Outcome Based Syllabus

&

Scheme of Examinations

for the

Three Years Under Graduate (UG) Programme in

Information Science & Telecommunication (IST) Core

B.Sc. (Information Science & Telecommunication) Core

BSc (IST)

(Effective from the Academic Year 2021-22)

This syllabus covers the of courses offered in
Core Courses (CC), Skill Enhancement Course-I (SEC-I),
Generic Electives (GE) & Discipline Specific Electives (DSE)
for the BSc(IST) Core Program

Ability Enhancement Compulsory Courses (AECC) & Skill Enhancement Course-I(SEC-I)
are same with other UG Science Programs

School of Information Science & Telecommunication(IST)

Gangadhar Meher University

Amruta Vihar, Sambalpur, Odisha, India ,768004

Vision:

To impart high quality technological and professional education in the field of information sciences, electronics and communication technologies with effort to instill the necessary skills to convert the ideas of young minds to innovation , develop communication skills, entrepreneurial skills, strong human values and problem solving abilities to face the contemporary world with solution for it's crisis or problems.

Mission:

1. To emerge as a centre of excellence in providing in-depth knowledge of practical, theories, research and innovation skills in the field of information sciences, electronics and communication technologies so that the graduates will be efficient enough to implement in solving real life problems.

2. To be recognized as a skill development centre, to upgrade the necessary skills of the learners like, communication skills, analytical and critical thinking and ability of decision making in addition to the core skills of ICT domain.

3. To gain reputation as a centre of professional studies and guidance in preparing it's students to face the challenges in future in employment, entrepreneurship or in higher studies , with ethics and human values.

PROGRAMME OUTCOMES (POs)

(Selected from the suggested list of UGC for UG programs)

Based upon the UGC guidelines, the following POs for the UG program have been decided for the school of Information Science & Telecommunication (IST)

- **PO-1: Disciplinary Knowledge:** Capable of demonstrating comprehensive knowledge and understanding of one or more disciplines
- **PO-2: Problem solving:** Capacity to extrapolate from what one has learned and apply their competencies to solve different kinds of non-familiar problems, rather than replicate curriculum content knowledge; and apply one's learning to real life situations.
- **PO-3: Research-related skills:** A sense of inquiry and capability for asking relevant/ appropriate questions, problematising, synthesising and articulating; Ability to recognise cause-and-effect relationships, define problems, formulate hypotheses, test hypotheses, analyse, interpret and draw conclusions from data, establish hypotheses, predict cause-and-effect relationships; ability to plan, execute and report the results of an experiment or investigation
- **PO-4: Cooperation/Team work:** Ability to work effectively and respectfully with diverse teams; facilitate cooperative or coordinated effort on the part of a group, and act together as a group or a team in the interests of a common cause and work efficiently as a member of a team
- **PO-5: Communication Skills:** Ability to express thoughts and ideas effectively in writing and orally; Communicate with others using appropriate media; confidently share one's views and express herself/himself; demonstrate the ability to listen carefully, read and write analytically, and present complex information in a clear and concise manner to different groups.
- **PO-6: Information/digital literacy:** Capability to use ICT in a variety of learning situations, demonstrate ability to access, evaluate, and use a variety of relevant information sources; and use appropriate software for analysis of data.
- **PO-7: Scientific reasoning:** Ability to analyse, interpret and draw conclusions from quantitative/qualitative data; and critically evaluate ideas, evidence and experiences from an open-minded and reasoned perspective.
- **PO-8: Lifelong learning:** Ability to acquire knowledge and skills, including 'learning how to learn', that are necessary for participating in learning activities throughout life, through self-paced and self-directed learning aimed at personal development, meeting economic, social and cultural objectives, and adapting to changing trades and demands of work place through knowledge/skill development/reskilling.

Program Specific Outcomes (PSOs)
Specific to the
School of Information Science & Telecommunication (IST)

1. **PSO1:** Demonstrate
   (i) A fundamental/systematic or coherent understanding of the academic field of Information Science/Technology, Electronics and Communication Technologies, its different learning areas and applications, and its linkages with related disciplinary areas.
   (ii) Basic professional knowledge and skills that creates different types of professionals related to the areas of Information Science/Technology, Electronics and Communication Technologies, including professionals engaged in research and development, teaching and government/public service.
   (iii) The skills related to the core, allied and specialized areas of IT, electronics and communication technologies and the current and emerging developments in this field.

2. **PSO2:** Demonstrate the ability to use the different ICT devices and their features available. Formulating and tackling ICT related problems, identifying and applying appropriate principles and methodologies to solve a wide range of problems associated with ICT.

3. **PSO3:** Recognize the importance of computing skills, and the role of programming and mathematical approaches to solve any problem using appropriate programming language.

4. **PSO4:** Recognize the importance of data, importance of data collection, pooling/record keeping, retrieving, modeling, managing, providing safety /security, maintaining privacy and integrity of data etc using well defined, efficient and appropriate computerized database management system. Demonstrate the skills of aanalysing and mining data using sophisticated advance technologies and tools for various purposes/applications.

5. **PSO5:** Produce efficient manpower to be able to recognize, demonstrate and use different types of electronics devices, gadgets, electronics and communication laboratory equipments/kits, and different electronics components. Understand the basic principles of the electronics circuits and apply to design different appliances.

6. **PSO6:**Identify the inherent qualities, interest, skills and potential of the students and nurture their talent through upgrading their communication skills, group activities, team works, extension activities, , learning from experience, role play etc, to prepare them for future career path in higher level of studies, improve employability or entrepreneurial potential with ethics and human values.

7. **PSO7:** Build self confidence among the graduating students based on the strong foundation of theoretical and practical knowledge, problem solving capability, implementation and application skills, communication skills and scientific reasoning so that they can to be able to understand the new trends and technologies, ideas, thoughts, principles of the changing global scenarios and provide efficient solutions to cater the local, regional, national and global needs from time to time.

Mapping Criteria	
Matching Percentages	**level Indicator**
>70%	**3**
50 % – 70%	**2**
<50%	**1**

MISSION TO PROGRAM OUTCOME (PO) MAPPING								
	PO-1	**PO-2**	**PO-3**	**PO-4**	**PO-5**	**PO-6**	**PO-7**	**PO-8**
MISSION-1	3	3	3	1	1	3	2	3
MISSION-2	2	3	3	2	3	2	3	2
MISSION-3	1	3	1	3	2	2	1	3

PROGRAM SPECIFIC OUTCOME(PSO) TO PROGRAM OUTCOME (PO) MAPPING								
	PO-1	**PO-2**	**PO-3**	**PO-4**	**PO-5**	**PO-6**	**PO-7**	**PO-8**
PSO-1	3	3	3	2	2	3	3	3
PSO-2	3	2	1	1	1	3	1	2
PSO-3	3	3	3	1	1	3	2	3
PSO-4	3	2	3	2	2	3	3	2
PSO-5	3	3	2	1	2	3	2	3
PSO-6	1	3	2	3	3	2	2	3
PSO-7	3	3	3	3	3	2	3	3

UG IST 2021

SCHEME FOR CHOICE BASED CREDIT SYSTEM

B. Sc. Information Science & Telecommunication (IST) Core

Semeste	CODE	CORE COURSE (14)	Ability Enhancement Compulsory	Ability Enhancement Elective Course (AEEC) (2)	Elective: Discipline Specific DSE (4)	Elective: Generic (GE) (4)
I	CCI	Fundamentals of Computing and Programming with C	Environmental Studies			GE-I Physics
	CCII	Electronics Circuits (EC)				
II	CCIII	Data structure (DS)	English Communication / Odia/ Hindi			GE-II Mathematics
	CCIV	Computer System Architecture (CSA)				
III	CCV	Operating System (OS)		SEC -I Communicative English and English Writing Skills		GE-III Digital Electronics
	CCVI	Discrete Mathematics (DM)				
	CCVII	Database Management [illegible]				
IV	CCVIII	Design and Analysis of Algorithm (DAA)		SEC -II Cloud Computing (CC)/Microprocessor & Microcontrollers (MPMC)		GE-IV Foundations of Management & Organizational Behavior (FMOB)
	CCIX	Communication Electronics (CE)				
	CCX	OOP with Core JAVA(JAVA)				
V	CCXI	Data Communication & Computer Networks (DCCN)			DSE-I Core Python / Big Data/ Embedded Systems Design(ESD)	
	CCXII	Modern Communication System (MCS)			DSE -II Internet of Things (IoT)/ Data Mining(DM)/ Computer Graphics(CG)	
VI	CCXIII	Digital Signal Processing(DSP)			DSE -III Software Engineering (SE)/Web Technology/ Data Science	
	CC XIV	Artificial Intelligence &Machine Learning(AI&ML)			DSE –IV Project	

Mapping Courses with POs and PSOs

Course Code	Course Name	Program Outcomes (POs)								Programme Specific Outcome (PSOs)						
		1	2	3	4	5	6	7	8	1	2	3	4	5	6	7
CC-I	Fundamentals of Computing and Programming with C	√	√	√	√	√	√	√	√	√	√	√			√	√
CC-II	Electronics Circuits (EC)	√	√	√			√	√	√	√	√	√		√	√	√
GE-I	Physics	√	√	√			√	√	√	√	√	√		√	√	√
CCIII	Data Structure (DS)	√	√	√			√	√	√	√		√			√	√
CCIV	Computer System Architecture	√	√	√			√	√	√	√	√	√		√	√	√
GE-II	Mathematics	√	√	√			√	√	√	√	√	√	√	√	√	√
CC-V	Operating System (OS)	√	√	√			√	√	√	√	√	√			√	√
CC-VI	Discrete Mathematics (DM)	√	√	√			√	√	√	√	√	√	√	√	√	√
CC-VII	Database Management System	√	√	√			√	√	√	√	√	√	√	√	√	√
GE-III	Digital Electronics (DE)	√	√	√			√	√	√	√	√	√		√	√	√
SEC -II	Cloud Computing	√	√	√	√		√	√	√	√	√	√	√	√	√	√
	Microprocessor & Microcontroller	√	√	√			√	√	√	√	√	√		√	√	√
CC-VIII	Design &Analysis of Algorithm	√	√	√			√	√	√	√		√			√	√
CC-IX	Communication Electronics	√	√	√		√	√	√	√	√	√	√		√	√	√
CC-X	OOP with Core JAVA	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
GE-IV	Foundations of Management & Organizational Behavior	√	√	√	√	√		√	√	√	√	√	√	√	√	√
CC-XI	Data Communication & Computer Networks (DCCN)	√	√	√	√		√	√	√	√	√	√		√	√	√
CC-XII	Morden Communication System	√	√	√			√	√	√	√	√	√		√	√	√
DSE-I	Core Python	√	√	√	√		√	√	√	√	√	√	√		√	√
	Embedded Systems Design	√	√	√			√	√	√	√	√	√		√	√	√
DSE-II	Internet of Things (IoT)	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
	Computer Graphics (CG)	√	√	√			√	√	√	√	√	√	√		√	√
CC-XIII	Digital Signal Processing	√	√	√			√	√	√	√	√	√		√	√	√
CC-XIV	Artificial Intelligence & Machine Learning (AI&ML)	√	√	√		√	√	√	√	√	√	√	√	√	√	√
DSE-III	Software Engineering (SE)	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
	Web Technology	√	√	√	√	√	√	√	√	√	√	√	√		√	√
DSE-IV	Internship/ Project	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√

B.Sc. (IST)

SEMESTER-I

UG IST 2021

GE -I: Physics

(Credits: Theory-04, Practicals-02)

Full Marks: 100 (Midterm – 15+ End term – 60+Practical-25)

Course Objectives:

The basic objective of this course is to give fundamental knowledge about vector algebra, electrostatics, magnetism, how electric field and magnetic field creates and their behavior, also given the idea about transient response to series RL and RC circuit, finally they also learn about alternating current, its behavior and the AC response to series resonance circuit.

Course Structure:

Unit I : Vectors, Dot and cross product of vectors, Triple product of Vectors, Gradient of a scalar, Divergence and curl of a Vector (Expressions only)**.**Gauss's laws in electrostatics (statement and proof), Applications of Gauss's law:

Unit II: Electric field due to (i) a informally changed sphere,(ii) a informally changed cylinder,(iii) a plane sheet of charge. Parallel plate capacitor, cylindrical capacitor.Energy stored in electric field, Electric dipole, Force and torque on a dipole placed in an uniform electric field.

Magnetic effect of current, Biot-savart's Law- Application of Biot-Savart's Law: Magnetic field due to (i) and infinitely long straight current carrying conductor (ii) a circular current carrying coil at an axial point (iii) a current carrying solenoid. Amper's Law, its applications to long straight conductor and solenoid.

Unit III: Force between two parallel current carrying conductors, Torque on a current carrying coil placed in a uniform magnetic field. Principle of moving coil Galvanometer, Transient current in L-R and C-R circuits, Time constant of L-R & C-R circuit.

Unit IV: Faraday's laws of electromagnetic introduction. Lenz's law, self induction & coefficient of self induction, mutual induction & coefficient of mutual induction, self inductance of a solenoidal coil, mutual induction of two co-axial solenoidal coils, self inductance of an arbitrary circuit, mutual inductance of two arbitrary circuits.

