



Asansol Engineering College

**Curriculum & Syllabus for B. Tech under Autonomy
Incorporation of NEP2020**

(Effective from 2024-25 admission batches)

Department of Computer Science and Engineering

(Internet of Things, Cyber Security including Block Chain Technology)





1 st Year 1 st Semester									
Sl. No	Broad Category	Category	Course Code	Course Title	Hours per week				Credits
					L	T	P	Total	
THEORY									
1	SCI	Multidisciplinary	CH(IOT) 101	Engineering Chemistry	2	0	0	2	2
2	SCI	Multidisciplinary	M(IOT) 101	Engineering Mathematics –I	3	0	0	3	3
3	ENGG	Major	IOT 101	Programming for Problem Solving	3	0	0	3	3
4	HUM	Ability Enhancement Course	HU(IOT) 101	Professional Communication	2	0	0	2	2
5	HUM	Value added course	HU(IOT) 102	Values and Ethics	2	0	0	2	2
6	HUM	Value added course	HU(IOT) 103	Constitution of India	1	0	0	1	1
PRACTICAL									
7	SCI	Skill enhancement	CH(IOT) 191	Engineering Chemistry Lab	0	0	2	2	1
8	ENGG	Skill enhancement course	ME(IOT) 191	Workshop & Manufacturing Practices Lab	0	0	3	3	1.5
9	ENGG	Major	IOT 191	Programming for Problem Solving Lab	0	0	3	3	1.5
10	HUM	Ability Enhancement Course	HU(IOT) 191	Professional Communication Lab	0	0	2	2	1
Total of Theory, Practical, and Mandatory Activities/Courses								23	18



1 st Year 2 nd Semester									
Sl. No.	Broad Category	Category	Course Code	Course Title	Hours per week				Credits
					L	T	P	Total	
THEORY									
1	ENGG	Major	IOT 201	Data Structures	3	0	0	3	3
2	SCI	Multidisciplinary	PH(IOT) 201	Engineering Physics	3	0	0	3	3
3	SCI	Multidisciplinary	M(IOT) 201	Engineering Mathematics –II	3	0	0	3	3
4	ENGG	Minor	EE-EC (IOT) 201	Basic Electrical and Electronics Engineering	3	0	0	3	3
5	HUM	Value added course	HU(IOT)201	Environmental Science	2	0	0	2	2
6	HUM	Value added course	HU(IOT)202	Indian Knowledge System	1	0	0	1	1
PRACTICAL									
7	ENGG	Major	IOT 291	Data Structures Lab	0	0	3	3	1.5
8	SCI	Skill Enhancement course	PH(IOT)291	Engineering Physics Lab	0	0	3	3	1.5
9	ENGG	Minor	EE-EC (IOT) 291	Basic Electrical and Electronics Engineering Lab	0	0	3	3	1.5
10	ENGG	Skill enhancement course	ME(IOT) 291	Engineering Graphics & Design Lab	0	0	3	3	1.5
11	HUM	Ability Enhancement Course	HU(IOT) 291	Design thinking Lab	0	0	2	2	1
Total of Theory, Practical, and Mandatory Activities/Courses								29	22



2 nd Year 1 st Semester									
Sl. No.	Broad Category	Category	Course Code	Course Title	Hours per week				Credits
					L	T	P	Total	
THEORY									
1	ENGG	Multidisciplinary	EC(IOT) 301	Digital System Design	3	0	0	3	3
2	ENGG	Major	IOT 301	Design & Analysis of Algorithm	3	0	0	3	3
3	ENGG	Major	IOT 302	Computer Architecture & Organization	3	0	0	3	3
4	SCI	Multidisciplinary	M(IOT) 301	Probability & Statistics	3	0	0	3	3
5	HUM	Minor	HU (IOT) 301	Economics for Engineers	3	0	0	3	3
PRACTICAL									
6	ENGG	Major	IOT 391	Design & Analysis of Algorithm	0	0	3	3	1.5
7	ENGG	Multidisciplinary	EC(IOT) 391	Digital Electronics	0	0	2	2	1
8	ENGG	Major	IOT 392	Computer Architecture & Organization	0	0	2	2	1
9	ENGG	Skill enhancement course	IOT 393	IT Workshop (Python/Matlab/R)	0	0	3	3	1.5
Total of Theory, Practical, and Mandatory Activities/Courses								25	20



2 nd Year 2 nd Semester									
Sl. No.	Broad Category	Category	Course Code	Course Title	Hours per week				Credits
					L	T	P	Total	
THEORY									
1	SCI	Multidisciplinary	M(IOT) 401	Discrete Mathematics	3	0	0	3	3
2	ENGG	Major	IOT 401	Data Communication and Networks	3	0	0	3	3
3	ENGG	Major	IOT 402	Formal Language and Automata Theory	3	0	0	3	3
4	ENGG	Major	IOT 403	Microprocessor, Microcontroller & Sensors	3	0	0	3	3
5	SCI	Minor	BIO (IOT) 401	Biology	2	1	0	3	3
6	HUM	Minor	HU (IOT) 401	Principles of Management	2	0	0	2	2
PRACTICAL									
7	ENGG	Major	IOT 491	Data Communication and Networks Lab	0	0	3	3	1.5
8	ENGG	Major	IOT 492	Microprocessor, Microcontroller & Sensors	0	0	3	3	1.5
Total of Theory, Practical, and Mandatory Activities/Courses								26	20



3 rd Year 1 st Semester									
Sl. No.	Broad Category	Category	Course Code	Course Title	Hours per week				Credits
					L	T	P	Total	
THEORY									
1	ENGG	Major	IOT 501	Database Management System	3	0	0	3	3
2	ENGG	Major	IOT 502	Operating System	3	0	0	3	3
3	ENGG	Major	IOT 503	Object Oriented Programming	3	0	0	3	3
4	ENGG	Major	IOT 504	Pattern Recognition	3	0	0	3	3
5	HUM	Minor	HU(IOT) 501	Introduction to Industrial Management	2	0	0	2	2
6	ENGG	Major	IOT 505 (A/B/C)	Embedded System/ Internet Technology/ Smart Sensors and IoT	3	0	0	3	3
PRACTICAL									
7	ENGG	Major	IOT 591	Database Management System lab	0	0	3	3	1.5
8	ENGG	Major	IOT 592	Operating System Lab	0	0	3	3	1.5
9	ENGG	Major	IOT 593	Object Oriented Programming Lab	0	0	3	3	1.5
Total of Theory, Practical, and Mandatory Activities/Courses								26	21.5



3 rd Year 2 nd Semester									
Sl. No	Broad Category	Category	Course Code	Course Title	Hours per week				Credits
					L	T	P	Total	
THEORY									
1	ENGG	Minor	IOT 601	Cryptography and Network Security	2	0	0	2	2
2	ENGG	Major	IOT 602	IoT Application and Design	3	0	0	3	3
3	ENGG	Major	IOT 603	Machine Learning	3	0	0	3	3
4	ENGG	Major	IOT 604 (A/B/C/D/E)	Cloud Computing/ Cyber law and Cybercrime/ Steganography and Watermarking/ Software Engineering/ Digital Forensics	3	0	0	3	3
5	HUM	Minor	HU(IOT) 601 (A/B/C)	Human Resource Development and Organizational Behaviour/ Indian Music System/ Economic Policies in India	3	0	0	3	3
PRACTICAL									
6	ENGG	Major	IOT 691	IoT Application and Design Lab	0	0	4	4	2
7	ENGG	Multidisciplinary	IOT 692 (A/B/C/D/E)	Lab based on IOT 604	0	0	3	3	1.5
8	ENGG	Major	IOT 692	Machine Learning	0	0	4	4	2
9	ENGG	Major	IOT 681	Project-I	0	0	4	4	2
Total of Theory, Practical, and Mandatory Activities/Courses								29	21.5



4 th Year 1 st Semester									
Sl. No	Broad Category	Category	Course Code	Course Title	Hours per week				Credits
					L	T	P	Total	
THEORY									
1	ENGG	Major	IOT 701 (A/B/C)	Blockchain and Cryptocurrency/ Social Network Analysis/ Ecommerce and ERP	3	0	0	3	3
2	ENGG	Major	IOT 702 (A/B)	Ethical Hacking/Cyber security in Block chain Technology	3	0	0	3	3
3	HUM	Minor	HU(IOT) 701 (A/B/C)	Soft skill and Interpersonal Communication/ Bio Informatics/ Business Analytics	3	0	0	3	3
4	HUM	Minor	HU(IOT) 701	Project Management and Entrepreneurship	3	0	0	3	3
PRACTICAL									
5	ENGG	Major	IOT 781	Project II	0	0	12	12	6
Total of Theory, Practical, and Mandatory Activities/Courses								24	18



4 th Year 2 nd Semester									
Sl. No.	Broad Category	Category	Course Code	Course Title	Hours per week				Credits
					L	T	P	Total	
THEORY									
1	ENGG	Major	IOT 801 (A/B)	Security Assessment and Risk Analysis/ Deep Learning	3	0	0	3	3
2	ENGG	Major	IOT 802 (A/B/C)	Operations Research/ Remote Sensing and GIS / Digital Signal Processing	3	0	0	3	3
3	ENGG	Minor	IOT 803 (A/B)	Numerical Methods/ Multimedia Technology	3	0	0	3	3
PRACTICAL									
4	ENGG	Major	IOT 881	Project III	0	0	12	12	6
5	ENGG	Major	IOT 882	Grand Viva					4
Total of Theory, Practical and Mandatory Activities / Courses								21	19

Total Credit: 160



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1st Year 1st Semester

Sl. No	Broad Category	Category	Course Code	Course Title	Hours per week				Credits
					L	T	P	Total	
THEORY									
1	SCI	Multidisciplinary	CH(IOT) 101	Engineering Chemistry	2	0	0	2	2
2	SCI	Multidisciplinary	M(IOT) 101	Engineering Mathematics –I	3	0	0	3	3
3	ENGG	Major	IOT 101	Programming for Problem Solving	3	0	0	3	3
4	HUM	Ability Enhancement Course	HU(IOT) 101	Professional Communication	2	0	0	2	2
5	HUM	Value added course	HU(IOT) 102	Values and Ethics	2	0	0	2	2
6	HUM	Value added course	HU(IOT) 103	Constitution of India	1	0	0	1	1
PRACTICAL									
7	SCI	Skill enhancement	CH(IOT) 191	Engineering Chemistry Lab	0	0	2	2	1
8	ENGG	Skill enhancement course	ME(IOT) 191	Workshop & Manufacturing Practices Lab	0	0	3	3	1.5
9	ENGG	Major	IOT 191	Programming for Problem Solving Lab	0	0	3	3	1.5
10	HUM	Ability Enhancement Course	HU(IOT) 191	Professional Communication Lab	0	0	2	2	1
Total of Theory, Practical, and Mandatory Activities/Courses								23	18

Course Name: Engineering Chemistry

Course Code: CH(IOT) 101

Total Contact Hours: 24

Credits: 2

Prerequisites:

COURSE OBJECTIVE

- To understand the basic principles of elements, organic reactions, drug synthesis and technological aspects of modern chemistry
- To apply the knowledge of different engineering materials, advanced polymers, and nanomaterials to solve complex engineering problems
- To analyze and evaluate quality parameters of water and its treatment
- Apply the knowledge of free energy, energy storage device, semiconductors, fuels and corrosion to design environment friendly & sustainable devices
- Apply the knowledge of different instrumental techniques to analyze unknown engineering materials.

COURSE OUTCOME

CO1. Able to understand the basic principles of elements, organic reactions drug synthesis and computational chemistry

CO2. Able to apply the knowledge of different engineering materials, advanced polymers, and nanomaterials to solve complex engineering problems

CO3. Able to analyze and evaluate water quality parameters and its treatment

CO4. Able to the knowledge of free energy, energy storage device, fuels and corrosion to design environment friendly & sustainable devices

CO5. Able to apply the knowledge of different instrumental techniques to analyze unknown engineering materials

CO v/s PO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	3	3	2	2	2	-	-	-	-	-	2	2
2	3	3	3	3	-	-	2	-	-	-	2	2
3	3	3	-	-	-	-	3	-	-	-	3	2
4	3	3	3	2	-	-	3	-	-	-	3	2
5	3	3	3	3	2	-	-	-	-	-	2	2

COURSE CONTENT

Module 1 - Elements and their properties (6L)

1. Elements and their properties(3L)

Bohr's theory for one electron system, Hydrogen spectrum, Quantum numbers, atomic orbitals, Pauli's exclusion principle, Hund's rule, exchange energy, Aufbau principle, Electronic configuration and Magnetic properties.

2. Periodic Table for Engineers(3L)

Modern Periodic table, Periodic properties, study of advanced functional materials like Silicones, Silicates, Zeolite and alloys like steel, mischmetall, Neodymium alloy and their applications.

Module 2 - Energy devices and Semiconductors (6L)

1. Use of free energy in chemical equilibria (3L)

Laws of Thermodynamics, Enthalpy, Entropy, Spontaneity, Electrochemical Cell, Dry Cell, Mercury Cell, Lead Storage batteries, Ni-Cd Cells, Fuel Cells, Solar Cells, Nernst equation and applications, Electrochemical sensors

2. Crystals and Semiconductors (3L)

Crystals and their defects, Stoichiometric and Non-stoichiometric defects, Band theory and Doping, n-type and p-type semiconductors, Superconductors

Module 3 –Industrial Applications of Chemistry (8L)

1. Advanced Polymeric materials (3L)

Classification, Engineering Plastics, conducting polymers, bio polymers, polymer composites

2. Industrial corrosion (2L)

Classification, Effects of corrosion, Preventive measures

3. Analysis of Water Quality (1L)

Physicochemical and Biological parameters

4. Nano materials(1L)

Synthesis of Nano materials, Applications in modern devices

5. Basic Computational Chemistry(1L)

Introduction of computational chemistry and their applications

Module 4 – Organic Reaction Products and their spectroscopic analysis (4L)

1. Organic Reactions(2L)

Substitution, Elimination and Addition reactions

2. Drug designing and synthesis(1L)

Paracetamol, Aspirin

3. Spectroscopic Analysis (1L) UV – Visible Spectra, IRspectra

Course Name: Engineering Mathematics -I

Paper Code: M (IOT) 101

Contact (L: T: P): 3:0:0

Total Contact Hours: 36

Credit: 3

Prerequisites:

The students to whom this course will be offered must have the concept of (10+2) standard matrix algebra, and calculus.

Course Objectives:

The objective of this course is to familiarize the prospective engineers with techniques in matrix algebra and calculus. It aims to equip the students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling more advanced level of mathematics and applications that they would find useful in their disciplines.

Course Outcomes (COs):

On successful completion of the learning sessions of the course, the learner will be able to:

CO1: Recall the properties related to matrix algebra and calculus.

CO2: Determine the solutions of the problems related to matrix algebra and calculus.

CO3: Apply the appropriate mathematical tools of matrix algebra and calculus for the solutions of the problems.

CO4: Analyze different engineering problems linked with matrix algebra and calculus.

CO-PO/PSO Mapping:

PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12
CO1	3	2	-	-	-	-	-	-	-	-	-	2
CO2	3	2	-	-	-	-	-	-	-	-	-	1
CO3	3	2	2	-	-	-	-	-	-	-	-	1
CO4	2	3	1	2	-	-	-	-	-	-	-	1
CO	2.75	2.25	1.5	2	-	-	-	-	-	-	-	1.25

Weightage Values: Strongly mapped: '3', moderately mapped: '2', weakly mapped: '1', Not mapped: '-'

Course Content:**Module I: Linear Algebra (11L)**

Echelon form and normal (canonical) form of a matrix; Inverse and rank of a matrix; Consistency and inconsistency of system of linear equations, Solution of system of linear equations; Eigen values and eigenvectors; Diagonalization of matrix, Cayley-Hamilton theorem.

Module II: Single Variable Calculus (5L)

Rolle's Theorem, Mean value theorems, Taylor's and Maclaurin theorems with remainders; Concept of sequence and series, Power series; Taylor's series.

Module III: Multivariable Calculus (Differentiation) (13L)

Function of several variables; Concept of limit, continuity and differentiability; Partial derivatives, Total derivative and its application; chain rules, Derivatives of implicit functions Euler's theorem on homogeneous function; Jacobian; Maxima and minima of functions of two variables.

Module IV: Multivariable Calculus (Integration) (7L)

Double Integral, Triple Integral; Change of order in multiple integrals; Line Integral, Surface Integral, Volume Integral. Change of variables in multiple integrals.

Text Books:

1. Grewal, B.S., Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.
2. Kreyszig, E., Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.

Reference Books:

1. Guruprasad, S. A text book of Engineering Mathematics-I, New age International Publishers.
2. Ramana, B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.
3. Veerarajan, T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
4. Bali, N.P. and Goyal, M., A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
5. Thomas, G.B. and Finney, R.L., Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.

Course Name: Programming for problem solving
Course Code: IOT 101
Contact (Periods/Week):3L/Week
Total Contact Hours: 36
Credits: 3

Course Outcome(s):

CO1: To identify the working principle of input and output devices of Computers memorize the basic terminology used in computer programming.

CO2: To express programs in C language and use different data types for writing the programs.

CO3: To implement programs using the dynamic behavior of memory by the use of pointers. CO4: To explain the difference between call by value and call by address.

CO5: To write programs using basic data files and developing applications for real world problems.

CO-PO-PSO Mapping:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO12	PSO 1	PSO 2	PSO 3
CO1	3	3	3	2	2						2	3	2	3	3
CO2	2	2	3	3	3							3	2	2	3
CO3	2	3	2	2	2							3	2	3	2
CO4	3	2	2	3	3							2	2	2	2
CO5	2	2	2	1	1						2	3	3	3	3

Course Content:

Module-1: Fundamentals of Computer (9L)

History of Computer, Generation of Computer, Classification of Computers, Basic structure of Computer System, Primary & Secondary Memory, Processing Unit, Input & Output devices.

Number System: basic of Binary, Octal, Decimal and Hexadecimal number systems; Representation and interchanging of number in different number systems. Introduction to complements system, Representation of signed and unsigned numbers in signed magnitude signed 1's complement system and signed 2's complement system.

Arithmetic– Addition and Subtraction (using 1's complement and 2's complement). Representation of Characters-ASCII Code, Basics of Compiler, Interpreter and Assembler

Problem solving– Basic concept of Algorithm. Representation of algorithm using flowchart and pseudo code, Some basic examples.

Module-2: Introduction to C Programming (5L)

Overview of Procedural vs Structural language; History of C Programming Language. Variable and Data Types: The C characters identifiers and keywords, data type & sizes, variable names, declaration, statements.

Operators & Expressions: Arithmetic operators, relational operators, Logical operators, increment and decrement operators, bitwise operators, Assignment operators, conditional operators, special operators-type Conversion, C expressions, precedence and associativity. Input and Output: Standard input and output, formatted output–printf, formatted input scanf.

Module-3: Branch and Loop (5L)

Branching: Concept of Statement and Blocks in C, Simple if, if -else, nested if-else and if-else ladder. Switch Case: break and continue; switch-case, concept of go to and labels Loops- while, for, do while.

Module-4: Program Structures (4L)

Function: Basics of Functions, function types, function prototypes, formal and actual parameter, function calling, functions returning values, functions not returning values. Recursion and Recursive Function.

Storage Class in C: Storage Class-auto, external, static and registers to rage class, scope rules and lifetime of variables

C pre-processor: Pre-processing directive and macro, parameterized macro.

Module-5: Array and Pointer (7L)

Arrays: One dimensional array, Two-dimensional arrays Passing an array to a function Pointers: Pointers, Pointer and Array, Pointer and functions.

Strings: Character array and string, array of strings, Passing a string to a function, String related functions, Pointer and String. Dynamic memory allocation: Malloc, calloc, realloc and free with example.

Module-6: Structures, Unions and Enum (3L)

Basic of structures, arrays of structures, structures and pointers, bit fields. Basics of union and enum, difference between structure and union.

Module-7: File in C (3L)

Files handling-opening and closing a file indifferent mode, formatted and unformatted files, Command line arguments, fopen, fclose, fgetc, fputc, fprintf, fscanf function.

Textbook:

1. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill
2. Kanetkar Y.- Let us C, BPB Publication, 15th Edition

Reference Books:

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India
2. K R Venugopal & S R Prasad– MASTERING C, TMH, 2nd Edition

Course Name: Professional Communication**Paper Code:** HU(IOT) 101**Contact:** 2:0:0**Total Contact Hours:** 24**Credit:** 2

Pre-requisites:	Basic (10+2) level of knowledge of English grammar, vocabulary reading and writing skills.
Course Objectives	The course aims to impart domain and industry-specific communications skill in a globalized context and to promote the understanding of business communication practices and cross cultural dynamics.
Course Outcomes:	By pursuing this course the students shall be able to
	1. Define, describe and classify the modalities and nuances of communication in a workplace context.
	2. Review, appraise and understand the modes, contexts and appropriacy of communicating across cultures and societies.
	3. Identify, interpret and demonstrate the basic formats, templates of business and official communication.
	4. Identify, compare and illustrate reading strategies and basic writing strategies.
	5. Interpret, analyze and evaluate semantic-structural, interpersonal and multicultural dynamics in business communication.

Course Content:**Module1:****Verbal and Nonverbal communication****4L**

Definition, Relevance and Effective Usage

Components of Verbal Communication: Written and Oral Communication

Components of Non-verbal Communication: Kinesics, Proxemics, Chronemics, Haptics

Paralanguage

Barriers to Effective Communication

Module2:**Workplace Communication Essentials and Cross Cultural Communication****4L**

Communication at the Workplace—Formal and Informal Situations

Language in Use—Jargon, Speech Acts/Language Functions, Syntactical and Grammatical Appropriacy

Cultural Contexts in Global Business: High Context and Low Context Cultures Understanding Cultural

Nuances and Stereotyping Achieving Culturally Neutral Communication in Speech and Writing

Module3:**4L**

Reading Strategies and Basic Writing Skills

Reading: Purposes and Nature of Reading

Reading Sub-Skills—Skimming, Scanning, Intensive Reading

Reading General and Business Texts (Reading for Comprehension and Detailed Understanding)

Basic Writing Skills—Paragraph and Essay writing, writing technical documents

Writing Technicalities—Paragraphing, Sentence Structure and Punctuation

Module4:**4L****Report Writing**

Nature and Function of Reports
 Types of Reports
 Researching for a Business Report
 Format, Language and Style
 Report Documentation

Module5:**Employment Communication**

- a. Writing Business Letters—(Enquiry,Order,Sales,Complaint,Adjustment,JobApplication,Offer) **2L**
- b. Creating an Employee Profile—Preparing a CV orRésumé.**
 Creating a Digital/Online Profile–Linked In (Résumé/VideoProfile) **2L**
- c. Writing Other Interoffice Correspondence--E-mails: types, convention, and etiquette, Memo, Notices and Circulars **2L**
- d. Preparing Meeting Documentation—Drafting Notice and Agenda of Meetings, Preparing Minutes of Meetings. **2L**

References:-

1. **Meenakshi Raman and Sangeetha Sharma. Technical Communication. 3rdedition. New Delhi: Oxford University Press,2015.**
2. Mark Ibbotson. Cambridge English for Engineering. Cambridge: Cambridge University Press, 2008.
3. Mark Ibbotson. Professional English in Use: Engineering. Cambridge: Cambridge UP,2009.
4. Lesikar et al. Business Communication: Connecting in a Digital World. New Delhi: TataMcGraw-Hill,2014.
5. John Seeley. Writing Reports. Oxford: Oxford University Press,2002.
6. Judith Leigh. CVs and Job Applications. Oxford: Oxford University Press,2002.
7. Judith Leigh. Organizing and Participating in Meetings. Oxford: Oxford University Press, 2002.
8. Michael Swan. Practical English Usage. Oxford: OUP,1980.
9. Pickett, Laster and Staples. Technical English: Writing, Reading & Speaking. 8 thed.London: Longman, 2001.
10. Diana Booher. E-writing: 21st Century Tools for EffectiveCommunication.

Links:-

1. PurdueUniversity’sOnlineWritingLab(OWL)-<https://owl.purdue.edu/>
2. BusinessEnglishPod-<https://www.businessenglishpod.com/>

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12
CO1	-	-	-	-	-	2	1	1	2	3	-	2
CO2	-	-	-	-	-	1	1	2	2	3	-	3
CO3	-	-	-	-	-	3	3	1	1	3	2	3
CO4	-	-	-	-	-	3	3	1	-	3	-	3
CO5						2	2	2	2	3	-	3

Course Name: Values and Ethics

Course Code: HU(IOT) 102

Contacts: 2:0:0

Total Contact Hours: 24

Credit: 2

Prerequisite: None

Module: 1 Introduction:(4L)

Definition of Ethics; Approaches to Ethics: Psychological, Philosophical, and Social

Types of values-Social, Psychological, Aesthetic, Spiritual, and Organizational

Natural acceptance of human values. Definitiveness of Ethical Human Conduct. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order.

Module 2: Universal Human Harmony. (4L)

Basic Human Aspirations, Happiness and Prosperity, Self-Exploration, Self and the Body Understanding the harmony in the Nature.

Interconnectedness and mutual fulfilment among the four orders of nature- recyclability and self- regulation in nature.

Values Crisis in contemporary society Nature of values: Value Spectrum of a good life (Maslow's Pyramid)

Module: 3 Ethical Concerns: (6L)

Renewable Energy Resources, Environmental degradation and pollution. Eco-friendly Technologies. Environmental Regulations, Environmental Ethics. Rapid Technological growth and depletion of resources, Reports of the Club of Rome.

Problems of Technology transfer- Technology assessment impact analysis -Human Centered Technology.

Module: 4 Ethics of Profession: (4L)

Work Ethics and Work Values, Business Ethics, Human values in organizations: Social and ethical responsibilities of Technologists. Codes of professional ethics.

Types of Ethical issues-Internal Ethics of Business-

Whistle Blowing, Impact of Ethics on Business Policies and Strategies- Ethical Leadership – Characteristics

Module: 5 Self Development AND Gender Awareness (6L)

Definition of Gender, Basic Gender Concepts and Terminology, Exploring Attitudes towards Gender, Social Construction of Gender

Gender Roles and Relations, Types of Gender Roles, Gender Roles and Relationships Matrix, Gender- based Division and Valuation of Labour. Gender Development Issues, Identifying Gender Issues

Text Books:

1. Beneria, Lourdes. (2004). Gender, Development, and Globalization: Economics as if All People Mattered. Routledge Press.(GDGE)
2. Molyneux and Razavi. (2002). Gender Justice, Development and Rights. Oxford University Press (GJDR orWGD)
3. Visvanathan, Duggan, Wiegansma and Nisonoff.(2011).

4. The Women, Gender and Development Reader. 2nd Edition. Zed Press(WGD)
5. Stephen H Unger, Controlling Technology: Ethics and the Responsible Engineers, John Wiley & Sons, New York 1994 (2ndEd)
6. Deborah Johnson, Ethical Issues in Engineering, Prentice Hall, Englewood Cliffs, New Jersey 1991.
7. A N Tripathi, Human values in the Engineering Profession, Monograph published by IIM, Calcutta 1996.

