Curriculum Structure & Syllabi

(As per National Education Policy 2020)

of

B. Tech.

in

(INFORMATION TECHNOLOGY)

(w.e.f. 2024-25)

Vision

Mission

Program Educational Objectives

Program Outcomes

Program Specific Outcomes

Overall Credit Structure

Curriculum

Syllabus

Offered By

DEPARTMENT OF INFORMATION TECHNOLOGY AND COMPUTER APPLICATION
MADAN MOHAN MALAVIYA UNIVERSITY OF TECHNOLOGY (MMMUT)
GORAKHPUR-273 010, UP, INDIA
June 2025

SYLLABUS AND CREDIT STRUCTURE FOR B. TECH. (INFORMATION TECHNOLOGY)
(SESSION 2024-2025 AND ONWARDS)

OVERALL CREDIT STRUCTURE FOR B.TECH. (INFORMATION TECHNOLOGY)

<table>
<tr><th colspan="4">Credit Courses</th></tr>
<tr><th colspan="2">Core Courses (CC)</th><th colspan="2">Electives Courses (EC)</th></tr>
<tr><th>Category</th><th>Min. Credits</th><th>Category</th><th>Min. Credits</th></tr>
<tr><td>Basic Sciences & Maths (BSM)</td><td rowspan="3">20
24</td><td rowspan="3">Professional Electives (PE)/ Open Electives (OE)</td><td rowspan="3">36</td></tr>
<tr><td>Engineering Fundamentals (EF)</td></tr>
<tr><td>Professional Skill (PS)</td></tr>
<tr><td>Professional Core (PC)</td><td>48</td><td>Humanities & Social Science Elective (HSSE)</td><td>04</td></tr>
<tr><td>Management (M)</td><td>04</td><td></td><td></td></tr>
<tr><td>Humanities & Social Science (HSS)</td><td>08</td><td></td><td></td></tr>
<tr><td>Minor Project (P)</td><td>06</td><td></td><td></td></tr>
<tr><td>Industrial Practice (IP) (In Industry)/ Major Project (MP) (In University)</td><td>10</td><td></td><td></td></tr>
<tr><td>Sub-total</td><td>120</td><td>Sub-total</td><td>40</td></tr>
<tr><td>Grand Total</td><td>160</td><td colspan="2"></td></tr>
<tr><th colspan="4">Non-Credit Courses</th></tr>
<tr><td colspan="3">One Expert Lecture per semester for students (Mandatory).
(BSM-Ist year), (PC-2nd Year), (T&P-3rd Year)</td><td>Non-Credit</td></tr>
<tr><td colspan="3">Social work/Training of at least 60 hours during break after first/ second semester (Mandatory) (Dean of Extension, Field Outreach and Alumni Relations).</td><td>Non-Credit</td></tr>
<tr><td colspan="3">Industrial Training during the summer break after fourth semester (Mandatory).</td><td>Non-Credit</td></tr>
<tr><td colspan="3">One -week workshop during the winter break after fifth semester on professional/ industry/ Social/ entrepreneurial orientation (Mandatory) (Dean of Extension, Field Outreach and Alumni Relations).</td><td>Non-Credit</td></tr>
<tr><td colspan="3">Value Added Courses (VAC) / Audit Courses (AC)
Two of the Value-Added Courses / Audit Courses are compulsory.</td><td>Non-Credit</td></tr>
<tr><td colspan="3">Extracurricular Activities Courses (ECA)
Two compulsory courses from the following S. No (ii) to (v) non-credit courses:
(i) Induction Program (compulsory)
(ii) Skill development
(iii) Unity and Discipline (NCC or NSS)
(iv) Sports, Cultural and Games
(v) Personality Development</td><td>Non-Credit</td></tr>
<tr><td colspan="4">Minor Degree (MD) from any Department and Micro Specializations (MS) within the Department</td></tr>
<tr><td colspan="3">• The total number of credits for graduation will be kept to minimum 160. The additional 18-20 credits required for Minor Degree Courses.
• Micro specializations (MS) will be run by the department in order to aligned to industry careers or higher studies</td><td>Offered as a Professional Electives (PE)</td></tr>
</table>

DEPARTMENT OF INFORMATION TECHNOLOGY AND COMPUTER APPLICATION

MADAN MOHAN MALAVIYA UNIVERSITY OF TECHNOLOGY (MMMUT)
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SEMESTER WISE CREDIT STRUCTURE FOR B. TECH. (INFORMATION TECHNOLOGY)