Alternating current, alternating e.m.f. mean value and r.m.s value of alternating e.m.f., A.C circuit containing L-R, C-R and L-C-R, lag and lead of applied e.m.f and current reactance, impedance, susceptance , power in A.C. circuits, Wattless current, Electrical Resistance.

Mode of Transaction:

- **Class Room Teaching**
- **Practical(Laboratory Work)**
- **Assignment**
- **Remedial /Tutorial**

Course Outcomes:

- **CO1:** Students will be able to recognize vectors and electrostatic. [UNIT-I]
- **CO2:** Students will be able to explain magnetism and classify it's application. [UNIT-II]
- **CO3:** Students will be able to implement transient response in some real-life application and analyze their behavior.[UNIT-IV]
- **CO4:** Students can apply their knowledge and skills to develop basic RC, RL and RLC circuits. [UNIT-IV]

Text Book:

1. Electricity & magnetism-K.K Tiwari(S.Chand)

Reference Book:

2. Electricity & Magnetism-D.C Tayal(Himalaya Publishing Co)
3. Electricity, Magnetism & Electromagnetic Theory- S. Mahajan & Choudhury
4. Electricity & Magnetism: -Mochiram Das & et.al.(Sri Krishna Publisher Cuttack)

IST -GE -I: Practical: Physics Lab

Credits – 2, Full Marks – 25,

1. Determination of Resistance using post-office box.
2. Determination of Resistance using Meter Bridge.
3. E.C.E of Copper by using Copper voltameter.
4. To study the characteristics of p-n junction diode.
5. Comparison of capacitance by De-sauty‘s Bridge.
6. Refractive index of glass by using travelling microscope.
7. Refractive index of water by using travelling microscope.
8. Surface tension of water by weighing drop method.
9. AC circuit containing Resistance and Inductance in Series.
10. AC circuit containing Resistance and Inductance in Series.
11. AC circuit containing Resistance, Inductance and Capacitance in Series.
12. To study the purely Resistive circuit and it’s characteristics.
13. To study the purely Inductive circuit and its characteristics.
14. To study the purely Capacitive circuit and its characteristics.
15. To study the purely Resistive circuit and its characteristics.
16. To study the Transient current in L-R circuit.
17. To study the Transient current in C-R circuit.

IST Paper: CC-I: Fundamentals of Computing and Programming with C (FCPC)

(Credits: Theory-04, Practicals-02)

Full Marks: 100 (Midterm – 15+ End term Theory – 60+ Practical-25)

Course Objectives:

Understand the basic objectives and working principles of computing in terms of modern computers. Learn the concept of hardware, software and High Level Programming Language. Train the students to be able to write programs using C language.

Course Structure:

UNIT-I

Fundamentals of Computing

Introduction of computer as an electronic device, simple model of a computer, steps in information processing. [1 hour],Computer hardware and software, characteristics and features of computers, [1 hour] computer organization[1] ,memory and it's organization[1], data storage in computers, basic concept of processor as a functional unit of a PC[1].

Planning a computer program: ***Introduction,*** need for logical analysis and thinking [1], ***Algorithm*** concept and characteristics, simple examples (without using decision/selection/looping), advantages, limitations [1]***Flow chart*** concept, symbols, guidelines, simple examples (without using decision/selection/looping), advantages, limitations [2], ***Pseudo codes*** concepts an d simple examples, advantages, limitations [1]

UNIT-II

Introduction to programming languages:

Introduction, types of programming languages [1], computer programming languages, First generation, second generation, third generation languages, compiler, [2] Types of programming techniques (procedural and OOP)[1],

Fundamentals of programming language:

Character set, tokens (identifier, keywords, constants, string literals, operators, separators)[1]

Variables, data types, operators in details [2], type casting, operator precedence, structure of a C program [1], formatted input/output functions, escape sequences, assignment statement, writing, compiling and executing a C program, character i/o functions[2]

UNIT-III

Control statements in C:

Types of **control statements** (if...else, switch) [2], **loop** control structure(while, do, for),nested loop[2],go to, break, continue, exit() [1]

Arrays: 1dimentional, 2 dimensional [3] string manipulation, string handling functions [2]

UNIT-IV

Functions: concept of library functions and user defined functions, uses of functions, user defined function, declaration, calling, arguments and prototype**.** Local variables vs global variables [4]

Pointer: Concept, Pointer- To Pointer, Chain of Pointers [1]

Structure: Concept of structure, structure variables, array of structure, initialization of structure variable and array. Dot operator, structure as a function argument [4], Union [1]

Mode of Transaction:

- Theory Classes
- Practical Classes (Laboratory Work)
- Assignments
- Remedial /Tutorial Classes

Course Outcomes:

- **CO1:** Able to know the different parts of a computer and their uses. They can also know the use of software and the different functionalities of a modern computer. [UNIT-I]
- **CO2:** Able to plan and represent the solution of a problem using algorithms and flowcharts. [UNIT-I, II]
- **CO3:** Able to write codes in High Level Programming Language using the syntax of C. [UNIT- III]
- **CO4:** Develop effective and efficient programming solution for complex problems using different features of C language. [UNIT-IV]

Text Books

1. Jeyapoovan T, ‒Fundamentals of Computing and Programming in C‖
2. Balagurusamy, E., “Programming in ANSI C

Reference Books:

1. Kanetkar,Y., “C Programming”
2. A.K.Rath, A.K.Jagadev and S.K.Swain, ― Programming in C‖, Published by SCITECH Publicaton 2008.
3. A.K.Rath, A.K.Jagadev and S.K.Swain, ‒Computers fundamentals and C Programming‖,Published by SBG Publicaton 2003 /Published by SCITECH Publicaton 2006
4. Jeyapoovan T, ‒A First Course in Programming with C.

IST CC II: Electronics Circuits

(Credits: Theory-04, Practicals-02)

Full Marks: 100 (Midterm – 15+ End term Theory – 60+ Practical-25)

Course Objectives:

To provide a comprehensive understanding of electronic circuits and present application-oriented approach to the students in the field of electronic circuits.

Course Structure:

Unit- I: **Introduction to Electronics:** Signals, Frequency Spectrum of Signals, Analog and Digital Signal, Amplifier. **Diode Circuits**: Introduction physical operation of p-n junction diode characterizationof pn junction diode. Clipping and clamping circuits. Rectifiers: HWR, FWR (center tapped and bridge).Circuit diagrams, working and waveforms. Filters & their types. Zener diode regulator circuit diagram and explanation, disadvantages of Zener diode regulator.

Unit- II: Bipolar Junction Transistor: npn and pnp transistor. Current voltage characterization of BJT, Transistor biasing, circuit diagrams and their working. Transistor as an amplifier and a switch. circuit and working, Darlington pair and its applications. **MOSFET Circuits:** Principle and physical operation of FETS and MOSFETS, P-channel andN-channel MOSFET, complimentary MOS, V-I characteristics of E-MOSFETS and D-MOSFETS.

Unit- III: Feedback Amplifiers: Concept of feedback, negative and positive feedback, advantages and disadvantages of negative feedback, voltage (series and shunt), current (series and shunt) feedback amplifiers, gain, input and output impedances . Barkhausen criteria for oscillations, Study of phase shiftoscillator, Colpitts oscillator and Hartley oscillator.

Unit-IV: Power Amplifiers: The ideal op-amp, inverting and non-inverting, configuration, difference amplifier, CMRR, application of op-amp (Instrumentation – amplifier, Summing amplifier, Integrator and Differentiator. classification of power amplifiers, Oscillator Class A, Class B, Class C and their comparisons. Difference between voltage and power amplifier.

Mode of Transaction:

- Theory Classes
- Practical Classes(Laboratory Work)
- Assignments
- Remedial / Tutorial Classes

Course Outcomes:

After completing this course the students should be able to:

- **CO 1:** Students will know the basic concept of signals and electronic circuits. [Unit-I]
- **CO 2:** Understand and classify the different types of diodes and their characteristics. [Unit-II]
- **CO 3:** Effectively work to explore new applications. [Unit-III]
- **CO 4:** Design and develop the DC bias circuitry of BJT, FET, diode application circuits, amplifier circuits and oscillators employing BJT, FET devices. [Unit-IV]

Text Book:

1. Principles of Electronics, V. K. Mehta and Rohit Mehta, 12th Edition, S.CHAND Publishing.
2. Basic Electronics Engineering, B.B.Swain and C.K. Samanta, Kitab Mahal (2016).

Reference Books:

1. Electronic Devices and circuit theory, Robert Boylstead and Louis Nashelsky, 9th Edition, 2013,PHI
2. J. Millman and C. C. Halkias, Integrated Electronics, Tata McGraw Hill (2001).
3. Fundamentals of electronics, M.L. Gupta
4. Electronic devices, David A Bell, Reston Publishing Company
5. D. L. Schilling and C. Belove, Electronic Circuits: Discrete and Integrated, Tata McGraw Hill(2002)
6. Donald A. Neamen, Electronic Circuit Analysis and Design, Tata McGraw Hill (2002)
7. J. R. C. Jaegar and T. N. Blalock, Microelectronic Circuit Design, Tata McGraw Hill (2010)
8. J. J. Cathey, 2000 Solved Problems in Electronics, Schaum's outline Series, Tata McGraw Hill(1991)
9. Allen Mottershed, Electronic Devices and Circuits, Goodyear Publishing Corporation

B. Sc IST CC II Pr

Electronics Circuits Practical

IST CC- II Practical
Electronics Circuits Practical

B. Sc. IST CC IV Practical: Electronics Circuits Lab
(Hardware / Circuit Simulation Software)
Credits – 2, Full Marks – 25,

1. Study of the half wave rectifier and Full wave rectifier.
2. Study of power supply using C filter and Zener diode.
3. Designing and testing of 5V/9 V DC regulated power supply and find its load-regulation
4. Study of clipping and clamping circuits .
5. Study of Fixed Bias, Voltage divider and Collector-to-Base bias Feedback configuration for transistors.
6. Designing of a Single Stage CE amplifier.
7. Study of Class A, B and C Power Amplifier.
8. Study of the Colpitt_s Oscillator.
9. Study of the Hartley_s Oscillator.
10. Study of the Phase Shift Oscillator
11. Study of the frequency response of Common Source FET amplifier.

B.Sc. (IST)

SEMESTER-II

IST-GE II: Mathematics

(Credits: Theory-04, Practicals-02)

Full Marks: 100 (Midterm – 15+ End term Theory – 60+ Practical-25)

Course Objectives:

This course is an indispensable tool for science and engineering. It provides the basic language for understanding the world and lends precision to scientific thought. So there is a large demand for student with strong analytical skills and broad-based background in the mathematical science.

Course Structure:

Unit-I: Ordinary Differential Equations: First Order Ordinary Differential Equations, Basic Concepts, Separable Ordinary Differential Equations, Exact Ordinary Differential Equations, Linear Ordinary Differential Equations. Second Order homogeneous and non-homogeneous Differential Equations.

Unit-II: Series solution of differential equations and special functions: Power series method, Legendre Polynomials, Frobenius Method, Bessel_s equations and Bessel_s functions of first and second kind. gamma function.

Unit-III: Matrices: Introduction to Matrices, System of Linear Algebraic Equations, Gaussian Elimination Method, Gauss -Seidel Method, LU decomposition, Solution of Linear System by LU decomposition. Eigen Values and Eigen Vectors, Properties of Eigen Values and Eigen Vectors, Cayley-Hamilton Theorem, Diagonalization, Powers of a Matrix. Real and Complex Matrices, Symmetric, Skew Symmetric, Hermitian, Skew Hermitian, Unitary Matrices.

Unit-IV: Fourier Analysis & Lap lace transformation: Fourier series expansion of any periodic signals and fourier transforms, Lap lace transform introduction and Laplace transform of periodic function integrals, derivatives and inverse Lap lace transformation,**NumericalDifferentiationandIntegration:**Introduction, Numerical Differentiation based on interpolation formula, derivatives using forward interpolation, derivatives using backward interpolation, errors in Numerical differentiation, numerical Integration based on interpolation, trapezoidal Rule, Simpson_s one-third Rule, Simpson_s three-eight rule.

Mode of Transaction:

- Theory Classes
- Practical Classes(Laboratory Work)
- Assignments
- Remedial / Tutorial Classes

Course Outcomes:

After completion the course the student will be able to:

CO 1. Acquainted with quantitative information. [UNIT-I]

CO 2. Make sense of problems and identify the appropriate strategies to find solutions. [UNIT II]

CO 3. Solve mathematical, statistical and quantitative problems with available information. [UNIT III]

CO 4. Critique and evaluate quantitative arguments that utilize numerical, statistical and quantitative information. [UNIT IV]

Text Books :

1. Higher Engineering Mathematics - By B.S.Grewal
2. Engineering Mathematics - By H.K. Das

Reference Books:

1. . E. Kreyszig, advanced engineering mathematics, Wiley India
2. C .R. Wylie and L. C. Barrett, Advanced Engineering Mathematics, Tata McGraw-Hill (2004)
3. R. K. Jain, and S.R.K. Iyengar, Advanced Engineering Mathematics

IST-GE II: Mathematics Lab

Practical: 20 Classes (2hrs duration) 25 marks Students has to perform any 05 practical experiment using C/C++/JAVA Programming decided by the concern faculty)

1. WAP to find the sum of any two matrices having equal size **N**.
2. WAP to find the subtraction of any two matrices having equal size **N**.
3. WAP to find multiplication of two matrices.