Course Outcomes:

CO 1	Understand the significance of values, various approaches to ethics and its applications in life and profession.
CO2	Able to distinguish Self and the Body, to understand Harmony in the Self
CO3	To identify and eradicate environmental concerns through technology
CO4	Demonstrate work ethics and analyse business strategies
CO5	Ability to understand gender terminologies and to identify gender issues

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	2	-	-	-	-	-	3	3	-	2
CO2	-	-	-	-	-	3	3	-	3	2	-	-
CO3	-	3	3	-	3	2	3	-	-	-	-	2
CO4	2	-	-	2	-	-	-	3	-	-	2	-
CO5	-	3	-	-	-	2	1	-	-	2	-	2

Paper Name: Constitution of India
Paper Code: HU(IOT)103
Credit: 01
No. of lectures: 12

Module 1: History of Making of the Indian Constitution: History. Drafting Committee, (Composition & Working) **3L**
Philosophy of the Indian Constitution: Preamble Salient Features
Module2:Fundamental Rights, Fundamental Duties,Directive Principles of State Policy **6L**

The Right to Equality
The Right to Freedom: I (Article 19)
The Right to Freedom: II (Articles 20, 21 and 22)
The Right against Exploitation
The Right to freedom of Religion Cultural and Educational rights
The Right to Property
The Right to Constitutional Remedies
Fundamental Duties

Module-3: Organs of Governance: 3L

Parliament - Composition - Qualifications and Disqualifications -Powers and Functions – Executive- President -Governor - Council of Ministers - Judiciary, Appointment and Transfer of Judges, Qualifications - Powers and Functions

Text / Reference Books:

- 1) Indian Constitution by D. D. Basu, The Publisher, Lexis Nexis
- 2) Constitution of India by Subhas C Kasyap, Vitasta Publishing
- 3) The Constitution of India. M Bakshi, Universal Law Publishing Co. Ltd, New Delhi, 2003.
- 4) Indian Constitution Text Book-Avasthi, Avasthi, Publisher: LAKSHMINARAINAGARWAL
- 5) Introduction to the Constitution of India, Brij Kishore Sharma, PHI

Course Name: Programming for problem solving

Lab Course Code: IOT 191

Contact Hours: 3L/Week

Total Contact Hours: 36

Credits: 1.5

Course Outcomes	Name of Course Outcomes
CO1	To identify the working of different operating systems like DOS, Windows, Linux
CO2	To express programs in C language
CO3	To implement programs connecting decision structures, loops
CO4	To experiment with user defined functions to solve real time problems
CO5	To write C programs using Pointers to access arrays, strings, functions, structures and files

CO-PO-PSO Mapping:

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	3	3	2	2						2	3	2	3	3
CO2	2	2	3	3	3							3	2	2	3
CO3	2	3	2	2	2							3	2	3	2
CO4	3	2	2	3	3							2	2	2	2
CO5	2	2	2	1	1						2	3	3	3	3

Course Content:

Module- 1: Familiarization with some basic commands of DOS and Linux. File handling and Directory structures, file permissions, creating and editing simple C program in different editor and IDE, compilation and execution of C program. Introduction to Code block.

Module-2: Problem based on

- Basic datatypes
- Different arithmetic operators.
- Printf() and scanf() functions.

Module-3: Problem based on conditional statements using

- if-else statements
- different relational operators
- different logical operators

Module-4: Problem based on

- a) **for** loop
- b) **while** loop
- c) **do-while** loop

Module-5: Problem based on

- a) How to write a menu driven program using switch-case statement
- b) How to write a function and passing values to a function
- c) How to write a recursive function.

Module-6: Problem based on

- a) How to use array (both 1-D and 2-D).
- b) How to pass an array to a function.

Module-7: Problem based on manipulation of strings in different way.

Module-8: Problem based on

- a) How to handle compound variable in C
- b) How to handle file in C
- c) How to use command line argument in C

Textbook:

1. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill
2. Kanetkar Y.-Let us C, BPB Publication, 15th Edition

Reference Books:

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India K R Venugopal & S R Prasad–MASTERING C, TMH, 2nd Edition

Course Name: Professional Communication Lab
Course Code: HU (IOT) 191
Contact: (0:0:2)
Total Contact Hours: 26
Credit: 1

Pre requisites: Basic knowledge of LSRW skills.

Course Objectives: To train the students in acquiring interpersonal communication skills by focusing on language skill acquisition techniques and error feedback.

Course Outcome:

By pursuing this course the students will be able to:

CO1: Recognize, identify and express advanced skills of Technical Communication in English through Language Laboratory.

CO2: Understand, categorize, differentiate and infer listening, speaking, reading and writing skills in societal and professional life.

CO3: Articulate and present the skills necessary to be a competent Interpersonal communicator. CO4: Deconstruct, appraise and critique communication behaviors.

CO5: Adapt, negotiate and facilitate with multifarious socio-economical and professional arenas with effective communication and interpersonal skills.

Course Contents:

Module 1: Introduction to the Language Lab

- a. The Need for a Language Laboratory
- b. Tasks in the Lab
- c. Writing a Laboratory Notebooks

Module 2: Active Listening

- a. What is Active Listening?
- b. Listening Sub-Skills—Predicting, Clarifying, Inferencing, Evaluating, Note-taking
- c. Listening in Business Telephony

Module 3: Speaking

- a. Speaking—Accuracy and Fluency Parameters
- b. Pronunciation Guide—Basics of Sound Scripting, Stress and Intonation
- c. Fluency-focused activities—JAM, Conversational Role Plays, Speaking using Picture/Audio Visual inputs
- d. Accuracy-focused activities—Identifying Minimal Pairs, Sound Mazes, Open and Closed Pair Drilling, Student Recordings (using software)
- e. Group Discussion: Principles and Practice
- f. Giving a Presentation—Learning Presentation Basics and Giving Micro Presentations

Module 4: Lab Project Work

- a. Writing a Book Review
- b. Writing a Film Review
- c. Scripting a Short Presentation (2minutes)
- d. Making a short video CV (1-2minutes)

References:

1. IT Mumbai, **Preparatory Course in English** syllabus
2. IIT Mumbai, **Introduction to Linguistics** syllabus
3. Sasi Kumar et al. *A Course in Listening and Speaking*. New Delhi: Foundation Books, 2005.
4. Tony Lynch, *Study Listening*. Cambridge: Cambridge UP, 2004.

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	2	-	-	1	1	-	2	3	-	2
CO2	-	-	2	2	-	3	3	-	2	3	-	3
CO3	-	-	2	2	-	3	3	2	2	3	-	3
CO4	-	-	-	-	-	3	3	2	2	3	-	3
CO5	-	-	2	2	-	3	3	2	2	3	-	3

Course Name: Engineering chemistry**lab Paper Code: CH (IOT) 191****Total Contact Hours: 24****Credit: 1****Course Objective**

- Study the basic principles of pH meter and conductivity meter for different applications
- Analysis of water for its various parameters & its significance in industries
- Learn to synthesis Polymeric materials and drugs
- Study the various reactions in homogeneous and heterogeneous medium

Course Outcome

CH191.1: Able to operate different types of instruments for estimation of small quantities chemicals used in industries and scientific and technical fields.

CH191.2: Able to analyse and determine the composition and physical property of liquid and solid samples when working as an individual and also as a team member

CH191.3: Able to analyse different parameters of water considering environmental issues

CH191.4: Able to synthesize drug and sustainable polymer materials.

CH191.5: Capable to design innovative experiments applying the fundamentals of modern chemistry

CO-PO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	3	1	3	1	-	2	3	-	-	-	-	1
2	2	2	1	1	-	1	-	-	-	1	-	1
3	-	-	-	-	-	-	-	-	3	3	2	2
4	2	1	2	2	-	-	1	-	-	-	-	2

5	3	3	3	3	1	1	1	1	-	-	2	2
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COURSE CONTENT

1. Determination of the concentration of the electrolyte through conductance measurement.
2. Determination of water quality measurement techniques.
3. Determination of the concentration of the electrolyte through pH measurement.
4. Estimation of Cu in brass
5. Estimation of Fe₂O₃ in Cement
6. Isolation of graphene from dead dry batteries and their use for temporary soldering.
7. Synthesis of Silver Nanoparticles doped organic thin film for organic transistors.
8. Estimation of corrosion in a given sample metal.
9. Preparation of Si-nano crystals for future memory devices.
10. Green Synthesis of ZnO based Polymer Nano composites.
11. Synthesis of polymers for electrical devices and PCBs.
12. Determination of Partition Coefficient of acetic acid between two immiscible liquids.
13. Drug design and synthesis
14. Rheological properties of the Newtonian fluids
15. Innovative Experiments

**Course Name: Workshop
and Manufacturing Lab**
Course Code: ME(IOT)191
Contact: 0:0:3
Credits: 1.5

Prerequisite: Physics & Mathematics (10+2 Level)

CO1: Gain basic knowledge of Workshop Practice and Safety useful for our daily living.

CO2: Understand the use of Instruments of a pattern shop like Hand Saw, Jack Plain, Chisels etc. CO3: Apply and performing operations like such as Marking, Cutting etc used in manufacturing processes.

CO4: Analyze the various operations in the Fitting Shop using Hack Saw, various files, Scriber, etc to understand the concept of tolerances applicable in all kind of manufacturing.

CO5: Get hands on practice of in Welding and apply various machining processes which give a lot of confidence to manufacture physical prototype sin project works.

Course Content:

3P

(i) Theoretical discussions:

1. Manufacturing Methods-casting, forming, machining, joining, advanced manufacturing methods
2. Fitting operations & power tools
3. Carpentry
4. Welding(arc welding & gas welding),brazing
5. Electrical Electronics
6. Metal casting
7. CNC machining ,Additive manufacturing, 3D Printing
8. Plastic molding &Glass Cutting

(ii) Workshop Practice:

At least 6 Modules should be covered

Module 1-Machinshop

6P

Typical jobs that may be made in this practice

- i. To make a pin from a mild steel rod in lathe.
- ii. To make rectangular and vee slot in a block of cast iron or mild steel in a shaping and / or milling machine.

Module2-Fitting shop**6P**

Typical jobs that may be made in this practice **Module:** To make a Gauge from MS plate.

Module3 –Carpentry Shop**6P**

Typical jobs that may be made in this practice **Module:** To make wooden joints and/or a pattern or like.

Module4-Welding & Soldering shop**6P**

Typical jobs that may be made in this practice **Module:**

- i. Arc Welding: To join two thick (approx 5mm) MS plates by manual metal arc welding.
- ii. Gas Welding: To join two thin mild steel plates or sheets by gas welding.
- iii. House wiring, soft Soldering

Module 5–Smithy & Casting**6P**

Typical jobs that may be made in this practice **Module:**

- i. A simple job of making a square rod from a round bar or similar.
- ii. One/two green sand molds to prepare, and a casting to be demonstrated.

Module6– CNC Machining & Laser Cutting**6P**

Typical jobs that may be made in this practice **Module:**

- i. At least one sample shape on mild steel plate should be made using CNC Milling / CNC Lathe Machine
- ii. At least one sample shape on glass should be made using laser cutting machine.

Module 7 – 3D Printing**6P**

- i) Exposure to a 3D printing machine,
- ii) 3D printing of at least one sample model using available materials.

Examinations could involve the actual fabrication of simple components, utilizing one or more of the techniques covered above.

TextBooks:

1. Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K.,— Elements of Workshop Technology, Vol.I, 2008 and Vol. II, 2010, Media promoters and publishers private limited, Mumbai.
2. Rao P.N.,—Manufacturing Technology, Vol.I and Vol.II, Tata McGraw Hill House, 2017.

ReferenceBooks:

1. Gowri P., Hariharan and A. Suresh Babu, Manufacturing Technology– I, Pearson Education, 2008.
2. Roy A. Lindberg,—Processes and Materials of Manufacture,

4th edition, Prentice Hall India, 1998.

3. Kalpakjian S. and Steven S. Schmid, Manufacturing Engineering and Technology, 4th edition, Pearson Education India Edition, 2002.
4. Manufacturing Science by A. Ghosh and A.K. Mallick, Wiley Eastern.
5. Principles of Metal Cutting/Principles of Machine Tools by G.C. Sen and A. Bhattacharya, New Central Book Agency, Kolkata.

CO-PO/PSO Mapping:

CO Codes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3						2		2	2					
CO2	3						2		2	2					
CO3	3						2		2	2			2		2
CO4	3						2		2	2			2		2
CO5	3	2	2				2		2	2					



Asansol Engineering College

**Curriculum & Syllabus for B. Tech under Autonomy
Incorporation of NEP2020**

(Effective from 2024-25 admission batches)

**Department of Computer Science and Engineering
(Internet of Things, Cyber Security including Block Chain Technology)**

1st Year 2nd Semester

Sl. No.	Broad Category	Category	Course Code	Course Title	Hours per week				Credits
					L	T	P	Total	
THEORY									
1	ENGG	Major	IOT 201	Data Structures	3	0	0	3	3
2	SCI	Multidisciplinary	PH(IOT) 201	Engineering Physics	3	0	0	3	3
3	SCI	Multidisciplinary	M(IOT) 201	Engineering Mathematics –II	3	0	0	3	3
4	ENGG	Minor	EE-EC (IOT) 201	Basic Electrical and Electronics Engineering	3	0	0	3	3
5	HUM	Value added course	HU(IOT)201	Environmental Science	2	0	0	2	2
6	HUM	Value added course	HU(IOT)202	Indian Knowledge System	1	0	0	1	1
PRACTICAL									
7	ENGG	Major	IOT 291	Data Structures Lab	0	0	3	3	1.5
8	SCI	Skill Enhancement course	PH(IOT)291	Engineering Physics Lab	0	0	3	3	1.5
9	ENGG	Minor	EE (IOT) 291	Basic Electrical and Electronics Engineering Lab	0	0	3	3	1.5
10	ENGG	Skill enhancement course	ME(IOT) 291	Engineering Graphics & Design Lab	0	0	3	3	1.5
11	HUM	Ability Enhancement Course	HU(IOT) 291	Design thinking Lab	0	0	2	2	1
Total of Theory, Practical, and Mandatory Activities/Courses								29	22

Course Name: Data Structures
Course Code: IOT 201
Contact (Periods/Week):=3L/Week
Total Contact Hours: 36
Credits: 3

Course Objectives:

1. To learn the basics of abstract datatypes.
2. To learn the principles of linear and nonlinear datastructures.
3. To build an application using sorting and searching.

Course Outcomes	Name of Course Outcomes
CO1	To identify how the choices of data structure & algorithm methods impact the performance of program.
CO2	To express problems based upon different data structure for writing programs.
CO3	To implement programs using appropriate data structure & algorithmic methods for solving problems.
CO4	To explain the computational efficiency of the principal algorithms for sorting, searching, and hashing.
CO5	To write programs using dynamic and static data structures and building applications for real world problems.

CO-PO-PSO Mapping:

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3	
CO 1	3	2		2	3						1	3	1	1	1	
CO 2	3	2	2	2	2							2	3	2	2	
CO 3	2	3	3	2	3						1	2	3	3	3	
CO 4	2	2	2	3	1							1	2	1	2	
CO 5	2	3	3	3	2						1	2	3	3	3	
	2.40	2.40	2.50	2.40	2.20								2.00	2.40	2.00	2.20

Course Content:

Module 1: Introduction [4L]

Concepts of data and information; Concept of Abstract Data Type, Data Structure and Data Type. Classification of Data Structures- Primitive and Non-Primitive Data Structure, Linear and Non-Linear Data Structure. Need of Data Structures. (1L)

Concept of algorithms and programs, Different methods of representing algorithm; Algorithm analysis, time and space analysis of algorithms – Asymptotic notations like Big Oh (O), Small Oh(o), Big Omega(Ω), Small Omega(ω) and Theta(Θ) notation (definition and significance).(3L)

Module 2: Non-Restricted Linear Data Structure [9L]

List or Linear List: Definition and Example, List as ADT. Representation of Linear List- Sequential Representation and Linked Representation.

Array: Introduction to sequential representation, Linearization of multidimensional array.

Application of array:

Representation of polynomial using array, Representation of Sparse matrix using array.

Linked List: Introduction to linked representation, Implementation of different types of linked list- Singly linked list, Doubly linked list, Circular linked list, Circular Doubly Linked List.

Application of Linked list- Representation of polynomial.

Module 3: Restricted Linear Data Structure [6L]

Stack: Definition of Stack, implementations of stack using array and linked list, Applications of stack- infix to postfix conversion, Postfix Evaluation

Recursion: Principles of recursion - use of stack, tail recursion. Tower of Hanoi using recursion.

Queue: Definition of Queue; Implementation of queue using array-physical, linear and circular model; Implementation of queue using linked list.

Deque - Definition and different types of dequeue.

Module 4: Nonlinear Data structures [9L]

Trees and Binary Tree:

Basic terminologies; Definition of tree and binary tree. Difference between tree and binary tree, Representation of binary tree (using array and linked list)

Binary tree traversal (pre-, in-, post- order); Threaded binary tree- definition, insertion and deletion algorithm; Binary search tree- Definition, insertion, deletion, searching algorithm;

Height balanced binary tree: AVL tree- definition, insertion and deletion with examples only.

m –Way Search Tree: B Tree – Definition, insertion and deletion with examples only; B+

Tree – Definition, insertion and deletion with examples only.

Heap: Definition (min heap and max heap), creation, insertion and deletion algorithm.

Application of heap (priority queue and sorting).

Graphs: Definition and representation (adjacency matrix, incidence matrix and adjacency list).

Graph traversal– Depth-first search (DFS), Breadth-first search (BFS) - concepts of edges used in DFS and BFS (tree-edge, back-edge, cross-edge, and forward-edge).

Module 5: Sorting and Searching [8L]

Sorting Algorithms: Definition and need of sorting, different types of sorting algorithm

(internal, external, stable, in-place, comparison based); Factors affecting sorting Methods,

Bubble sort, Insertion sort, Selection sort, Quick sort, Merge sort, Radix sort – algorithm with

analysis (time complexity) Searching: Factors affecting searching Methods; Sequential search – algorithm with analysis (time complexity); improvement using sentinel.

Binary search and Interpolation Search algorithm with analysis (time complexity)

Hashing: Introduction and purpose of Hashing and Hash functions (division, folding and mid-

square), Collision resolution techniques.

Text book:

1. Data Structures Through 'C' Language by Samiran Chattopadhyay, Debabrata Ghosh Dastidar, Matangini Chattopadhyay, Edition: 2001, BPB Publications
2. Fundamentals of Data Structures of C by Ellis Horowitz, Sartaj Sahni, Susan Anderson-freed 2nd Edition, Universities Press

Reference Books:

1. Data Structures, Algorithms, and Software Principles in C by Thomas A. Standish, 1 Edition, Pearson.
2. Data Structures by S. Lipschutz, Special Indian Edition, Tata McGraw Hill Education (India) Private Limited
3. Data Structures and Program Design in C by Robert L. Kruse, Bruce P. Leung 2nd Edition, Pearson
4. Data Structures in C by Aaron M. Tenenbaum, 1st Edition, Pearson.

Course Name: Engineering Physics

Course Code: PH(IOT)201

Contact: (3:0:0)

Total Contact Hours: 36

Credits: 3

Prerequisites: Knowledge of Physics up to 12th standard.

Course Objectives:

The aim of courses in Physic-I is to provide adequate exposure and develop insight about the basic principles of physical sciences and its practical aspects which would help engineers to learn underlying principles of various tools and techniques they use in core engineering and related industrial applications. The course would also inculcate innovative mindsets of the students and can create awareness of the vital role played by science and engineering in the development of new technologies.

Course Outcomes (COs):

After attending the course students' should be able to

CO	Description
CO1	explain basic principles of laser and optical fibers.
CO2	understand the properties of Nano material.
CO3	analyze different crystallographic structures according to their co-ordination number and packing factors.
CO4	analyze the structure, function and characteristics of different storage devices.
CO5	justify the need of a quantum mechanics as remedy to overcome limitations imposed by classical physics.

CO-PO Mapping:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	--	--	--	--	--	--	--	2
CO2	3	3	2	2	--	--	--	--	--	--	--	2
CO3	3	3	2	2	--	--	--	--	--	--	--	1
CO4	3	2	2	2	--	--	--	--	--	--	--	2
CO5	3	3	3	2	2	--	--	--	--	--	--	1

Course Content:**Module 1 (12L)****Modern Optics**

1.01- Laser: Concepts of various emission and absorption processes, Einstein A and B coefficients and

equations, working principle of laser, meta stable state, population inversion, condition necessary for active laser action, optical resonator, illustrations of Ruby laser, He-Ne laser, Semiconductor laser, applications of laser, related numerical problems 6L

1.02-Fibre optics-Principle and propagation of light in optical fibers (Step index, Graded index, single and multiple modes) - Numerical aperture and Acceptance angle, Basic concept of losses in optical fiber, related numerical problems. 3L

1.03-Holography-Theory of holography, viewing of holography, applications 3L

Module 2 (6L) Solid State Physics

2.01 Crystal Structure: Structure of solids, amorphous and crystalline solids (definition and examples), lattice, basis, unit cell, Fundamental types of lattices –Bravais lattice, simple cubic, fcc and bcc lattices, Miller indices and miller planes, co-ordination number and atomic packing factor, Bragg's equation, applications, numerical problems.

3L

2.02 Semiconductor: Physics of semiconductors, electrons and holes, metal, insulator and semiconductor, intrinsic and extrinsic semiconductor, p-njunction.3L

Module 3 (8L) Quantum Mechanics

1.01 Quantum Theory: Inadequacy of classical physics-concept of quantization of energy, particle concept of electromagnetic wave (example: photoelectric and Compton Effect; no derivation required, origin of modified and unmodified lines), wave particle duality; phase velocity and group velocity; deBroglie hypothesis; Davisson and Germer experiment,related numerical problems.

4L

1.02 Quantum Mechanics 1: Concept of wave function, physical significance of wave function, probability interpretation; normalization of wave functions-Qualitative discussion; uncertainty principle, relevant numerical problems, Introduction of Schrödinger wave equation (only statement).

4L

Module 4 (4L)**Physics of Nano materials**

Reduction of dimensionality, properties of nanomaterials, Quantum wells (two dimensional), Quantum wires (one dimensional), Quantum dots (zero dimensional); Quantum size effect and Quantum confinement. Carbon allotropes. Application of nanomaterials (CNT, graphene, electronic, environment, medical).

Module 5 (6L)**Storage and display devices**

Different storage and display devices-Magnetic storage materials, Hard disc (examples related to computers compared with semiconductor storage viz. Pendrive), Operation and application of CRT, CRO, Liquid crystal display (LCD), LED, OLED, Plasma display, Thin film transistor display).

Recommended Text Books for Physics I:**Text Books:**

1. Refreshercoursesinphysics(Vol.1,Vol.2&Vol.3)-C.L.Arora(S.ChandPublishers)
2. Basic Engineering Physics-Amal Chakraborty (Chaya Prakashani Pvt.Ltd.)
3. Perspective & Concept of Modern Physics –Arthur Baiser
4. Principles of engineering physics – Md. N Khan and S Panigrahi.

Course Name: Engineering Mathematics - II

Paper Code: M(IOT)201

Contact (L: T: P): 3:0:0

Total Contact Hours: 36

Credit: 3

Prerequisites:

The students to whom this course will be offered must have the concept of (10+2) standard calculus.

Course Objectives:

The objective of this course is to familiarize the prospective engineers with techniques in ordinary differential equations, Laplace transform and numerical methods. It aims to equip the students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling more advanced level of mathematics and applications that they would find useful in their disciplines.

Course Outcomes (COs):

On successful completion of the learning sessions of the course, the learner will be able to:

CO1: Recall the properties related to ordinary differential equations, Laplace transform and numerical techniques.

CO2: Determine the solutions of the problems related to ordinary differential equations, Laplace transform and numerical techniques.

CO3: Apply appropriate mathematical tools of ordinary differential equations, Laplace transform and numerical techniques for the solutions of the problems.

CO4: Analyze engineering problems by using ordinary differential equation, Laplace transform and numerical Methods.

CO-PO/PSO Mapping:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12
CO1	3	2	-	-	-	-	-	-	-	-	-	2
CO2	3	2	-	-	-	-	-	-	-	-	-	1
CO3	3	2	2	-	-	-	-	-	-	-	-	1
CO4	2	3	1	2	-	-	-	-	-	-	-	1
M(CS) 201	2.75	2.25	1.5	2	-	-	-	-	-	-	-	1.25

Weightage Values: Strongly mapped: '3', Moderately mapped: '2', Weakly mapped: '1', Not mapped: '0'.

Course Content:**Module I: First Order Ordinary Differential Equations (ODE) (9L)**

Solution of first order and first degree ODE: Exact ODE, Rules for finding Integrating factors, Linear ODE, Bernoulli's equation. **Solution of first order and higher degree ODE:** solvable for p, solvable for y and solvable for x and Clairaut's equation.

Module II: Second Order Ordinary Differential Equations (ODE) (8L)

Solution of second order ODE with constant coefficients: C.F. &P.I., Method of variation of parameters, Cauchy-Euler equations.

Module III: Laplace Transform (LT) (12L)

Concept of improper integrals; Definition and existence of LT, LT of elementary functions, First and second shifting properties, Change of scale property, LT of $tf(t)$, LT of $f(t)t$, LT of derivatives of $f(t)$, LT of integral of $f(t)$, Evaluation of improper integrals using LT, LT of periodic and step functions, Inverse LT: Definition and its properties, Convolution theorem (statement only) and its application to the evaluation of inverse LT, Solution of linear ODE with constant coefficients (initial value problem) using LT.

Module IV: Numerical Methods (7L)

Introduction to error analysis, Calculus of finite difference. **Interpolation:** Newton forward and backward interpolation, Lagrange's interpolation. **Numerical integration:** Trapezoidal rule, Simpson's 1/3 rule. **Numerical solution of ordinary differential equation:** Euler method, Fourth order Runge - Kuttamethod.

Text Books:

1. Grewal, B.S., Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.
2. Kreyszig, E., Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.

Reference Books:

1. Guruprasad, S. A text book of Engineering Mathematics-I, New age International Publishers.
2. Ramana, B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.
3. Veerarajan, T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
4. Bali, N.P. and Goyal, M., A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
5. Thomas, G.B. and Finney, R.L., Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
6. Apostol, M., Calculus, Volumes 1 and 2 (2nd Edition), Wiley Eastern, 1980.
7. Kumaresan, S., Linear Algebra - A Geometric approach, Prentice Hall of India, 2000.
8. Poole, D., Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.
9. Bronson, R., Schaum's Outline of Matrix Operations, 1988.
10. Piskunov, N., Differential and Integral Calculus, Vol. I & Vol. II, Mir Publishers, 1969.

MODULE 6: Introduction to IC:**8L**

Integrated circuit-Basic idea, classifications, advantages, disadvantages; OPAMP(IC741)-Pin configuration and equivalent circuit; Characteristics of OPAMP(IC741); Inverting & Non- Inverting Amplifier; Adder, Subtractor, Differentiator & Integrator Circuit.

Textbooks:

1. A Textbook of Electrical Technology - Volume I (Basic Electrical Engineering) & Volume II (Ac&DC Machines)-B.L.Theraja&A.K.Teraja,S.Chad,23rdEdition,1959
2. D. Chattopadhyay, P.C Rakshit, "Electronics Fundamentals and Applications", New Age International (P) Limited Publishers, SenenthEdition,2006
3. Basic Electrical & Electronics Engineering by J.B. Gupta , S.K.Kataria & Sons,2013
4. Basic Electrical and Electronics Engineering-I by Abhijit Chakrabarti and Sudip Debnath, McGraw Hill,2015
5. M.S.Sukhija and T.K.Nagsarkar, Basic Electrical and Electronics Engineering, Oxford UniversityPress,2012.
6. DP Kothari and I J Nagrath, "Basic Electrical & Electronics Engineering", Tata McGraw Hill,2020.

Reference Books

1. D C Kulshreshtha, "Basic ElectricalEngineering",Tata McGraw Hill,2010.
2. T.K. Nagsarkar, M.S. Sukhija, "Basic Electrical Engineering", Oxford Higher Education.
3. Hughes,"Electrical and Electronic Technology", PearsonEducation".
4. Parker and Smith, "Problems in Electrical Engineering", CBS Publishers and Distributors.
5. Anant Agarwal, Jeffrey Lang, Foundations of Analog and Digital Electronic Circuits, Morgan Kaufmann Publishers,2005.
6. Bernard Grob, Basic Electronics, McGraw Hill.
7. Chinmoy Saha, Arindham Halder and Debarati Ganguly, Basic Electronics-Principles and Applications, Cambridge University Press,2018.

CO-PO Course Articulation Matrix Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO 7	PO8	PO9	PO 10	PO 11	PO 12
CO1	3	3	2	1	-	-	-	-	-	-	2	2
CO2	3	3	2	1	-	-	-	-	-	-	2	2
CO3	3	2	2	1	-	-	-	-	-	-	1	2
CO4	2	3	2	1	-	-	-	-	-	-	2	1

Course Name: Environmental Science**Paper Code: HU (IOT)201****Contact (L: T: P): 2 : 0 : 0****Total Contact Hours: 24****Credit: 3****Course Objective(s)***This course will enable the students to,*

- Realize the importance of environment and its resources.
- Apply the fundamental knowledge of science and engineering to assess environmental and health risk.
- Know about environmental laws and regulations to develop guidelines and procedures for health and safety issues.
- Solve scientific problem-solving related to air, water, land and noise pollution.