Category/Semesters	**I**	**II**	**III**	**IV**	**V**	**VI**	**VII**	**VIII**	**Total**
Basic Sciences & Maths (BSM)	8	8	0/4	4/0					**20***
Humanities & Social Science (HSS)	4	4							**08***
Humanities & Social Science Elective (HSSE)					4				**04***
Management (M)						4			**04***
Engineering Fundamentals (EF)	4	4	8/4	0/4					**16***
Professional Skill (PS)	4	4							**08***
Professional Core (PC)			12	12	12	12			**48***
Professional Electives (PE)/ Open Electives (OE)				4-8	28-32				**36***
Minor Project (P)						0	6		**06***
Industrial Practice (IP) (in Industry)/ Major Project (MP) (In University)								10	**10***
Total Credit	**20***	**20***	**20***	**20-24***	**16*-32***	**16*-32***	**6-30***	**10-30***	**160***
	80-84*				**76-80***				
Total Courses Offered	**05***	**05***	**05***	**05*-06***	**04*-08***	**04*-08***	**00-06***	**00-05***	**36***

**Minor variation is allowed as per need of the respective disciplines.*

First Year, Semester I

S. N.	**Category**	**Paper Code**	**Subject**	**L**	**T**	**P**	**Credit**
1.	BSM	BSM-110	Engineering Mathematics I	3	1	0	4
2.	BSM	BSM-131/181	Engineering Physics	3	0	2	4
3.	EF	BIT-103/156	Programming in C	3	0	2	4
4.	PS	BIT-104	Internet and Web Designing	2	0	4	4
5.	HSS	BHS-101/151	Universal Human Values: Understanding Harmony	3	1	0	4
			Total	**13-14**	**1-3**	**6-10**	**20**
6.	ECA-I		Induction Program	-	-	-	0

 # Group-1: CSE, IT, CH, CE; Group-2: ECE, ECE(IOT), ME, EE.

First Year, Semester II

S. N.	**Category**	**Paper Code**	**Subject**	**L**	**T**	**P**	**Credit**
1.	BSM	BSM-160	Engineering Mathematics II	3	1	0	4
2.	BSM	BSM-140/190	Environmental Science and	3	0	2	4

			Green Chemistry				
3.	EF	BEE- 110 / BEE-160	Basic Electrical Engineering	3	0	2	4
4.	PS	BIT-154	Object Oriented Programming with C++	2	0	4	4
5.	HSS	BHS-102/152	Technical Writing and Professional communication	2	1	2	4
			Total	**13-14**	**1-3**	**6-10**	**20**
6.	VAC/AC	BIT-155	AC-1 (Design Thinking) Design Thinking for Software Development	0	0	2	0
7.	ECA-II			-	-	-	**0**

Second Year, Semester III

S. N.	Category	Paper Code	Subject	L	T	P	Credit
1.	EF	BIT-205	AI Tools and Applications	3	0	2	4
2.	PC	BIT-206	Java Programming	3	0	2	4
3.	PC	BIT-207	Data Structures	3	0	2	4
4.	PC	BIT-208	Computer Organization & Architecture	3	0	2	4
5.	EF	BIT-211	Game Theory and Applications	3	1	0	4
			Total	**15**	**1-5**	**0-8**	**20**
6.	VAC/AC	AUC-101	Constitution of India	2	0	0	0

Second Year, Semester IV

S. N.	Category	Paper Code	Subject	L	T	P	Credit
1.	BSM	BSM-263	Discrete Mathematics	3	1	0	4
2.	PC	BIT-256	Database Management System	3	0	2	4
3.	PC	BIT-257	Design & Analysis of Algorithm	3	0	2	4
4.	PC	BIT-258	Python Programming	3	0	2	4
	Students may choose either PE-1 or PE-2 or Both PE-1 and PE-2.						
5.	PE1	EIT-101	Introduction to Arduino Programming	3	0	2	4
		EIT-103	Cryptography	3	0	2	4
		EIT-104	Artificial Intelligence	3	0	2	4
6.	PE2	EIT-201	Web Development with Django	3	0	2	4
			Total	**15-**	**0-6**	**0-12**	**20-24**