   Hints- i. (No.of column in first Matrix must be equal to the No.of row in second Matrix).

   ii. Number of row and column of both matrix is given at run time.

   iii. Highest Order of matrix is three.
4. WAP to find the transpose of given matrix.
   i. Matrix is given by user at run time.
5. WAP to show the $(\overline{AB})=\bar{B}.\bar{A}$
6. WAP to prove the matrix addition is a commutative or not.
7. WAP to prove the matrix multiplication is a commutative or not.
8. WAP to check the $\overline{(A+B)}=\bar{A}+\bar{B}$
9. WAP to prove the distributive law in matrix.
10. WAP to calculate the determinants (Hints – Determinant given at run time.)

IST CC-III: Data Structure

(Credits: Theory-04, Practicals-02)
Full Marks: 100 (Midterm – 15+ End term Theory – 60+ Practical-25)

Course Objectives:

To provide the knowledge of basic data structures and their implementations. To understand importance of data structures in context of writing efficient programs. To develop skills to apply appropriate data structures in problem solving.

Course Structure:

Unit-I: Introduction to Data Structure and Sparse Matrix: Abstract data type (ADT), definition and types of data structures, operations on data structures [2], time and space complexity, sparse matrices [2]
Single Linked List: Introduction, array based implementation of lists, linked list implementation, singly linked list, operations on singly linked list [6]
Unit-II: Circular Linked List: Traversing, insertion, deletion [2], **Doubly Linked List:** insertion, deletion [3]
Stack: introduction, definition and concept, operations, implementation (array implementation), push and pop operation [2], Applications(reversing a string, infix to post fix, infix to prefix, evaluation of postfix expression) [3]
Unit-III: Recursion: difference between recursion and iteration, factorial calculation, Fibonacci series, GCD calculation [2]
Queues: introduction, definition and concept, operations, array implementation of queues [2], circular queue, priority queue [2], deque[4]
Unit-IV: Trees: introduction, general tree, binary trees, complete binary tree, extended binary tree[1], linked representation of binary tree, binary tree traversal(preorder, in order, post order) [2],
Binary search tree: searching, inserting [1], deleting a node [2]
AVL Tree: inserting, single rotation, double rotation, left rotation, right rotation [2]
Sorting and Searching: insertion sort, selection sort, linear search, binary search [2]

Mode of Transaction:

- Theory Classes
- Practical Classes (Laboratory Work)
- Assignments
- Remedial / Tutorial Classes

Course Outcomes:

After Completing the Course, Students will be able to:

- **CO1:** Learn the basics of data structure and its types [UNIT I]
- **CO2:** Identify the strength and weakness of different data structures. [UNIT II]
- **CO3:** Develop appropriate algorithm associated with different data structures to solve given problem. [UNIT III]
- **CO4:** Solve real life complex problems associated with data structure [UNIT IV]

Text Book: Data Structures using C, Rohit Khurana ,Vikash Publication

Reference Books:

1. Data Structure through C in Depth, S.K. Srivastava, Deepali Srivastava (BPB Publication)
2. Data Structure through C(4th edition), Yashvant Kanetkar (BPB Publisher)

IST CC IV: Computer System Architecture

(Credits: Theory-04, Practicals-02)
Full Marks: 100 (Midterm – 15+ End term Theory – 60+ Practical-25)

Course Objectives:

To have a thorough understanding of the basic structure and operation of a digital computer and to discuss in detail the operation of the arithmetic unit. To study the different ways of communicating with I/O devices and standard I/O interfaces.

Course Structure:

Unit-1: Computer and Computing: Evolution of computers, Computer types, **Functional units and working:** Input Unit, Memory Unit, Arithmetic and Logic Unit, Output Unit, Control Unit, Basic Operational Concepts, Bus Structures, Software, performance, Multiprocessors and Multicomputer.

Unit-2: Computer Arithmetic: Number systems, complements, fixed point representation, floating point representation, character representation, addition, subtraction, magnitude comparison, multiplication and division algorithms for integers, Logic gates, Boolean algebra. **Basic building blocks:** flip-flops and sequential circuits, decoders, multiplexers, registers, counters and memory units.

Unit-3: Memory System: Memory hierarchy, Semiconductor memories, RAM (Random Access Memory), Read Only Memory (ROM), types of ROM, Cache memory, Performance considerations, Virtual memory, Paging, Secondary storage, Redundant Array of Independent Disks (RAID).

Unit-4

Input-Output Organization: Peripheral devices, I/O modules, I/O Interface, Modes of transfer: Programmed, Interrupt Driven and DMA, I/O Processor, Data communication processor.

Computer Organization and Design: Instruction codes, Computer registers, Computer instructions and instruction cycle. Memory-reference instructions, Input-Output and interrupt. Central Processing Unit: Instruction formats, Addressing modes, Data transfer and manipulation, CISC, RISC.

Mode of Transaction:

- Theory Classes
- Practical Classes(Laboratory Work)
- Assignments
- Remedial / Tutorial Classes

Course Outcomes:

After completing this course, the students will be able to:

- **CO1**: Know about the basic logical structure of modern digital computers. [UNIT I]
- **CO 2**: Classify the different functional units and understand the principles of arithmetic and logic operations. [UNIT II]
- **CO 3**: Analyze the complex functionalities of different components of CPU and memory organization in digital computers. [UNIT III]
- **CO 4:** Design the architecture of a personal computer and analyze it's performance with different models of other existing architectures. [UNIT IV]

Text Book:

1. M. Mano, Computer System Architecture, Pearson Education 1992

Reference Books: 1. William Stalling: Computer organization and architecture, Latest Edition

John P. Hayes (1998), Computer Architecture and Organization, 3rd edition, Tata McGraw Hill

IST-CC IV Practical: Computer System Architecture Lab
Credits – 2, Full Marks – 25

(Use Simulator CPU Sim 3.6.9 or any higher version for the implementation)

1. Create a machine based on the following architecture:

Registers

IR	DR	AC	AR	PC	I	E
0 15	0 15	0 15	0 11	0 11	1 bit	1 Bit

Memory
4096 words

Instruction format

0	3 4	15
Opcode	Address	

Basic Computer Instructions

Memory Reference			Register Reference		
Symbol	Hex		Symbol	Hex	
AND	0xxx	Direct Addressing	CLA	E800	
ADD	2xxx		CLE	E400	
LDA	4xxx		CMA	E200	
STA	6xxx		CME	E100	
BUN	8xxx		CIR	E080	
			CIL	E040	
ISZ	Cxxx		INC	E020	
AND_I	1xxx		SPA	E010	

ADD_I	3xxx		SNA	E008	
LDA_I	5xxx		SZA	E004	
STA_I	7xxx	Indirect	SZE	E002	
BUN_I	9xxx	Addressin	HLT	E001	
ISZ_I	Dxxx	g			

Refer to Chapter-5 of Text Book 1 for description of instructions.

Design the register set, memory and the instruction set. Use this machine for the assignmentsof this section.

2. Create a Fetch routine of the instruction cycle.
3. Write an assembly program to simulate ADD operation on two user-entered numbers.
4. Write an assembly program to simulate SUBTRACT operation on two user-entered numbers.
5. Write an assembly program to simulate the following logical operations on two user-entered numbers.
    1. AND
    2. OR
    3. NOT
    4. XOR
    5. NOR
    6. NAND
6. Write an assembly program to simulate MULTIPLY operation on two user-entered numbers.
7. Write an assembly program for simulating following memory-reference instructions.
    1. ADD
    2. LDA
    3. STA
    4. BUN
    5. ISZ
8. Write an assembly language program to simulate the machine for following register reference instructions and determine the contents of AC, E, PC, AR and IR registers in decimal after the execution:

1. CLA
2. CMA
3. CME
4. HLT

9. Write an assembly language program to simulate the machine for following register reference instructions and determine the contents of AC, E, PC, AR and IR registers in decimal after the execution:

1. INC
2. SPA
3. SNA
4. SZE

10. Write an assembly language program to simulate the machine for following register reference instructions and determine the contents of AC, E, PC, AR and IR registers in decimal after the execution:

1. CIR
2. CIL

11. Write an assembly program that reads in integers and adds them together; until a negativenon-zero number is read in. Then it outputs the sum (not including the last number).
12. Write an assembly program that reads in integers and adds them together; until zero isread in. Then it outputs the sum.
13. Create a machine for the following instruction format:

Instruction format

15 14 13 12 11 0

The instruction format contains a 3-bit opcode, a 1-bit addressing mode and a 12-bit address.

Write an assembly program to simulate the machine for addition of two numbers with I= 0 (Direct Address) and address part = 082. The instruction to be stored at address 022 in RAM,initialize the memory word with any decimal value at address 082. Determine the contents ofAC, DR, PC, AR and IR in decimal after the execution.

14. Simulate the machine for the memory-reference instruction referred in above question with I= 1 (Indirect Address) and address part = 082. The instruction to be stored at address 026 in RAM. Initialize the memory word at address 082 with the value 298. Initialize the memory word at address 298 with operand 632 and AC with 937. Determine the contents of AC, DR, PC, AR and IR in decimal after the execution.

B.Sc. (IST)
SEMESTER-III

IST GE-III: Digital Electronics

(Credits: Theory-04, Practicals-02)

Full Marks: 100 (Midterm – 15+ End term Theory – 60+ Practical-25)

Course Objectives:

To familiarize the students with the basic principles of two-valued logic and various devices used to implement logical operations on variables and to build the foundation for studies in areas such as communication, VLSI, computer organization and architecture, microprocessor.

Course Structure:

Unit-1

Number System and Codes: Decimal, Binary, Hexadecimal and Octal number systems, base conversions, Binary, octal and hexadecimal arithmetic (addition, subtraction by complement method, multiplication). representation of signed and unsigned numbers, Binary Coded Decimal code. **Logic Gates and Boolean algebra:** Introduction to Boolean Algebra and Boolean operators, Truth Tables of OR, AND, NOT, Basic postulates and fundamental theorems of Boolean algebra, Truth tables, construction and symbolic representation of XOR, XNOR, Universal (NOR and NAND) gates.

Unit-2

Combinational Logic Analysis and Design: Standard representation of logic functions (SOP and POS). Karnaugh map minimization, Encoder and Decoder, Multiplexers and Demultiplexers, Implementing logic functions with multiplexer, binary Adder, binary subtractor, parallel adder/subtractor

Unit-3

Sequential logic design: Latches and Flip flops, S-R Flip flop, J-K Flip flop. T and D type Flip flop, Clocked and edge-triggered Flip flops, master-slave flip flop. Registers, Counters (synchronous, asynchronous, and modulo-N). State Table, State Diagrams, counter design using excitation table and equations, Ring counter and Johnson counter

Unit-4: A/D And D/A Converters- Analog to Digital and Digital to Analog converters. Semiconductor Memories- ROM, 2-dimensional addressing of a ROM and their applications, elementary idea of RAM, EPROM, and EEPROM. Digital Logic Families- RTL, DIL, TTL, ECL. MOS and CMOS logic circuits. Programmable Logic Devices: Basic concepts- ROM, PLA, PAL, CPLD, FPGA. Introduction to VHDL: Basic concepts.

Mode of Transaction:

- Theory Classes
- Practical Classes(Laboratory Work)
- Assignments
- Remedial / Tutorial Classes

Course Outcomes:

After completing this course the students will be able to:

- **CO1**: The students will recognize the use of number system, logic functions, different logic gates and different minimization techniques. [UNIT-I]
- **CO2**: Classify the different combinational and sequential circuits. [UNIT-II]
- **CO3**: Break the composite concept of storage blocks. [UNIT-III]
- **CO4**: Apply the knowledge in VHDL programming. [UNIT-

IST CC-V: Operating System

(Credits: Theory-04, Practicals-02)
Full Marks: 100 (Midterm – 15+ End term Theory – 60+ Practical-25)

Course Objectives:

The basic objectives of this course are to make aware of different types of Operating System and their services. The students will learn about Different process scheduling algorithms and synchronization techniques to achieve better performance of a system and the concept of memory management.

Course Structure:

Unit I: Introduction-Basic OS functions, types of operating systems–multiprogramming systems, batch systems , time sharing systems; operating systems for personal computers & workstations & real time systems.

Operating System Organization-Kernels, System Calls, and System programs.

Unit -II: Process Management overview, process, and process state, PCB-Threads overview, threading issues, (Fork & exec() system call , cancellation, signal handling , Thread specificated, process scheduling, basic concept , non-pre-emptive and pre-emptive,Scheduling algorithms).

Critical section, semaphores usage, concept of interProcess communication, deadlocks (System model, necessary conditions, deadlock handling).