Course Outcome

CO	Statement
C01	Able to understand the natural environment and its relationships with human activities
C02	The ability to apply the fundamental knowledge of science and engineering to assess environmental and health risk
C03	Ability to understand environmental laws and regulations to develop guidelines and procedures for health and safety issues
C04	Acquire skills for scientific problem-solving related to air, water, noise & land pollution.

CO - PO Mapping

CO	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	Able to understand the natural environment and its relationships with human activities	2	2	3	-	-	2	3	3	-	-	1	2

2	The ability to apply the fundamental knowledge of science and engineering to assess environmental and health risk	3	3	3	1	1	2	3	3	-	-	1	2
3	Ability to understand environmental laws and regulations to develop guidelines and procedures for health and safety issues	3	3	3	2	1	2	3	3	-	-	1	2
4	Acquire skills for scientific problem-solving related to air, water, noise & land pollution.	1	1	1	1	2	2	3	3	-	-	1	2
AVERAGE		2	2	2	1	1	2	3	3	-	-	1	2

Module 1 - Resources and Ecosystem (6L)

1. Resources (2L)

Types of resources, resistance to resources, Human resource, Population Growth models: Exponential Growth, logistic growth

2. Ecosystem (3L)

Components of ecosystem, types of ecosystem, Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems, Food chain, Food web.

3. Energy and Environment(1L)

Conventional energy sources, coal and petroleum, Green energy sources, solar energy, tidal energy, geothermal energy, biomass

Module 2 - Environmental Degradation (9L)

1. Air Pollution and its impact on Environment (3L)

Air Pollutants, primary & secondary pollutants, Criteria pollutants, Smog, Photochemical smog and London smog, Greenhouse effect, Global Warming, Acid rain, Ozone Layer Depletion.

2. Water Pollution and its impact on Environment (3L)

Water Pollutants, Oxygen demanding wastes, heavy metals, BOD, COD, Eutrophication, Hardness, Alkalinity, TDS and Chloride, Heavy metal poisoning and toxicity.

3. Land Pollution and its impact on Environment (2L)

Solid wastes, types of Solid Waste, Municipal Solid wastes, hazardous wastes, bio-medical wastes, E-wastes

4. Noise Pollution and its impact on Environment (1L)

Types of noise, Noise frequency, Noise pressure, Noise intensity, Noise Threshold limit, Effect of noise pollution on human health.

Module 3 – Environmental Management (6L)

1. Environmental Impact Assessment (1L)

Objectives of Environmental management, Components of Environmental Management, Environmental Auditing, Environmental laws and Protection Acts of India

2. Pollution Control and Treatment (2L)

Air Pollution controlling devices, Catalytic Converter, Electrostatic Precipitator, etc., Waste Water Treatment, Noise pollution control.

3. Waste Management (3L)

Solid waste management, Open dumping, Land filling, incineration, composting, E-waste management, Biomedical Waste management.

Module 4 – Disaster Management (3L)

1. Study of some important disasters (2L)

Natural and Man-made disasters, earthquakes, floods drought, landside, cyclones, volcanic eruptions, tsunami, Global climate change. Terrorism, gas and radiations leaks, toxic waste disposal, oil spills, forest fires.

2. Disaster management Techniques (1L)

Basic principles of disasters management, Disaster Management cycle, Disaster management policy, Awareness generation program

Text Books:

1. Basic Environmental Engineering and Elementary Biology (For MAKAUT), Gourkrishna Dasmohapatra, Vikas Publishing.
2. Basic Environmental Engineering and Elementary Biology, Dr. Monindra Nath Patra & Rahul Kumar Singha, Aryan Publishing House.
3. Textbook of Environmental Studies for Undergraduate Courses, Erach Barucha for UGC, Universities Press

Reference Books:

1. A Text Book of Environmental Studies, Dr. D.K. Asthana & Dr. Meera Asthana, S.Chand Publications.
2. Environmental Science(As per NEP 2020), Subrat Roy, Khanna Publisher

Course Name: Indian knowledge System

Course Code: HU(IOT)202

Credit: 01

No. of lectures: 12

Module-1 (3L)

An overview of Indian Knowledge System (IKS): Importance of Ancient Knowledge - Definition of IKS - Classification framework of IKS - Unique aspects of IKS.

The Vedic corpus: Vedas and Vedangas - Distinctive features of Vedic life. Indian philosophical systems: Different schools of philosophy.

Module-2 (3L)

Salient features of the Indian numeral system - Importance of decimal representation - The discovery of zero and its importance - Unique approaches to represent numbers.

Highlights of Indian Astronomy: Historical development of astronomy in India

Module-3 (3L)

Indian science and technology heritage - Metals and metalworking - Mining and ore extraction – Physical structures in India - Irrigation and water management - Dyes and painting technology - Surgical Techniques - Shipbuilding

Module-4 (3L)

Traditional Knowledge in Different Sectors: Traditional knowledge and engineering, Traditional medicine system, Traditional Knowledge in agriculture, Traditional societies depend on it for their food and healthcare needs.

References:

1. Introduction to Indian knowledge system: concepts and applications-Mahadevan B.Bhat, Vinayak Rajat, Nagendra PavanaR.N.,PHI
2. Traditional Knowledge system in India, Amit Jha, AtlanticPublishers
3. S. N. Sen and K. S. Shukla, History of Astronomy in India, Indian National Science Academy, 2nd edition, New Delhi,2000

Course Name: Data Structures Lab
Course Code: IOT 291
Contact (Periods/Week): 3L/Week
Total Contact Hours: 36
Credits: 1.5

Course Outcomes	Name of Course Outcomes
CO1	To identify the appropriate data structure as applied to specified problem definition.
CO2	To summarize operations like searching, insertion, deletion, traversing mechanism used on various data structures.
CO3	To implement practical knowledge of data structures on the applications.
CO4	To illustrate how to store, manipulate and arrange data in an efficient manner.
CO5	To write programs to access queue and stack using arrays and linked list, binary tree and binary search tree.

CO-PO-PSO Mapping:

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	3	3	2	3	-	-	-	-	-	-	2	1	1	1
CO2	3	2	2	3	3	-	-	-	-	-	3	2	3	2	2
CO3	2	3	3	-	2	-	-	-	-	-	-	2	3	3	3
CO4	2	2	1	3	2	-	-	-	-	-	2	3	2	1	2
CO5	2	2	3	1	2	-	-	-	-	-	-	3	3	3	3
	2.4	2.4	2.4	2.3	2.4	-	-	-	-	-	2.5	2.4	2.4	2	2.2

Course Content:

Module 1: Implementing Non-Restricted Linear Data Structure [2 Lab]

Problem based on Implementation of Non-Restricted Linear Data Structure like- Implementation of list as data structure using array. Implementation of list as data structure using linked list of different types. Implementation of polynomial as data structure using array and linked list. Implementation of sparse matrix as data structure using array.

Module 2: Implementing Restricted Linear Data Structure [3 Lab]

Problem based on Implementation of Restricted Linear Data Structure like- Implementation of stack as data structure using array. Implementation of stack as data structure using linked list. Implementation of queue as data structure using array (physical, linear and circular model). Implementation of queue as data structure using linked list. Converting infix to post-fix and evaluating post-fix expression using stack. Implementing Tower-of-Hanoi problem.

Module 3: Implementing Non-Linear Data Structure [2 Lab]

Problem based on Implementation of Non-Linear Data Structure like Implementation of Binary Tree as data structure using array and linked list. Implementation of Binary Search Tree (BST) as data structure using linked list. Implementation of Heap as data structure using array. Implementation of Priority Queue as data structure using Heap.

Module 4: Implementing Sorting and Searching algorithm [5 Lab] Problem based on Implementation of Sorting and Searching algorithm

Implementation of Bubble sort using appropriate data structure. Implementation of Selection sort using appropriate data structure.

Implementation of Insertion sort using appropriate data structure. Implementation of Quick sort using appropriate data structure.

Implementation of Merge sort using appropriate data structure.

Implementation of Heap sort using appropriate data structure.

Implementation of Radix sort using appropriate data structure.

Implementation of Sequential Search using appropriate data structure.

Implementation of Binary Search using appropriate data structure.

Implementation of hashing with collision resolution using linear and quadratic probing.

Text books:

1. Data Structures Through 'C' Language by Samiran Chattopadhyay, Debabrata Ghosh Dastidar, Matangini Chattopadhyay, Edition: 2001, BPB Publications.
2. Fundamentals of Data Structures of C by Ellis Horowitz, Sartaj Sahni, Susan Anderson-freed 2nd Edition, Universities Press.

Reference books:

1. Data Structures, Algorithms, and Software Principles in C by Thomas A. Standish, 1 Edition, Pearson.
2. Data Structures by S. Lipschutz, Special Indian Edition, Tata McGraw Hill Education (India) Private.
3. Limited Data Structures and Program Design In C by Robert L. Kruse, Bruce P. Leung 2nd Edition, Pearson.
4. Data Structures in C by Aaron M. Tenenbaum, 1st Edition, Pearson

Course Name: Basic Electrical & Electronics Engineering Lab

Course Code: EE(IOT)291

L-T-P: 0-0-3

Total Lecture: 36

Credit: 1.5

CO	Statement
CO1	To Analyze a given network by applying KVL and KCL.
CO2	To Examine the Operation of DC Motor.
CO3	To Examine the Operation of Basic Electronics Devices and ICs.
CO4	To design simple electronics circuits.

List of Experiments: -

1. Familiarization with different passive and active electrical & electronic components.
2. Familiarization with different Electrical & Electronics Instruments.
3. Verification of KVL and KCL.
4. Forward and reversal of DC shunt motor.
5. Speed control of DC shunt motor.
6. Study of the P-N junction diode V-I characteristics (Forward & Reverse Bias).
7. Study of the Characteristics of Zener diode (Forward & Reverse Bias).
8. Study of the Input and Output characteristics of BJT in CE mode.
9. Determination of offset voltage, offset current & bias current of OPAMP(IC741).
10. Determination of CMRR and slew rate of OPAMP(IC741).
11. Determination of inverting and non-inverting gain of OPAMP(IC741).
12. Extramural Experiment.

Textbooks:

1. Handbook of Laboratory Experiments in Electronics Engineering Vol. 1, Author Name: A.M. Zungeru, J.M. Chuma, H.U. Ezea, and M. Mangwala, Publisher -Notion Press Electronic Devices and Circuit Theory by Robert Boylestad Louis Nashelsky, 7th Edition, Prentice Hall
2. Experiments Manual for use with Grob's Basic Electronics 12th Edition by Wes Ponick, Publisher-McGraw Hill, 2015
3. Laboratory Manual for 'Fundamentals of Electrical & Electronics Engineering': A handbook for Electrical & Electronics Engineering Students by Manoj Patil (Author), Jyoti Kharade (Author), 2020
4. The Art of Electronics, Paul Horowitz, Winfield Hill, Cambridge University Press, 2015.
5. A Handbook of Circuit Math for Technical Engineers, Robert L. Libbey CRC Press, 05-Jun-1991

Reference Books

1. Basic Electrical and Electronics Engineering, Author:S. K. Bhattacharya, Publisher: Pearson EducationIndia,2011
2. Practical ElectricalEngineering
3. By Sergey N. Makarov, Reinhold Ludwig, Stephen J. Bitar, Publisher: Springer International Publishing,2016
4. Electronics Lab Manual (Volume 2) By Navas, K. A. Publisher: PHI Learning Pvt. Ltd. 2018
5. Practical Electronics Handbook, Ian R. Sinclair and John Dunton, Sixth edition 2007, Published by ElsevierLtd.

CO-PO Course Articulation Matrix Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO 7	PO8	PO9	PO 10	PO 11	PO 12
CO1	3	2	3	2	-	2	-	-	2	-	2	3
CO2	3	3	2	3	-	2	-	-	3	-	2	2
CO3	3	2	2	3	-	2	-	-	2	-	3	3
CO4	3	3	2	2	-	2	-	-	3	-	2	3

Course Name: Engineering Physics Lab

Code: PH(IOT)191

Contact Hours: 0:0:3

Credit: 1.5

Prerequisites: Knowledge of Physics up to 12th standard.

Course Objectives:

The aim of course is to provide adequate exposure and develop insight about the basic principles of physical sciences and its practical aspects which would help engineers to learn underlying principles of various tools and techniques they use in core engineering and related industrial applications. The course would also inculcate innovative mindsets of the students and can create awareness of the vital role played by science and engineering in the development of new technologies.

Course Outcomes (COs):

After attending the course students' will be able to

CO1 : demonstrate experiments allied to their theoretical concepts
CO2 : conduct experiments using LASER, Optical fiber.

CO3 : participate as an individual, and as a member or leader in groups in laboratory sessions actively

CO4 : analyze experimental data from graphical representations, and to communicate effectively them in Laboratory reports including innovative experiment.

CO5: Design solutions for real life challenges.

CO-PO Mapping:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	2	3	3	--	--	--	--	--	--	--
CO2	2	3	2	3	3	--	--	--	--	--	--	--
CO3	2	3	2	3	3	--	--	--	--	--	--	--
CO4	2	2	3	2	3	--	--	--	--	--	--	--
CO5	2	2	3	2	3	--	--	--	--	--	--	--

Course Content:

General idea about Measurements and Errors (One Mandatory):

1. Error estimation using Slide calipers/ Screw-gauge/travelling microscope for one experiment.
2. Experiments on Classical Physics (Any 4 to be performed from the following experiments):
3. Study of Torsional oscillation of Torsional pendulum & determination of time using various load of the oscillator.
4. Determination of Young's moduli of different materials.
5. Determination of Rigidity moduli of different materials.
6. Determination of wavelength of light by Newton's ring method.
7. Determination of wavelength of light by Laser diffraction method.
8. Optical Fibre-numerical aperture, power loss.
9. Experiments on Quantum Physics (Any 2 to be performed from the following experiments):
10. Determination of Planck's constant using photoelectric cell.
11. Verification of Bohr's atomic orbital theory through Frank-Hertz experiment.
12. Determination of Stefan's Constant.
13. Study of characteristics of solar cell.
14. Perform at least one of the following experiments:

15. Calibration of an oscillator using Lissajous Figure.
16. Determination of specific charge of an electron (e/m) by J. J Thompson Method.

****In addition it is recommended that each student should carry out at least one experiment beyond the syllabus/one experiment as Innovative experiment.**

Probable experiments beyond the syllabus:

1. Study of dispersive power of material of a prism.
2. Study of viscosity using Poiseuille's capillary flow method/using Stoke's law.
3. Determination of thermal conductivity of a bad/good conductor using Lees-Charlton / Searle apparatus.
4. Determination of the angle of optical rotation of a polar solution using polarimeter.
5. Any other experiment related to the theory.

Text Books:

1. Practical Physics by Chatterjee & Rakshit (Book & Allied Publisher)
2. Practical Physics by K.G. Mazumder (New Central Publishing)
3. Practical Physics by R. K. Kar (Book & Allied Publisher)

Course Name: Design thinking

Course Code: HU(IOT)292

Credit: 01

L:T:P:: 0:0:2

Module 1: Understanding the Learning Process, Kolb’s Learning Styles, Assessing and Interpreting. **2**

Module 2: Memory: process, Sensory memory, STM and LTM, Problems in retention, Memory enhancement techniques. **4**

Module 3: Emotions: Experience & Expression Understanding Emotions, Empathy, And Concept of Emotional Intelligence. **2**

Module 4: Basics of Design Thinking Definition of Design Thinking, Need for Design Thinking, Objective of Design Thinking, Concepts & Brainstorming, Stages of Design Thinking Process (explain with examples) – Empathize, Define, Ideate, Prototype, Test. **6**

Module 5: Understanding Creative thinking process, Understanding Problem Solving, Testing Creative ProblemSolving **4**

Unit 6: Prototyping & Testing -Rapid Prototype Development process, Testing, Sample Example, Test Group Marketing **2**

Module-7: Design thinking for strategic innovations Growth –Change- Examples of Customer Challenges, Use of Design Thinking to Enhance Customer Experience -Value redefinition - Extreme Competition – Standardization —Strategy– Business Model design. **4**

References:

1. John.R.Karsnitz, Stephen O’Brien and John P. Hutchinson, “Engineering Design”, Cengage learning (International edition) second Edition,2013.
2. Roger Martin, "The Design of Business: Why Design Thinking is the Next Competitive Advantage", Harvard Business Press,2009.
3. Idris Mootee, "Design Thinking for Strategic Innovation: What They Can't Teach You at Business or Design School", John Wiley & Sons2013
4. George,E, Dieter, Linda,C, Schmidt.(2017).Engineering Design, McGraw Hill publisher,4th edition

Course Name: Engineering Graphics & Design Lab

Course Code: ME(IOT)291

Contact: 0:0:3

Credits: 1.5

Prerequisites: Basic knowledge of geometry

Course Outcomes: Upon successful completion of this course, the student will be

able to: CO1: Learn the basics of drafting

CO2: Understand the use of drafting tools which develops the fundamental skills of industrial drawings.

CO3: Apply the concept of engineering scales, dimensioning and various geometric curves necessary to understand design of machine elements.

CO4: Analyse the concept of projection of line, surface and solids to create the knowledge base of orthographic and isometric view of structures and machine parts.

CO5: Evaluate the design model to different sections of industries as well as for research & development.

Course Contents:

Basic Engineering Graphics: (3P)

Principles of Engineering Graphics; Orthographic Projection; Descriptive Geometry; Drawing Principles; Isometric Projection; Surface Development; Perspective; Reading a Drawing; Sectional Views; Dimensioning & Tolerances; True Length, Angle; intersection, Shortest Distance.

Module 1: Introduction to Engineering Drawing (6P)

Principles of Engineering Graphics and their significance, Usage of Drawing instruments, lettering, Conic sections including Rectangular Hyperbola (General method only); Cycloid, Epicycloid and Involute; Scales – Plain, Diagonal and Vernier Scales.

Module 2: Orthographic & Isometric Projections (6P)

Principles of Orthographic Projections-Conventions - Projections of Points and lines inclined to both planes; Projections of planes on inclined Planes - Auxiliary Planes; Projection of Solids inclined to both the Planes- Auxiliary Views; Isometric Scale, Isometric Views of lines, Planes, Simple and compound Solids; Conversion of Isometric Views to Orthographic Views and Vice-versa.

Module 3: Sections and Sectional Views of Right Angular Solids (6P)

Drawing sectional views of solids for Prism, Cylinder, Pyramid, Cone and project the true shape of the sectioned surface, Auxiliary Views; Development of surfaces of Right Regular Solids - Prism, Pyramid, Cylinder and Cone; Draw sectional orthographic views of objects from industry and dwellings (foundation to slabonly).

Computer Graphics: (3P)

Engineering Graphics Software; -Spatial Transformations; Orthographic Projections; Model Viewing; Co-ordinate Systems; Multi-view Projection; Exploded Assembly; Model Viewing; Animation; Spatial Manipulation; Surface Modeling; Solid Modeling.

Module 4: Overview of Computer Graphics: (3P)

Demonstration of CAD software [The Menu System, Toolbars (Standard, Properties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs, Coordinate System),

Dialog Boxes and windows ,Shortcut menus (ButtonBars) ,Zooming methods, Select and erase objects].

Module 5: CAD Drawing, Customization, Annotations, layering (6P)

Set up of drawing page including scale settings, ISO and ANSI standards for dimensioning and tolerance; Using various methods to draw straight lines, circles, applying dimensions and annotations to drawings; Setting up and use of Layers, changing line lengths (extend/lengthen); Drawing sectional views of solids; Drawing annotation, CAD modeling of parts and assemblies with animation, Parametric and nonparametric solid, surface and wireframe modeling, Part editing and printing documents.

Module 6: Demonstration of a simple team design project (3P)

Illustrating Geometry and topology of engineered components: creation of engineering models and their presentation in standard 2D blueprint form and as 3D wire-frame and shaded solids; Meshed topologies for engineering analysis and tool-path generation for component manufacture, use of solid-modeling software for creating associative models at the component and assembly levels.

Text Books:

1. Bhatt N.D., Panchal V.M. & Ingle P.R, (2014), Engineering Drawing, Charotar Publishing House
2. K. Venugopal, Engineering Drawing + AutoCAD, New Age International publishers

Reference Books:

1. Pradeep Jain, Ankita Maheswari, A.P. Gautam, Engineering Graphics & Design, Khanna Publishing House
2. Agrawal B. & Agrawal C. M. (2012), Engineering Graphics, TMH Publication.
3. Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education
4. Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers.

CO-PO/PSO Mapping:

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	2			2									2	2	2
CO2	2			2									2	2	2
CO3	3			2									2	2	2
CO4	3			3									3	3	2
CO5	3	2		3	2								3	3	2

Asansol Engineering College

Curriculum & Syllabus for B. Tech under Autonomy

Incorporation of NEP2020

(Effective from 2024-25 admission batches)

Department of Computer Science and Engineering

(Internet of Things, Cyber Security including Block Chain Technology)

2 nd Year 1 st Semester									
Sl. No.	Broad Category	Category	Course Code	Course Title	Hours per week				Credits
					L	T	P	Total	
THEORY									
1	ENGG	Multidisciplinary	EC(IOT) 301	Digital System Design	3	0	0	3	3
2	ENGG	Major	IOT 301	Design & Analysis of Algorithm	3	0	0	3	3
3	ENGG	Major	IOT 302	Computer Architecture & Organization	3	0	0	3	3
4	SCI	Multidisciplinary	M(IOT) 301	Probability & Statistics	3	0	0	3	3
5	HUM	Minor	HU (IOT) 301	Economics for Engineers	3	0	0	3	3
PRACTICAL									
6	ENGG	Major	IOT 391	Design & Analysis of Algorithm	0	0	3	3	1.5
7	ENGG	Multidisciplinary	EC(IOT) 391	Digital Electronics	0	0	2	2	1
8	ENGG	Major	IOT 392	Computer Architecture &	0	0	2	2	1

				Organization					
9	ENGG	Skill enhancement course	IOT 393	IT Workshop (Python/Matlab/R)	0	0	3	3	1.5
Total of Theory, Practical, and Mandatory Activities/Courses								25	20

THEORY

SYLLABUS Semester III

Digital System Design

Code: EC(IOT)-301

Contact: 3L

Total Contact Hours: 34L

Credits: 3

Course outcomes:

At the end of this course students will demonstrate the ability to

EC(IOT)-301.1. Design & analyze combinational logic circuits

EC(IOT)-301.2. Design & analyze modular combinational circuits with MUX/DEMUX, Decoder, Encoder

EC(IOT)-301.3. Design & analyze synchronous sequential logic circuits

EC(IOT)-301.4. Design various A/D & D/A Circuits and compare different logic families.

Course Content:

Module I 10 L

Review of Number System, Signed and Unsigned Number. Logic Simplification and Combinational Logic Design: Review of Boolean Algebra and De Morgan's Theorem, SOP & POS forms, Canonical forms, Karnaugh's map, Binary codes, Code Conversion.

Module II 6L

MSI devices like Comparators, Multiplexers, Encoder, Decoder, Half and Full Adders, Subtractors, Serial and Parallel Adders, BCD Adder, Fast adders, Barrel shifter and ALU.

Module III 10L

Sequential Logic Design: Building blocks like S-R, JK and Master-Slave JK FF, Edge triggered FF, Ripple and Synchronous counters, Shift registers, Finite state machines, Design of synchronous FSM. Designing synchronous circuits like Synchronous Counter, Pulse train generator, Pseudo Random Binary Sequence generator,

Module IV 8L

Logic Families and Semiconductor Memories: TTL, ECL, CMOS families Semiconductor Memories, Concept of Programmable logic devices like FPGA. Logic implementation using Programmable Devices. Different types of A/D and D/A conversion techniques. Sample & Hold Circuit

Text/Reference Books:

1. R.P. Jain, "Modern digital Electronics", Tata McGraw Hill, 4th edition, 2009.
2. Schilling & Belove, Digital Integrated Electronics, Tata McGraw Hill,
3. Douglas Perry, "VHDL", Tata McGraw Hill, 4th edition, 2002.
4. W.H. Gothmann, "Digital Electronics- An introduction to theory and practice", PHI, 2nd edition ,2006.
5. D.V. Hall, "Digital Circuits and Systems", Tata McGraw Hill, 1989
6. Charles Roth, "Digital System Design using VHDL", Tata McGraw Hill 2nd edition 2012.
7. R. Anand, "Digital Electronics", Khanna Publishing House, New Delhi, 2017.

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
EC(IOT)-301.1	3	2	-	-	-	-	-	1	-	-	1	-
EC(IOT)-301.1	3	3	-	2	-	-	2	-	-	1	-	-
EC(IOT)-301.1	3	3	-	-	-	-	-	2	-	2	-	2
EC(IOT)-301.1	-	-	3	3	3	-	-	-	2	-	-	-

Course Name: Design & Analysis of Algorithm

Course Code: IOT 301

Contact: 3:1:0

Total Contact Hours: 36L

Credits: 3

Prerequisites: To know data-structure and basic programming ability

Course Outcomes (COs):

After attending the course students should be able to

- IOT 301.1.** Understand and illustrate the concepts of time and space complexity, worst case, average case and best-case complexities and the asymptotic notation.
- IOT 301.2.** Analyze and apply the design principles and concepts to various basic algorithm design viz. dynamic programming, greedy methods etc.
- IOT 301.3** Understand and analyze various string matching and graph algorithms.

- IOT 301.4.** Understand, illustrate and analyze the different complexity classes
- IOT 301.5.** Discuss, implement and analyze, verify the efficiency of the randomized and approximation algorithms.

Course Content:

Module-1 4L

Algorithm Development & Complexity Analysis: 4L Stages of algorithm development for solving a problem: Describing the problem, identifying a suitable technique, Design of an algorithm, Proof of Correctness of the algorithm. Time and Space Complexity, Different Asymptotic notations – their mathematical significance. Solving Recurrences: Substitution Method, Recurrence Tree Method, Master Theorem (Statement Only).

Module-2 14L

Algorithm Design Techniques Brute force techniques – Traveling Salesman Problem, Divide and Conquer - Matrix multiplication: Strassen algorithm, Greedy techniques - Fractional Knapsack problem, Job Sequencing with Deadline, Graph Coloring, Finding Minimum Cost Spanning Tree, Dynamic programming - 0/1 Knapsack problem, Matrix chain multiplication, Travelling Salesman Problem, Backtracking-NQueens Problem, Knights Tour on Chess Board.

Module-3 3L

String matching problem:Different techniques – Naive algorithm, string matching using finite automata, and Knuth, Morris, Pratt (KMP) algorithm with their complexities.

Module-4 5L

Graph Algorithms Single Source Shortest Path –Dijkstra Algorithm, All pair shortest path – Floyd-Warshall Algorithm. Network Flows, Maximum Flows – Ford-Fulkerson Algorithm, Push Re-label Algorithm, Minimum Cost Flows – Cycle Cancelling Algorithm.

Module-5 5L

Complexity Classes: The Class P, The Class NP, Reducibility and NP-completeness – SAT (without proof), 3-SAT, Vertex Cover, Independent Set, Maximum Clique.

Module-6 5L

Approximation and Randomized Algorithms, Approximation Algorithms - The set-covering problem – Vertex cover, K-center clustering. Randomized Algorithms - The hiring problem, Finding the global Minimum. Recent Trends.

Textbook:

1. "Introduction to Algorithms" by Cormen,Leiserson, Rivest,Stein.
2. "The Design and Analysis of Computer Algorithms" by Aho, Hopcroft, Ullman. 3. "Algorithm Design" by Kleinberg and Tardos.
3. Design & Analysis of Algorithms, Gajendra Sharma, Khanna Publishing House, New Delhi Reference Books:
4. Design Analysis and Algorithms || by Hari Mohan Pandey.