				18			
7.	VAC/AC	AUC-(102 to 115)		2	0	**0**	0

List of Value-Added Courses (VAC)/Audit Courses (AC)**

S. No.	Subjects	Codes
1.	Constitution of India	AUC 101
2.	Indian Culture and Heritage	AUC 102
3.	Indian Architecture	AUC 103
4.	Indian Festivals	AUC 104
5.	Vaidic Mathematics	AUC 105
6.	Astronomy	AUC 106
7.	Arts of India	AUC 107
8.	Intellectual Property Right	AUC 108
9.	Human Rights	AUC 109
10.	Logical Research	AUC 110
11.	Professional Ethics	AUC 111
12.	Environmental Law	AUC 112
13.	Health Law	AUC 113
14.	National Cadet Corps	AUC 114
15.	Basics of Human Health and preventive medicines	AUC 115

**Note: Detailed syllabus of Audit Courses (AC) is attached as Annexure-02.

List of Extra Curricular Activity (ECA) Courses

ECA-II						
S. No.	Branch	Category	Subject Name	Subject Code	Hours/ Week	Credit
1.	Open to all Branches	ECA	Skill Development-I	ECA-151	2	0
2.	Open to all Branches	ECA	Unity and Discipline (NCC)-I	ECA-171	2	0
3.	Open to all Branches	ECA	Unity and Discipline (NSS)-I	ECA-172	2	0
4.	Open to all Branches	ECA	Games & Sports-I	ECA-181	2	0
5.	Open to all Branches	ECA	Cultural, Art & Literary-I	ECA-182	2	0

ECA-III						
S. No.	Branch	Category	Subject Name	Subject Code	Hours/ Week	Credit
1.	Open to all Branches	ECA	Skill Development-II	ECA-201	2	0
2.	Open to all Branches	ECA	Unity and Discipline (NCC)- II	ECA-221	2	0
3.	Open to all Branches	ECA	Unity and Discipline (NSS)-II	ECA-222	2	0
4.	Open to all Branches	ECA	Games & Sports-II	ECA-231	2	0

5.	Open to all Branches	ECA	Cultural, Art & Literary-II	ECA-232	2	0

ECA-IV						
S. No.	Branch	Category	Subject Name	Subject Code	Hours /Week	Credit
1.	Open to all Branches	ECA	Skill Development-III	ECA-251	2	0
2.	Open to all Branches	ECA	Unity and Discipline (NCC)-III	ECA-271	2	0
3.	Open to all Branches	ECA	Unity and Discipline (NSS)-III	ECA-272	2	0
4.	Open to all Branches	ECA	Games & Sports-III	ECA-281	2	0
5.	Open to all Branches	ECA	Cultural, Art & Literary-III	ECA-282	2	0

ECA-V						
S. No.	Branch	Category	Subject Name	Subject Code	Hours/Week	Credit
1.	Open to all Branches	ECA	Skill Development-IV	ECA-301	2	0
2.	Open to all Branches	ECA	Unity and Discipline (NCC)-IV	ECA-321	2	0
3.	Open to all Branches	ECA	Unity and Discipline (NSS)-IV	ECA-322	2	0
4.	Open to all Branches	ECA	Games & Sports-IV	ECA-331	2	0
5.	Open to all Branches	ECA	Cultural, Art & Literary-IV	ECA-332	2	0

ECA-VI						
S. No.	Branch	Category	Subject Name	Subject Code	Hours/ Week	Credit
1.	Open to all Branches	ECA	Skill Development-V	ECA-351	2	0
2.	Open to all Branches	ECA	Games & Sports-V	ECA-381	2	0
3.	Open to all Branches	ECA	Cultural, Art & Literary-V	ECA-382	2	0

ECA-VII						
S. No.	Branch	Category	Subject Name	Subject Code	Hours/ Week	Credit

1.	Open to all Branches	ECA	Skill Development-VI	ECA-401	2	0
2.	Open to all Branches	ECA	Games & Sports-VI	ECA-431	2	0
3.	Open to all Branches	ECA	Cultural, Art & Literary-VI	ECA-432	2	0

SKILLS-ENHANCEMENT COURSES FOR EXIT (INFORMATION TECHNOLOGY):

2-Months internship for 6-Credits **OR** Two courses mentioned below of 4 to 6 credits.

A. After First Year: UG Certificate (Engg.).

The candidate should pass the following two additional courses (ITI Level) **OR** any two suitable skill-based courses to qualify for **UG Certificate (Engg.).**

S. N.	Category	Paper Code	Subject	L	T	P	Credit
1.	Skill Enhancement	BIT-105	IT Tools and Applications	2	0	2	3
2.	Skill Enhancement	BIT-106	LINUX and Shell Programming	2	0	2	3

OR

Equivalent skills-enhancement courses from MOOC/SWAYAM.