Unit -III: Memory Management-Physical and virtual address space; memory allocation strategies –fixed and variable partitions, Paging, (Basic method) segmentation, (Basic method) virtual memory.(Basic concept, Demand paging-basic concepts)

Unit -IV: File and I/O Management-Directory structure, (Storage structure, directory overview, single level, 2-level) file operations, files allocation methods.

Protection and Security-Authentication, Internal access Authorization.

Mode of Transaction:

- Theory Classes
- Practical Classes(Laboratory Work)
- Assignments
- Remedial / Tutorial Classes

Course Outcomes:

After Completing the course, students will be able to:

- **CO1:** Remembers the basic functions and services of an Operating System. [UNIT-I]
- **CO2:** Understand the different process scheduling algorithm and synchronization techniques. [UNIT-II]
- **CO3:** Interpret different memory management techniques like paging, segmentation and demand paging etc. [UNIT-III]
- **CO4:** Analys the different complex functionalities and behavior of processes and accordingly take appropriate decision to solve complex problems associated with operating system. [UNIT-IV]

Text Books:

A.S. Tanenbaum, Modern Operating Systems, 3rd Edition, Pearson Education 2007.

Recommended Books:

1. A. Silberschatz, P.B. Galvin, G. Gagne, Operating Systems Concepts, 8 Edition, John Wiley Publications 2008.
2. G. Nutt, Operating Systems: A Modern Perspective, 2ndEdition Pearson Education 1997.
3. W. Stallings, Operating Systems, Internals & Design Principles, 5 India. 2008.Edition, Prentice Hall of
4. M. Milenkovic, Operating Systems- Concepts and design, Tata McGraw Hill 1992.
5. Rohit Khurana, –Operating System,2e‖ New Edition

IST CC-VI: Discrete Mathematics

(Credits: Theory-04, Practicals-02)
Full Marks: 100 (Midterm – 15+ End term Theory – 60+ Practical-25)

Course Objectives:

The basic objective of this course is to lay the foundation for theoretical computer science and understand the basic mathematical concept generally required for most computer science course.It is helpful for developing precise and formal reasoning skills in students.

Course Structure:

Unit -I: Prepositional Logic-Logical Connectives, Well-formed Formulas, Tautologies, Equivalences, Inference Theory, **Sets** - finite and Infinite sets, uncountably Infinite Sets; functions, relations, Properties of Binary Relations, Closure, Partial Ordering Relations; counting - Pigeonhole Principle, Permutation and Combination; Mathematical Induction, Principle of Inclusion and Exclusion.

Unit –II: Growth of Functions: Asymptotic Notations, Summation formulas and properties, Bounding Summations, **Algebra:** Definition and elementary properties of groups, semigroups, monoids, rings, fields

Unit -III: Recurrences: Recurrence Relations, generating functions, Linear Recurrence Relations with constant coefficients and their solution, Substitution Method, Recurrence Trees, Master Theorem.

Unit -IV: Graph Theory: Basic Terminology, Models and Types, multi graphs and weighted graphs, Graph Representation, Graph Isomorphism, Connectivity, Euler and Hamiltonian Paths and Circuits, Planar Graphs, Graph Coloring, Trees, Basic Terminology and properties of Trees, Introduction to Spanning Trees.

Mode of Transaction:

- Theory Classes
- Practical Classes(Laboratory Work)
- Assignments
- Remedial / Tutorial Classes

Course Outcomes:

After completion the course the students will be able to

- **CO1:** Remember the properties of relations, functions and sequences to complete operations. [UNIT-I]
- **CO2:** Learn the process of verifying the correctness of an argument using propositional logic. [UNIT-II]
- **CO3**: Apply counting techniques and combinatory to determine discrete probability. [UNIT-III]
- **CO4**: Solve real life problems associated with computer science using appropriate recurrence relation and model relationships using graph theories. [UNIT-IV]

Text Books:

1. Kenneth Rosen, Discrete Mathematics and Its Applications, Sixth Edition ,McGraw Hill 2006

Recommended Books:

1. C.L. Liu , D.P. Mahopatra, Elements of Discrete mathematics, 2nd Edition , Tata McGraw Hill, 1985,

3. T.H. Coremen, C.E. Leiserson, R. L. Rivest, Introduction to algorithms, 3rd edition Prentice Hall on India, 2009

4. M. O. Albertson and J. P. Hutchinson, Discrete Mathematics with Algorithms , John wiley Publication, 1988

5. J. L. Hein, Discrete Structures, Logic, and Computability, 3rd Edition, Jones and Bartlett Publishers, 2009

6. D.J. Hunter, Essentials of Discrete Mathematics, Jones and Bartlett Publishers, 2008

7. J.K. Mantri & T.K. Tripathy, Discrete Mathematics and Structure, Laxmi Publishers, New Delhi,2008.

8. Lyengar SN/Chandrasekaran VM/Venkatesh KA/Arunachalam PS, — Discrete Mathematics‖

IST CC-VII: Database Management System (DBMS)

(Credits: Theory-04, Practicals-02)
Full Marks: 100 (Midterm – 15+ End term Theory – 60+ Practical-25)

Course Objectives: The basic objective of this course is to familiarize the students with the foundation on the relational model. Outline the various systematic database design approaches. It also helps the students to explore the file organizations, indexing and hashing mechanisms.

Course Structure:

Unit-I Introduction- Characteristics of database approach, data models, database system architecture anddata independence.

Entity Relationship(ER) Modeling- Entity types, relationships, constraints.

Unit II: Relation data model- Relational model concepts, relational constraints

Unit III: Relational algebra, SQL queries(select, project, rename, set)

Unit IV: Database design- Mapping ER/EER model to relational database, functional dependencies, Normal forms (up to BCNF).

Unit V: File Structure and Indexing-Operations on files, File of Unordered and ordered records, overview of File organizations, (Introduction secondary storage devices), Indexing structures for files (Primary index, secondary index, clustering index), Multilevel indexing using B and B^+ trees.

Mode of Transaction:

- Theory Classes
- Practical Classes(Laboratory Work)
- Assignments
- Remedial / Tutorial Classes

Course Outcomes:

At the end of this Database Management System course, students will be able to:

- **CO1:** Know the concept of computerized database, it's benefits and features. [UNIT-I]
- **CO2:** Define different entities, entity types, attributes and their relations with each other and formulate Queries using SQL . [UNIT-II]
- **CO3:** Apply different normal forms to design efficient relational databases. [UNIT-III]
- **CO4:** Implement indexing and structure mechanism for effective storage. [UNIT-IV]

Text Book:

R. Elmasri, S.B. Navathe, Fundamentals of Database Systems 6th Edition, Pearson Education,2010.

Reference Books:

1. R. Ramakrishanan, J. Gehrke, Database Management Systems 3rd Edition, McGraw-Hill, 2002
2. A. Silberschatz, H.F. Korth, S. Sudarshan, Database System Concepts 6th Edition, McGraw Hill 2010
3. R. Elmasri, S. B. Navathe Dataase System Models, Language, Design and application Programming, 6th Edition, Pearson Education, 2013

4. Leon Alexis/ Leon Mathews, ― Database Management Systems‖

IST CC-VIII Practical: Database Management Systems Lab

Credits – 2, Full Marks – 25,

Create and use the following database schema to answer the given queries.

EMPLOYEE Schema				
Field	**Type**	**NULL**	**KEY**	**DEFAUL T**
Eno	Char(3)	NO	PRI	NIL
Ename	Varchar(50)	NO		NIL
Job_type	Varchar(50)	NO		NIL
Manager	Char(3)	Yes	FK	NIL
Hire_date	Date	NO		NIL
Dno	Integer	YES	FK	NIL
Commission	Decimal(10,2)	YES		NIL
Salary	Decimal(7,2)	NO		NIL

DEPARTMENT Schema			
Field	**Type**	**NULL KEY**	**DEFAUL T**
Dno	Integer	No PRI	NULL
Dname	Varchar(50)	Yes	NULL
Location	Varchar(50)	Yes	New Delhi

Query List

1. Query to display Employee Name, Job, Hire Date, Employee Number; for each employee with the Employee Number appearing first.
2. Query to display unique Jobs from the Employee Table.
3. Query to display the Employee Name concatenated by a Job separated by a comma.
4. Query to display all the data from the Employee Table. Separate each Column by a comma and name the said column as THE_OUTPUT.
5. Query to display the Employee Name and Salary of all the employees earning more than $2850.
6. Query to display Employee Name and Department Number for the Employee No= 7900.
7. Query to display Employee Name and Salary for all employees whose salary is not in the range of $1500 and $2850.
8. Query to display Employee Name and Department No. of all the employees in Dept 10 and Dept 30 in the alphabetical order by name.

9. Query to display Name and Hire Date of every Employee who was hired in 1981.
10. Query to display Name and Job of all employees who don_t have a current Manager.
11. Query to display the Name, Salary and Commission for all the employees who earn commission.
12. Sort the data in descending order of Salary and Commission.
13. Query to display Name of all the employees where the third letter of their name is _A_.
14. Query to display Name of all employees either have two _R_s or have two _A_s in their name and are either in Dept No = 30 or their Manger_s Employee No = 7788.
15. Query to display Name, Salary and Commission for all employees whose Commission Amount is 14 greater than their Salary increased by 5%.
16. Query to display the Current Date.
17. Query to display Name, Hire Date and Salary Review Date which is the 1st Monday after six months of employment.
18. Query to display Name and calculate the number of months between today and the date each employee was hired.
19. Query to display the following for each employee <E-Name> earns < Salary> monthly but wants < 3 * Current Salary >. Label the Column as Dream Salary.
20. Query to display Name with the 1st letter capitalized and all other letter lower case and length of their name of all the employees whose name starts with _J_, _A_ and _M_.
21. Query to display Name, Hire Date and Day of the week on which the employee started.
22. Query to display Name, Department Name and Department No for all the employees.
23. Query to display Unique Listing of all Jobs that are in Department # 30.
24. Query to display Name, Dept Name of all employees who have an _A_ in their name.
25. Query to display Name, Job, Department No. And Department Name for all the employees working at the Dallas location.
26. Query to display Name and Employee no. Along with their Manger_s Name and the Manager_s employee no; along with the Employees_ Name who do not have a Manager.
27. Query to display Name, Dept No. And Salary of any employee whose department No. and salary matches both the department no. And the salary of any employee who earns a commission.
28. Query to display Name and Salaries represented by asterisks, where each asterisk (*) signifies $100.
29. Query to display the Highest, Lowest, Sum and Average Salaries of all the employees
30. Query to display the number of employees performing the same Job type functions.
31. Query to display the no. of managers without listing their names.
32. Query to display the Department Name, Location Name, No. of Employees and the average salary for all employees in that department.
33. Query to display Name and Hire Date for all employees in the same dept. as Blake.
34. Query to display the Employee No. And Name for all employees who earn more than the average salary.
35. Query to display Employee Number and Name for all employees who work in a department with any employee whose name contains a _T_.
36. Query to display the names and salaries of all employees who report to King.
37. Query to display the department no, name and job for all employees in the Sales department.

B.Sc. (IST)

SEMESTER-IV

IST GE-IV: Foundation of Management & Organizational Behaviour

(Credits: Theory-04, Practicals-02)

Full Marks: 100 (Midterm – 15+ End term Theory – 60+ Practical-25)

Course Objective:

Toacquaintthestudentswiththefundamentalsofmanagingbusinessandtounderstandindividual and group behavior at work place so as to improve the effectiveness of an organization. The course will use and focus on Indian experiences, approaches and cases.

Course Structure

Unit-I: Basic forms of Business Ownership; Special forms of ownership: Franchising, Licensing, Leasing; Choosing a form of Business ownership; Corporate Expansion: mergers and acquisitions, diversification, forward and backward integration, joint ventures, Strategic alliance.

Evolution of Management Theory. Managerial functions and Roles. Insights from Indian practices and ethos.

Unit-II: Overview of Planning: Types of Plans& The planning process; Decision making: Process, Typesand Techniques. Control: Function, Process and types of Control; Principles of organizing: Common organizational structures; Delegation & Decentralization: Factors affecting the extent of de centralization, Process and Principles of delegation.

Unit-III: Importance of organizational Behaviour: Perception and Attribution: Concept, Nature, Process, Personality: Personality: Learning: Concept and Theories of Learning, rein forcement. Motivation: Conceptsand their application, Need, Content & Process theories, Contemporary Leadership issues: Charismatic, Transformational Leadership. Emotional Intelligence.

Unit-IV: Groups and Teams: Definition, Difference between Groups and teams; Stages of Group Development, Group Cohesiveness, Types of teams. Analysis of Interpersonal Relationship: Transactional Analysis, Johari Window.

Organizational Power and Politics: Nature of organisational politics. Conflict: Concept, Sources, Types, Stages of conflict, Management of conflict.

Mode of Transaction:

- Theory Classes
- Practical Classes (Laboratory Work)
- Assignments
- Remedial / Tutorial Classes

Course Outcomes:

After completion the course the students will be able to

CO1: Remember the importance and role of management in the organizations. [UNIT-I]

CO 2: Identify the different aspects related to decision making and controlling process. [UNIT-II]

CO 3: Analyze the different theories related to individual's behavior in the organization. [UNIT-III]

CO 4: Take appropriate decision based on the group behavioral influence in the organization. [UNIT-IV]

Text Books:

1. Gilbert, Principles of Management, McGraw Hill.

2. Greenberg, Jerald, and Baron, Robert A., Behaviour in Organisations: Understanding and Managing The Human Side of Work, Prentice Hall of India.