CO-POMapping

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
IOT 301.1	2	2	2	2	-	-	-	-	-	-	-	2
IOT 301.1	3	3	3	3	-	-	-	-	-	-	-	2
IOT 301.1	3	3	3	3	-	-	-	-	-	-	-	2
IOT 301.1	3	3	3	3	-	-	-	-	-	-	-	2
IOT 301.1	3	3	3	3	-	-	-	-	-	-	-	2

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
IOT 301.1	3	3	3
IOT 301.1	3	3	3
IOT 301.1	3	3	3
IOT 301.1	3	3	3
IOT 301.1	3	3	3

Course Name: Computer Organization and Architecture**Course Code: IOT 302****Contact: 3:0:0****Total Contact Hours: 36L****Credits: 3****Prerequisite: Digital Electronics****Course Outcomes (COs):**

After attending the course students should be able to

IOT 302.1 Illustrate the basic concept of computer architecture and its performance measurement, parallel processing, Flynn's classification and Amdahl's law and apply this knowledge in designing solutions for real life engineering problems.

IOT 302.2 Summarize the basic concept of pipeline, instruction pipeline, arithmetic pipeline hazards detection and prevention and use this knowledge for designing and implementing mathematical and engineering problems leading to lifelong learning.

- IOT 302.3** Identify the concept of Instruction-Level Parallelism to solve engineering problems.
- IOT 302.4** Illustrate and compare the concept of Multiprocessor architecture and parallel architecture and apply this knowledge for developing an approach by means of existing and new methods as a teamwork.
- IOT 302.5** Understand the concept of message passing architecture and interconnection network and design an optimized model for building a new solution as a professional engineering practice as a team.

Course Contents:

Module 1 8L

Introduction to CPU and concepts of ALU, Instruction format and instruction Cycle. Addressing Modes Fixed- point multiplication -Booth's algorithm. , Fixed-point division - Restoring and non-restoring algorithms, Floating-point number representation-IEEE754 format and Floating-point arithmetic operation.

Module 2 7L

Introduction to basic computer architecture, Stored Program Concepts: Von Neumann & Harvard Architecture, RISC VS CISC, Amdahl law , Performance measurement parameters – MIPS, MFLOPS, SPEC ratings, CPI etc. Micro programmed and hardwired control unit.

Module 3 8L

Pipelining: Basic concepts, instruction and arithmetic pipeline, data hazards, control hazards and structural hazards, techniques for handling hazards Pipeline vs. Parallelism, Levels of parallelism , Instruction- Level Parallelism: Basic Concepts, Techniques for Increasing ILP, Superscalar, Super Pipelined and VLIW Processor Architectures , Array and Vector Processors

Module 4 9L

Introduction to memory-RAM and ROM , Register transfer, memory transfer, Tri-state bus buffer, Memory Hierarchy: Secondary memory , Main Memory , Cache Memory , Mapping Technique in cache memory: Direct, Full Associative and Set Associative , Performance Implementation in Cache Memory , Virtual memory Concepts , page replacement policies .

Module 5 4L

Multiprocessor architecture: taxonomy of parallel architectures; Flynn Classification , Centralized and Shared-memory architecture: synchronization , Interconnection Network (Omega, Baseline, Butterfly, Crossbar) .

Text Books:

1. Advanced Computer Architecture Parallelism Scalability Programmability, Tata McGraw-Hill Education Private Limited ISBN-13: 978-0-07-053070-6 ISBN-10:0-07-053070-X
2. Hwang & Briggs—Computer Architecture & Parallel Processing, TMH

Reference Books:

1. Patterson D. A. and Hennessy, J. L.—Computer architecture a quantitative approach, 2nd ed. Morgan Kaufman, 1996
2. Hayes J. P., —Computer Architecture & Organization, Mc Graw Hill
3. Siegel, H. J.—InterconnectionNetworkforLargeScaleparallelProcessing,2nd Ed .Mc Graw Hill,1990
4. Design and Analysis of Parallel Algorithm-Schism G. Akl

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	
IOT 302.1	3	3	3	2	-	-	-	-	-	-	-	-
IOT 302.2	3	3	3	3	-	-	-	-	-	-	-	3
IOT 302.3	2	2	2	3	-	-	-	-	-	-	-	-
IOT 302.4	3	3	3	3	-	-	-	-	-	-	-	-
IOT 302.5	3	3	3	3	-	-	-	-	-	-	-	-

CO-PSO Mapping

Cos	PSO1	PSO2	PSO3
IOT 302.1	3	3	3
IOT 302.2	3	3	3
IOT 302.3	3	3	3
IOT 302.4	3	3	3
IOT 302.5	3	3	3

Course Name: Probability and Statistics**Course Code: M(IOT) 301****Contacts: 3:0:0****Total Contact Hours: 36****Credits: 3****Prerequisite:**

The students to whom this course will be offered must have the concept of (10+2) standard algebra and calculus.

Course Outcome(s):

After completion of the course students will be able to

M(IOT) 301.1: Recall the distinctive principles of probability and statistics.

M(IOT) 301.2: Understand the theoretical workings of theory of probability and tests of hypotheses.

M(IOT) 301.3: Apply statistical methods to compute and explain point estimators and interval estimators for mean, variance and proportion.

M(IOT) 301.4: Analyze statistical data from engineering experiments.

Course Content

Module 1 (Probability and Random Variables) 15L

The axioms of probability , Conditional probability, Baye_s theorem, Discrete and continuous random variables, probability mass, probability density and cumulative distribution functions, mathematical expectation, Moments, Moment generating functions, Binomial, Poisson, Geometric, Uniform, Exponential and Normal distributions.

Module 2 (Two dimensional random variables) 5L

Joint distributions, Marginal and conditional distributions, Covariance , Correlation and linear regression , Transformation of random variables , Central limit theorem (for independent and identically distributed random variables).

Module 3 (Sampling Distribution) 3L

Distributions of the sample mean and the sample variance for a normal population, Chi-Square, t and F distributions, problems

Module 4 (Estimation) 4L

Unbiasedness, consistency, the method of moments and the method of maximum likelihood estimation, confidence intervals for parameters in one sample and two sample problems of normal populations, confidence intervals for proportions, problems.

Module 5 (Testing of Hypotheses) 9L

Null and alternative hypotheses, the critical and acceptance regions, two types of error, power of the test, the most powerful test and Neyman-Pearson Fundamental Lemma, tests for one sample and two sample problems for normal populations, tests for proportions, Chi square goodness of fit test and its applications, problems.

Text and Reference Books:

1. Sheldon M.Ross,—Introduction to Probability and Statistics for Engineers and Scientists ,Academic Press,(2009).
2. D.C.Montgomery and G. C. Runger, —Applied Statistics and Probability for Engineers,5th edition, John Wiley & Sons,(2009)..
3. Robert H.Shumway and David S. Stoffer,—Time Series Analysis and Its Applications with R Examples, Third edition, Springer Texts inStatistics, (2006).
4. N. G. Das: Statistical Methods, TMH.
5. Sancheti , D. S. & Kapoor , V.K. : *Statistics Theory , Method & Application*, Sultan chand & sons , NewDelhi, N.K.Dutta (2004). Fundamentals of Biostatistics, Kanishka Publishers.

CO-PO Mapping:

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
M(IOT) 301.1	3	1	1	-	-	-	-	-	-	-	-	1
M(IOT) 301.2	3	2	1	-	-	-	-	-	-	-	-	2
M(IOT) 301.3	3	2	2	-	-	-	-	-	-	-	-	1
CO4 M(IOT) 301.4	3	3	2	3	-	-	-	-	-	-	-	2

CO-PSO Mapping:

Cos	PSO1	PSO2	PSO3
M(IOT) 301.1	3	3	2
M(IOT) 301.2	3	3	3
M(IOT) 301.3	3	3	2
CO4 M(IOT) 301.4	3	3	2

Economics for Engineers**Code: HU(IOT) 301****Contacts: 3L****Total Contact Hours: 36****Credits: 3****Pre-requisites:**

MATH–College Algebra, Pre-Calculus Algebra and Trigonometry

On successful completion of the learning sessions of the course, the learner will be able to:

HU(IOT)301.1: Apply the appropriate engineering economics analysis method(s) for problem solving: present worth, annual cost, rate-of-return, payback, break-even, benefit-cost ratio.**HU(IOT)301.2:** Evaluate the cost effectiveness of individual engineering projects using the methods learned and draw inferences for the investment decisions.

HU(IOT)301.3: Compare the life cycle cost of multiple projects using the methods learned, and make a quantitative decision between alternate facilities and/or systems.

HU(IOT)301.4: Evaluate the profit of a firm, carry out the break even analysis and employ this tool to make production decision.

HU(IOT)501.5: Discuss and solve advanced economic engineering analysis problems including taxation and inflation.

Module 1 **9L**

Economic Decisions Making – Overview, Problems, Role, Decision making process. Engineering Costs & Estimation – Fixed, Variable, Marginal & Average Costs, Sunk Costs, Opportunity Costs, Recurring And Nonrecurring Costs, Incremental Costs, Cash Costs vs Book Costs, Life-Cycle Costs; Types Of Estimate, Estimating Models - Per- Unit Model, Segmenting Model, Cost Indexes, Power- Sizing Model, Improvement & Learning Curve, Benefits.

Module 2 **9L**

Cash Flow, Interest and Equivalence: Cash Flow – Diagrams, Categories & Computation, Time Value of Money, Debt repayment, Nominal& Effective Interest. 4. Cash Flow & Rate of Return Analysis – Calculations, Treatment of Salvage Value, Annual Cash Flow Analysis, Analysis Periods; Internal Rate of Return, Calculating Rate of Return, Incremental Analysis; Best Alternative Choosing an Analysis Method, Future Worth Analysis, Benefit-Cost Ratio Analysis, Sensitivity and Breakeven Analysis. Economic Analysis In The Public Sector -Quantifying And Valuing Benefits& drawbacks.

Module 3 **9L**

Inflation and Price Change – Definition, Effects, Causes, Price Change with Indexes, Types of Index, Composite vs Commodity Indexes, Use of Price Indexes In Engineering Economic Analysis, Cash Flows that inflate at different Rates. Present Worth Analysis: End-Of-Year Convention, Viewpoint Of Economic Analysis Studies, Borrowed Money Viewpoint, Effect Of Inflation & Deflation, Taxes, Economic Criteria, Applying Present Worth Techniques, Multiple Alternatives. Uncertainty In Future Events - Estimates and Their Use in Economic Analysis, Range Of Estimates, Probability, Joint Probability Distributions, Expected Value, Economic Decision Trees, Risk, Risk vs Return, Simulation, Real Options

Module 3 **9L**

Depreciation - Basic Aspects, Deterioration & Obsolescence, Depreciation And Expenses, Types Of Property, Depreciation Calculation Fundamentals, Depreciation And Capital Allowance Methods, Straight-Line Depreciation Declining Balance Depreciation, Common Elements Of Tax Regulations For Depreciation And Capital Allowances. Replacement Analysis - Replacement Analysis Decision Map, Minimum Cost Life of a New Asset, Marginal Cost, Minimum Cost Life Problems. Accounting – Function, Balance Sheet, income Statement, Financial Ratios Capital Transactions, Cost Accounting, Direct and Indirect Costs, Indirect Cost allocation.

Text book and Reference books:

1. James L. Riggs, David D. Bedworth, Sabah U. Randhawa : Economics for Engineers 4e , TataMcGraw-Hill
2. Donald Newnan, Ted Eschembach, Jerome Lavelle: Engineering Economics Analysis, OUP
3. John A. White, Kenneth E. Case, David B. Pratt : Principle of Engineering Economic Analysis, John Wiley
4. Sullivan and Wicks: Engineering Economy, Pearson
5. R. Paneer Seelvan: Engineering Economics, PHI

6. Michael R Lindeburg : Engineering Economics Analysis, Professional Pub
7. Premvir Kapoor, Sociology & Economics for Engineers, Khanna Publishing House (AICTE Recommended Textbook – 2018)

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
HU(IOT)301.1	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-
HU(IOT)301.2	-	-	-	3	-	3	-	-	-	-	-	-	-	-	-
HU(IOT)301.3	-	-	2	-	-	-	-	-	-	-	-	2	-	-	-
HU(IOT)301.4	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-
HU(IOT)301.5	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-

PRACTICAL

SYLLABUS Semester III

Course Name: Design & Analysis of Algorithm Lab

Course Code: IOT 391

Contact: 0:0:3

Credit: 1.5

Prerequisite:

Programming knowledge

Course Outcomes (COs):After attending the course students should be able to

- CO1 Identify and prove the correctness and analyze the running time of the basic algorithms for those classic problems in various domains.
- CO2 Understand and illustrate methods for analyzing the efficiency and correctness of algorithms (such as exchange arguments, recurrence, induction, and average case analysis)
- CO3 Analyze and design algorithms using the dynamic programming, greedy method, Backtracking, Branch and Bound strategy, and recite algorithms that employ this strategy.
- CO4 Understand, compare, contrast, and choose appropriate implementation of the algorithmic design techniques to present an algorithm that solves a given problem.
- CO5 Identify and analyze criteria and specifications appropriate to new problems.

List of Experiments

1. Implementation of various Divide & Conquer Methods; viz. Matrix Multiplication.
 2. Implementations of various Dynamic Programming Methods, viz. Matrix Chain Multiplication Method, Travelling Salesman Problem etc.
 3. Implementations of various Branch & Bound Techniques, viz.
 4. Implementations of various Backtracking Methods, viz. n-Queen Problem.
 5. Implementations of Greedy Method, viz. Fractional Knapsack Problem, Job Sequencing Problem etc.
 6. Implementations of String-matching Algorithm viz. Naïve Algorithm, String Matching with Finite Automata etc.
 7. Implementations of Various Graph Algorithms, viz. Dijkstra 's Algorithm, Floyd Algorithm etc.
 8. Implementation of some Real-Life Trendy Problems
-

CO-PO Mapping

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	3	-	-	-	3	-	-	3
CO2	3	3	3	2	3	-	-	-	3	-	-	3
CO3	3	3	2	3	3	-	-	-	3	-	-	3
CO4	3	3	2	2	3	-	-	-	3	-	-	3
CO5	3	3	3	2	3	-	-	-	3	-	-	3

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
CO1	3	3	3
CO2	3	3	3
CO3	3	3	3
CO4	3	3	3
CO5	3	3	3

Digital Electronics Lab

Code: EC(IOT)-391

Contacts: 2P

Credit: 1

List of Experiments

1. Introduction to Digital Electronics Lab- Nomenclature of Digital Ics, Specifications, Study of the Data Sheet, Concept of Vcc and Ground, Verification of the Truth Tables of Logic Gates using TTL ICs.
2. Implementation of the Given Boolean Function using Logic Gates in Both Sop and Pos Forms.
3. Verification of State Tables of Rs, J-k, T and D Flip-Flops using NAND & NOR Gates
4. Implementation and Verification of Decoder/De-Multiplexer and Encoder using Logic Gates. 5. Implementation of 4x1 Multiplexer using Logic Gates.
6. Implementation of 4-Bit Parallel Adder Using 7483 IC.
7. Design , and Verify the 4- Bit Synchronous Counter
8. Design, and Verify the 4-Bit Asynchronous Counter.
9. Simulation of MOS Inverter with different loads using PSPICE software
10. Simulation of CMOS Inverter for different parameters Kn, Kp as a design variable in suitable circuit simulator software.
11. Design of a 4-bit Multiplexer using VHDL\Verilog
12. Design of a decade counter using VHDL\Verilog.
13. Design of a 3-input NAND gate and its simulation using suitable logic simulator

Book List

1. Douglas L.Perry, "VHDL: Programming by Example", McGraw-Hill, 2002.
2. Charles H. Roth, Lizy Kurian John, "Digital systems design using VHDL", Thomson, 2008.

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	3	-	-	-	-	-	-	-
CO2	3	3	3	3	3	-	-	-	-	-	-	-
CO3	3	3	3	3	3	-	-	-	-	-	-	-
CO4	3	3	3	3	3	-	-	-	-	-	-	-
CO5	3	3	3	3	3	-	-	-	-	-	-	-

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
CO1	2	2	2
CO2	2	2	2
CO3	2		2
CO4	2	2	2
CO5	2	2	2

Course Name: Computer Organization and Architecture Lab

Course Code: IOT 392

Contact: 0:0:2

Credits: 1

Prerequisites:

Knowledge of designing different circuits in Computer Organization Lab

Course Outcomes (COs):

After attending the course students should be able to

- CO1 Illustrate and use proper syntax in appropriate platforms for developing programs to solve problems related to Mathematics and Engineering fields leading to lifelong learning.
- CO2 Apply the knowledge of algorithms in the computational area to efficient programming codes to design the problem using modern tools for solving complex engineering problems.
- CO3 Outline different types of digital electronic circuits such as adder, subtract or, encoder decoder, multiplexer, demultiplexer, flip-flops, register, counter using various mapping and modern tools to prepare the most simplified circuit and optimize using various mapping and mathematical methods for solving the problem as a professional engineering practice as a team.
- CO4 Apply the knowledge of digital electronic circuits to design memory and ALU and analyze the same to solve engineering-related computational problems as a team.
- CO5 Interpret the result of the experiments, prepare laboratory reports based on observed output and analyze it to validate professional ethics and responsibilities and norms of the engineering practice.

List of Experiment:

1. Implement different types of Basic gates and simulate for truth table verification.
2. Implement half adder circuit and simulate for truth table verification.
3. Implement full adder circuit and simulate for truth table verification.
4. Implement half subtractor circuit and simulate for truth table verification.

5. Implement a full subtractor circuit and simulate for truth table verification.
6. Implement Multiplexer, De-Multiplexer circuit and simulate for truth table verification.
7. Implement Encoder, Decoder circuit and simulate for truth table verification.
8. Implement different types of flip flop and simulate for truth table verification.
9. Implement different types of parallel circuits (SISO, SIPO, PISO, PIPO) and simulate the result.
10. Implement ALU and simulate the result.
11. Implement a RAM chip and simulate the result.
12. Innovative Experiments

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	3	-	-	-	-	-	-	-
CO2	3	3	3	3	3	-	-	-	-	-	-	-
CO3	3	3	3	3	3	-	-	-	-	-	-	-
CO4	3	3	3	3	3	-	-	-	-	-	-	-
CO5	3	3	3	3	3	-	-	-	-	-	-	-

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
CO1	2	2	2
CO2	2	2	2
CO3	2		2
CO4	2	2	2
CO5	2	2	2

IT Workshop (Sci Lab/MATLAB/Python/R)

Code: IOT 393

Contacts: 3P

Credits: 1

Prerequisite

Computer Fundamentals and principles of computer programming

Course Outcomes (COs):

After attending the course students should be able to

CO1	Demonstrate a thorough understanding of modular programming by designing programs that require the use of programmer-defined functions.
CO2	Demonstrate a thorough understanding of arrays by designing and implementing programs that search and sort arrays.
CO3	Demonstrate a thorough understanding of the object-oriented programming concepts of encapsulation, data abstraction and composition by designing and implementing classes including the use of overloaded functions and constructors.
CO4	Demonstrate a thorough understanding of the concept of pointers and dynamic memory allocation the implementation of programmer-defined functions and classes by writing code, performing unit testing and debugging of multiple complex programs.
CO5	Demonstrate an understanding of the differences between C and C++ in the areas of strings, pass by reference/passing pointers, and structs by designing and implementing programs that use C strings, C++

Practical Syllabus

Programming in R

1. Introduction to mechanism for statistics, data analysis, and machine learning; Introduction of R Programming, How to install and run R, Use of R help files, R Sessions, R Objects – Vectors, Attributes, Matrices, Array, Class, List, Data Frames etc. Operators in R.
2. R Programming Structures, Control Statements, Loops, Repeat and Break, R-Function, RVector Function, Recursive Function in R.
3. R Packages (Install and Use), Input/Output Features in R, Reading or Writing in File. Data Manipulation in R. Rearranging data, Random Number and Simulation, Statistical methods like min, max, median, mean, length, Linear Regression, Normal Distribution, Decision tree
4. Graphics, Creating Graphs, The Workhorse of R Base Graphics, Graphical Functions – Customizing Graphs, Saving Graphs to Files, Pie chart, Bar Chart, Histogram.

Programming in Matlab Introduction

Why MATLAB?, History, Its strengths, Competitors, Starting MATLAB, Using MATLAB as a

calculator, Quitting MATLAB Basics

Familiar with MATLAB windows, Basic Operations, MATLAB-Data types, Rules about variable names, Predefined variables

Programming-I

Vector, Matrix, Array Addressing, Built-in functions, Mathematical Operations, Dealing with strings (Array of characters), Array of array (cell) concept

Programming-II

Script file, Input commands, Output commands, Structure of function file, Inline functions, Feval command, Comparison between script file and function file

Conditional statements and Loop

Relational and Logical Operators, If-else statements, Switch-case statements, Forloop, While loop, Special commands (Break and continue), Import data from large database, Export data to own file or database

2D Plotting

In-built functions for plotting, Multiple plotting with special graphics, Curvefitting, Interpolation, Basic fitting interface

3D Plotting

Use of meshgrid function, Mesh plot, Surface plot, Plots with special graphics

Programming with Python

Introduction History, Features, Setting up path, Working with Python, Basic Syntax, Variable and Data Types, Operator

Conditional Statements

If, If- else, Nested if-else, Looping, For, While, Nested loops Control Statements

Break, Continue, Pass String Manipulation

Accessing Strings, Basic Operations, String slices, Function and Methods Lists

Introduction, Accessing list, Operations, Working with lists, Function and Methods Tuple

Introduction, Accessing tuples, Operations, Working, Functions and Methods Dictionaries

Introduction, Accessing values in dictionaries, Working with dictionaries, Properties Functions

Defining a function, Calling a function, Types of functions, Function Arguments, Anonymous functions, Global and local variables Modules

Importing module, Math module, Random module, Packages, Composition, Input-Output Printing on screen, Reading data from keyboard, Opening and closing file, Reading and writing files, Functions

Exception Handling

Exception, Exception Handling, Except clause, Try? finally clause, User Defined Exceptions.

Text Books

1. The C++ Programming Language by Bjarne Stroustrup Addison-Wesley publisher
2. Object-Oriented Programming in C++ b by Robert Lafore Publisher: Sams

Reference Books

1. Object Oriented Programming with C++ by Balaguruswamy McGraw Hill Education; Sixth edition Addison-Wesley publisher
2. Object-Oriented Programming in C++ b by Robert Lafore Publisher:Sams
3. MATLAB Getting StartedGuidehttps://www.mathworks.com/help/pdf_doc/matlab/getstart.pdf

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	2	2	-	-	-	3	-	-	-
CO2	3	2	2	2	2	-	-	-	3	-	-	-
CO3	3	3	3	2	2	-	-	-	3	-	-	-
CO4	3	3	3	2	2	-	-	-	3	-	-	-
CO5	3	3	3	2	2	-	-	-	3	-	-	-

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
CO1	3	3	3
CO2	3	3	3
CO3	3	3	3
CO4	3	3	3
CO5	3	3	3

Asansol Engineering College

Curriculum & Syllabus for B. Tech under Autonomy

Incorporation of NEP2020

(Effective from 2024-25 admission batches)

Department of Computer Science and Engineering

(Internet of Things, Cyber Security including Block Chain Technology)

2 nd Year 2 nd Semester									
Sl. No.	Broad Category	Category	Course Code	Course Title	Hours per week				Credits
					L	T	P	Total	
THEORY									
1	SCI	Multidisciplinary	M(IOT) 401	Discrete Mathematics	3	0	0	3	3
2	ENGG	Major	IOT 401	Data Communication and Networks	3	0	0	3	3
3	ENGG	Major	IOT 402	Formal Language and Automata Theory	3	0	0	3	3
4	ENGG	Major	IOT 403	Microprocessor, Microcontroller & Sensors	3	0	0	3	3
5	SCI	Minor	BIO (IOT) 401	Biology	2	1	0	3	3
6	HUM	Minor	HU (IOT) 401	Principles of Management	2	0	0	2	2
PRACTICAL									
7	ENGG	Major	IOT 491	Data Communication and Networks Lab	0	0	3	3	1.5
8	ENGG	Major	IOT 492	Microprocessor, Microcontroller & Sensors	0	0	3	3	1.5
Total of Theory, Practical, and Mandatory Activities/Courses								26	20

THEORY

SYLLABUS Semester IV

Course Name: Discrete Mathematics

Course Code: M(IOT) 401

Contact: 3:0:0

Credits: 3

Prerequisites: Higher Secondary Level Mathematics

Course Outcome(s):

After completion of the course students will be able to

CO1	Understand the fundamental concepts of Set Theory to Explain or Illustrate and Identify problems where students can Apply the concept appropriately to Solve them.
CO2	Understand the fundamental concepts of Mathematical Logic and Proof Techniques so that they can Prove theorems using Proof Techniques and Mathematical Logic Frameworks to justify a claim.
CO3	Explain or illustrate the fundamental Theory of Numbers and Identify problems where students can Use the concept appropriately to Solve them.
CO4	Explain or illustrate the fundamental principles of Algebraic Structures and Identify problems where students can Apply the concept appropriately to Solve them.
CO5	Develop ideas to Propose solutions to the problems of Graph Theory and Identify problems where students can Apply the concept appropriately and analyze the effectiveness as well as limitations of solutions making the students aware of its utilitarian importance for further explorations leading towards lifelong learning.

Module I

8L

Sets, Relation and Function: Operations and Laws of Sets, Cartesian Products, Binary Relation, Partial Ordering Relation, Equivalence Relation, Image of a Set, Sum and Product of Functions, Bijective functions, Inverse and Composite Function, Size of a Set, Finite and infinite Sets, Countable and uncountable Sets, Cantor's diagonal argument and The Power Set theorem, Schroeder- Bernstein theorem.

Principles of Mathematical Induction: The Well- Ordering Principle, Recursive definition, The Division algorithm: Prime Numbers, The Greatest Common Divisor: Euclidean Algorithm, The Fundamental Theorem of Arithmetic.

Module II

5L

Basic counting techniques- inclusion and exclusion, pigeon- hole principle, permutation and combination

Module III

8L

Propositional Logic: Syntax, Semantics, Validity and Satisfiability, Basic Connectives and Truth Tables, Logical Equivalence: The Laws of Logic, Logical Implication, Rules of Inference, The use of Quantifiers. Proof Techniques: Some Terminology, Proof Method sand Strategies, Forward Proof, Proof by Contradiction, Proof by Contraposition, Proof of Necessity and Sufficiency.

Module IV

7L

Algebraic Structures and Morphism: Algebraic Structures with one Binary Operation, Semi Groups, Monoids, Groups, Congruence Relation and Quotient Structures, Free and Cyclic Monoids and Groups, Permutation Groups, Substructures, Normal Subgroups, Algebraic Structures with two Binary Operation, Rings, Integral Domain and Fields. Boolean algebra and Boolean Ring, Identities of Boolean Algebra, Duality, Representation of Boolean Function, Disjunctive and Conjunctive Normal Form

Module IV

8L

Graphs and Trees: Graphs and their properties, Degree, Connectivity, Path, Cycle, Sub Graph, Isomorphism, Eulerian and Hamiltonian Walks, Graph Colouring, Colouring maps and Planar Graphs, Colouring Vertices, Colouring Edges, List Colouring, Perfect Graph, definition properties and Example, rooted trees, trees and sorting, weighted trees and prefix codes, Bi-connected component and Articulation Points, Shortest distances.

Textbook and Referencebooks:

1. Russell Merris, Combinatorics, Wiley-Inter science series in Discrete Mathematics and Optimisation
2. N. Chandrasekaran and M. Umaparvathi, Discrete Mathematics, PHI
3. Gary Haggard, John Schlipf and Sue Whitesides, Discrete Mathematics for Computer Science, CENGAGE Learning
4. Gary Chartrand and Ping Zhang– Introduction to Graph Theory, TMH
5. J. K. Sharma, Discrete Mathematics, Macmillan

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	-	-	-	-	-	-	-	-	-
CO2	3	3	2	2	-	-	-	-	-	-	-	-
CO3	3	3	2	-	-	-	-	-	-	-	-	-
CO4	3	3	2	-	-	-	-	-	-	-	-	-
CO5	3	3	2	3	-	-	-	-	-	-	-	-

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
CO1	2	2	2
CO2	2	2	2
CO3	2	2	2
CO4	2	2	2
CO5	2	2	2

Course Name: Data Communication and Networks

Course Code: IOT 401

Contact: 3:0:0

Credits: 3

Prerequisite:

1. Familiarity and knowledge of Operating Systems and Computer Architecture.
2. Also require a little bit of programming languages concepts like C,Java.