B. After Second Year: UG Diploma (Engg.).

The candidate should pass the following two additional courses **OR** any two suitable skill-based courses to qualify for **UG Diploma (Engg.).**

S. N.	Category	Paper Code	Subject	L	T	P	Credit
1.	Skill Enhancement	BIT-209	Web Programming with Java Script	2	0	2	3
2.	Skill Enhancement	BIT-210	E-Commerce and its Applications	2	0	2	3

Syllabus

First Year

BSM-110		**Engineering Mathematics I**
Course category	:	Basic Sciences & Maths (BSM)
Pre-requisite Subject	:	NIL
Contact hours/week	:	Lecture : 3, Tutorial : 1 , Practical: 0
Number of Credits	:	4
Course Assessment methods	:	Continuous assessment through tutorials, attendance, home assignments, quizzes, practical work, record, viva voce, one Minor test and one Major Theory Examination
Course Objectives	:	The course is aimed to develop the basic mathematical skills of engineering students that are imperative for effective understanding of engineering subjects.
Course Outcomes	:	The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. Use of basic differential operators in various engineering problems.
2. Understand the concepts of limit theory and nth order differential equations and their applications to our daily life
3. Solve linear system of equations using matrix algebra.
4. Know about qualitative applications of Gauss, Stoke's and Green's theorem.
5. To know the applications of double and triple integration in finding the area and volume.
6. To inculcate the habit of mathematical thinking and lifelong learning.

Topics Covered

UNIT-I **9**

Differential Calculus: Limit, Continuity and Differentiability, Mean value theorems. Leibnitz theorem, Partial derivatives, Euler's theorem for homogenous function, Total derivative, Change of variable. Taylor's and Maclaurin's theorem. Expansion of function of two variables, Jacobian, Extrema of function of several variables.

UNIT-II **9**

Linear Algebra: Symmetric, Skew-symmetric matrices, Hermitian, Skew Hermitian Matrices, orthogonal and unitary matrices and basic properties, linear independence and dependence of vectors, Rank of Matrix, Inverse of a Matrix, Elementary transformation, Consistency of linear system of equations and their solution, Characteristic equation, Eigenvalues, Eigen-vectors, Cayley-Hamilton theorem, Diagonalization of matrices.

UNIT-III **9**

Multiple Integrals: Double and triple integrals, change of order of integration, change of variables. Application of multiple integrals to surface area and volume. Beta and Gamma functions, Dirichlet integral.

UNIT-IV **9**

Vector Calculus: Gradient, Divergence and Curl. Directional derivatives, line, surface and volume integrals. Applications of Green's, Stoke's and Gauss divergence theorems (without Proofs).

Books & References

1. B.S. Grewal: Higher Engineering Mathematics; Khanna Publishers
2. Erwin kreyszig: Advanced Engineering Mathematics, John Wiley & Sons.
3. R. K. Jain and Iyenger: Advanced Engineering Mathematics, Narosa Publications.
4. B.V. Ramana: Higher Engineering Mathematics, Tata Mc. Graw Hill Education Pvt. Ltd.,

BSM-131/181 ENGINEERING PHYSICS

Course Category : Basic Sciences and Maths (BSM)

Pre-requisite Subject : Physics at 12thStandard

Contact hours/week : Lecture: 3, Tutorial: 0, Practical: 2

No. of Credits : 4

Course Assessment Methods : Continuous assessment through tutorials, attendance, home assignments, quizzes, practical work, record, viva voce, one Minor test and one Major Theory Examination

Course Objective: Understanding of the principles and concept of Optics, Quantum Mechanics, Fiber Optics, Electrodynamics and Physics of Advanced Materials.

Course Outcomes: The students are expected to be able to demonstrate the following knowledge, skills, and attributes after completing this course.

1. Understand the basics principles of Optics and its applications in Engineering and Technology.
2. Compare and understand the uses of various lasers in different fields of Engineering.
3. Know the knowledge of Optical Fibre and their applications in Photonics.
4. Understand the principles of Quantum Mechanics and their applications in Engineering and Technology.
5. Know the principles of Electrodynamics and their applications in Engineering and Technology.
6. Understand the basic properties of advanced materials and their engineering applications.

Topics Covered

UNIT-I: Optics: **9**

Interference: Interference of light, Interference in thin films, Newton's rings. Refractive index and wavelength determination.