Reference Books

1. Kaul, Vijay Kumar, Business Organisation & Management - Text and Cases, Pearson.
2. Kaul, Vijay Kumar, Management - Text & Cases, Vikas Publication.
3. Singh, Kavita, Organisational Behaviour, Vikas Publication.
4. Koontz, Harold, and Weihrich, Heinz, Essentials of Management, McGraw Hill.
5. Luthans, Fred, Organisational Behaviour, Tata McGraw Hill.
6. McShane, L. Steven, Glinow, Mary Ann Von, and Sharma, Radha R., Organisational Behaviour, Tata McGraw Hill.
7. Newstrom, John W., Organisational Behaviour, Tata McGraw Hill.
8. Daft, Richard L., Principles of Management, Cengage Learning India.
9. Robbins, Stephen P., Organisational Behaviour, Pearson.
10. Robbins, Stephen P., and Coulter, Mary, Management, Pearson.
11. Stoner, James A. F., and Wankel, Charles, Management, Prentice Hall of India.
12. Bhushan, Y. K., Fundamentals of Business Organisation & Management, Sultan Chand & Sons.
13. Mathur, Navin, Management Gurus, National Publishing House, New Delhi.

IST GE IV Practical:

Fundamentals of Management & Organizational Behaviour (Project)

Credits–2,FullMarks–25,

1. Students have to complete one project/ dissertation in the area of management (including general management and/or organizational behavior) under the guidance of a faculty member of concerned subject as decided by the HOD.

2. The Project should be bsed on general management/ organizational behavior/ financial management/ human resource management/ marketing research/ brand management/ advertising management/marketing management/sales management etc.OR as decided by theres pective guide.

3. Theprojectworkshouldstartatthebeginningofthe4th semesterandtheprojectreport/dissertationshouldbesubmittedtotheHODconcernedbeforethecommencementofthe4thsemester term end examination. However it should progress parally with the other theory andpracticalpapersof4thsemester.

The project report /dissertation should be evaluated by an external examiner and an internal examiner jointly like other practical papers of generic elective.

IST SEC-II: CLOUD COMPUTING

(Credits: Theory-06,)
Full Marks: 100 (Midterm – 20+ End term Theory – 80)

Course Objectives:
The main objective of the course is to identify the technical foundations of cloud systems. The students analyze the problems and solutions to cloud application problems and also identify technical challenges for cloud applications and assess their importance.

Course Structure

UNIT-I

Cloud Computing Foundation

Basics, importance of CC in the current era (examples, reasons for server crashes/ failure, solution to server crashes/failure, dynamism, abstraction, resource sharing, solution)[3] Characteristics of CC[1],what CC is?, what CC isn't[1],Pros and cons of CC [3], Technologies in CC [2]

UNIT-II

Migration in to the cloud: migration issues, deployment considerations, benefits, communication revolution, cloud inside the firewall, applications on cloud platform, consumer versus enterprise, payment procedure [5]

Types of clouds: public and private cloud, cloud infrastructure, cloud application architecture [3]

Trends in computing [2]

UNIT-III

Cloud service models [2] cloud deployment models [1], pros and cons of cc, cloud computing and services: pros and cons [2], CC Technology: cloud lifecycle model, role of cloud modelling and architecture [3]

Cloud computing logical architecture [2]

UNIT-IV

Developing holistic cloud computing reference model[2],cloud system architecture[1],cloud deployment model[1], key principles of CC[1],cloud federation[1],cloud ecosystem[1]

Virtualisation: definition, adoption types [1], virtualisation architecture and software [1]clustering, application[1]

Mode of Transaction:

- Theory Classes
- Practical Classes(Laboratory Work)
- Assignments
- Remedial / Tutorial Classes

Course Outcomes:

After completion the course the students will be able to

CO1: Learn the fundamental principles of distributed computing. [UNIT-I]

CO2: Understand how the distributed computing environments can be built from lower service. [UNIT-II]

CO3: Analyze the performance of cloud computing and identify the security threats. [UNIT-III]

CO4: Take the responsibility of maintaining the cloud eco system of an organization. [UNIT-IV]

Text Book:

1. Cloud Computing: A practical approach for learning and implementation.
   Author: A. Srinivasan, J. Suresh (Pearson Education)

Reference Book:

2. Cloud computing: Web-Based applications that change the way you work and collaborate online. Author: Michel Miller, Pearson, QUE

IST SEC-II: Microprocessor and Microcontrollers

(Credits: Theory-06)
Full Marks: 100 (Midterm – 20+ End term Theory – 80)

Course Objective:
To understand the applications of Microprocessors and Microcontrollers, the need of these in computer system and features of typical Microprocessors and Microcontrollers. To learn interfacing of real-world input and output devices.

Course Structure:

Unit-I: Introduction to Microprocessor: Introduction, Applications, Basic block diagram, Speed, Word size, Memory capacity, Classification of microprocessors (mention of different microprocessors being used)
Microprocessor 8085: Features, Architecture -block diagram, General purpose registers, register pairs, flags, stack pointer, program counter, types of buses. Multiplexed address and data bus, generation of control signals, pin description of microprocessor 8085. Basic interfacing concepts, Memory mapped I/O and I/O mapped I/O.

Unit-II: 8085 Instructions**:** Operation code, Operand & Mnemonics. Instruction set of 8085, instruction classification, addressing modes, instruction format. Data transfer instructions, arithmetic instructions, increment & decrement instructions, logical instructions, branch instructions and machine control instructions Assembly language programming examples.
Stack operations, subroutine, call and return instructions. Delay loops, use of counters, timing diagrams - instruction cycle, machine cycle, T-states, time delay.

Unit-III: Introduction to Microcontrollers: Basic block diagram, comparison of Microcontroller with Microprocessors: Comparison of 8-bit, 16-bit, and 32-bit Microcontrollers.
MICROCONTROLLER 8051- architecture **-**internal block diagram, key features of 8051, pin diagram, memory organization, Internal RAM memory, Internal ROM. General purpose data memory, special purpose/ function registers, external memory.

Unit-IV:8051Interrupts: Interrupts–IE, IP, Time Flag Interrupts, Serial Port Interrupt, External Interrupts, Reset, Interrupt Control, Interrupt Priority, Interrupt Destinations, and Software-Generated Interrupts.

Mode of Transaction:

- Theory Classes
- Practical Classes (Laboratory Work)
- Assignments
- Remedial / Tutorial Classes

Course Outcome:
After completing this course, the students will be able to:
CO1: Learn the importance of microprocessors and microcontrollers. [UNIT-I]
CO2: Explain the microprocessor's architectures and its features. [UNIT-II]
CO3: Can apply 8051 Microcontroller architectures and its features for different configuration. [UNIT-III]
CO4: Can apply the knowledge to develop interfacing to real world devices. [UNIT-IV]

Text Books:

1. Microprocessor Architecture, Programming and Applications with 8085, RameshS.Gaonkar-Wiley Eastern Limited-IV Edition.
2. Muhammad Ali Mazidi, Janice Gillispie Mazidi, RolinD.MCKinlay–The8051Microcontroller andEmbeddedSystems‖,2nd Edition, Pearson Education2008.

Reference Books

1. FundamentalsofMicroprocessor&Microcomputer:B.Ram—DanpatRaiPublications.

MuhammadAliMazidi,-MicroprocessorsandMicrocontrollers**||**,Pearson,2006

IST CC-VIII: Design and Analysis of Algorithms

(Credits: Theory-04, Practicals-02)
Full Marks: 100 (Midterm – 15+ End term Theory – 60+ Practical-25)

Course Objectives:

The main objectives are to give clear idea on algorithmic design paradigms like Divide-and-Conquer, Demonstrate a familiarity with major algorithms and data structures. Performance analysis of Algorithms using asymptotic and empirical approaches. To Introduce various designing techniques and methods for algorithms Dynamic Programming, Greedy, Branch and Bound etc.

Course Structure

Unit-I: Introduction: Role of Algorithm in Computing, Kind of Problem solved by Algorithm, Algorithm as a technology[2].

Analyzing algorithms: Analysis of Insertion sort, worst-case and average-case analysis[3].

Designing algorithms: Analyzing divide-and-conquer algorithms, Analysis of merge sort, bubble sort[4].

Characterizing Running Times: Asymptotic notation and running times, Comparing functions, properties of asymptotic notation [3].

Unit-II: **Recursive Algorithm:** Recurrences equation, substitution method for solving recurrences, master method for solving recurrences [4].

Sorting and Order: Heapsort, Quicksort, Sorting in Linear Time, Radix sort. Red-Black Trees[6].

Unit-III: Dynamic Programming: Element of Dynamic programming, Matrix chain multiplication [4].

Greedy Algorithms: Knapsack problem, fractional knapsack problem, Huffman codes [5].

Unit-IV: Graph Algorithm: Breath First Search, Depth First Search and its Applications [4].

Minimum Spanning Tree [2], Kruskal algorithm, Prim's algorithm, Dijkstra's algorithm [3].

Mode of Transaction:

- Theory Classes
- Practical Classes(Laboratory Work)
- Assignments
- Remedial / Tutorial Classes

Course Outcomes:

After completion of this course, the students will be able to:

CO1: Get idea on algorithmic design paradigms and analysis .[[UNIT-I]

CO2: Classify the different categories of algorithms. [UNIT- II]

CO3: Break the complex problems into small modules to be solved easily and to decide the appropriate algorithm to solve specific problems. [UNIT- III]

CO4: Performance analysis of algorithms using various designing techniques and methods. [UNIT-IV]

Text Book:

1. T.H.Cormen,CharlesE.Leiserson,RonaldL.Rivest,CliffordSteinIntroductiontoAlgorithms ,PHI,3rd Edition2009

Reference Book:

2. Sarabasse&A.V.GelderComputerAlgorithm–IntroductiontoDesignand Analysis,

Publisher–Pearson3rd Edition1999

M.R.Kabat-–Design&AnalysisofAlgorithms‖,PHI,1st edition2013.

IST CC- VIII: Practical: Design and Analysis of Algorithms Lab
Credit: 02, Full mark - 25

1. i. Implement Insertion Sort (The program should report the number of comparisons)
   ii. Implement Merge ;Sort (The program should report the number of comparisons)
2. Implement Heap Sort (The program should report the number of comparisons).
3. Implement Randomized Quick sort (The program should report the number of Comparisons)
4. Implement Radix Sort
5. Create a Red-Black Tree and perform following operations on it:
   i. Insert a node
   ii. Delete a node
   iii. Search for a number & also report the color of the node containing this number.
6. Write a program to determine the LCS of two given sequences
7. Implement Breadth-First Search in a graph
8. Implement Depth-First Search in a graph
9. Write a program to determine the minimum spanning tree of a graph For the algorithms at S.No I to 3 test run the algorithm on 100 different inputs of sizes varying from 30 to 10.
10. Count the number of comparisons and draw the graph. Compare it with a graph of nlogn

IST CCIX: Communication Electronics

(Credits: Theory-04, Practicals-02)
Full Marks: 100 (Midterm – 15+ End term Theory – 60+ Practical-25)

Course objective:
Describe and analyze the basics of electronic communication, different modulation techniques, their generation, transmission and reception. Conversion of analog signals to digital format and describe Pulse and digital Modulation techniques.

Course Structure

Unit I : Electronic communication: Block diagram of an electronic communication system, electromagnetic spectrum- band designations and applications, need for modulation, concept of channels and base-band signals. Concept of Noise, Types of Noise, Signal to ratio, Noise Figure, Noise Temperature, Friss formula.

Unit-II: Amplitude Modulation: Amplitude Modulation, Modulation Index, and Frequency Spectrum. Generation of AM, Amplitude Demodulation(diode detector), Concept of Double side band suppressed carrier, Single side band suppressed carrier, other forms of AM (Pilot Carrier Modulation, Vestigial Side Band modulation, Independent Side Band Modulation).Block diagram of AM Transmitter and Receiver

Unit -III: Angle modulation: Frequency and Phase modulation, modulation index and Frequency Spectrum. Equivalence between FM (Frequency Modulation) and PM (Phase Modulation).
Generation of FM: Direct Method and Indirect Method. FM detector (PLL). Block diagram of FM Transmitter and Receiver Comparison between AM, FM and PM.

Unit -IV: Pulse Analog Modulation: Channel capacity, Sampling theorem, PAM, PWM, PPM modulation and detection techniques, Multiplexing, TDM and FDM.

Pulse Code Modulation: Need for digital transmission, Quantizing, Uniform and Non- uniform Quantization, Quantization Noise, Companding, Coding, Decoding, Regeneration.