Course Outcomes (COs):

After attending the course students should be able to

CO1	Understand basics of computer network and different architecture and topologies of computer network and analyze the requirements for a given organizational structure and select the most appropriate networking architecture and technologies.
CO2	Understand/analyze different protocols of the data link layer and apply them to solve engineering problems.
CO3	Understand/analyze different protocols of Network and Transport Layer and apply them to solve engineering problems.
CO4	Understand/analyze different protocols of session and application layer and apply them to solve engineering problems.
CO5	Develop, Analyze, specify and design the topological and routing strategies using socket programming.

DATA COMMUNICATION AND NETWORKS

Basic concepts of computer networks, Layered architecture and comparison between ISO/OSI, TCP/IP layered models. Significance of Datalink layer and protocols. Network layer functionalities, classful, classless IP addressing, address allocation and role of forwarding module in forwarding the packet using routing table. Roles played by IP, ARP, RARP, ICMP & IGMP protocols in network layer. Inter-domain and intra-domain routing algorithms for routing tables. Importance of transport layer in achieving process-to-process communication. Insight of connection oriented protocol TCP and connectionless protocol UDP. Features of TCP in achieving flow control, error control and congestion control. Requirement of different timers in TCP. Drawbacks of IPv4 addressing and new IP addressing scheme IPv6. Migrating from IPv4 to IPv6. Introduction to application layer, a client/server application program and a case study. Client-server application program-Dynamic Host Configuration Protocol (DHCP).

References:

1. Behrouz A. Forouzan, *TCP/IP Protocol Suite*, 4th Edition, Tata McGraw Hill, 2010.
2. Tannenbaum, A.S, *Computer Networks*, 5th Edition, Prentice Hall of India EE Edition, 2011.
3. Behrouz A. Forouzan, *Data Communications and Networking*, 5th Edition, Tata McGraw Hill, 2013.
4. Leon Garcia and Widjaja, *Communication Networks*, 5th Edition, Tata McGraw Hill, 2017.
5. Bhawneet Sidhu, *An Integrated Approach to Computer Networks*, Khanna Publishing House, 2019.

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	2				2	2		3
CO2	3	3	3	3	3				2	2		3
CO3	3	3	3	3	3				2	2		3
CO4	3	3	3	3	3				2	2		3
CO5	2	3	3	3	3				2	2		3

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
CO1	3	3	3
CO2	3	3	3
CO3	3	3	3
CO4	3	3	3
CO5	3	3	3

Course Name: Formal Language & Automata Theory

Course Code: IOT 402

Contact: 3:0:0

Credits: 3

Prerequisites:

1. Digital Logic
2. Computer organization
3. Computer Fundamentals

Course Outcomes (COs):

After attending the course students should be able to

CO1	Understand the fundamental concepts of Finite State Automata to Explain or Illustrate and Identify problems where students can Apply the concept appropriately to Solve them.
CO2	Understand the fundamental concepts of Regular Expressions and its relation with DFA so that they can Develop regular expression for a specified language and Validate it.
CO3	Understand the fundamental concepts of Context Free Grammar so that they can Design grammar for a specified language and Validate it.
CO4	Explain or Illustrate the fundamental operating principles of Push Down Automata and Use it appropriately to Solve problems.

CO5	Understand the operating principles of Turing Machine and Design Turing Machines to Propose solution to the related problems appropriately and validate the effectiveness as well as limitations of computations making the students aware of its utilitarian importance for further explorations leading towards lifelong learning.
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Module I **6L**

Introduction: Alphabet, languages and grammars, productions and derivation, Chomsky hierarchy of languages.

Module II **7L**

Regular languages and finite automata: Regular expressions and languages, deterministic finite automata (DFA) and equivalence with regular expressions, non-deterministic finite automata (NFA) and equivalence with DFA, regular grammars and equivalence with finite automata, properties of regular languages, pumping lemma for regular languages, minimization of finite automata

Module III **6L**

Context-free languages and push down automata: Context- free grammars (CFG) and languages (CFL), Chomsky and Greibach normal forms, non-deterministic push down automata (PDA) and equivalence with CFG, parse trees, ambiguity in CFG, pumping lemma for context- free languages, deterministic push down automata, closure properties of CFLs.

Module IV **6L**

Context-sensitive languages: Context- sensitive grammars (CSG) and languages, linear bounded automata and equivalence with CSG.

Module V **6L**

Turing machines: The basic model for Turing machines (TM), Turing recognizable (recursively enumerable) and Turing-decidable (recursive) languages and their closure properties, variants of Turing machines, nondeterministic TMs and equivalence with deterministic TMs, unrestricted grammars and equivalence with Turing machines, TMs as enumerators

Module VI **6L**

Undecidability: Church- Turing thesis, universal Turing machine, the universal and diagonalization languages, reduction between languages and Rices theorem, undecidable problems about languages

Reference Books:

1. Formal Languages and Automata Theory, C. K. Nagpal, Oxford
2. —Switching and Finite Automata Theory, Zvi Kohavi, 2nd Edition, Tata McGraw Hill

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3								3
CO2	2	2	2	2								3
CO3	3	3	3	3								3
CO4	3	3	3	3								3
CO5	3	3	3	3					2	2		3

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
CO1	3	3	3
CO2	3	3	3
CO3	3	3	3
CO4	3	3	3
CO5	3	3	3

Course Name: Microprocessor, Microcontroller & Sensors**Course Code: IOT 403****Contact: 3:0:0****Credits: 3****Unit I Introduction to Microprocessor****6L**

Microprocessor architecture and its operations, Memory, Input & output devices, The 8085 MPU- architecture, Pins and signals, Timing Diagrams, Logic devices for interfacing, Memory interfacing, Interfacing output displays, Interfacing input devices, Memory mapped I/O.

Unit II Basic Programming concepts**8L**

Flow chart symbols, Data Transfer operations, Arithmetic operations, Logic Operations, Branch operation, Writing assembly language programs, Programming techniques: looping, counting and indexing. Additional data transfer and 16 bit arithmetic instruction, Logic operation: rotate, compare, counter and time delays, 8085 Interrupts.

Unit III 8051 Microcontroller Basics:**5L**

Inside the Computer, Microcontrollers and Embedded Processors, Block Diagram of 8051, PSW and Flag Bits, 8051 Register Banks and Stack, Internal Memory Organization of 8051, IO Port Usage in 8051, Types of Special Function Registers and their uses in 8051, Pins Of 8051. Memory Address Decoding, 8031/51 Interfacing With External ROM And RAM. 8051 Addressing Modes.

Unit IV Assembly programming and instruction of 8051**7L**

Introduction to 8051 assembly programming, Assembling and running an 8051 program, Data types and Assembler directives, Arithmetic, logic instructions and programs, Jump, loop and call instructions, IO port programming. Programming 8051 Timers. Serial Port Programming, Interrupts Programming, Interfacing: LCD

& Keyboard

Interfacing, ADC, DAC & Sensor Interfacing, External Memory Interface, Stepper Motor and Waveform generation.

Unit V Introduction to sensors and transducers 6L

Need for sensors in the modern world. Different fields of sensors based on the stimuli - various schematics for active and passive sensors. Static and dynamic characteristics of sensors - zero, I and II order sensors – Response to impulse, step, ramp and sinusoidal inputs. Environmental factors and reliability of sensors. UNIT – II Sensors for mechanical systems or mechanical sensors - Displacement - acceleration and force - flow of fluids - level indicators - pressure in fluids - stress in solids. Typical sensors - wire and film strain gauges, anemometers, piezo electric and magnetostrictive accelerometers, potentiometric sensors, LVDT.

Text Books:

1. Ramesh Gaonkar, “Microprocessor Architecture, Programming, and Applications with the 8085”, 6th Edition, Penram International Publication (India) Pvt. Ltd.,2013
2. Mazidi Ali Muhammad, Mazidi Gillispie Janice, and McKinlay Rolin D., “The 8051 Microcontroller and Embedded Systems using Assembly and C”, Pearson, 2nd Edition,2006
3. Doebelin, “Measurement Systems: Application and Design”, McGraw Hill Kogakusha Ltd.
4. Julian W. Gardner, Vijay K. Varadan, Osama O. Awadelkarim “Microsensors, MEMS and Smart Devices”, New York: Wiley, 2001.

Course Name: Principles of Management

Course Code: HU (IOT) 401

Contact: 2:0:0

Credits: 2

Course Outcomes (COs):

After attending the course students should be able to

CO1	Understand the basic concepts and technologies used in the field of management information Systems
CO2	Have the knowledge of the different types of management information systems
CO3	Understand the processes of developing and implementing information systems.
CO4	Be aware of the ethical, social, and security issues of information systems.
CO5	An ability to effectively integrate IT-based solutions into the user environment

Course Content:

Module-1: Management Concepts: Definition, roles, functions and importance of Management, Evolution of Management thought-contribution made by Taylor, Fayol, Gilbreth, Elton Mayo, McGregor, Maslow(4L)

Module - 2: Planning and Control: Planning: Nature and importance of planning, -types of planning, Levels of planning - The Planning Process. –MBO, SWOT analysis, McKinsey’s7S Approach.

Organizing for decision making: Nature of organizing, span of control, Organizational structure –line and staff authority.

Basic control process -control as a feedback system – Feed Forward Control –Requirements for effective control – control (4L)

Module - 3: Group dynamics: Types of groups, characteristics, objectives of Group

Dynamics. Leadership: Definition, styles & functions of leadership, qualities for good leadership, Theories of leadership(4L)

Module – 4: Work Study and work measurement: Definition of work study, Method Study Steps, Tools and Techniques used in the Method Study and Work Measurement Time Study: Aim & Objectives, Use of stopwatch procedure in making Time Study. Performance rating, allowances and its types. Calculation of Standard Time. Work sampling(4L)

Module - 5: Marketing Management: Functions of Marketing, Product Planning and development, Promotional Strategy (2L)

Module - 6: Quality management: Quality definition, Statistical quality control, acceptance sampling, Control Charts –Mean chart, range chart,c chart,p chart,np chart, Zero Defects, Quality circles,, Kaizen & Six Sigma,ISO -9000 Implementation steps, Total quality management(6L)

Text Books:

1. Essentials of Management, by Harold Koontz & Heinz Weihrich TataMcGraw
2. Production and Operations Management-K. Aswathapa, K .Shridhara Bhat,Himalayan Publishing House

References:

1. Organizational Behavior, by Stephen Robbins Pearson Education, NewDelhi
2. New era Management, Daft, 11th Edition, Cengage Learning
3. Principles of Marketing, Kotlar Philip and Armstrong Gary, Pearson publication

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	2							3	
CO2	3	2	2	2							3	
CO3	3	3	2	2							3	
CO4	3	2	2	2							3	
CO5	3	2	2	2							3	

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
CO1	2	2	2
CO2	2	2	2
CO3	2	2	2
CO4	2	2	2
CO5	2	2	2

Course Name: Biology
Course Code: BIO (IOT) 401
Contact: 2:1:0
Credits: 3

Module I 3L

To convey that Biology is as important a scientific discipline as Mathematics, Physics and Chemistry Bring out the fundamental differences between science and engineering by drawing a Comparison between eye and camera, Bird flying and aircraft. Mention the most exciting aspect of biology as an independent scientific discipline. Why we need to study biology?

Discuss how biological observations of 18th Century that lead to major discoveries. Examples from Brownian motion and the origin of the rmo dynamics by referring to the original observation of Robert Brown and Julius Mayor. These examples will highlight the fundamental importance of observations in any scientific inquiry.

Module II 3L

The under lying criterion, such as morphological, biochemical or ecological be highlighted. Hierarchy of life forms at phenomenological level. A common thread weaves this hierarchy Classification. Discuss classification based on (a) cellularity-Unicellularor multicellular (b) ultrastructure-prokaryotes or eucaryotes. (c) energy and Carbonutilisation- Autotrophs, heterotro phs, lithotropes (d) Ammonia excretion– aminotelic, uricotelic, ureotelic (e) Habitata- aquaticor terrestrial (e) Moleculartaxonomy-three major kingdoms of life.

A given organism can come under different category based on classification. Model organisms for the study of biology come from different groups. E.coli, S. cerevisiae, D.Melanogaster, C. elegance, A.Thaliana, M.musculus

Module III 4L

To convey that “Genetics is to biology what Newton’s laws are to Physical Sciences” Mendel’s laws, Concept of segregation and independent assortment. Concep to fallele. Gene mapping, Gene interaction, Epistasis. Meiosis and Mitosis be taught as a part of genetics.

Emphasis to be given ot to the mechanics of cell division nor the phases but how genetic material passes from parent to offspring. Concepts of recessiveness and dominance. Concept of mapping of phenotype to genes.

Discuss about the single gene disorders in humans.

Discuss the concept of complementation using human genetics

Module IV 4L

Biomolecules: To convey that all forms of life have the same building blocks and yet the manifestations are as diverse as one can imagine Molecules of life. In this context discuss monomeric units and polymeric structures. Discuss about sugars, starch and cellulose. Amino acids and proteins. Nucleotides and DNA/RNA. Two carbon units and lipids.

Module V 4L

Enzymes: To convey that without catalysis life would not have existed on earth

Enzymology: How to monitor enzyme catalyzed reactions. How donesan enzyme catalyse reactions? Enzyme classification. Mechanism of enzyme action. Discuss at least two examples. Enzyme kinetics and kinetic parameters. Why should we know these parameters to understand biology? RNA catalysis.

Module VI 4L

Information Transfer: The molecular basis of coding and decoding genetic information is Universal Molecular basis of information transfer. DNA as a genetic material. Hierarchy of DNA structure- from single stranded to double helix to nucleosomes. Concept of geneti ccode. Universality and degeneracy of geneti ccode. Define gene in terms of complementation and recombination.

Module VII 5L

Macro molecular analysis: How to analyse biological processes at the reductionit level Proteins- structure and function. Hierarch in protein structure. Primary secondary, tertiary and quaternary structure. Proteins as enzymes, transporters, recept or sand structural elements.

Module VIII

4L

Metabolism: The fundamental principles of energy transactions are the same in physical and biological world.

Thermodynamics as applied to biological systems. Exothermic and endothermic versus endergonic and exergonic reactions. Concep to fKeq and its relation to standard free energy.

Spontaneity. ATP as an energy currency. This should include the breakdown of glucose to CO₂ + H₂O (Glycolysis and Krebscycle) and synthesis of glucose from CO₂ and H₂O (Photosynthesis). Energy yielding And energy consuming reactions. Concep to fEnergy charge

Module IX

3L

Microbiology Concept of single celled organisms. Concept of species and strains. Identification and classification of microorgan is ms. Microscopy.

Ecological aspects of single celled organisms. Sterilization and media compositions. Growthkin etics.

Tex books/ reference books:

1. Uma Devi, General Biology, Khanna Publishing House.
2. Biology: A global approach: Campbell, N.A.; Reece,J.B.; Urry,Lisa; Cain,M, L.; Wasserman,S. A.; Minorsky,P.V.; Jackson, R.B.Pearson Education Ltd
3. Outlines of Biochemistry, Conn,E.E; Stumpf, P.K; Bruening, G; Doi, R.H.John Wiley and Sons
4. PrinciplesofBiochemistry(VEdition),ByNelson,D.L.;andCox,M.M.W.H.Freeman and Company
5. Molecular Genetics (Second edition) ,Stent, G.S.; and Calender, R.W.H. Freeman and company,Distributedby Satish Kumar Jainfor CBS Publisher
6. Microbiology, Prescott,L.M.J.P.HarleyandC.A.Klein1995.2nd edition Wm,C.Brown Publishers

PRACTICAL

Course Name: Data Communication and Networking Lab

Course Code: IOT 491

Contact: 0:0:3

Credits: 1.5

Prerequisites:

1. Familiarity and knowledge of Computer Network and Computer Architecture
2. Also require strong knowledge of programming languages like C,Java and UNIX or Linux environment.

Course Outcomes (COs):

After attending the course students should be able to

CO1	To design and implement small size network and to understand various networking commands.
CO2	To provide the knowledge of various networking tools and their related concepts.
CO3	To understand various application layer protocols for its implementation in client/server environment
CO4	Understand the TCP/IP configuration for Windows and Linux
CO5	Learn the major software and hardware technologies used on computer networks

Objectives :

Student should be able to configure peer-to-peer network. This will help to understand different issues involved in peer-to-peer network.

Apply computer engineering discipline specific knowledge to solve core computer engineering related problems.

Function effectively as a leader and team member in diverse/multi disciplinary teams.

Ability to install and configure TCP/IP protocol. Ability to configure peer to peer network.

List of Experiments

- 1) Configure Peer-to-Peer Network at least three Host.
- 2) Create desired standard network cable including cross cable and test it by using cable tester
- 3) Connect computer using given topology with wired media.
- 4) Connect Computers Using Wireless Media
- 5) Write a C Program for CRC Error Detection
- 6) Create a Network Using Bluetooth. Setting up wireless network
- 7) Configure File Server. Configure client to file server and use file services
- 8) Configure static and dynamic IP addresses. Configure DHCP server
- 9) Run basic utilities and network commands: ipconfig, ping, tracert, netstat, path ping, route.
- 10) Create two subnets and implement it with calculated subnet masking
- 11) Set access rights and security permissions for user.
- 12) Create IPv6 environment in a small network using simulator
- 13) Linux network configuration, measurement and analysis tool: Wireshark
- 14) Socket Programming: TCP and UDP, peer to peer applications
- 15) Client Server using RPC using threads or processes
- 16) Simulation of LAN and Wi-Fi

Reference Books :

- 1) "Data and Computer Communication" by William Stallings
- 2) "Data Communication and Networking" by Behrouz A Forouzan
- 3) "Internetworking with TCP/IP, Volume 1" by Douglas Comer
- 4) "Computer Networks 5th Edition" by Tanenbaum
- 5) "An Integrated Approach to Computer Networks" by Bhawneet Sidhu

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	2	3							2
CO2	3	3	3	3	3							2
CO3	3	3	3	3	3							2
CO4	3	3	3	3	3							2
CO5	2	3	2	2	3							2

CO-PSO Mapping

Course Name: Microprocessor, Microcontroller & Sensors Lab

Course Code: IOT 492

Contact: 0:0:3

Credits: 1.5

OBJECTIVES:

- To Introduce ALP concepts, features and Coding methods
- Write ALP for arithmetic and logical operations in 8086 and 8051
- Differentiate Serial and Parallel Interface
- Interface different I/Os with Microprocessors
- Be familiar with Simulators
- Use various sensors in circuit making

LIST OF EXPERIMENTS:

8085 Programs using kits and Simulation

1. Basic arithmetic and Logical operations
2. Move a data block without overlap
3. Code conversion, decimal arithmetic
4. Floating point operations, string manipulations, sorting and searching
5. Counters and Time Delay

Peripherals and Interfacing Experiments

6. Traffic light controller
7. Stepper motor control
8. Digital clock
9. Square Wave Generation

8051 Experiments using kits and Simulation

10. Basic arithmetic and Logical operations
11. Square and Cube program, Find 2's complement of a number
12. Unpacked BCD to ASCII

Sensor Lab

1. Voltage and Current Detection Circuitry
- 2 Temperature and Pressure Detection Circuitry
- 3 Water flow and Level detection Circuitry
- 4 Position Indication (LVDT,Pot)
- 5 Proximity sensors(inductive)
- 6 Distance(Ultrasonic) sensor
- 7 Light sensor
- 8 Humidity sensor
- 9 Rainfall and Soil moisture Sensor
- 10 Motion sensor

Asansol Engineering College

Curriculum & Syllabus for B. Tech under Autonomy Incorporation of NEP2020 (Effective from 2024-25 admission batches)

Department of Computer Science and Engineering
(Internet of Things, Cyber Security including Block Chain Technology)

3 rd Year 1 st Semester									
Sl. No.	Broad Category	Category	Course Code	Course Title	Hours per week				Credits
					L	T	P	Total	
THEORY									
1	ENGG	Major	IOT 501	Database Management System	3	0	0	3	3
2	ENGG	Major	IOT 502	Operating System	3	0	0	3	3
3	ENGG	Major	IOT 503	Object Oriented Programming	3	0	0	3	3
4	ENGG	Major	IOT 504	Pattern Recognition	3	0	0	3	3
5	HUM	Minor	HU(IOT) 501	Introduction to Industrial Management	2	0	0	2	2
6	ENGG	Major	IOT 505 (A/B/C)	Embedded System/ Internet Technology/ Smart Sensors and IoT	3	0	0	3	3
PRACTICAL									
7	ENGG	Major	IOT 591	Database Management System lab	0	0	3	3	1.5

Relational query languages: Relational algebra, Tuple and domain relational calculus, SQL3, DDL and DML constructs, Open source and Commercial DBMS - MYSQL, ORACLE, DB2, SQL server.

Relational database design: Domain and data dependency, Armstrong's axioms, Normal forms, Dependency preservation, Lossless design.

Query processing and optimization: Evaluation of relational algebra expressions, Query equivalence, Join strategies, Query optimization algorithms.

Module III 3L

Storage strategies: Indices, B-trees, hashing.

Module IV 5L

Transaction processing: Concurrency control, ACID property, Serializability of scheduling, Locking and timestamp based schedulers, Multi- version and optimistic Concurrency Control schemes, Database recovery.

Module V 3L

Database Security: Authentication, Authorization and access control, DAC, MAC and RBAC models, Intrusion detection, SQL injection.

Module VI 3L

Advanced topics: Object oriented and object relational databases, Logical databases, Web databases, Distributed databases, Data warehousing and data mining.

Text book and Reference books:

1. "Database System Concepts", 6th Edition by Abraham Silberschatz, Henry F. Korth, S. Sudarshan, McGraw-Hill.
2. "Principles of Database and Knowledge – Base Systems", Vol 1 by J. D. Ullman, Computer Science Press.
3. Database Management Systems, R.P. Mahapatra, Khanna Publishing House, New Delhi (AICTE Recommended Textbook – 2018)
4. "Fundamentals of Database Systems", 5th Edition by R. Elmasri and S.Navathe,
5. Pearson Education "Foundations of Databases", Reprint by Serge Abiteboul, Richard Hull, Victor Vianu, Addison-Wesley

CO-PO Mapping:

CO#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	2							
CO2	3	3	3	2	2							
CO3	3	3	3	3	3	2	1					
CO4	3	3	3	2	3	2	2					
CO5	3	2	3	2	3	2	2				1	1

Operating Systems**Code: IOT 502****Contacts: 3L****Credit: 3****Prerequisites:**

1. Computer organization
2. Computer Architecture
3. Data Structures
4. Algorithms & Programming Concept

Course Outcomes (COs):

After attending the course students should be able to

CO1	Understand the fundamental concepts of Operating System, Protection & Security and differentiate different types of Operating System.
CO2	Understand and implement process & thread; understand, apply, compare different process synchronization algorithm and inter process communication to solve engineering problems
CO3	Understand/explain/analyze different synchronization techniques, critical section problems and deadlock and apply them to solve engineering problems.
CO4	Understand/explain different memory management techniques including virtual memory management; also able to apply, compare, and implement different page replacement algorithms to solve engineering problems.
CO5	Understand/explain different I/O mechanisms, File structures and disk management techniques and solving engineering problems applying different disk scheduling algorithms.

Module I**3L**

Introduction: Concept of Operating Systems, Generations of Operating systems, Types of Operating Systems, OS Services, System Calls, Structure of an OS - Layered, Monolithic, Microkernel Operating Systems, Concept of Virtual Machine. Case study on UNIX and WINDOWS Operating System.

Module II**10L**

Processes: Definition, Process Relationship, Different states of a Process, Process State transitions, Process Control Block (PCB), Context switching Thread:

Definition, Various states, Benefits of threads, Types of threads, Concept of multithreads, Process Scheduling: Foundation and Scheduling objectives, Types of Schedulers, Scheduling criteria: CPU utilization, Throughput, Turnaround Time, Waiting Time, Response Time; Scheduling algorithms: Pre-emptive and Non pre-emptive, FCFS, SJF, RR; Multiprocessor scheduling: Real Time scheduling: RM and EDF.

Module III **5L**

Inter-process Communication: Critical Section, Race Conditions, Mutual Exclusion, Hardware Solution, Strict Alternation, Peterson's Solution, The Producer Consumer Problem, Semaphores, Event Counters, Monitors, Message Passing, Classical IPC Problems: Reader's & Writer Problem, Dining Philosopher Problem etc.

Module IV **5L**

Deadlocks: Definition, Necessary and sufficient conditions for Deadlock, Deadlock Prevention, Deadlock Avoidance: Banker's algorithm, Deadlock detection and Recovery.

Module V **5L**

Memory Management: Basic concept, Logical and Physical address map, Memory allocation: Contiguous Memory allocation– Fixed and variable partition– Internal and External fragmentation and Compaction; Paging: Principle of operation –Page allocation Hardware support for paging, Protection and sharing, Disadvantages of paging.

Virtual Memory: Basics of Virtual Memory – Hardware and control structures – Locality of reference, Page fault, Working Set, Dirty page/Dirty bit – Demand paging, Page Replacement algorithms:

Optimal, First in First Out (FIFO), Second Chance (SC), Not recently used (NRU) and Least Recently used (LRU).

Module VI **6L**

I/O Hardware: I/O devices, Device controllers, Direct memory access Principles of I/O Software: Goals of Interrupt handlers, Device drivers, Device independent I/O software, Secondary-Storage Structure: Disk structure, Disk scheduling algorithms

File Management: Concept of File, Access methods, File types, File operation, Directory structure, File System structure, Allocation methods (contiguous, linked, indexed), Free-space management (bit vector, linked list, grouping), directory implementation (linear list, hash table), efficiency and performance.

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
CO1	3	3	3
CO2	3	3	3
CO3	3	3	3
CO4	3	3	3
CO5	3	3	3

Object Oriented Programming**Code: IOT 503****Contacts: 3L****Credit: 3****Prerequisite:** Partial Object Oriented Programming using C++**Course Outcome(s):****CO1:** Design the process of interaction between Objects, classes & methods w.r.t. Object Oriented Programming.**CO2:** Acquire a basic knowledge of Object Orientation with different properties as well as different features of Java.**CO3:** Analyze various activities of different string handling functions with various I/O operations.**CO4:** Discuss basic code reusability feature w.r.t. Inheritance, Package and Interface. **CO5:** Implement Exception handling, Multithreading and Applet(Webprograminjava) programming concept in Java.**Module I 8L**

Abstract data types and their specification. How to implement an ADT. Concrete state space, concrete invariant, abstraction function. Implementing operations, illustrated by the Text example.

Module I 8L

Features of object-oriented programming. Encapsulation, object identity, polymorphism – but not inheritance.

Module I 6L

Pattern Recognition**Code: IOT 504****Contracts: 3L****Credits- 3****Course Objectives:**

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

1. Understand basic concepts in pattern recognition
2. Gain knowledge about state-of-the-art algorithms used in pattern recognition research
3. Understand pattern recognition theories, such as Bayes classifier, Decision trees, SVM, linear discriminant analysis.
4. Apply pattern recognition techniques in practical problems.

Course Outcomes :

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

CO1	Acquire knowledge to interpret relevant information to design a simple pattern recognition system
CO2	Identify the strengths and weaknesses of different pattern classification techniques
CO3	Implement different pattern classifiers
CO4	Apply pattern recognition techniques to real-world problems
CO5	Evaluate the result from a simple pattern recognition system

Introduction [2L]

Basic idea of pattern recognition: Some basic definition, Types of learning, Few examples of pattern recognition techniques.

Bayesian Decision Theory [8L]

Classifiers, Discriminant functions, Decision surfaces, Normal density and decision functions, Discrete features

Parameter Estimation Methods [6L]

Maximum likelihood estimation, Gaussian mixture models, Expectation maximization method, Bayesian estimation

Hidden Markov Models for Sequential Pattern Classification [8L]

Discrete hidden Markov models, Continuous density hidden Markov models

Dimension Reduction Methods [3L]

COs-PSOs Mapping

Course	CO's	PSO-1	PSO-2	PSO-3
PEC-IT602D	PEC-IT602D.1	3		
	PEC-IT602D.2		2	2
	PEC-IT602D.3	3	2	3
	PEC-IT602D.4	2	3	2
	PEC-IT602D.5	2	2	1
	PEC-IT602D			

Introduction to Industrial Management**Code: HU(IOT) 501****Contacts: 2L****Credit: 2****Module I****6L**

Introduction

System- concept, definition, types, parameters, variables and behavior.