Diffraction: Fresnel and Fraunhofer class of diffraction. Resultant of n-hormonic waves, single, double and N- slit diffraction, Diffraction grating, Grating spectra, Dispersive power.

Polarization: Phenomena of double refraction, Nicol prism, Production and analysis of plane, circular and elliptical polarized light, Retardation Plate, Polarimeter.

Laser: Spontaneous and stimulated emission of radiation, Population inversion, Concept of 3 and 4

level Laser, Construction and working of Ruby, He-Ne lasers, and laser applications.

UNIT-II : Quantum Mechanics and Fiber Optics: 9

Quantum Mechanics: de Broglie waves, Davisson-Germer experiment, Concept of Phase and Group velocities, Uncertainty principle and its applications, Derivation of time independent and time dependent Schrodinger wave equations. Postulates of quantum mechanics, Significance of wave function, Application of Schrodinger wave equation for a particle in one dimensional infinite potential well.

Fiber Optics: Fundamentals of optical fiber, Acceptance angle and cone, Numerical aperture, Single and Multi-Mode Fibers, Step index and graded index fiber, Propagation Mechanism in optical fibers.

UNIT-III: Electrodynamics: 9

Scalar and Vector fields, Gradient, Divergence and curl, Concept of displacement current, Maxwell's equation in differential and integral forms, Physical significance of each equation.

Maxwell's equation in free space, Velocity of electromagnetic wave, Transverse nature of the electromagnetic wave, Poynting vector, Maxwell's equations in dielectric and conducting medium, and skin depth.

UNIT-IV: Physics of Advanced Materials: 9

Concept of energy bands in solids, Semiconducting materials**,** Concept of direct and indirect band gap in semiconductors, Carrier concentration and conductivity in semiconductors, Optoelectronic Materials, Superconducting Materials**,** Temperature dependence of resistivity in superconducting materials, Effect of magnetic field (Meissner effect), Type I and Type II superconductors, London Equations, BCS theory (Qualitative), Introduction of nanoscience, Nanotechnology and its applications.

EXPERIMENTS

1. To determine the specific resistance of a given wire using Carrey Foster's Bridge.
2. To determine the wavelength of sodium light using Newton's Ring experiment.
3. To determine the wavelength of spectral lines of white light using plane diffraction grating.
4. To determine the specific rotation of cane sugar solution using polarimeter.
5. To study the variation of magnetic field along the axis of current carrying circular coil.
6. To study the Hall's effect and to determine Hall coefficient in n type Germanium.
7. To study the energy band gap of Germanium using four probe method.
8. To determine the height of Tower by Sextant.

Books & References

1. Optics- Ajoy Ghatak, Tata McGraw-Hill
2. Optics- N. Subrahmanyam, Brij Lal, M.N. Avadhanulu, S. Chand
3. Quantum Mechanics: Theory and Applications- Ajoy Ghatak, Tata McGraw-Hill
4. Fiber optics and laser Principles and Applications-Anuradha De, New Age International
5. Optical Fibers and its application as sensors by R. K. Shukla, New Age International.
6. Introduction to Electrodynamics by David J. Griffiths, Pearson
7. Physics of Semiconductor Devices, by S. M. Sze, Wiley

8. Concepts of Modern Physics by Arthur Beiser, Tata MCGraw Hill.
9. Introduction to Solid State Physics by C. Kittel, Wiley.
10. Engineering Physics by B. K. Pandey and S. Chaturvedi, 3e Cengage Learning Pvt. Limited, India.
11. Engineering Physics by H. K. Malik and A. Singh Tata MCGraw Hill.
12. Advanced Practical Physics Vol. I and Vol. II by D. K. Dwivedi, Victorius Publishers, New Delhi.

BIT-103 PROGRAMMING IN C

Course category : Engineering Fundamentals (EF)

Pre-requisite Subject : NIL

Contact hours/week : Lecture: 3, Tutorial: 0, Practical:2

Number of Credits : 4

Course Assessment Methods : Continuous assessment through tutorials, attendance, home assignments, quizzes, practical work, record, viva voce, one Minor test and one Major Theory Examination

Course Objective: Students will gain an understanding of the fundamentals of computers and programming. The objective is to prepare them for various dimensions of C Programming language.