Mode of Transaction:

- Theory Classes
- Practical Classes(Laboratory Work)
- Assignments
- Remedial / Tutorial Classes

Course Outcomes:
After completing this course the students will be able to
CO1: Know about the basic elements of a communication system. [UNIT-I]
CO2: Explain and classify the different types of signals and their representations. [UNIT-II]
CO3: Analyze various modulation and demodulation techniques and can take decision to implement appropriate techniques for different communications. [UNIT-III]
CO4: Set the height of sending and receiving antennas for communication purpose. [UNIT-IV]
Text Books:

1. Electroniccommunicationsystems-Kennedy,3rd edition,McGrawinternationalpublications
2. Communication Systems,S.Haykin,WileyIndia(2006)

Reference Book:

3. Principles of Electronic communication systems–Frenzel,3rd edition,McGraw Hill
4. Advanced electronic communications systems–Tomasi,6th edition,PHI.

IST CCX: Programming in Java

(Credits: Theory-04, Practicals-02)
Full Marks: 100 (Midterm – 15+ End term Theory – 60+ Practical-25)

Course Objective: To learn and understand the basic building blocks of a purely object oriented programming language and to develop solutions for complex problems both as application programs and web applications with the best features of Java.

Course Structure:

Unit-I

Fundamentals of object-oriented programming: introduction, object-oriented paradigm, basic concepts of object-oriented programming (objects, classes, data abstraction, encapsulation, inheritance, polymorphism, compile time and run time mechanisms, dynamic binding, message communication)[3], benefits and applications of OOP[1]
Java evolution: history, features [2], java environment(JDK,API,JRE)[1]
Overview of Java Language: Introduction, A Sample Java Program, use of import statement, math class and inbuilt method, java program structure [3]

Unit-II

Overview of Java Language:Java tokens,[1] compilation and run of a java program, JVM[1], command line argument[1],
Constants, variables and data types: Constants, variables and data types: constants [3] type casting [1]
Operators and expressions: [3]

Unit-III

Decision making and branching: introduction, if statement, simple if, if ...else [1], nesting of if...else [1], else...if ladder [1], switch [1]
Decision making and looping: introduction, while, do, for [2], jumps in loops, labelled loops [1]
Class, objects and methods: introduction, defining a class, field declaration, method declaration, creating objects, accessing class members [2], constructors [1]

Unit-IV

Class, objects and methods: method overloading, static members[1],inheritance(only single inheritance)[1] method overriding, final variables, methods and classes, finalizer methods, abstract methods and classes[1], visibility control, arrays and strings[1],
Interfaces: introduction, defining and extending interfaces, implementing interfaces[1]
Packages: introduction, API packages, system packages, naming, creating packages, accessing and using package **[**1]
Multi threading: introduction, creating threads, extending thread class, stopping and blocking a thread [1]
Managing Errors and Exceptions: introduction, types of errors, exceptions, syntax of exception handling code, multiple catch statements, finally [1]
Applet programming: introduction, preparing to write applets, building applet code, creating an executable applet, design a web page, adding applet to HTML file, running the applet[1],
Graphics: Introduction, graphics class, drawing lines, rectangles, circles, ellipses, arcs and polygons [1]

Mode of Transaction:

- Theory Classes
- Practical Classes(Laboratory Work)
- Assignments
- Remedial / Tutorial Classes

Course Outcomes:

After completion of this course the students will be able to

CO1. Learn the basic principles of object-oriented programming. [UNIT-I]

CO2. To understand the concept of objects and their relations with the members of a class. [UNIT-II]

CO3. To instantiate objects and deploy java solutions with ease and confidence. [UNIT-III]

CO4. Will be able to develop and deploy portable applications that run on servers and desktop systems spanning most operating systems. [UNIT-IV]

Text book:

1. Programming with Java: A primer, E. Balagurusamy, MGH.

Reference Books:

2. The complete Reference JAVA, Schildet, TMH, Java 2, C. Xavier, Scitech.
3. Core Java:An Integrated Approach ,DreamTech Press, R. Nageswara Rao

Programming in Java Lab

Credits–2 ,FullMarks–25,

1:

(a) Write a program to receive a number from the command line and display it's square root.
(b) Receive two numbers from command line and display their sum.
(c) Receive the feature of Java from the command line and display them with a prefix "Serial No: Java is _____" for each feature.

Sample output:
1: Java is Object Oriented
2: Java is Robust and secure
And so on.

2:

a) To count the number of candidates qualified for defence job.

Given condition

	ale	male
ight	nimum 8 cm	nimum 0 cm
eight	nimum kg	nimum 5 kg

b) Find out the largest among three number received from command line.
c) Calculate the total return of a fixed deposit in bank (include the principal amount)

Condition given

ale	ss than 1lakh @ 6%
	ore than 1lakh @6.25%
male	ss than 1lakh @ 6.25%
	ore than 1lakh @6.75%

3:

(a) Prepare a grade sheet of a student based on the secured marks and full marks of at least 5 papers. (Using else-if ladder).
(b) Prepare a grade sheet of a student based on the secured marks and full marks of at least 5 papers. (Using switch case).
(c) Display only the prime number, which are odd between 1 to 100.

4:

WAP to display the following structure

(a)
```
*
* *
* * *
* * * *
* * * * *
```

b)
```
* * * * *
  * * * *
    * * *
      * *
        *
```

c)
```
        *
      * *
    * * *
  * * * *
* * * * *
```

d)
```
* * * * *
  * * * *
    * * *
      * *
        *
```

5: WAP to display following structure (a)

```
* * * * * * * * * *
* * * *     * * * *
* * *       * * *
* *         * *
*           *
*           *
* *         * *
* * *       * * *
* * * *     * * * *
* * * * * * * * * *
```

(b)

```
                *
            *   *   *
        *   *   *   *   *
    *   *   *   *   *   *   *
        *   *   *   *   *
            *   *   *
                *
```

6:

Display the following structure.

(a)

```
1
1  2
1  2  3
1  2  3  4
1  2  3  4  5
```

(b)

```
1
2  3
4  5  6
7  8  9  10
11 12 13 14 15
```

©

```
1
2  2
3  3  3
4  4  4  4
```

5 5 5 5 5

(d)

5

4 4
3 3 3

2 2 2 2

1 1 1 1 1

7: WAP to display the multiplication table from 2 to 10 using nested loop;

Class and Object

8: Write a program to find out the area of a room.

(a) By using data to the instance variable.
(b) By passing data to the instance variables from main method.

Constructor and Method Overloading

9:

(a) Write a program to demonstrate the use of contractor.
b) Write a program to demonstrate method overloading and constructor overloading.

Static Members

10: Write a program to demonstrate the use of static variables and static methods.

Inheritance

11: Write a program to implement and demonstrate single inheritance /simple inheritance (Use **super()**).

12: Implement and demonstrate hierarchical inheritance.

13: Implement and demonstrate multiple inheritance.

14: Implement and demonstrate method overloading.

15: Implement and demonstrate the use of

(a) Final field
(b) Final class
(c) Abstract method & abstract class.

Arrays

16:

a) Create an one dimensional array.
b) Demonstrate array initialization.

17: Produce a multiplication table using 2D arrays.

18: Initialize an array of 10 string and sort them based on alphabetical order.

Interface

19: Define an interface.

Demonstrate interface extension and implementation.

20: Implement multiple inheritance using interface.

User-defined Package

21: Create package(s) demonstrate the access and use of it.

Multithreaded Package

22: Implement and demonstrate the multithreading capability of java.

23: Demonstrate how to control the threads in a multithreading program.

(hits: use yield (), stop (), sleep (), etc method)

24: Demonstrate how to control the thread in a multithreaded program using thread priority.

25: Implement multiple thread using runnable interface.

Exception Handling

26: Demonstrate the exception and handle all the common java exception.

27: Implement the Multiple catch block with finally statement.

B.Sc. (IST)
SEMESTER-V

IST DSE-I: Core Python

(Credits: Theory-04, Practicals-02)
Full Marks: 100 (Midterm – 15+ End term Theory – 60+ Practical-25)

Course Objective:
Programming landscape has changed significantly over the last few years. The main objective of this course is to prepare the learners to make inroads into every field that has anything to do with programming.

Course Structure

Unit-I

Introduction to python: what is python?, reasons for popularity[1], what sets python apart?, where is python used?, which organisations uses python ?[1] , programming paradigms, functional , procedural, object oriented and event-driven models[1] , python specification, python installation for windows[1], python resources, third party packages[1], more sophisticated tools, compilation approach in python[1], pros and cons of modern approach used by Python, Java and C#, working with Python[1], python programming modes, determining python version[1]

Unit-II

Python Basics: Identifiers and keywords, data types-basic types, integer and float ranges[1], variable type and assignment, arithmetic operators[1], operation nuances, precedence and associatively [1] , conversions, built in functions[1], built in modules[1], container types, python type Jargon[1], comments and indentation, multi lining, classes and objects, multiple objects, program to demonstrate the use of integer types, use of float, complex and bool types and operators to be used on them[3], demonstration to convert from one number type to another type[1], Built in mathematical functions, use of mathematical functions from math module, random number operations using random module[2]

Unit-III

String and regular expressions: what is string?, accessing string elements, string properties, built in functions, string methods, string conversions, string comparison[3]

Decision control instruction: introduction, nuances of conditions, logical operators, conditional expressions, all() and any(),receiving input, pass statement[5]

Unit-IV

Repetition control instruction: usage of while loop, usage of for loop, break and continue, else block of a loop [5]

Console input and output: console input, console output**,** formatted printing [3]

Lists: What are lists? Accessing list elements, looping in lists, basic list operations, using built-in functions on lists, list methods, sorting and reversing, list varieties [4]

Mode of Transaction:

- Theory Classes
- Practical Classes(Laboratory Work)
- Assignments
- Remedial / Tutorial Classes

Course Outcomes:

After completing this course the students will be able to

CO1: Know the use of python and it's popular features. [UNIT-I]

CO2: Explain the different built in functions, modules and containers. [UNIT-II]

CO3: Perform different operations with strings and to write codes using the different decision control instructions. [UNIT-III]

CO4: Develop software solution using repetition control instruction and lists. [UNIT-IV]

Text Book: Let Us Python , Yashavant Kanetkar, Aditya Kanetkar, BPB Publications(4th edition)

IST DSE-I: Embedded System Design

(Credits: Theory-04, Practicals-02)
Full Marks: 100 (Midterm – 15+ End term Theory – 60+ Practical-25)

Course Objective:

To understand the need and applications of embedded system. To understand architecture and features of typical Microcontroller. To learn interfacing of real-world input and output devices.

Course Structure:

Unit I: Introduction to Embedded Systems: Overview of Embedded Systems, Features, Requirements and Applications, Recent Trends in the Embedded System Design, Common architectures for the Embedded System Design, Embedded Software design issues.

Unit II: Introduction to microcontrollers, Overview of Harvard architecture and Von Neumann architecture, RISC and CISC microcontrollers

Unit III: AVR RISC Microcontrollers: Introduction to AVR RISC Microcontrollers ,Architecture Overview, Status Register, General Purpose Register File, Memories, instruction Set, Data Transfer Instructions, Arithmetic and Logic Instructions, Branch Instructions, Bit and Bit- test Instructions, MCU Control Instructions. Simple programs in Assembly Language/ C Language

Unit IV: Interrupts and Timer: Introduction to System Clock, Reset sources, Introduction to interrupts, External interrupts, IO Ports, 8-bit and 16-bit Timers, introduction to different modes, Input Capture and Compare Match.

Mode of Transaction:

- Theory Classes
- Practical Classes(Laboratory Work)
- Assignments
- Remedial / Tutorial Classes

Course Outcomes:

After completing this course the students should be able to:

CO1: Remember the architecture and interconnection of embedded systems. [UNIT-I]
CO2: Explain importance of microcontroller, different type of embedded system based on the configuration. [UNIT-II]
CO3: Break the composite concept of the interfacing to real world devices. [UNIT-III]
CO4: Apply the knowledge to develop microcontroller based embedded systems. [UNIT-IV]

Text Books:

1. AVR Microcontroller and Embedded Systems: Using Assembly and C by Muhammad Ali Mazidi, Sarmad Naimi, Sepehr Naimi, PHI

Reference Book:

1. Embedded System Design: Authors: Frank Vahid and Tony Givargis, Publisher: John Wiley, Year: 2002
2. Programming and Customizing the AVR Microcontroller: Author: D.V. Gadre, Publisher: McGraw-
3. Atmel AVR Microcontroller Primer: Programming and Interfacing, Authors: Steven F. arrett and Daniel J. Pack, Publisher: Morgan & Claypool Publishers
4. An Embedded Software Primer by David E.Simon, Addison Wesley
5. AVR Microcontroller Datasheet, Atmel Corporation,www.atmel.com

IST DSE-I: Practical: Embedded Systems Design Lab
(Experiments to be performed on AVR trainer kit)
Credits–2,FullMarks–25,

1. 1. Flash LED at an observable rate.
2. Hello LED - Flash LED at a rate such that the LED appears always on. Estimate the onset of the rate when the LED appears to stay on.
3. Controlling ON/OFF of an LED using a switch.
4. Use LFSR (Linear Feedback Shift Register) based random number generator to generate a random number and display it.
5. Toggle the LED every second using Timer interrupt.
6. Use the potentiometer to change the red LED intensity from 0 to maximum in 256 steps.
7. Use the switch to select the LED (from RGB led) and then the potentiometer to set the intensity of that LED, and thus create your own color from amongst 16 million colors.
8. Read the ADC value of the voltage divider involving the LDR. Print the value on the serial monitor.
9. Use the LDR and estimate a threshold for the LDR value and use that to turn the RGB LED on, to simulate an 'automatic porch light'.
10. ReadtheADCvalueofthevoltagedividerinvolvingtheLDR.Printthevalueontheserialmonitor.
11. Use the thermistor to estimate the temperature and print the raw value on the serial monitor.
12. Connect the LCD I/O Board and print 'Hello World' on the LCD. Scroll display from left to right.
13. Use the on-board EEPROM to store the temperature min and max values together with a timestamp.
14. Speed control of DC motor.
15. Speed control of stepper motor.