Management – definition and functions.

Organization structure:

- i. Definition.
- ii. Goals.
- iii. Factors considered in formulating structure.
- iv. Types.
- v. Advantages and disadvantages. vi. Applications.

Concept, meaning and importance of division of labor, scalar & functional processes, span of control, delegation of authority, centralization and decentralization in industrial management. Organizational culture and climate – meaning, differences and factors affecting them. Moral-factors affecting moral. Relationship between moral and productivity. Job satisfaction- factors influencing job satisfaction. Important provisions of factory act and labor laws.

Module II**8L**

Critical Path Method (CPM) and Programme Evaluation Review Technique (PERT):

2.1 CPM & PERT-meaning, features, difference, applications. 2.2 Understand different terms used in network diagram. Draw network diagram for a real life project containing 10-15 activities, computation of LPO and EPO.(Take minimum three examples).

Determination of critical path on network. Floats, its types and determination of floats. Crashing of network, updating and its applications

Module III **6L**

Materials Management: Material management-definition, functions, importance, relationship with other departments. Purchase - objectives, purchasing systems, purchase procedure, terms and forms used in purchase department. Storekeeping- functions, classification of stores as centralized and decentralized with their advantages, disadvantages and application in actual practice. Functions of store, types of records maintained by store, various types and applications of storage equipment, need and general methods for codification of stores. Inventory control:

i. Definition. ii. Objectives. iii. Derivation for expression for Economic Order Quantity (EOQ) and numeric examples. iv. ABC analysis and other modern methods of analysis. v. Various types of inventory models such as Wilson's inventory model, replenishment model and two bin model. (Only sketch and understanding, no derivation.). 3.6 Material Requirement Planning (MRP)- concept, applications and brief details about software packages available in market.

Module IV **8L**

Production planning and Control (PPC): Types and examples of production.

PPC :

i. Need and importance. ii. Functions. iii. Forms used and their importance. iv. General Approach for each type of production.

Scheduling- meaning and need for productivity and utilisation. Gantt chart- Format and method to prepare.

Critical ratio scheduling-method and numeric examples. Scheduling using Gantt Chart (for at least 5-7 components having 5-6

Module V **4L**

Value Analysis (VA) and Cost Control:

5.1 VA-definition, terms used, process and importance. 5.2 VA flow diagram.

DARSIRI method of VA. Case study of VA-at least two. Waste-types, sources and ways to reduce them. Cost control-methods and important guide lines.

Module VI **4L**

Recent Trends in IM: ERP (Enterprise resource planning) - concept, features and applications.

Important features of MS Project. Logistics- concept, need and benefits. Just in Time (JIT)- concept and benefits. Supply chain management-concept and benefits.

Text book and Reference books:

1. L.S. Srinath– “CPM & PERT principles and Applications”.
2. Buffa – “Modern Production Management”.
3. N. Nair – “Materials Management”.

4. O. P. Khanna – “Industrial Engineering & Management”.
5. Mikes – “Value Analysis”.
6. S.C. Sharma, “Engineering Management – Industrial Engineering & Management”, Khanna Book Publishing Company, New Delhi

Embedded System

Code: IOT 505A

Contacts: 3L

Credit: 3

Overview of Embedded System: Embedded System, Embedded Processor in System, Components of Embedded System, Brief introduction to Embedded software in system, Design Process in Embedded System.

Embedded Hardware:

Processor & Memory: Brief overview of 8051 Architecture and real world interfacing, Introduction to advanced Processor Architectures-ARM, Processor and Memory organization, Parallelism in instruction level, Processor and memory selection.

I/O Types: Serial and Parallel communication Ports, Timer and Counting devices, Watchdog timers, real time clock, Serial bus Communication Protocols- I2C, CAN, and Parallel Communication Protocol-ISA.

Interrupt Service Mechanism: Concept of ISR, different interrupt sources, Interrupt handling Mechanism, Multiple Interrupts, Interrupt Latency and deadline.

Embedded Software Development- Software Development: Programming concept in ALP (assembly language programming) and High level language-C, Processor directives, functions and macros and other programming elements, Embedded C++ concept only.

RTOS(Real time operating System)- OS overview, Process, Interrupt and memory management, RTOS overview, Basic Design rule using RTOS, Task scheduling using Priority based scheduling, cyclic scheduling and round robin scheduling.

Embedded system Design using PIC microcontroller: Introduction toMicrochip PIC16 family, PIC16F873 processor architecture- features, memory organization, on chip peripherals, Watchdog timer, ADC, Data EEPROM, Asynchronous serial port, SPI mode, I2C mode, Interfacing with LCD, ADC, sensors, stepper motor, key board,DAC.

Case study of different types of Embedded System: Design of Automated Chocolate Vending Machine, Digital Camera.

Text Book

1. Microcontrollers Theory and Application, Ajay V. Deshmukh, TMH, 2011.

Smart Sensors and IoT

Code: IOT 505 C

Contacts: 3L

Credit: 3

Module I 6L

Sensors/Transducers and Actuators fundamentals: Principles, Sensor Classification, Characteristics, Performance, Error Analysis, Different types of Actuators (Pneumatic, Hydraulic, Electrical, Thermal and Mechanical).

Module II 8L

Introduction to Thermal, Optical, Velocity and Acceleration sensors: Photo detectors, Resistance based temperature sensors, Semiconductor temperature sensors, Ultrasonic distance sensor, Electromagnetic velocity sensor, Accelerometer (capacitive, piezo-resistive and piezoelectric), Gyroscope (rotor, monolithic and optical).

Module III 6L

Interfacing: Temperature and Humidity sensors, Tilt sensor, Accelerometer, Distance sensors, Obstacles sensors etc with Arduino and Raspberry Pi Development Board for various IoT applications.

Module IV 6L

Smart Sensors: Introduction, Architecture of Smart Sensors: Important components and their features. Some smart sensors: ACOEM Eagle, EnOcean Push Button, NEST Sensor, Ninja Blocks, Introduction to Wearable Electronics Sensors.

Module V 6L

Smart sensors and IoT: Seven Generations of IoT Sensors: Industrial sensors, First Generation, Advanced Generation, Integrated IoT Sensors, Polytronics Systems, Sensors' Swarm, and Printed Electronics – their Description & Characteristics. Interfacing of Sensors for IoT application.

Module VI 4L

Wireless Sensor: Structure, Energy Storage Module, Power Management Module, RF Module, Sensing Module.

Module VII 4L

Applications: Agriculture, Home Security, Smart City, Automobile, Medical field.

Text Book(s):

1. Jacob Fraden, “Hand Book of Modern Sensors: physics, Designs and Applications”, 2015, 3rd edition, Springer, New York.
2. Jon. S. Wilson, “Sensor Technology Hand Book”, 2011, 1st edition, Elsevier, Netherland.
3. Dr. Guillaume Girardin , Antoine Bonnabel, Dr. Eric Mounier, 'Technologies & Sensors for the Internet of Things Businesses & Market Trends 2014 - 2024',Yole Development Copyrights, 2014.
4. Hiroto Yasuura, Chong-Min Kyung, Yongpan Liu, Youn-Long Lin, “Smart Sensors at the IoT Frontier”, Springer Link.

Reference Books:

1. John G Webster, “Measurement, Instrumentation and sensor Handbook”, 2017, 2nd edition, CRC Press, Florida.
2. Eric Udd and W.B. Spillman, “Fiber optic sensors: An introduction for engineers and scientists”, 2013, 2nd edition, Wiley, New Jersey.
3. Bahaa E. A. Saleh and Malvin Carl Teich, “Fundamentals of photonics”, 2012, 1st edition, John Wiley, New York.
4. D. Patranabis , “Sensors and Transducers” –PHI Learning Private Limited.
5. W. Bolton ,“Mechatronics” –Pearson Education Limited.
6. D. Patranabis , “Sensors and Actuators”,x 2nd Ed., PHI, 2013
7. Subhas C. Mukhopadhyay, “Wearable Electronics Sensors, For Safe and Healthy Living”, Springer Lin

Database Management System Lab

Code: IOT 591

Contacts: 3P

Credit: 1.5

Course Outcome(s):

On completion of the course students will be able to

CO1:Understand the database management system and data base language

CO2:Understand and apply the SQL queries related to management of data and transaction processing.

CO3: Explain about query processing techniques involved in query optimization

CO4: Understand PL/SQL programming, the concept of Cursor Management, Error Handling, Package and Triggers

CO5: Design and build the commercial data base systems.

Laboratory Experiments:
Structured Query Language

1. Creating Database

- Creating a Database
- Creating a Table
- Specifying Relational Data Types
- Specifying Constraints
- Creating Indexes

2. Table and Record Handling

- INSERT statement
- Using SELECT and INSERT together
- DELETE, UPDATE, TRUNCATE statements
- DROP, ALTER statements

3. Retrieving Data from a Database

- The SELECT statement
- Using the WHERE clause
- Using Logical Operators in the WHERE clause
- Using IN, BETWEEN, LIKE, ORDER BY, GROUP BY and HAVING Clause
- Using Aggregate Functions
- Combining Tables Using JOINS
- Subqueries

4. Database Management

- Creating Views
- Creating Column Aliases
- Creating Database Users
- Using GRANT and REVOKE

Cursors in Oracle PL / SQL

Writing Oracle PL / SQL Stored Procedures

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	3				3			
CO2	3	3	3	3	3				3			
CO3	3	3	3	3	3				3			
CO4	3	3	3	3	3				3			
CO5	3	3	3	3	3				3			

Operating System Lab**Code: IOT 592****Contacts: 3P****Credit: 1.5****Prerequisites:**

1. Computer organization
2. Computer Architecture
3. Data Structures
4. Algorithms & Programming Concept

Course Outcomes (COs):

After attending the course students should be able to

CO1	Analyze and simulate CPU Scheduling Algorithms like FCFS, Round Robin, SJF, and Priority.
CO2	Understand the concepts of deadlock in operating systems.
CO3	Implement them in Multiprogramming system.
CO4	Create process creation and implement inter process communication
CO5	Analyze the performance of the various page replacement schemes

1. Managing Unix/Linux Operating System [8P]: Creating a bash shell script, making a script executable, shell syntax (variables, conditions, control structures, functions, commands). Partitions, Swap space, Device files, Raw and Block files, Formatting disks, Making file systems, Superblock, I-nodes, File system checker, Mounting file systems, Logical Volumes, Network File systems, Backup schedules and methods Kernel loading, init and the inittab file, Run-levels, Run level scripts. Password file management, Password security, Shadow file, Groups and the group file, Shells, restricted shells, user-management commands, homes and permissions, default files, profiles, locking accounts, setting passwords, Switching user, Switching group, Removing users & user groups.
2. Process [4P]: starting new process, replacing a process image, duplicating a process image, waiting for a process, zombie process.
3. Signal [4P]: signal handling, sending signals, signal interface, signal sets.
4. Semaphore [6P]: programming with semaphores (use functions semctl, semget, semop, set_semvalue, del_semvalue, semaphore_p, semaphore_v).
5. POSIX Threads [6P]: programming with pthread functions (viz. pthread_create, pthread_join, pthread_exit, pthread_attr_init, pthread_cancel) Inter-process communication [6P]: pipes (use functions pipe, popen, pclose), named pipes (FIFOs, accessing FIFO), message passing & shared memory (IPC version V).

Books:

1. Yashavant P. Kanetkar, UNIX Shell Programming, 1st edition, BPB Publications
2. Beej's Guide to Unix IPC
3. W. Richard Stevens, UNIX Network Programming, 2nd edition, Prentice Hall

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	3				3			
CO2	3	3	3	3	3				3			
CO3	3	3	3	3	3				3			
CO4	3	3	3	3	3				3			
CO5	3	3	3	3	3				3			

CO-PSO Mapping

COs	PSO1	PSO2	PSO3
CO1	3	3	3
CO2	3	3	3
CO3	3	3	3
CO4	3	3	3
CO5	3	3	3

Object Oriented Programming & Java Lab**Code: IOT 593****Contacts: 3P****Credit: 1.5****Prerequisites:**

1. Computer Fundamentals
2. Basic understanding of Computer Programming and related Programming Paradigms
3. Problem Solving Techniques with proper logic Implementation.

Course Objective(s):

- It demonstrates that how can you change the implementation of an object without affecting any other code by increasing data security and protecting unwanted data access. (Encapsulation).
- It allows you to have many different functions, all with the same name, all doing the same job, but depending upon different data. (Polymorphism).
- It guides you to write generic code: which will work with arrange of data, so you don't have to write basic stuff over, and over again. (Generics).
- It lets you write a set of functions, then expand them in different direction without changing or copying them in anyway. (Inheritance)

Course Outcome(s):

CO1: Create the procedure of communication between Objects, classes & methods.

CO2: Understand the elementary fact of Object Orientation with various characteristics as well as several aspects of Java.

CO3: Analyze distinct features of different string handling functions with various I/O operations.

CO4: Discuss simple Code Reusability notion w.r.t. Inheritance, Package and Interface.

CO5: Apply Exception handling, Multithreading and Applet (Web program in java) programming concept in Java.

Laboratory Experiments:

1. Assignments on class, constructor, overloading, inheritance, overriding
2. Assignments on wrapper class, arrays
3. Assignments on developing interfaces- multiple inheritance, extending interfaces
4. Assignments on creating and accessing packages
5. Assignments on multithreaded programming
6. Assignments on applet programming Note: Use Java for programming

Any experiment specially designed by the college

(Detailed instructions for Laboratory Manual to be followed for further guidance)

Textbooks:

1. Herbert Schildt – "Java:The Complete Reference"– 9th Ed.–TMH
2. E. Balagurusamy– "Programming With Java: APrimer " – 3rdEd.– TMH.

ReferenceBooks:

1. R.KDas–"CoreJava forBeginners" –VIKASPUBLISHING.
Rambaugh, James Michael, Blaha–"Object Oriented Modelling and Design"–Prentice Hall,India

CO-PO Mapping:

COs	ProgrammeOutcomes(POs)											
	PO 1	PO 2	PO3	PO 4	PO5	PO6	PO7	PO 8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	2	-	-	-	1	-	-	1
CO2	3	2	2	-	1	-	-	-	1	-	-	2
CO3	2	3	2	3	-	-	-	-	2	-	-	-
CO4	1	-	-	-	-	-	-	-	1	2	-	2
CO5	2	1	1	-	1	-	-	-	2	-	-	2

Asansol Engineering College

Curriculum & Syllabus for B. Tech under Autonomy
Incorporation of NEP2020
(Effective from 2024-25 admission batches)

Department of Computer Science and Engineering
(Internet of Things, Cyber Security including Block Chain Technology)

3 rd Year 2 nd Semester									
Sl. No	Broad Category	Category	Course Code	Course Title	Hours per week				Credits
					L	T	P	Total	
THEORY									
1	ENGG	Minor	IOT 601	Cryptography and Network Security	2	0	0	2	2
2	ENGG	Major	IOT 602	IoT Application and Design	3	0	0	3	3
3	ENGG	Major	IOT 603	Machine Learning	3	0	0	3	3
4	ENGG	Major	IOT 604 (A/B/C/D/E)	Cloud Computing/ Cyber law and Cybercrime/ Steganography and Watermarking/ Software Engineering/ Digital Forensics	3	0	0	3	3
5	HUM	Minor	HU(IOT) 601 (A/B/C)	Human Resource Development and Organizational Behaviour/ Indian Music System/ Economic Policies in India	3	0	0	3	3
PRACTICAL									
6	ENGG	Major	IOT 691	IoT Application and Design Lab	0	0	4	4	2
7	ENGG	Multidisciplinary	IOT 692 (A/B/C/D/)	Lab based on IOT 604	0	0	3	3	1.5

			E)						
8	ENGG	Major	IOT 692	Machine Learning	0	0	4	4	2
9	ENGG	Major	IOT 681	Project-I	0	0	4	4	2
Total of Theory, Practical, and Mandatory Activities/Courses								29	21.5

THEORY

SYLLABUS Semester VI

Cryptography & Network Security

Code: IOT 601

Contact: 2L

Total Contact Hours: 2L

Credits: 2

Module I

10 L

Computer Security Concepts, The OSI Security Architecture, Security Attacks, Security Services, Security Mechanisms, A Model for Network Security, Classical Encryption Techniques, Symmetric Cipher Model, Substitution Techniques, Transposition Techniques, Rotor Machines, Steganography, Cryptographic Tools, Confidentiality with Symmetric Encryption, Message Authentication and Hash Functions, Public-Key Encryption, Digital Signatures and Key Management, Random and Pseudorandom Numbers, Practical Application: Encryption of Stored Data, User Authentication, Means of Authentication, Password-Based Authentication, Token-Based Authentication, Biometric Authentication, Remote User Authentication, Security Issues for User Authentication, Malicious Software, Types of Malicious Software (Malware), Propagation—Infected Content—Viruses, Propagation—Vulnerability Exploit—Worms, Propagation—Social Engineering—SPAM Email, Trojans, Payload—System Corruption, Payload—Attack Agent—Zombie, Bots, Payload—Information Theft—Key loggers, Phishing, Spyware, Payload—Stealth—Backdoors, Rootkits, Countermeasures, Firewalls and Intrusion Prevention Systems, the Need for firewalls, Firewall Characteristic, Types of Firewalls, Firewall Basing, Firewall Location and Configurations, Intrusion Prevention Systems.

Text Books:

1. Cryptography and Network Security: Principles and Practice by William Stallings 6th Edition published by PHI (2011)
2. Computer security principles and practice, William Stallings, Lawrie Brown, third edition, Prentice-Hall, 2011
3. Cryptography and Network Security, V.K. Jain, Khanna Publishing House

IoT Application and Design**Code: IOT 602****Contact: 3L****Credit: 3**

Module No.	Content	Lecture Hours
1.	<ul style="list-style-type: none"> • Definition, Characteristics, and Features of IoT. • IoT Ecosystem • IoT Decision Framework 	4
2.	<ul style="list-style-type: none"> • IoT Architecture, Applications, and Design • Domain-specific IoTs – Home, City, Environment, Energy, Retail, Logistics, Agriculture, Industry, health, and Lifestyle. 	4
3.	<ul style="list-style-type: none"> • IoT & M2M • Software-defined networks and network function virtualization • Basics of IoT System Management. 	6
4.	<ul style="list-style-type: none"> • IoT Physical Devices & Endpoints • Introduction to Raspberry PI and other IoT boards • Different types of Interfaces (Serial, SPI, I2C). 	6
5.	<ul style="list-style-type: none"> • Data Link Layer, Network Layer, and Session Layer. • Corresponding Protocols (IEEE 802.15.4, Zigbee, 6LoWPAN, Bluetooth) • LoRa, MQTT Communication 	8
6.	<ul style="list-style-type: none"> • Introduction to Cloud Storage models and communication APIs. • Web server – Web server for IoT, Cloud for IoT • Designing a RESTful web API 	8
7.	<ul style="list-style-type: none"> • IoT Design Methodology and Case studies: Home Automation • IoT-enabled technologies: Wireless sensor networks, Cloud computing, Big data analytics 	8
8.	<ul style="list-style-type: none"> • Python program with Raspberry Pi. • Relevant applications on Python packages - JSON, XML, HTTP Lib, URL Lib, SMTP Lib. • Python web application framework. 	8

Textbook:

1. Internet of Things - A Hands-on Approach, Arshdeep Bahga, and Vijay Madiseti, Universities Press, 2015.
 2. Internet of Things, K.G. Srinivasa, G.M. Siddesh, R.R. Hanumantha, CENGAGE Learning India, 2018
 3. Getting Started with Raspberry Pi, Matt Richardson & Shawn Wallace, O'Reilly (SPD), 2016.
 4. IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things, David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Robert Barton, Jerome Henry, Pearson Education, 2017.
 5. Getting Started with Raspberry Pi, Matt Richardson & Shawn Wallace, O'Reilly (SPD), 2016.
- Reference books:
6. Internet of Things (A Hands-on-Approach), Arshdeep Bahga and Vijay Madiseti, VPT, 2014.

7. Internet of Things: Architecture and Design Principles, Raj Kamal, McGraw Hill Education, 2017.

Course Name: Machine Learning

Course Code: IOT 603

Contact (Periods/Week): 3L/Week

Credit: 3

Prerequisite:

1. Basic programming skills, Algorithm design.

2. Probability, Axioms of Probability, Conditional Probability,

Bernoulli Distribution, Binomial Distribution, Multinomial Distribution, Uniform Distribution, Normal (Gaussian) Distribution, Chi-Square Distribution, t Distribution, F Distribution. Probability Distribution and Density Functions, Joint Distribution and Density Functions, Conditional Distributions, Bayes' Rule, Expectation, Variance, Weak Law of Large Numbers.

3. Linear Algebra; Convex Optimization; Statistics; Calculus

Prerequisite:

Course Outcome(s)

CO1: Have a good understanding of the fundamental issues and challenges of machine learning: data, model selection, model complexity, etc.

CO2: Have an understanding of the strengths and weaknesses of many popular machine learning approaches.

CO3: Understand how to evaluate models generated from data.

CO4: Apply the algorithms to problem, optimize the models learned and report on the expected accuracy that can be achieved by applying the models

Module 1: [8L]

Supervised Learning (Regression/Classification)

- Basic methods: Distance-based methods, Nearest Neighbours, Decision Trees, Naive Bayes
- Linear models: Linear Regression, Logistic Regression, Generalized Linear Models
- Support Vector Machines, Nonlinearity and Kernel Methods
- Beyond Binary Classification: Multi-class/Structured Outputs, Ranking

Module 2: [5L]

Unsupervised Learning • Clustering: K-means/Kernel K-means • Dimensionality Reduction: PCA and kernel PCA • Matrix Factorization and Matrix Completion • Generative Models (mixture model and latent factor models) R23B.TechCSE

Module 3: [4L]

Evaluating Machine Learning algorithms and Model Selection, Introduction to Statistical Learning Theory, Ensemble Methods (Boosting, Bagging, Random Forests)

Module 4: [7L]

Sparse Modelling and Estimation, Modelling Sequence/Time-Series Data, Deep Learning and Feature Representation Learning

Module 5: [7L]

Scalable Machine Learning (Online and Distributed Learning) A selection from some other advanced topics, e.g., Semi-supervised Learning, Active Learning, Reinforcement Learning, Inference in Graphical Models, Introduction to Bayesian Learning and Inference

Module6: [4L]

Recent trends in various learning techniques of machine learning and classification methods.

Text Book 1. Kevin Murphy, Machine Learning: A Probabilistic Perspective, MITPress,2012 2. Trevor Hastie, Robert Tibshirani, Jerome Friedman, The Elements of Statistical Learning, Springer

References: 1. Christopher Bishop, Pattern Recognition and Machine Learning, Springer, 2007
2. Dr. Rajiv Chopra, Machine Learning, Khanna Publishing House, 2018

CO-PO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	3	2	3							2
CO2		3	3	2								1
CO3	2	3	3	3								1
CO4	2	2	3	3	2							

Cloud Computing

Code: IOT 604 A

Contact: 3L

Credit: 3

Unit	Content	Hrs/Unit
1	<u>Definition of Cloud Computing and its Basics (Lectures)</u> . Defining a Cloud, Cloud Types – NIST model, Cloud Cube model, Deployment models (Public , Private, Hybrid and Community Clouds), Service Platform as a Service, Software as a Service with examples of services/ service providers, models – Infrastructure as a Service, Cloud Reference model, Characteristics of Cloud Computing – a shift in paradigm Benefits and advantages of Cloud Computing, A brief introduction on Composability, Infrastructure, Platforms, Virtual Appliances, Communication Protocols, Applications, Connecting to the Cloud by Clients, IaaS – Basic concept, Workload, partitioning of virtual private server instances, Pods, aggregations, silos PaaS – Basic concept, tools and development environment with examples SaaS - Basic concept and characteristics, Open SaaS and SOA, examples of SaaS platform Identity as a Service (IDaaS) Compliance as a Service (CaaS)	9

2	<p>Use of Platforms in Cloud Computing</p> <p>Concepts of Abstraction and Virtualization Virtualization technologies : Types of virtualization (access, application, CPU, storage), Mobility patterns (P2V, V2V, V2P, P2P, D2C, C2C, C2D, D2D) Load Balancing and Virtualization: Basic Concepts, Network resources for load balancing, Advanced load balancing (including ApplicationDelivery Controller and Application Delivery Network), Mention of The Google Cloud as an example of use of load balancing Hypervisors: Virtual machine technology and types, VMware vSphere Machine Imaging (including mention of Open Virtualization Format – OVF) Porting of applications in the Cloud: The simple Cloud API and AppZero Virtual Application appliance, Concepts of Platform as a Service, Definition of services, Distinction between SaaS and PaaS (knowledge of Salesforce.com and Force.com), Application development Use of PaaS Application frameworks, Discussion of Google Applications Portfolio – Indexed search, Dark Web, Aggregation and disintermediation, Productivity applications and service, Adwords, Google Analytics, Google Translate, a brief discussion on Google Toolkit (including introduction of Google APIs in brief), major features of Google App Engine service., Discussion of Google Applications Portfolio – Indexed search, Dark Web, Aggregation and disintermediation, Productivity applications and service, Adwords, Google Analytics, Google Translate, a brief discussion on Google Toolkit (including introduction of Google APIs in brief), major features of Google App Engine service, Windows Azure platform: Microsoft’s approach, architecture, and main elements, overview of Windows Azure AppFabric, Content Delivery Network, SQL Azure, and Windows Live services,</p>	12
3.	<p><u>Cloud Infrastructure:</u></p> <p>Cloud Management:</p> <p>An overview of the features of network management systems and a brief introduction of related products from large cloud vendors, Monitoring of an entire cloud computing deployment stack – an overview with mention of some products, Lifecycle management of cloud services (six stages of lifecycle).</p> <p>Concepts of Cloud Security:</p> <p>Cloud security concerns, Security boundary, Security service boundary Overview of security mapping Security of data: Brokered cloud storage access, Storage location and tenancy, encryption, and auditing and compliance Identity management (awareness of Identity protocol standards)</p>	7
4.	<p><u>Concepts of Services and Applications :</u></p> <p>Service Oriented Architecture: Basic concepts of message-based transactions, Protocol stack for an SOA architecture, Event-driven SOA, Enterprise Service Bus, Service catalogs,</p> <p>Applications in the Cloud: Concepts of cloud transactions, functionality mapping,</p>	8
	<p>Application attributes, Cloud service attributes, System abstraction and Cloud Bursting, Applications and Cloud APIs</p> <p>Cloud-based Storage: Cloud storage definition – Manned and Unmanned</p> <p>Webmail Services: Cloud mail services including Google Gmail, Mail2Web, Windows Live Hotmail, Yahoo mail, concepts of Syndication services</p>	

Text book and Reference books:

1. Cloud Computing Bible by Barrie Sosinsky, Wiley India Pvt. Ltd, 2013
2. Mastering Cloud Computing by Rajkumar Buyya, Christian Vecchiola, S. Thamarai Selvi, McGraw Hill Education (India) Private Limited, 2013
3. Cloud computing: A practical approach, Anthony T. Velte, Tata Mcgraw-Hill
4. Cloud Computing, Miller, Pearson
5. Building applications in cloud: Concept, Patterns and Projects, Moyer, Pearson

