professional engineer.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 40

Part A: Project Report	10 Marks
Part B: Efforts and quality of work carried put	20 Marks
Part C: Presentation	10 Marks