IST DSE –II: Internet of Things (IoT)

(Credits: Theory-04, Practicals-02)
Full Marks: 100 (Midterm – 15+ End term Theory – 60+ Practical-25)

Course Objective:

Internet of Things (IoT) is presently a hot technology worldwide. Government, academia, and industry are involved in different aspects of research, implementation, and business with IoT. IoT cuts across different application domain verticals ranging from civilian to defence sectors. These domains include agriculture, space, healthcare, manufacturing, construction, water, and mining, which are presently transitioning their legacy infrastructure to support IoT. Today it is possible to envision pervasive connectivity, storage, and computation, which, in turn, gives rise to building different IoT solutions. IoT-based applications such as innovative shopping system, infrastructure management in both urban and rural areas, remote health monitoring and emergency notification systems, and transportation systems, are gradually relying on IoT based systems. Therefore, it is very important to learn the fundamentals of this emerging technology.

Course Structure:

Unit-I

Understanding the IoT: What Is the Internet of Things?[1], services of IoT Platforms[1], IoT markets and trends[1], Wireless Standards That Enable the IoT, The goal: Interoperability [1], Matter to the rescue[1], Ultra-wideband[1], 5G and Wi-Fi 6/6E[1]

IoT Architecture and Technology Protocols: IoT Ecosystem, Cloud computing, Edge computing [1], IoT Architecture [1], Some IoT Protocols [1]

Unit-II

Smart Home: Smart-Home Open Standards and Some Key Characteristics[1], Mesh Network topology/One Pod Per Room[1], challenges: Interoperability[1], RF interference, RF filters to mitigate interference[1], Different filters for different needs[1], Maintaining a seamless, energy efficient, and reliable connection[1], Creating an ease-of-use self management IoT network[1], Network security and privacy[1], Power consumption[1], The Importance of Always-on Connectivity[1]

Unit-III

Next-Generation IoT Opportunities and Use Cases:
The Next-Generation Smart Home [1], Manufacturing/Industry 4.0[1], Transportation [1], Retail [1], Smart Energy [1], Healthcare [1], Smart Cities [1], Agriculture [1], Key Takeaways [1]

Unit-IV

Necessary Hardware and Software for IoT Applications in Telecom: Hardware Requirements[1], Single-Board Computer[1], Popular Single-Board Computers on the Market[1], Single-Board Microcontrollers[1], Arduino Mega 2560[1], IoT sensors[1], Drones[1], Modbus Device[1], Required Software[1],
Industrial Internet of Things: Introduction to IIoT [1], IoT and IIoT Differences [1]

Mode of Transaction:

- Theory Classes
- Practical Classes(Laboratory Work)
- Assignments
- Remedial / Tutorial Classes

Course Outcomes:

After completing this course the students will be able to
CO1 -See what the IoT can enable. [UNIT-I]
CO 2-Understand IoT Architecture. [UNIT-II]
CO 3-Examine IoT network protocols. [UNIT-III]
CO 4-Use the latest innovation to bridge multiple standards and discover IoT use cases. [UNIT-IV]

Text Books:

1. Internet of Things For Dummies®, Qorvo 2nd Special Edition, By by Cees Links, Tony Testa, John Anderton, WilcoVan Hoogstraeten, David Schnaufer, and Cindy Warschauer (Published by John Wiley & Sons, Inc. (2021).

2. IoT Machine Learning Applications in Telecom, Energy, and Agriculture With Raspberry Pi and Arduino using Python. Author: Puneet Mathur (Apress)

Reference Books:

1. Beginning Data Science, IoT, and AI on Single Board Computers: Core Skills and Real-World Application with the BBC micro:bit and XinaBox, by Philip Meitiner Pradeeka Seneviratne

2. Building Blocks for IoT Analytics Internet-of-Things Analytics, Editor John Soldatos, River Publishers Series in Signal, Image and Speech Processing

3. Website: www.qorvo.com/applications/internet-of-things

IST DSE-II: Computer Graphics

(Credits: Theory-04, Practicals-02)
Full Marks: 100 (Midterm – 15+ End term Theory – 60+ Practical-25)

Course Objectives:

To provide a comprehensive introduction to computer graphics leading to the ability to understand contemporary terminology, progress, issues, and trends. To understand computer graphics techniques (2-D/3-D) and Focusing on 3D modeling, image synthesis, and rendering. To introduce geometric transformations, geometric algorithms, software systems , 3D object models (surface, volume and implicit), visible surface algorithms, image synthesis, shading and mapping, ray tracing, To explore the interdisciplinary nature of computer graphics which is emphasized in the wide variety of examples and applications.

Course Structure:

Unit I: A survey of Computer graphics: Introduction**,** CAP[1], presentation, Ant[1], Entertainment, Education & training[1],visualization, image processing, GUI-[1]

Overview of GS: Video display devices (refresh CRT, Raster scan, color CRT monitors [3], direct view storage tube, flat panel displays, 3D viewing devices[2], Stereoscopic & visual Reality systems[1].

Unit II: Raster-scan systems- Video controller[1], Raster scan display processor[1], Random scan systems: Graphics monitors & workstations[1].

Input Devices- Keyboard, mouse, track & space ball, Joystick[1], Data glove, digitization, image scanners[1], Touch panels, light pens[1].

Graphics software: Coordinate representation, graphics functions[2], software standards[1], phigs workstations[1].

Unit-III: Output Primitives:points and lines[1], line drawing algorithm[1], DDA Algorithm[1], Bresenham's line drawing algorithm[2].

Circle generation algorithms: Properties [1], Midpoint circle, algorithm[2]

Ellipse generation algorithm: Properties, midpoint ellipse algorithm[2]

Unit IV: Filled Area primitives: Scanline polygon fill Algorithms[3], Scanline Fill Of Curved Boundary Areas, Boundary fill algorithm[2].

2D Geometric Transformation: Basic Transformations, Translation[1], Rotation[1], Scalling[1], Clipping Operations, Point clipping, line clipping, cohen- suther land line clipping[2]

Mode of Transaction:

- Theory Classes
- Practical Classes(Laboratory Work)
- Assignments
- Remedial / Tutorial Classes

Course Outcomes:

After completing this course the students will be able to

CO1: To know about the applications areas of computer graphics and about the graphics devices and softwires. [UNIT-I]

CO2: Classify the different architectures of computer graphics and hardware technologies associated with CG. [UNIT-II]

CO3: Apply different principles and techniques of computer graphics for 2D and 3D transformations and projections. [UNIT-III]

CO4: Apply computer graphics techniques in the development of computer games, information visualization, and business applications. [UNIT-IV]

Text Book:

1. D .Hearn,Baker:ComputerGraphics,PrenticeHallofIndia2008.

Reference Books:

2. **2.** J.D.Foley,A.VanDan,Feiner,HughesComputerGraphicsPrinciples&Practice 2ndeditionPublicationAddisonWesley1990.
3. D.F.RogersProceduralElementsforComputerGraphics,McGrawHill1997.
4. D.F.Rogers,AdamsMathematicalElementsforComputerGraphics,McGrawHill 2ndedition1989.
5. NeeteNain,— ComputerGraphics‖™
6. Singh PK/RajendraKumar,–Computer Graphics-(GBTU)‖

IST DSE-II: Practical: Computer Graphics Lab
Credits–2, FullMarks–25,

1. Write a program to implement Bresenhamsline drawing algorithm.
2. Write a program to implement mid-point circle drawing algorithm.
3. Write a program to clip a line using Cohen and Sutherland line clipping algorithm.
4. Write a program to clip a polygon using Sutherland Hodgeman algorithm.
5. Write a program to apply various 2D transformations on a 2D object (use homogenous coordinates).
6. Write a program to apply various 3D transformations on a 3D object and then apply parallel and perspective projection on it.
7. Write a program to draw Hermite/Bezier curve.

IST CC-XI: Data Communication & Computer Networks (DCCN)

(Credits: Theory-04, Practicals-02)
Full Marks: 100 (Midterm – 15+ End term Theory – 60+ Practical-25)

Course Objectives:

The main objectives of this course is to enable the students to know the basic understanding of how do computers and terminals actually communicate with each other and understand the parts of network and how they work together.

Course Structure:

Unit I: Introduction to Computer Networks-Network definition; network topologies; network classifications; network protocol; layered network architecture; overview of OSI reference model; overview of TCP/IP protocol suite.

Unit II: Data Communication Fundamentals and Techniques-Analog and digital signal; digital to digitalline encoding schemes; pulse code modulation; parallel and serial transmission; digital to analog modulation-; multiplexing techniques- FDM, TDM; transmission media.

Unit III: Networks Switching Techniques and Access mechanisms-Circuit switching; packet switching-connectionless datagram switching, connection-oriented virtual circuit switching; dial-up modems; digital subscriber line; cable TV for data transfer.

Unit IV: Data Link Layer Functions and Protocol-Error detection and error correction techniques; data-link control- framing and flow control; error recovery protocols- stop and wait ARQ, go-back-n ARQ; Pointto Point Protocol on Internet.

Mode of Transaction:

- Theory Classes
- Practical Classes(Laboratory Work)
- Assignments
- Remedial / Tutorial Classes

Course Outcomes:

After completing this course the students should be able to:

- **CO1**- Learn the basics of data communication, networking, internet and their importance. [UNIT-I]
- **CO2**-Clacify the different modulation and demodulation techniques. [UNIT-I]
- **CO3**-Establish a network of computers using different switching techniques. [UNIT-III]
- **CO4**- Detect errors and correct/recover in a computer network using different datalink layer. [UNIT-IV] protocols.

Text Book:

1. B.A.Forouzan: Data Communications and Networking, Fourth edition, THM ,2007.

Reference Books:

2. A.S.Tanenbaum:ComputerNetworks**,**Fourthedition**,**PHI,2002
3. Rajesh RS/ Easwarakumar KS/Balasubramanian R,―Computer Networks: Fundamentals & Applications‖
4. Agrawal R/TiwariBB,‖Data Communication and Computer Networks‖
5. Agrawal Rajneesh,–Data Communication and Networking‖

IST-CCXI Practical: Data Communication & Computer Networks(DCCN)Lab

Credits–2,FullMarks–25,

1. S 1. Simulate Cyclic Redundancy Check (CRC) error detection algorithm for noisy channel.
2. Simulate and implement stop and wait protocol for noisy channel.
3. Simulate and implement go-back-N sliding window protocol.
4. Simulate and implement selective repeat sliding window protocol.
5. Simulate and implement distance vector routing algorithm.
6. Simulate and implement Dijkstra's algorithm for shortest path routing.
7. Establishing a LAN connection.
8. Accessing data from other devices through LAN.
9. Setting up a wireless network.
10. Setting up a home network.
11. Change Browser’s security setting.
12. Change proxy settings in Internet Explorer.
13. Change TCP/IP settings.
14. 7. Setup a computer-to-computer (ad hoc) network.
15. HOTSPOT setting on desktop

IST CC XII: Modern Communication System (MCS)

(Credits: Theory-04, Practicals-02)
Full Marks: 100 (Midterm – 15+ End term Theory – 60+ Practical-25)

Course Objective:
Understand fundamentals of optical communication, optical sources, mobile communication and satellite Communication technology.

Course Structure:

Unit-I: Optical Communication: Introduction of Optical Fiber, Types of Optical Fibers and classification of optical Fibers with regard to number of mores and refractive index profiles. Guidance in Optical Fiber, Basic principles of Optical Sources and Detectors, Block Diagram of optical fiber communication system.
Why is fiber optics important? Attractive features of optical fibers. Application of optical fibers in telecommunication, imaging and sensing. Fiber optics for future. Basic laws in geometrical optics, Brewster angle, total internal reflection. Concept of coherence, temporal and spatial coherence, two beam interference. Ray path and ray equation, one dimensional ray equation, ray paths in homogeneous & square law medium. Numerical aperture of optical fiber .

Unit-II: Optical Fiber: Propagation characteristics in step index Optical Fiber, mode concept in fiber, Attenuation in optical fibers, dispersion in optical fibers. Bandwidth and transmission characteristics from dispersion and attenuation. Principle of lasers, Einstein_s A, B coefficients, different classes of lasers, elementary idea about solid states, semiconductor, gas, molecular laser, doped insulated and tunable lasers. Properties of lasers and applications based on these properties, LED source, principle of LED, output characteristics of LEDs, different types of LEDs with application.