Cyber Law & Cyber Crime**Code: IOT 604 B****Contact: 3L****Credit: 3**

Module	Name of the Topic	Hours
01	Introduction to Cyberspace, Cybercrime and Cyber Law The World Wide Web, Web Centric Business, e-Business Architecture, Models of e-Business, e-Commerce, Threats to virtual world. IT Act 2000 - Objectives, Applicability, Non-applicability, Definitions, Amendments and Limitations. Cyber Crimes- Cyber Squatting, Cyber Espionage, Cyber Warfare, Cyber Terrorism, Cyber Defamation. Social Media-Online Safety for women and children, Misuse of Private information.	9
02	Regulatory Framework of Information and Technology Act 2000 Information Technology Act 2000, Digital Signature, E-Signature, Electronic Records, Electronic Evidence and Electronic Governance. Controller, Certifying Authority and Cyber Appellate Tribunal. (Rules announced under the Act), Network and Network Security, Access and Unauthorized Access, Data Security, E Contracts and E Forms.	9
03	Offences and Penalties: Information Technology (Amendment) Act 2008 – Objective, Applicability and Jurisdiction; Various cyber-crimes under Sections 43 (a) to (j), 43A, 65, 66, 66A to 66F, 67, 67A, 67B, 70, 70A, 70B, 80 etc. along with respective penalties, punishment and fines, Penal Provisions for Phishing, Spam, Virus, Worms, Malware, Hacking, Trespass and Stalking; Human rights in cyberspace, International Co-operation in investigating cybercrimes.	9
04	Indian Evidence Act Classification – civil, criminal cases. Essential elements of criminal law. Constitution and hierarchy of criminal courts. Criminal Procedure Code. Cognizable and non-cognizable offences. Bailable and non-bailable offences. Sentences which the court of Chief Judicial Magistrate may pass. Indian Evidence Act – Evidence and rules of relevancy in brief. Expert witness. Cross examination and re-examination of witnesses. Sections 32, 45, 46, 47, 57, 58, 60, 73, 135, 136, 137, 138, 141. Section 293 in the code of criminal procedure. Secondary Evidence Section 65-B.	9

Name of Author	Title of the Book
Karnika Seth	Computers, Internet and New Technology Laws
Jonathan Rosenoer	Cyber Law: The Law of Internet
Sreenivasulu N.S	Law Relating to Intellectual Property
PavanDuggal	Cyber Law – The Indian Perspective
Harish Chander	Cyber Laws and IT Protection

Steganography & Watermarking

Code: IOT 604 C

Contact: 3L

Credit: 3

Module	Name of the Topic	Hours
01	INTRODUCTION Information Hiding, Steganography and Watermarking – History of watermarking – Importance of digital watermarking – Applications – Properties – Evaluating watermarking systems. WATERMARKING MODELS & MESSAGE CODING: Notation – Communications – Communication based models – Geometric models – Mapping messages into message vectors – Error correction coding – Detecting multi-symbol watermarks.	7
02	WATERMARKING WITH SIDE INFORMATION & ANALYZING ERRORS: Informed Embedding – Informed Coding – Structured dirty- paper codes – Message errors – False positive errors – False negative errors – ROC curves – Effect of whitening on error rates	7
03	PERCEPTUAL MODELS: Evaluating perceptual impact – General form of a perceptual model – Examples of perceptual models – Robust watermarking approaches – Redundant Embedding, Spread Spectrum Coding, Embedding in Perceptually significant coefficients	7
04	WATERMARK SECURITY & AUTHENTICATION: Security requirements – Watermark security and cryptography – Attacks – Exact authentication – Selective authentication – Localization – Restoration.	8
05	STEGANOGRAPHY: Steganography communication – Notation and terminology – Information theoretic foundations of steganography – Practical steganographic methods – Minimizing the embedding impact – Steganalysis	7

Name of Author	Title of the Book	Name of the Publisher
Ingemar J. Cox, Matthew L. Miller, Jeffrey A. Bloom, Jessica Fridrich, Ton Kalker	Digital Watermarking and Steganography	Morgan Kaufmann Publishers, New York

Ingemar J. Cox, Matthew L. Miller, Jeffrey A. Bloom	Digital Watermarking	Morgan Kaufman Publishers, New York
Michael Arnold, Martin Schmucker, Stephen D. Wolthusen	Techniques and Applications of Digital Watermarking and Content Protection	Artech House, London

Software Engineering**Code: IOT 604 D****Contact: 3L****Credit: 3**

Module	Content	Hrs
1	Overview of System Analysis & Design, Business System Concept, System Development Life Cycle, Waterfall Model, Spiral Model, Feasibility Analysis, Technical Feasibility, Cost- Benefit Analysis, COCOMO model.	10
2	System Design – Context diagram and DFD, Problem Partitioning, Top Down and Bottom-Up design; Decision tree, decision table and structured English; Functional vs. Object- Oriented approach.	5
3	Coding & Documentation – Structured Programming, OO Programming, Information Hiding, Reuse, System Documentation. Testing – Levels of Testing, Integration Testing, Test case Specification, Reliability Assessment, Validation & Verification Metrics, Monitoring & Control.	12
4.	Software Project Management – Project Scheduling, Staffing, Software Configuration Management, Quality Assurance, Project Monitoring.	7
5	Static and dynamic models, why modeling, UML diagrams: Class diagram, interaction diagram: collaboration diagram, sequence diagram, state chart diagram, activity diagram, implementation diagram.	10

Text book and Reference books:

1. Pressman, Software Engineering: A practitioner's approach– (TMH)
2. Pankaj Jalote, Software Engineering- (Wiley-India)
3. N.S. Gill, Software Engineering – (Khanna Publishing House)
4. Rajib Mall, Software Engineering- (PHI)
5. Agarwal and Agarwal, Software Engineering – (PHI)
6. Sommerville, Software Engineering – Pearson
7. Martin L. Shooman, Software Engineering – TMH

Digital Forensics

Code: IOT 604 E

Contact: 3L

Credit: 3

INTRODUCTION TO COMPUTER FORENSICS
History of Forensics – Computer Forensic Flaws and Risks
Rules of Computer Forensics – Legal issues – Digital Forensic Principles
Digital Environments – Digital Forensic Methodologies
AN OVERVIEW OF DIGITAL FORENSICS INVESTIGATION
Live forensics and investigation –digital evidence
seizure methodology factors limiting the whole sale seizure of hardware- Demystifying computer/ cyber crime
explosion of networking – explosion of wireless networks – interpersonal communication
DATA FORENSICS
Recovering deleted files and deleted partitions – deleted file recovery tools –
deleted partitioned recovery tools – data acquisition and duplication
data acquisition tools – hardware tools – backing up and duplicating data.
ROUTER FORENSICS AND NETWORK FORENSICS
overview of Routers – Hacking Routers – Investigating Routers
Investigating Wireless Attacks – Basics of wireless -Wireless Penetration Testing
Direct Connections to Wireless Access Point – Wireless Connect to a Wireless Access Point.
E-MAIL FORENSICS AND STEGANOGRAPHY
Forensics Acquisition – Processing Local mail archives –
Processing server level archives – classification of steganography
categories of steganography in Forensics – Types of password cracking.

Reference Books:

1. Anthony Reyes, Jack Wiles, “Cybercrime and Digital Forensics”, Syngress Publishers, Elsevier 2007.
2. John Sammons, “The Basics of Digital Forensics”, Elsevier 2012
3. Linda Volonins, Reynalds Anzaldua, “Computer Forensics for dummies”, Wiley Publishing 2008.

Human Resource Development and Organizational Behaviour**Code: HU (IOT) 601 A****Contact: 3L****Credit: 3**

Module	Content	Hrs
1	Organizational Behaviour: Definition, Importance, Historical Background, Fundamental Concepts of OB, Challenges and Opportunities for OB. Personality and Attitudes: Meaning of personality, Personality Determinants and Traits, Development of Personality, Types of Attitudes, Job Satisfaction.	4
2	Perception: Definition, Nature and Importance, Factors influencing Perception, Perceptual Selectivity, Link between Perception and Decision Making. Motivation: Definition, Theories of Motivation - Maslow's Hierarchy of Needs Theory, McGregor's Theory X & Y, Herzberg's Motivation-Hygiene Theory, Alderfer's ERG Theory, McClelland's Theory of Needs, Vroom's Expectancy Theory.	8
3	Group Behaviour: Characteristics of Group, Types of Groups, Stages of Group Development, Group Decision Making. Communication: Communication Process, Direction of Communication, Barriers to Effective Communication. Leadership: Definition, Importance, Theories of Leadership Styles	4
4.	Organizational Politics: Definition, Factors contributing to Political Behaviour. Conflict Management: Traditional vis-a-vis Modern View of Conflict, Functional and Dysfunctional Conflict, Conflict Process, Negotiation – Bargaining Strategies, Negotiation Process. Organizational Design: Various Organizational Structures and their Effects on Human Behaviour, Concepts of Organizational Climate and Organizational Culture.	8

Text book and Reference books:

1. Robbins, S. P. & Judge, T.A.: Organizational Behavior, Pearson Education, 15th Edn.
2. Luthans, Fred: Organizational Behavior, McGraw Hill, 12th Edn.
3. Shukla, Madhukar: Understanding Organizations – Organizational Theory & Practice in India, PHI
4. Fincham, R. & Rhodes, P.: Principles of Organizational Behaviour, OUP, 4th Edn.
5. Hersey, P., Blanchard, K.H., Johnson, D.E.- Management of Organizational Behavior Leading Human Resources, PHI, 10th Edn.

Economic Policies in India

Code: HU (IOT) 601 B

Contacts: 3L

Credit: 3

Economic Development and its Determinants

Approaches to economic development and its measurement – sustainable development; Role of State, market and other institutions; Indicators of development – PQLI, Human Development Index (HDI), gender development indices. Planning in India Objectives and strategy of planning; Failures and achievements of Plans; Developing grass-root organizations for development – Panchayats, NGOs and pressure groups. Demographic Features, Poverty and Inequality Broad demographic features of Indian population; rural-urban migration; Urbanization and civic amenities; Poverty and Inequality.

Resource Base and Infrastructure Energy; social infrastructure – education and health; Environment; Regional imbalance; Issues and policies in financing infrastructure development.

The Agricultural Sector

Institutional Structure – land reforms in India; Technological change in agriculture – pricing of agricultural inputs and output; industry; Agricultural finance policy; Agricultural Marketing and Warehousing; Issues Terms of trade between agriculture and in food security – policies for sustainable agriculture.

Industrial policy; Public Sector enterprises and their performance; Problem of sick units in India;

Privatization and disinvestment debate; Growth and pattern of industrialization; Small-scale sector; Productivity in industrial sector; Exit policy – issues in labour market reforms; approaches for employment generation. Public Finances Fiscal federalism – Centre-State financial relations; Finances of central government; Finances of state governments; Parallel economy; Problems relating to fiscal policy; Fiscal sector reforms in India. Money, Banking and Prices Analysis of price behaviour in India; Financial sector reforms; Interest rate policy; Review of monetary policy of RBI; Money and capital markets; Working of SEBI in India. External Sector Structure and direction of foreign trade; Balance of payments; Issues in export-import policy and FEMA; Exchange rate policy; Foreign capital and MNCs in India; The progress of trade reforms in India. Economic Reforms Rationale of internal and external reforms; Globalization of Indian economy; WTO and its impact on the different sectors of the economy; Need for and issues in good governance; Issues in competition and safety nets in Indian economy.

BASIC READING LIST

1. Ahluwalia, I. J. and I. M. D Little (Eds.) (1999), *India's Economic Reforms and Development (Essays in honour of Manmohan Singh)*, Oxford University Press, New Delhi.
2. Bardhan, P. K. (9th Edition) (1999), *The Political Economy of Development in India*, Oxford University Press, New Delhi.
3. Bawa, R. s. and P. S. Raikhy (Ed.) (1997), *Structural Changes in Indian Economy*, Guru Nanak Dev University Press, Amritsar.
4. Brahmananda, P. R. and V. R. Panchmukhi (Eds.) (2001), *Development Experience in the Indian Economy: Inter-State Perspectives*, Book well, Delhi.
5. Chakravarty, S. (1987), *Development Planning: The Indian Experience*, Oxford University Press, New Delhi.
6. Dantwala, M. L. (1996), *Dilemmas of Growth: The Indian Experience*, Sage Publications, New Delhi.
7. Datt, R. (Ed.) (2001), *Second Generation Economic Reforms in India*, Deep & Deep Publications, New Delhi.
8. Government of India, *Economic Survey (Annual)*, Ministry of Finance, New Delhi.
9. Jain, a. K. (1986), *Economic Planning in India*, Ashish Publishing House, New Delhi.
10. Jalan, B. (1992), *The Indian Economy – Problems and Prospects*, Viking, New Delhi.

LABORATORY

SYLLABUS Semester IV

IoT Application & Design Lab

Code: IOT 691

Contact: 4P

Credit: 2

Laboratory Experiments

- 1 Study of IoT Physical Devices & Endpoints: Familiarisation with different types of Sensors, Actuators, and Arduino
- 2 Study of Zigbee protocol using IoT devices
- 3 Study of Bluetooth protocol using IoT devices
- 4 Interfacing an IoT device with Smartphone: Using Bluetooth and Wi-Fi module
- 5 Study of the ESP232 and Node MCU
- 6 Study of M2M communication of multi-sensor data: Using Wired and Wireless media
- 7 Setting up Raspberry Pi: Installation of Operating System into the Raspberry Pi
- 8 Interfacing Sensor with Raspberry Pi
- 9 Interfacing Actuator with Raspberry Pi
- 10 To study data logging to cloud server of IoT data
- 11 Controlling actuators with the server using the Internet.
- 12 Study and implement Paho MQTT client in Python.
- 13 Study of Relevant applications on Python packages - JSON, XML, HTTP Lib, URL Lib, SMTP Lib.
- 14 Study of Python web application framework Making a Domain-specific IoT application

Textbook:

1. Internet of Things - A Hands-on Approach, Arshdeep Bahga, and Vijay Madisetti, Universities Press, 2015.
2. Getting Started with Raspberry Pi, Matt Richardson & Shawn Wallace, O'Reilly (SPD), 2016.
3. IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things, David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Robert Barton, Jerome Henry, Pearson Education, 2017.

Reference books:

1. Internet of Things: Architecture and Design Principles, Raj Kamal, McGraw Hill Education, 2017.

Software Engineering Lab

Code: IOT 692 D

Contact: 3P

Credit: 1.5

Laboratory Experiments:

- Problem Analysis and Project Planning -Thorough study of the problem – Identify Project scope, Objectives and Infrastructure.
- Software Requirement Analysis – Describe the individual Phases/modules of the project and Identify deliverables. Identify functional and non-functional requirements.
- Data Modeling – Use work products – data dictionary.
- Software Designing - Develop use case diagrams and activity diagrams, build and test class diagrams, sequence diagrams and add interface to class diagrams.
- Prototype model – Develop the prototype of the product.

The SRS and prototype model should be submitted for end semester examination.

Any experiment specially designed by the college

(Detailed instructions for Laboratory Manual to be followed for further guidance)

Text book and Reference books:

1. Cloud Computing Bible by Barrie Sosinsky, Wiley India Pvt. Ltd, 2013
2. Mastering Cloud Computing by Rajkumar Buyya, Christian Vecchiola, S. Thamarai Selvi, McGraw Hill Education (India) Private Limited, 2013
3. Cloud computing: A practical approach, Anthony T. Velte, Tata Mcgraw-Hill
4. Cloud Computing, Miller, Pearson
5. Building applications in cloud:Concept, Patterns and Projects, Moyer, Pearson
6. Cloud Computing – Second Edition by Dr. Kumar Saurabh, Wiley India

Digital Forensic Lab**Code: IOT 692 E****Contact: 3P****Credit: 1.5**

Unit 1	Introduction to computer forensics
A	Learn to install wine / virtual box or any other equivalent software on the host os
B	Perform an experiment to grab a banner with telnet and perform the task using netcat utility
Unit 2	An overview of digital forensics investigation
A	Perform an experiment for port scanning with nmap, superscan or any other software.
B	Using nmap 1)find open ports on a system 2) find the machines which are active 3)find the version of remote os on other systems 4)find the version of s/w installed on other system
Unit 3	Data forensics
A	Perform an experiment on active and passive finger printing using xprobe2 and nmap.
B	Performa an experiment to demonstrate how to sniff for router traffic by using the tool wireshark
Unit 4	Router forensics and network forensics
A	Perform an experiment how to use dumpsec.
B	Perform an wireless audit of an access point / router and decrypt wep and wpa.
C	Perform an experiment to sniff traffic using arp poisoning.
Unit 5	E-mail forensics and steganography
A	Install ipcop on a linux system and learn all the function available on the software.
B	Install jcrypt tool (or any other equivalent) and demonstrate asymmetric, symmetric crypto algorithm, hash and digital/pki signatures

Reference Books:

1. Anthony Reyes, Jack Wiles, "Cybercrime and Digital Forensics", Syngress Publishers, Elsevier 2007.
2. John Sammons, "The Basics of Digital Forensics", Elsevier 2012
3. Linda Volonins, ReynaldsAnzaldua, "Computer Forensics for dummies", Wiley Publishing 2008.

Machine Learning Lab**Code: IOT 693****Contact: 4P****Credit: 2**

- Write a python program to import and export data using Pandas library functions
- Demonstrate various data pre-processing techniques for a given dataset
- Implement Dimensionality reduction using Principle Component Analysis (PCA) method.
- Write a Python program to demonstrate various Data Visualization Techniques.
- Implement Simple and Multiple Linear Regression Models.
- Develop Logistic Regression Model for a given dataset.
- Develop Decision Tree Classification model for a given dataset and use it to classify a new sample.
- Implement Naïve Bayes Classification in Python 48 9 Build KNN Classification model for a given dataset.
- Build Artificial Neural Network model with back propagation on a given dataset.
- a) Implement Random forest ensemble method on a given dataset.
- b) Implement Boosting ensemble method on a given dataset.
- Write a python program to implement K-Means clustering Algorithm.

Asansol Engineering College

Curriculum & Syllabus for B. Tech under Autonomy Incorporation of NEP2020

(Effective from 2024-25 admission batches)

Department of Computer Science and Engineering
(Internet of Things, Cyber Security including Block Chain Technology)

4 th Year 1 st Semester									
Sl. No	Broad Category	Category	Course Code	Course Title	Hours per week				Credits
					L	T	P	Total	
THEORY									
1	ENGG	Major	IOT 701 (A/B/C)	Blockchain and Cryptocurrency/ Social Network Analysis/ Ecommerce and ERP	3	0	0	3	3
2	ENGG	Major	IOT 702 (A/B)	Ethical Hacking/Cyber security in Block chain Technology	3	0	0	3	3
3	HUM	Minor	HU(IOT) 701 (A/B/C)	Soft skill and Interpersonal Communication/ Bio Informatics/ Business Analytics	3	0	0	3	3
4	HUM	Minor	HU(IOT) 702	Project Management and Entrepreneurship	3	0	0	3	3
PRACTICAL									
5	ENGG	Major	IOT 781	Project II	0	0	12	12	6
Total of Theory, Practical, and Mandatory Activities/Courses								24	18

THEORY

SYLLABUS

Semester VII

Subject: Blockchain and Cryptocurrency

Course Code: IoT 701 A

Contact: 3 Hrs.

Credit: 3

Contents:

INTRODUCTION

Need for Distributed Record Keeping, Modeling faults and adversaries, Byzantine Generals problem, Consensus algorithms and their scalability problems, Why Nakamoto Came up with Blockchain based cryptocurrency? Technologies Borrowed in Blockchain – hashpointers, consensus, byzantine fault-tolerant distributed computing, digital cash etc.

Basic Distributed Computing

Atomic Broadcast, Consensus, Byzantine Models of fault tolerance

Basic Crypto primitives

Hash functions, Puzzle friendly Hash, Collision resistant hash, digital signatures, public key crypto, verifiable random functions, Zero- knowledge systems

Blockchain 1.0

Bitcoin blockchain, the challenges, and solutions, proof of work, Proof of stake, alternatives to Bitcoin consensus, Bitcoin scripting language and their use

Blockchain 2.0

Ethereum and Smart Contracts, The Turing Completeness of Smart Contract Languages and verification challenges, Using smart contracts to enforce legal contracts, comparing Bitcoin scripting vs. Ethereum Smart Contracts

Blockchain 3.0

Hyperledger fabric, the plug and play platform and mechanisms in permissioned blockchain

Privacy, Security issues in Blockchain

Pseudo-anonymity vs. anonymity, Zcash and Zk-SNARKS for anonymity preservation, attacks on Blockchains – such as Sybil attacks, selfish mining, 51% attacks - advent of algorand, and Sharding based consensus algorithms to prevent these

List of Books

Name of Author	Title of the Book	Name of the Publisher
Don Tapscott , Alex Tapscott	Blockchain Revolution:How the Technology Behind Bitcoin and Other Cryptocurrencies is Changing the World Paperback	
Reference Books:		
William Mougayar	The Business Blockchain: Promise, Practice, and Application of the Next Internet Technology	Wiley

Subject: SOCIAL NETWORK ANALYSIS

Course Code: IoT 701 B

Contact: 3 Hrs.

Credit: 3

Introduction to Social Web, Nodes, Edges and Network Measures, Describing Nodes and Edges, Describing Networks, Layouts, Visualizing network features, The role of Tie strength, Measuring Tie strength and its network structures, network propagation, Link prediction, entity resolution, Case study, Introduction to community discovery, communities in context, quality functions, The Kernighan-Lin algorithm, Agglomerative algorithms, spectral algorithms, multi-level graph partitioning, Markov clustering, Other approaches, Introduction to social influence, Influence related statistics, social similarity and influence, Homophily, Existential Test for social influence, Influence and actions, Influence and interactions, influence maximization in viral marketing.

References:

1. Jennifer Golbeck., *Analysing the Social Web*, Morgan Kaufmann publications, 2013
2. Charu C. Aggarwal, *Social Network Data Analytics*, Springer publications, 2011
3. John Scott, *Social Network Analysis*, (3e), Sage publications limited, 2013
4. Jay Goldman, *Facebook Cookbook*, O'Reilly, 2009
5. Shamanth Kumar, Fred Morstatter, Huan Liu, *Twitter Data Analytics*, Springer publications, 2013

Subject: E-Commerce & ERP

Course Code: IoT 701 C

Contact: 3 Hrs.

Credit: 3

CONTENT

1. Overview, Definitions, Advantages & Disadvantages of E – Commerce, Threats of E – Commerce, Managerial Prospective, Rules & Regulations f For Controlling E – Commerce, Cyber Laws.
2. Technologies Relationship Between E – Commerce & Networking, Different Types of Networking Commerce, Internet, Intranet & Extranet, EDI Systems Wireless Application Protocol: Definition, Hand Held Devices, Mobility & Commerce, Mobile Computing, Wireless Web, Web Security, Infrastructure Requirement For E – Commerce.
3. Business Models of e – commerce Model Based On Transaction Type, Model Based On Transaction Party - B2B, B2C,C2B, C2C, E – Governance.
4. E – strategy: Overview, Strategic Methods for developing E – commerce.
5. Four C's: (Convergence, Collaborative Computing, Content Management & Call Center). Convergence: Technological Advances in Convergence – Types, Convergence and its implications, Convergence & Electronic Commerce. Collaborative Computing: Collaborative product development, contract as per CAD, Simultaneous Collaboration, Security. Content Management: Definition of content, Authoring Tools & Content Management, Content – partnership, repositories, convergence, providers, Web Traffic & Traffic Management; Content Marketing. Call Center: Definition, Need, Tasks Handled, Mode of Operation, Equipment, Strength & Weaknesses of Call Center, Customer Premises Equipment (CPE).
6. Supply Chain Management: E – logistics, Supply Chain Portal, Supply Chain Planning Tools (SCP Tools), Supply Chain Execution (SCE),SCE - Framework, Internet's effect on Supply Chain Power.
7. E – Payment Mechanism: Payment through card system, E –Cheque, E – Cash, E – Payment Threats & Protections.
8. E – Marketing: Home –shopping, E-Marketing, Tele-marketing
9. Electronic Data Interchange (EDI): Meaning, Benefits, Concepts, Application, EDI Model, Protocols (UN EDI FACT / GTDI,ANSI X – 12), Data Encryption (DES / RSA).
10. Risk of E – Commerce: Overview, Security for E – Commerce, Security Standards, Firewall, Cryptography, Key Management, Password Systems, Digital certificates, Digital signatures.
11. Enterprise Resource Planning (ERP): Features, capabilitiesand Overview of Commercial Software, re-engineering work processes for IT applications, Business Process Redesign, Knowledge engineering and data warehouse. Business Modules: Finance, Manufacturing (Production), Human Resources, Plant Maintenance, Materials Management, Quality Management, Sales & Distribution ERP Package, ERP Market: ERP Market Place, SAP AG, PeopleSoft, BAAN, JD Edwards, Oracle Corporation ERP-Present and Future: Enterprise Application Integration (EAI), ERP and E-Commerce, ERP and Internet,Future Directions in ERP

Text book and Reference books:

1. Information theory, coding and cryptography - Ranjan Bose; TMH.
2. Information and Coding - N Abramson; McGraw Hill.
3. Introduction to Information Theory - M Mansurpur; McGraw Hill.
4. Information Theory - R B Ash; Prentice Hall.
5. Error Control Coding - Shu Lin and D J Costello Jr; Prentice Hall

Reference :

1. E-Commerce,M.M. Oka, EPH
2. Kalakotia, Whinston : Frontiers of Electronic Commerce , Pearson Education.
3. Bhaskar Bharat : Electronic Commerce - Technologies & Applications.TMH
4. Loshin Pete, Murphy P.A. : Electronic Commerce , Jaico Publishing Housing.
5. Murthy : E – Commerce , Himalaya Publishing.
6. E – Commerce : Strategy Technologies & Applications, Tata McGraw Hill.
7. Global E-Commerce, J. Christopher & T.H.K. Clerk, University Press
8. Beginning E-Commerce, Reynolds, SPD
9. Krishnamurthy, E-Commerce Mgmt, Vikas

Subject: Ethical Hacking

Course Code: IoT 702 A

Contact: 3 Hrs.

Module	Contents	Hrs
1	Module: Introduction to ethical Hacking: What is ethical hacking? Types of hacking, advantages, disadvantages and purpose of hacking, Types of hackers, Code of ethics, Types of attacks and attack vector types, Prevention from hackers, The Indian IT Act 2000 and Amendments to the Indian IT Act(2008) ,Phases of hacking.	04
2	Module:Footprinting and Reconnaissance. What is footprinting? Active and passive footprinting, purposeof footprinting, objectives of footprinting, footprinting threats, Types of footprinting, footprinting countermeasures.	05
3	Module: Scanning networks, Enumeration and sniffing: Scanning networks: Network scanning and its types, objectives of network scanning, scanning live systems, scanning techniques-TCP Connect / Full Open Scan, Types of Stealth scans, port scanning countermeasures, IDS evasion techniques, Banner grabbing and its tools, vulnerability scanning, proxy servers, anonymizers, IP spoofing and its countermeasures. Enumeration and Sniffing: What is Enumeration? Enumeration techniques, Enumeration types,Enumeration countermeasures, what is sniffing? Wiretrapping and its types, packet sniffing, sniffing threats, how sniffers work?, sniffing methods-ARP spoofing and MAC flooding, active and passive sniffing, types of sniffing attacks, sniffing countermeasures,sniffing detection techniques	08
4	Module: Trojans and other Attacks: Worms, viruses, Trojans, Types of worms, viruses and worms, Preventing malware attacks, types of attacks: (DoS /DDoS), Waterhole attack, brute force, phishing and fake WAP, Eavesdropping, Man-in-the-middle, buffer overflow, DNS poisoning, ARP poisoning, Identity Theft, IoT Attacks, BOTs andBOTNETs, Steganography - text, image and audio and video, types of Social Engineering: Physical social engineering, Remotesocial engineering and hybrid social engineering.	08
5	Module: Hacking web servers, web applications and sql injection: Session hijacking: What is session hijacking? , why session hijacking is successful?session hijacking techniques, session hijacking process, Types ofsession hijacking, session hijacking countermeasures: protecting and preventing, Hacking web servers and web applications: Causes of webservers being compromised, web server attacks, stages of web server attacks, defending against web server attacks, web application components, its working, architecture, web serverattack vectors, web application threats and counter measures SQL Injection: What is SQL injection, SQL injection threats, SQL injection attacks,SQL injection detection, Types of SQL injection, SQL injection methodology, SQL injection prevention and countermeasures.	6

6	<p>Module: Wireless network hacking, cloud computing security, cryptography, Pen testing::</p> <p>Types of wirelessArchitecture, wireless encryption techniques-WEP and WPA, breaking WEP/WPA and defending WPA encryption, wireless Sniffing, Characteristics, types of cloud computing services, models and benefits, threats and attacks, cryptography and its objectives, cryptography types, cryptography attacks, what is Pen Testing, need for pen testing, types and techniques of pen testing, phases of pen testing.</p>	07
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Books & References

1. Matt Walker, All-In-One-CEH-Certified-Ethical-Hacker-Exam-Guide.
2. Tutorials Point Professionals, Ethical Hacking by Tutorials Point.
3. Kimberly Graves(26th-April-2010), "CEH Certified Ethical Hacker Study Guide" 1st Edition, ISBN-13: 978-0470525203, ISBN-10:0470525207, Sybex- Wiley Publishing.
4. Sean-Philip Oriyano, Sybex, Certified Ethical Hacker Study Guide v9, Study Guide Edition, 2016.

Subject: Cyber Security in Block Chain Technology

Course Code: IoT 702 B

Contact: 3 Hrs.

Credit: 3

Privacy, Security issues in Blockchain

Pseudo-anonymity vs. anonymity, Zcash and Zk-SNARKS for anonymity preservation
 attacks on Blockchains – such as Sybil attacks, selfish mining, 51% attacks - -advent of algorand
 Sharding based consensus algorithms to prevent these attacks

Cryptography

Public Key Infrastructure (PKI) and Cryptography
 Conventional PKI , Blockchain as a Form of Distributed PKI , Blockchain vs PKI
 Blockchain - Public Key Cryptography, Decentralized Public Key Infrastructure (DPKI)

Digital Signature

Digital Signature from Blockchain context
 Undeniable signature
 Diffie–Hellman, Digital signature scheme for information non-repudiation in block chain.

Blockchain-based time stamping

Time stamping Metadata Using Blockchain
 Decentralized Trusted Time stamping Based on Blockchains
 Content Time stamping

Use Cases of Blockchain In Cyber security

Decentralized Storage Solutions, How Guardtime uses blockchain technology to safeguard data
 IoT Security, Safer DNS, Using blockchains to prevent DDoS attacks
 Implementing Security in Private Messaging

Reference Books:

1. Blockchain Technology Basics: Blockchain cryptography and cybersecurity Kindle Edition by Raghava Shankar (Author), Srikanth RC Cherukupalli M.Tech (Author)
2. Mastering Blockchain: Deeper insights into decentralization, cryptography, Bitcoin, and popular Block chain frameworks Kindle Edition by Imran Bashir(Author) Format: Kindle Edition

Subject: Soft Skill & Interpersonal Communication

Course Code: HU (IOT) 701A

Contact: 3 Hrs.

Credit: 3

Module	Content	Hrs
1	Introduction: A New Approach To Learning, Planning And Goal-Setting, Human Perceptions: Understanding People, Types Of Soft Skills: Self-Management Skills, Aiming For Excellence: Developing Potential And Self-Actualization, Need Achievement And Spiritual Intelligence	5

2	Conflict Resolution Skills: Seeking Win-Win Solution, Inter-Personal Conflicts: Two Examples, Inter-Personal Conflicts: Two Solutions, Types Of Conflicts: Becoming A Conflict Resolution Expert Types Of Stress: Self-Awareness About Stress, Regulating Stress: Making The Best Out Of Stress	5
3	Habits: Guiding Principles, Habits: Identifying Good And Bad Habits, Habits: Habit Cycle, Breaking Bad Habits, Using The Zeigarnik Effect For Productivity And Personal Growth,	5
4.	Communication: Significance Of Listening, Communication: Active Listening, Communication: Barriers To Active Listening, Telephone Communication: Basic Telephone Skills , Telephone Communication: Advanced Telephone Skills, Telephone Communication: Essential Telephone Skills, Forming Habits Of Success	5
5.	Technology And Communication: Technological Personality, Technology And Communication: Mobile Personality?, Topic: Technology And Communication: E-Mail Principles, Technology And Communication: How Not To Send E-Mails!, Technology And Communication: Netiquette, Technology And Communication: E-Mail Etiquette	5
6	Communication Skills: Effective Communication, Barriers To Communication: Arising Out Of Sender/Receiver's Personality, Barriers To Communication: Interpersonal Transactions, Barriers To Communication: Miscommunication, Non-Verbal Communication: Pre-Thinking Assessment-1, Non-Verbal Communication: Pre-Thinking Assessment-2	5
7	Nonverbal Communication: Introduction And Importance, Non-Verbal Communication: Issues And Types, Non- Verbal Communication: Basics And Universals, Non-Verbal Communication: Interpreting Non- Verbal Cues, Body Language: For Interviews, Body Language: For Group Discussions	5
8	Presentation Skills: Overcoming Fear, Presentation Skills: Becoming A Professional, Presentation Skills: The Role Of Body Language, Presentation Skills: Using Visuals, :Reading Skills: Effective Reading, Human Relations: Developing Trust And Integrity	5

TEXT BOOKS AND REFERENCES

1. Dorch, Patricia. *What Are Soft Skills?* New York: Execu Dress Publisher, 2013.
2. Kamin, Maxine. *Soft Skills Revolution: A Guide for Connecting with Compassion for Trainers, Teams, and Leaders*. Washington, DC: Pfeiffer & Company, 2013.
3. Klaus, Peggy, Jane Rohman & Molly Hamaker. *The Hard Truth about Soft Skills*. London: HarperCollins E-books, 2007.
4. Petes S. J., Francis. *Soft Skills and Professional Communication*. New Delhi: Tata McGraw-Hill Education, 2011.
5. Stein, Steven J. & Howard E. Book. *The EQ Edge: Emotional Intelligence and Your Success*. Canada: Wiley & Sons, 2006.

Subject: BIO Informatics
Course Code: HU (IOT) 701 B
Contact: 3 Hrs.
Credit: 3

Module	Name of the Topic	Hours
01	Concepts of Cell, tissue, types of cell, components of cell, organelle. Functions of different organelles. Concepts of DNA: Basic Structure of DNA; Double Helix structure; Watson and crick model. Exons and Introns and Gene Concept. Concepts of RNA : Basic structure, Difference between RNA and DNA. Types of RNA. Concept of Protein: Basic components and structure. Introduction to Central Dogma: Transcription and Tranlation Introduction to Metabolic Pathways	7
02	Sequence Databases 2 Introduction to Bioinformatics. Recent challenges in Bioinformatics. Protein Sequence Databases, DNA sequence databases. sequence database search programs like BLAST and FASTA. NCBI different modules: GenBank; OMIM, Taxonomybrowser, PubMed;	7
03	DNA SEQUENCE ANALYSIS 14 Syllabus for B.Tech(Information Technology) Up to Fourth Year Revised Syllabus of B.Tech IT DNA Mapping and Assembly : Size of Human DNA ,Copying DNA: Polymerase Chain Reaction (PCR), Hybridization and Microarrays, Cutting DNA into Fragments, Sequencing Short DNA Molecules, Mapping Long DNA Molecules. DeBruijn Graph. Sequence Alignment: Introduction, local and global alignment, pair wise and multiple alignment, Dynamic Programming Concept. Alignment algorithms: Needleman and Wunsch algorithm, Smith-Waterman.	8
04	Introduction Probabilistic models used in Computational Biology 8 Probabilistic Models; Hidden Markov Model: Concepts, Architecture, Transition matrix, estimation matrix. Application of HMM in Bioinformatics: Genefinding, profile searches, multiple sequence alignment and regulatory site identification. Bayesian networks Model: Architecture, Principle, Application in Bioinformatics.	7
05	Biological Data Classification and Clustering 6 Assigning protein function and predicting splice sites: Decision Tree	7

Text Books:

Name of Author	Title of the Book	Edition/ISSN/ISBN	Name of the Publisher
Des Higgins (Editor), Willie Taylor.	Bioinformatics: Sequence, Structure and Databanks: A Practical Approach	ISBN: 978-0199637904. 1st edition,	Oxford University Press.
David W. Mount.	Bioinformatics: Sequence and Genome Analysis	ISBN: 978-0879697129 2nd edition,	Cold spring harbor laboratory press.

Reference Books:

	Introduction to Bioinformatics	ISBN: 978-8178085074 1st edition	Pearson Education.
	Bioinformatics: A Practical Guide to	ISBN: 978-0471478782.	John Wiley & Sons, Inc., Publication.

Subject: FUNDAMENTALS OF BUSINESS ANALYTICS

Course Code: HU (IOT) 701 C

Contact: 3 Hrs.

Credit: 3

Content

Data-Analytic Thinking for Business: The Ubiquity of Data Opportunities, Data Science as a strategic asset, data analytic thinking, Business Enterprise and its functions, Enterprise Applications – ERP, CRM, MIS.

Difference between Business Intelligence and Business Analytics. Database systems for Business: OLTP and OLAP systems for business overview and architecture overview. Business Problems and Data Science Solutions using CRISP-DM Approach: Business Understanding, preparation, modeling, evaluation, deployment. Performance Metrics in Analytics - Key performance

Indicators (KPIs), KPI based balanced score card, KPIs on Dashboards. Project Management - Project Management, phases, tools, techniques and methodologies in project management, Agile Framework and Scrum Approach. Quality Management - quality management philosophy, concepts and tools, Statistical Quality Control methods, Lean and Six Sigma, SERVQUAL model of service quality. Case studies – Human Capital Analytics, IT Analytics, Sales and Marketing Analytics, Analytics in telecom, Retail, healthcare, financial markets, social media, sports and other related business fields.

References:

1. Prasad, R, N. and Acharya, Seema *Fundamentals of Business Analytics*. Wiley India Pvt,Ltd, New Delhi,2016.
2. Provost and Fawcett ,*Data Science for Business*, O'Reilly,2013.
3. Shmueli, Patel, and Bruce, *Data Mining for Business Intelligence, Concepts, Techniques and Applications*. Wiley, 2009.
4. Clifford F. Gray, Erik W. Larson, Gautam V. Desai - *Project Management* - Tata McGraw Hill,2014.
5. Schwaber Ken *Agile project management with scrum*, WP Publishers and Distributors,Bangalore, 2004.
6. Sridhar Bhatta, *Total Quality Management, concepts and cases-Himalaya Publishing House*, 2015.

Subject: Project Management and Entrepreneurship

Course Code: HU (IOT) 702

Contact: 3 Hrs.

Credit: 3

ENTREPRENEURSHIP

1. Introduction: Meaning and Concept of Entrepreneurship, Innovation and entrepreneurship, Contributions of entrepreneurs to the society, risk-opportunities perspective and mitigation of risks
2. Entrepreneurship – An Innovation: Challenges of Innovation, Steps of Innovation Management, Idea Management System, Divergent v/s Convergent Thinking, Qualities of a prospective Entrepreneur
3. Idea Incubation: Factors determining competitive advantage, Market segment, blue ocean strategy, Industry and Competitor Analysis (market structure, market size, growth potential), Demand-supply analysis
4. Entrepreneurial Motivation: Design Thinking - Driven Innovation, TRIZ (Theory of Inventive Problem Solving), Achievement motivation theory of entrepreneurship – Theory of McClelland, Harvesting Strategies
5. Information: Government incentives for entrepreneurship, Incubation, acceleration. Funding new ventures – bootstrapping, crowd sourcing, angel investors, Government of India's efforts at promoting entrepreneurship and innovation – SISI, KVIC, DGFT, SIDBI, Defense and Railways[4L]
6. Closing the Window: Sustaining Competitiveness, Maintaining Competitive Advantage, the Changing Role of the Entrepreneur.
7. Applications and Project Reports Preparation
8. PROJECT MANAGEMENT : Definitions of Project and Project Management, Issues and Problems in Project Management, Project Life Cycle - Initiation / Conceptualization Phase, Planning Phase, Implementation / Execution Phase, Closure / Termination Phase
9. Project Feasibility Studies – Pre-Feasibility and Feasibility Studies, Preparation of Detailed Project Report, Technical Appraisal, Economic/Commercial/Financial Appraisal including Capital Budgeting Process, Social Cost Benefit Analysis
10. Project Planning – Importance of Project Planning, Steps of Project Planning, Project Scope, Work Breakdown Structure (WBS) and Organization Breakdown Structure (OBS), Phased Project Planning
11. Project Scheduling and Costing – Gantt chart, CPM and PERT Analysis, Identification of the Critical Path and its Significance, Calculation of Floats and Slacks, Crashing, Time Cost Trade-off Analysis, Project Cost Reduction Methods.
12. Project Monitoring and Control – Role of Project Manager, MIS in Project Monitoring, Project Audit
13. Case Studies with Hands-on Training on MS-Project

Text Books and References

1. Innovation and Entrepreneurship by Drucker, P.F.; Harper and Row
2. Business, Entrepreneurship and Management: Rao, V.S.P. ;Vikas
3. Entrepreneurship: Roy Rajeev; OUP.
4. Text Book of Project Management: Gopalkrishnan, P. and Ramamoorthy, V.E.; McMillan
5. Project Management for Engineering, Business and Technology: Nicholas, J.M., and Steyn, H.; PHI
6. Project Management: The Managerial Process: Gray, C.F., Larson, E.W. and Desai, G.V.; MGH

Asansol Engineering College

Curriculum & Syllabus for B. Tech under Autonomy
Incorporation of NEP2020

(Effective from 2024-25 admission batches)

Department of Computer Science and Engineering
(Internet of Things, Cyber Security including Block Chain Technology)

4 th Year 2 nd Semester									
Sl. No.	Broad Category	Category	Course Code	Course Title	Hours per week				Credits
					L	T	P	Total	
THEORY									
1	ENGG	Major	IOT 801 (A/B)	Security Assessment and Risk Analysis/ /Deep Learning	3	0	0	3	3
2	ENGG	Major	IOT 802 (A/B/C)	Operations Research/ Remote Sensing and GIS / Digital Signal Processing	3	0	0	3	3
3	ENGG	Minor	IOT 803 (A/B)	Numerical Methods/ Multimedia Technology/	3	0	0	3	3
PRACTICAL									
4	ENGG	Major	IOT 881	Project III	0	0	12	12	6
5	ENGG	Major	IOT 882	Grand Viva					4
Total of Theory, Practical and Mandatory Activities / Courses								21	19

THEORY

SYLLABUS

Semester VIII

Security Assessment and Risk Analysis

Code: IOT-801 A

Contact: 3L

Total Contact Hours: 36L

Credits: 3

Module	Name of the Topic	Hours
01	<p>Risk Assessment</p> <p>Understand the principles and terminology of risk; Probability, Likelihood, Threat, Vulnerability, Impact, Threat actor, Risk owner, Understand and describe the five key steps in risk management: Identify assets Identify threats and vulnerabilities, Assess the impact of threats and vulnerabilities on an organisation Identify ways to manage those threats and vulnerabilities, Monitor and report on risk management action, Discuss qualitative and quantitative approaches to risk assessment; Quantitative approaches (such as loss expectancy approaches (SLE/ARO)), Quantitative scalar approaches (such as High/Medium/Low), Illustrate how the results of an assessment can be presented; Financial impact, Dashboards, Heat maps, RAG.</p>	12
02	<p>Risk Assessment: Threat and Vulnerabilities</p> <p>Define and state the differences between: Threat, Vulnerability, Exploit, Attack, Describe and explain the following: Categories of threats The concept of a threat lifecycle The use of threat intelligence in an organisation. The uses of attribution, Discuss vulnerabilities, especially those relating to people and staff. Apprentices will understand how they can be exploited to attack an organisation; Phishing, Social engineering, Blended attacks, Describe common methods for finding vulnerabilities; Penetration testing Phishing simulators Social engineering attacks</p>	12
03	<p>Risk Assessment: Standards</p> <p>Explain that risk assessment can be carried out using several methodologies or frameworks, but that it is better to select one methodology or framework for consistent and comparable results, List the common risk assessment methodologies or frameworks; ISO/IEC 27005, NIST, Risk Management, Framework, OCTAVE, FAIR, Compare common risk methodologies/frameworks; highlighting similarities and differences. Demonstrate how to select and then apply a risk methodology/framework in an organisation.</p>	12

Text Books:

Name of Author	Title of the Book	Name of the Publisher
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Mark Ryan M. Talabis and Jason L. Martin	Information Security Risk Assessment Toolkit: Practical Assessments through Data Collection and Data Analysis	Syngress, 2012
Reference Books:		
Douglas J. Landoll	The Security Risk Assessment Handbook: A Complete Guide for Performing Security Risk Assessments	CRC Press, 2011

Deep Learning**Code: IOT-801B****Contact: 3L****Total Contact Hours: 36L****Credits: 3**

Module	Name of the Topic	Hours
01	Introduction Various paradigms of learning problems, Perspectives and Issues in deep learning framework, review of fundamental learning techniques.	3
02	Feed forward neural network Artificial Neural Network, activation function, multi-layer neural network, cardinality, operations, and properties of fuzzy relations.	6
03	Training Neural Network Risk minimization, loss function, back propagation, regularization, model selection, and optimization.	6
04	Conditional Random Fields Linear chain, partition function, Markov network, Belief propagation, Training CRFs, Hidden Markov Model, Entropy.	9
05	Deep Learning Deep Feed Forward network, regularizations, training deep models, dropouts, Convolutional Neural Network, Recurrent Neural Network, Deep Belief Network.	6
06	Deep Learning research Object recognition, sparse coding, computer vision, natural	6

Name of Author	Title of the Book	Publisher
Rajiv Chopra	Deep Learning (AICTE Recommended Textbook)	
Goodfellow, I., Bengio, Y., and Courville A.,	Deep Learning	MIT Press
Satish Kumar	Neural Networks: A Classroom Approach	Tata McGraw-Hill
Reference Books:		
Bishop, C. M.	Pattern Recognition and Machine Learning	Springer
Yegnanarayana, B.	Artificial Neural Networks	PHI Learning Pvt. Ltd
Golub, G. H., and Van Loan, C. F.	Matrix Computations	JHU Press

Operation Research**Code: IOT-802 A****Contact: 3L****Total Contact Hours: 36L****Credits: 3**

Module	Content	Hrs
1	Basic LPP and Applications; Various Components of LP Problem Formulation. Solution of Linear Programming Problems: Solution of LPP: Using Simultaneous Equations and Graphical Method; Definitions: Feasible Solution, Basic and non-basic Variables, Basic Feasible Solution, Degenerate and Non- degenerate Solution, Convex set and explanation with examples Solution of LPP by Simplex Method; Charnes' Big-M Method; Duality Theory. Transportation Problems and Assignment Problems.	17
2	Network Analysis: Shortest Path: Floyd Algorithm; Maximal Flow Problem (Ford-Fulkerson); PERT-CPM (Cost Analysis, Crashing, Resource Allocation excluded). Inventory Control: Introduction to EOQ Models of Deterministic and Probabilistic ; Safety Stock; Buffer Stock.	9
3	Game Theory: Introduction; 2-Person Zero-sum Game; Saddle Point; Mini-Max and Maxi-Min Theorems (statement only) and problems; Games without Saddle Point; Graphical Method; Principle of Dominance	5
4	Queuing Theory: Introduction; Basic Definitions and Notations; Axiomatic Derivation of the Arrival & Departure (Poisson Queue). Poisson Queue Models: (M/M/1): (∞ / FIFO) and (M/M/1: N / FIFO) and problems.	5

Text book and Reference books:

1. H. A. Taha, "Operations Research", Pearson
2. P. M. Karak – "Linear Programming and Theory of Games", ABS Publishing House
3. Ghosh and Chakraborty, "Linear Programming and Theory of Games", Central Book Agency
4. Ravindran, Philips and Solberg - "Operations Research", WILEY INDIA

Remote Sensing and GIS**Code: IOT-802 B****Contact: 3L****Total Contact Hours: 36L****Credits: 3**

Module	Content	Hrs
1	Introduction and Overview of Geographic Information Systems Definition of a GIS, features and functions; why GIS is important; how GIS is applied; GIS as an Information System; GIS and cartography; contributing and allied disciplines; GIS data feeds; historical development of GIS.	3
2	GIS and Maps, Map Projections and Coordinate Systems Maps and their characteristics (selection, abstraction, scale, etc.); automated cartography versus GIS; map projections; coordinate systems; precision and error.	4
3	Data Sources, Data Input , Data Quality and Database Concepts Major data feeds to GIS and their characteristics: maps, GPS, images, databases, commercial data; locating and evaluating data; data formats; data quality; metadata. Database concepts and components; flat files; relational database systems; data modeling; views of the database; normalization; databases and GIS.	3
4	Spatial Analysis Questions a GIS can answer; GIS analytical functions; vector analysis including topological overlay; raster analysis; statistics; integrated spatial analysis	3
5.	Making Maps Parts of a map; map functions in GIS; map design and map elements; choosing a map type; producing a map formats, plotters and media; online and CD-ROM distribution; interactive maps and the Web.	6
6.	Implementing a GIS Planning a GIS; requirements; pilot projects; case studies; data management; personnel and skill sets; costs and benefits; selecting a GIS package; professional GIS packages; desktop GIS; embedded GIS; public domain and lowcost packages.	4
7.	Technology & Instruments involved in GIS & Remote Sensing GIS applications; GIS application areas and user segments; creating custom GIS software applications; user interfaces; case studies. Future data; future hardware; future software; Object-oriented concepts and GIS; future issues – data ownership, privacy, education; GIS career options and how to pursue them.	8
8.	Remote Sensing Remote sensing of environment, E.M. Principle, Thermal infrared remote sensing, Remote sensing of Vegetation, Remote sensing of water, urban landscape	8L

Text book and Reference books:

1. "Principles of geographical information systems", P. A. Burrough and R. A. McDonnel, Oxford.

2. "Remote sensing of the environment", J. R. Jensen, Pearson

References:

1. "Exploring Geographic Information Systems", Nicholas Christmas, John Wiley & Sons.

2. "Getting Started with Geographic Information Systems", Keith Clarke, PHI.

3. "An Introduction to Geographical Information Systems", Ian Heywood, Sarah Cornelius, and Steve Carver. Addison-Wesley Longman.

Digital Signal Processing**Code: IOT-802 C****Contact: 3L****Total Contact Hours: 36L****Credits: 3**

Module	Content	Hrs
1	Module 1: Discrete-time signals and systems (6 hours) Discrete time signals and systems: Sequences; representation of signals on orthogonal basis; Representation of discrete systems using difference equations, Sampling and reconstruction of signals - aliasing; Sampling theorem and Nyquist rate.	6
2	Module 2: Z-transform (6 hours) z-Transform, Region of Convergence, Analysis of Linear Shift Invariant systems using z transform, Properties of z-transform for causal signals, Interpretation of stability in z-domain, Inverse z- transforms.	6
3	Module 2: Discrete Fourier Transform (10 hours) Frequency Domain Analysis, Discrete Fourier Transform (DFT), Properties of DFT, Convolution of signals, Fast Fourier Transform Algorithm, Parseval's Identity, Implementation of Discrete Time Systems.	10
4.	Module 3:Designof Digital filters (12 hours) Design of FIR Digital filters: Window method, Park-McClellan's method. Design of IIR Digital Filters: Butterworth, Chebyshev andElliptic Approximations; Low-pass, Band-pass, Band stop and High-pass filters. Effect of finite register length in FIR filter design. Parametric and non-parametric spectral estimation. Introduction to multi-rate signal processing	12
5	Module 4: Applications of Digital Signal Processing (6 hours) Correlation Functions and Power Spectra, Stationary Processes, Optimal filtering using ARMA Model, Linear Mean-Square Estimation, Wiener Filter.	6

Text book and Reference books:

1. S. K. Mitra, "Digital Signal Processing: A computer based approach", McGraw Hill, 2011.
2. A.V. Oppenheim and R. W. Schaffer, "Discrete Time Signal Processing", Prentice Hall, 1989.
3. J. G. Proakis and D.G. Manolakis, "Digital Signal Processing: Principles, Algorithms And Applications", Prentice Hall, 1997.
4. L. R. Rabiner and B. Gold, "Theory and Application of Digital Signal Processing", Prentice Hall, 1992.
5. J. R. Johnson, "Introduction to Digital Signal Processing", Prentice Hall, 1992.
6. D. J. DeFatta, J. G. Lucas andW. S. Hodgkiss, "Digital Signal Processing", John Wiley & Sons, 1988.

Numerical Methods**Code: IOT-803 A****Contact: 3L****Total Contact Hours: 26L****Credits: 3**

Module	Content	Hrs
1	Approximation in numerical computation: Truncation and rounding errors, Fixed and floating- point arithmetic, Propagation of errors.	2
2	Interpolation: Newton forward/backward interpolation, Lagrange's and Newton's divided difference Interpolation.	8
3	Numerical integration: Trapezoidal rule, Simpson's 1/3 rule, Expression for corresponding error terms.	3
4.	Numerical solution of a system of linear equations: Gauss elimination method, Matrix inversion, LU Factorization method, Gauss-Seidel iterative method.	8
5	Numerical solution of Algebraic equation: Bisection method, Regula-Falsi method, Newton- Raphson method.	3
6	Numerical solution of ordinary differential equation: Euler's method, Runge-Kutta methods, Predictor-Corrector methods and Finite Difference method.	2

Text book and Reference books:

1. C.Xavier: C Language and Numerical Methods.
2. R.S. Salaria: Computer Oriented Numerical Methods.
3. Dutta & Jana: Introductory Numerical Analysis.
4. J.B.Scarborough: Numerical Mathematical Analysis.
5. Jain, Iyengar , & Jain: Numerical Methods (Problems and Solution).
6. Balagurusamy: Numerical Methods, Scitech.
7. Baburam: Numerical Methods, Pearson Education.
8. N. Dutta: Computer Programming & Numerical Analysis, Universities Press.

Multimedia Technology**Code: IOT-803 B****Contact: 3L****Total Contact Hours: 26L****Credits: 3**

Module	Content	Hrs
1	Introduction: Multimedia today, Impact of Multimedia, Multimedia Systems, Components and Its Applications	2
2	Text and Audio, Image and Video(14L) Text: Types of Text, Ways to Present Text, Aspects of Text Design, Character, Character Set, Codes, Unicode, Encryption; Audio: Basic Sound Concepts, Types of Sound, Digitizing Sound, Computer Representation of Sound (Sampling Rate, Sampling Size, Quantization), Audio Formats, Audio tools, MIDI Image: Formats, Image Color Scheme, Image Enhancement; Video: Analogue and Digital Video, Recording Formats and Standards (JPEG, MPEG, H.261) Transmission of Video Signals, Video Capture, and Computer based Animation.	14
3.	Synchronization, Storage models and Access Techniques: Temporal relationships, synchronization accuracy specification factors, quality of service, Magnetic media, optical media, file systems (traditional, multimedia) Multimedia devices – Output devices, CD-ROM, DVD, Scanner, CCD Producer\ Consumer Problem, Semaphores, Event Counters, Monitors, Message Passing, Classical IPC Problems: Reader’s & Writer Problem, Dining Philosopher Problem etc.	8
4.	Image and Video Database, Document Architecture and Content Management (17L): Image representation, segmentation, similarity based retrieval, image retrieval by color, shape and texture; indexing- k-d trees, R-trees, quad trees; Case studies- QBIC, Virage. Video Content, querying, video segmentation, indexing, Content Design and Development, General Design Principles Hypertext: Concept, Open Document Architecture (ODA), Multimedia and Hypermedia Coding Expert Group (MHEG), Standard Generalized Markup Language (SGML), Document Type Definition (DTD), Hypertext Markup Language (HTML) in Web Publishing. Case study of Applications Producer\ Consumer Problem, Semaphores, Event Counters, Monitors, Message Passing, Classical IPC Problems: Reader’s & Writer Problem, Dining Philosopher Problem etc.	17
5.	Multimedia Applications(4L): Interactive television, Video-on-demand, Video Conferencing, Educational Applications, Industrial Applications, Multimedia archives and digital libraries, media editors	4

Text book and Reference books:

- 1.Ralf Steinmetz and Klara Nahrstedt , Multimedia: Computing, Communications & Applications , Pearson Ed.
- 2.Nalin K. Sharda , Multimedia Information System , PHI.
- 3.Fred Halsall , Multimedia Communications , Pearson Ed.
- 4.Koegel Buford , Multimedia Systems , Pearson Ed.
- 5.Fred Hoffstetter , Multimedia Literacy , McGraw Hill.
- 6.Ralf Steinmetz and Klara Nahrstedt , Multimedia Fundamentals: Vol. 1- Media Coding and Content Processing , PHI.
- 7.J. Jeffcoate , Multimedia in Practice: Technology and Application , PHI.

8. V.K. Jain, Multimedia and Animation, Khanna Publishing House, New Delhi (AICTE Recommended Textbook – 2018)