Unit-III: Cellular Communication: Concept of cellular mobile communication – cell and cell splitting, frequency bands used in cellular communication, absolute RF channel numbers (ARFCN), frequency reuse, roaming and hand off, authentication of the SIM card of the subscribers, IMEI number, concept of data encryption, architecture (block diagram) of cellular mobile communication network, CDMA technology, CDMA overview, simplified block diagram of cellular phone handset, Comparative study of GSM and CDMA, 2G, 3G and 4G concepts.

Unit-IV: Satellite communication: Introduction, need, satellite orbits, advantages and disadvantages of geostationary satellites. Satellite visibility, satellite system – space segment, block diagrams of satellite sub systems, up link, down link, cross link, transponders (C- Band), effect of solar eclipse, path loss, ground station, simplified block diagram of earth station. Satellite access, TDMA, FDMA, CDMA concepts, comparison of TDMA and FDMA, Satellite antenna (parabolic dish antenna), GPSservices like SPS & PPS.
Local area networks (LAN): Primary characteristics of Ethernet-mobile IP, OSI model, wireless LAN requirements-concept of Bluetooth, Wi-Fi and WiMAX.

Mode of Transaction:

- Theory Classes
- Practical Classes(Laboratory Work)
- Assignments
- Remedial / Tutorial Classes

Course Outcome:
After completing this course the students should be able to
CO1: Learn the differences of Traditional and Modern communication. [UNIT-I]
CO2: Explain the propagation of signals in optical fiber. [UNIT-II]
CO3: Break the composite concept of wireless communication. [UNIT-III]
CO4: Apply the knowledge to implement different communication protocols for communication. [UNIT-IV]

Text Books:

1. Introdution to fiber optics (By Ghatak & Thyagarajan, Cambridge university press)
2. Fiber Optics (By: Gred Kaiser)

Reference Books:

3. Optical Fiber and laser, principles and applications (By Anuradha De, New Age International Publisher)

4. Fundamentals of Fiber optics in Telecommunication and sensor systems (By Bishnu P .Pal (Editor))
5. W. Tomasi, Electronic Communication Systems: Fundamentals through Advanced, Pearson Education, 3rd Edition
6. Martin S. Roden, Analog & Digital Communication Systems, Prentice Hall, Englewood Cliffs, 3rd Edition
7. Modern digital and analog Communication systems- B. P. Lathi, 4th Edition 2009 Oxford University press
8. ThiagarajanVishwanathan, Telecommunication Switching Systems and Networks, Prentice Hall of India.
9. Theodore S. Rappaport, Wireless Communications Principles and Practice, 2nd Edition, Pearson Education Asia.

B.Sc. (IST)

SEMESTER-VI

IST DSE-III: Software Engineering

(Credits: Theory-04, Practicals-02)
Full Marks: 100 (Midterm – 15+ End term Theory – 60+ Practical-25)

Course Objectives:

The aim of the course is to provide an understanding of the working knowledge of the techniques for estimation, design, testing and quality management of large software development projects. Topics include process models, software requirements, software design, software testing, software process/product metrics, risk management, quality management

Course Structure:

Unit I:

Introduction-The Evolution of Software to an engineering discipline, Software development project, exploratory style software development, emergence of Software Engineering, changes in Software development practices, computer system engineering, software life-cycle Models, waterfall model and its extensions, rapid application development (RAD), Agile development model, spiral model.

Unit II:

Software Project Management: Software Project Management complexities, responsibilities of software project manager, Project Planning matrics for Project size estimations, project estimation techniques, empirical estimation techniques, COCOMO Model, Halstead software science, staffing level estimation, scheduling, organization and team structure, staffing risk management, software configuration management.

Unit III:

Requirement analysis and specification: Requirement gathering and analysis, software requirement specification, formal system specification, software design, characteristics of good software design, cohesion and coupling, layered arrangement of modules, approaches to software design.

Unit IV:

Coding and Testing: Code Review, Software documentation, Testing, Unit Testing, Risks, Black-Box Testing, White-Box Testing, Validation Testing, System testing, Quality Management: Quality Concepts, Software Quality Assurance, Software Reviews, software maintenance.

Mode of Transaction:

- Theory Classes
- Practical Classes(Laboratory Work)
- Assignments
- Remedial / Tutorial Classes

Course Outcomes:

After completing this course the students will be able to

CO1: Know the end-user's requirements and the different software development models. [UNIT-I]

CO2: Identify the appropriate SDLC model and software architectures to develop the software for a system. [UNIT-II]

CO3: Do feasibility study and requirement analysis to develop the software for a system and to compute the functional Points. [UNIT-III]

CO4: Develop efficient software and develop a simple testing report. [UNIT-IV]

Text Books:

1. R.S.Pressman,SoftwareEngineering:APractitioner_sApproach(7thEdition),McGraw-Hill,2009.
2. R.Mall, Fundamentals of Software Engineering(2nd Edition),Prentice-Hall of India,2004.

Reference Books:

1. P.Jalote,AnIntegratedApproachtoSoftwareEngineering(2thEdition),NarosaPublishing House,2003.
2. K.K.AggarwalandY.Singh,SoftwareEngineering(2ndEdition),NewAgeInternationalPublishers,2008.
3. I. Sommerville, Software Engineering(8thedition), AddisionWesley,2006
4. D.Bell, Software Engineering for Students(4thEdition),Addison-Wesley,2005.
5. Khurana Rohit,–Software Engineering: Principles and Practices,2e‖
6. Khurana Rohit,–Software Engineering and Quality Assurance(ANNA)

Software Engineering Lab

Credits–2,FullMarks–25

Sl.No.	PracticalTitle
1.	• Problem Statement • Process Model
2.	Requirement Analysis • Creating Dataflow • Data Dictionary, Use Cases
3	Project Management • Computing FP • Effort • Scheduled, Risk Table, Time line chart
4	Design Engineering • Architectural Design • Data Design, Component Level
5.	Testing • Basis Path Testing

Sample Projects:

1.Criminal Record Management: Develop a system for managing criminal records, allowing jailers, police officers and CBI officers to access and update records efficiently.

1. DTC Route Information: Create an online platform providing information on bus routes, frequencies, and fares for effective transportation management.
2. Car Pooling: Design a web-based intranet application for corporate employees to facilitate carpooling, promoting eco-friendly commuting and reducing costs.
3. Patient Appointment and Prescription Management System: Develop a system for managing patient appointments and prescriptions, streamlining healthcare services.
4. Organized Retail Shopping Management Software: Create software for managing retail operations, including inventory, sales, and customer management.
5. Online Hotel Reservation Service System: Develop a system for online hotel reservations, enabling customers to book rooms and manage their stays efficiently.
6. Examination and Result Computation System: Design a system for managing examinations and calculating results, reducing manual errors and increasing efficiency.
7. Automatic Internal Assessment System: Create a system for automating internal assessments, providing instant feedback and evaluation results.
8. Parking Allocation System: Develop a system for managing parking allocations, ensuring efficient use of parking spaces and reducing congestion.
9. Wholesale Management System: Create software for managing wholesale operations, including inventory, orders, and supplier management.

DSE-IV: PROJECT REPORT WITH VIVA AND SEMINAR

Full Marks -100

Each sixth semester student has to complete one project (individually or as a team member) in any area of Information Science and Telecommunication detailed in the course curriculum under the guidance of a regular faculty of the concerned department as decided by the head of the department. However, a student may opt an industrial expert as co-guide with due approval from the head of the department if needed. The project work should be based on research /development/implementation of hardware / software etc. or any related area to create new knowledge in the area of Information Science and Telecommunication with consultation with the concern guide and due approval from the concerned HOD. The students will have to submit a project report/dissertation before the termend examination. Marks will be awarded based on the evaluation of project report/dissertation, viva and presentation. If students desire to do their project work in any industry/development firm/reputed training institutions/R & D centers etc, they may be permitted subject to fulfilling theall other criteria as mentioned above. They may utilize the vacations like X-mas, dashahara etc. including the sundays so that they can attend the theory classes as usual.

IST CC -XIII: Digital Signal Processing

(Credits: Theory-04, Practicals-02)
Full Marks: 100 (Midterm – 15+ End term Theory – 60+ Practical-25)

Course Objective:
Understand fundamentals of digital systems, Digital Signal Processing & different strategies. Become aware of real-time applications of DSP.

Course Structure

Unit- I: Discrete Time systems: Discrete sequences, Representation of DTS, LSI Systems. Define convolution sum, Auto-correlation and Cross-correlation, causality and stability

Unit- II: Z-Transform: Definition , ROC Properties, Inverse Z Transform by power series expansion and partial fraction method, Stability System function of Linear time invariant. System Function: Discrete time Fourier transform and properties. Signal flow graph, It's use in representation of Discrete time systems. Properties of the Fourier Transform for Discrete time signals.

Unit- III: Discrete Fourier Transform: Discrete time Fourier, DFT and properties (Periodicity, Linearity, symmetry), circular convolution, Inverse of DFT, relationship with FT and z-Transform. FFT Algorithms, Radix-2 (DIT-FFT and DIF-FFT) Algorithms, IDFT using FFT Algorithms.

Unit IV: Digital Filters: Digital Filter: Analog filter review, system function for IIR and FIR filters, Network representation, IIR filter realization method and their limitations, FIR filter realization methods. Discrete correlation and convolution properties.

Mode of Transaction:

- Theory Classes
- Practical Classes(Laboratory Work)
- Assignments
- Remedial / Tutorial Classes

Course Outcomes:
After completing this course the students should be able to:
CO1: Remember the digital signals and systems. [UNIT-I]
CO2: Explain the mathematical tools like Z transform and Fourier transform as their uses. [UNIT-II]
CO3: Break the composite concept of digital filters. [UNIT-III]
CO4: Apply the knowledge to develop different filter realization. [UNIT-IV]

Text Books:

1. John G. Proakis and D.G. Manolakis, Digital Signal Processing: Principles, Algorithms and Applications, Prentice Hall, 1997.

Reference Book:

1. P. Ramesh Babu, digital Signal Processing, Scitech Publications.
2. A.V. Oppenheim and Schafer, Discrete Time Signal Processing, Prentice Hall, 1989.

Practical: Digital Signal Processing Lab

(Scilab/MATLAB/Other Mathematical Simulation software)

Credits – 2, Full Marks – 25,

1.Generation of unit sample sequence, unit step, ramp function, discrete time sequence, real sinusoidal sequence.

2. Generate and plot sequences over an interval.

3. Given x[n], write program to find X[z].

4. Fourier Transform, Discrete Fourier Transform and Fast Fourier Transform

5. Design of a Butterworth analog filter for low pass and high pass.

6. Design of digital filters.

IST CC XIV: Artificial Intelligence &Machine Learning (AI&ML)

(Credits: Theory-04, Practicals-02)
FullMarks:100(Midterm–15+Endterm–60+ Practical-25)

Course Objectives:
The basic objective of this course is to give a fundamental idea to the student, how machine can learn by its own without being explicitly programmed. They will learn about different techniques and application that provides systems the ability to automatically learn and improve from experience.

Course Structure

UNIT – I: Introduction to AI - Intelligent Agents, Problem-Solving Agents, Searching for Solutions - Breadth-first search, Depth-first search, Hill-climbing search, simulated annealing search, Local Search in Continuous Spaces.

UNIT-II: Games - Optimal Decisions in Games, Alpha–Beta Pruning, Defining Constraint Satisfaction Problems, Constraint Propagation, Backtracking Search for CSPs, Knowledge-Based Agents, Logic Propositional Logic, Propositional Theorem Proving: Inference and proofs, Proof by resolution, Horn clauses and definite clauses.

UNIT-III: First-Order Logic - Syntax and Semantics of First-Order Logic, Using First Order Logic, Knowledge Engineering in First-Order Logic. Inference in First-Order Logic: Propositional vs. First-Order Inference, Unification, Forward Chaining, Backward Chaining, Resolution. Knowledge Representation: Ontological Engineering, Categories and Objects, Events.

UNIT-IV: Planning - Definition of Classical Planning, Algorithms for Planning with State Space Search, Planning Graphs, other Classical Planning Approaches, Analysis of Planning approaches. Hierarchical Planning.

Mode of Transaction:

- Theory Classes
- Practical Classes(Laboratory Work)
- Assignments
- Remedial / Tutorial Classes

Course Outcomes:
After completion of this course, the students will be able to:
CO1- Remember the fundamental concept and use of Artificial Intelligence (AI) . [UNIT-I]
CO 2- Give Examples of expert systems. [UNIT-II]
CO 3- Apply basic principles of AI in solutions that require problem solving, inference, perception, knowledge representation and learning. [UNIT-III]
CO 4- Acquire the proficiency in applying scientific method to models of machine learning. [UNIT-IV]

Text Book:
1. Artificial Intelligence, 3rd Edition., E. Rich and K. Knight

Reference Books:
1. Artificial Intelligence, Saroj Kaushik
2. Artificial Intelligence, 3rd Edn., Patrick Henny Winston, Pearson Education.
3. Artificial Intelligence, Shivani Goel, Pearson Education.