Course Outcomes: The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. Describing the basics of terminologies used in computer programming.
2. Practicing C language programming by writing, compiling and debugging the code.
3. Designing programs involving simple statements, conditional statements, iterative statements, array, strings, functions, recursion and structure.
4. Discussing the dynamic memory allocations and use of the pointers.
5. Applying basic operations on files through programs.
6. Studying and implementing the codes using macros, pre-processor directives and command line arguments

Topics Covered

UNIT-I **9**

Basics of Computers and Programming: Functional diagram of computer; Language Processors; Approaches to problem solving, Concept of algorithm and flow charts. **Simple Statements:** Data types; Tokens and its types; Variable declaration and initialization; User defined type declaration: type def, enum; Comments; Format specifiers; Standard I/O: taking input and displaying output; **Operators:** types, precedence and associativity; Expressions; Type conversion, Cshort-hands.

UNIT-II **9**

Conditional Statements: Simple if, if-else, nested if-else, else-if ladder, switch statements, nested switch, advantages of switch over nested if, restrictions on switch values. **Iterative Statements:** Concepts of entry and exit controlled loops; Uses of for, while and do while loops; Nested Loops; Printing various patterns using nested loops; Using break, continue and goto statements.

9

UNIT-III

Arrays: Single-dimensional, multi-dimensional array and their applications; declaration and manipulation of arrays; strings and string handling functions. **Pointers:** Pointer and address arithmetic; dereferencing; pointers and arrays; dynamic memory allocation and de-allocation. **Functions:** Function prototype; Arguments and its types: actual, formal and default arguments; Scope of a variable; Argument passing methods; Passing pointer as the function argument; Recursion: types, advantages and disadvantages; Storage class specifies; Character test functions.

9

UNIT-IV

Structure: Declaring and defining structures; Array within structure; Array of structure; Defining and using some data structures: Stack, Queue, and Linked lists. **File Handling:** Types of files; Text files and different operations on text files, opening a file, closing a file; Data structure of a file; EOF; I/O operations on files; Random access to the files. **Standard C Pre-processors & C Library:** Pre-processor, Directives, Macro, Macro substitution; Conditional Compilation; Command Line Arguments; Standard C Library.

EXPERIMENTS

Implementing programs in following categories using programming language 'C':

1. Programs of simple statements, conditional statements, and iterative statements with the applications.
2. Programs of single and multi-dimensional arrays and their applications.
3. Programs of strings and the applications
4. Programs of pointer and the applications
5. Programs of function and the applications
6. Programs of structure and the applications
7. Codes of file handling and management
8. Codes with Pre-processor, Macro, Conditional Compilation and Command Line Arguments

Textbooks

1. Brian W. Kernighan and Dennis M. Ritchie, "The C programming language", Pearson
2. E. Balagurusamy, "Programming in ANSI C", McGraw Hill Education
3. Yashavant Kanetkar, "Let Us C", bpb publication
4. Jeri R. Hanly, Elliot B. Koffman, "Problem Solving and Program Design in C", Pearson
5. Herbert Schildt,"C: The Complete Reference", McGraw Hill Education

BIT-104 Internet & Web Designing

Course Category : Professional Skill (PS)
Pre-requisite Subject : NIL
Contact Hours/Week : Lecture : 2, Tutorial : 0 , Practical: 4
Number of Credits : 4
Course Assessment Methods : Continuous assessment through tutorials, attendance, home assignments, quizzes, practical work, record, viva voce, one Minor test and one Major Theory Examination

Course Objective : Internet & Web Technologies syllabus contains a basic introduction to familiarize students with the basics of designing a website to its tools, software applications and themes. Here are the key topics covered under the introduction to internet & web designing.

1. How to design a website
2. Creating different themes for different layouts
3. How to design the look and feel of a website
4. How to create and design banners, advertisements, etc.

Course Outcomes : The students are expected to be able to demonstrate the following knowledge, skills, and attitudes after completing this course

1. Understand principle of Web page design and about types of websites.
2. Visualize and Recognize the basic concept of HTML and application in web designing.
3. Recognize and apply the elements of Creating Style Sheet (CSS).
4. Understanding the basic concept of Java Script, Angular JS and its application.
5. Learning about the tools and techniques of web design covers using software Applications
6. Demonstrate an understanding of basic CSS, XML, JAVA Script, JSP, ASP.NET and PHP

Topics Covered

UNIT-I **9**

Introduction to internet, History of Internet, Advantages and disadvantages of Internet, Application of internet for Business Development, Network its types and typologies, Modem, gateways, routers, Bridge, hub, switch, Internet connections, Dial Up connection, Direct Connection & Broad Band Connection, Internet Address, URL, ISP, Intranet, Extranet, VPN. 1G, 2G, 3G, 4G, 5G and 6G Technologies, Wi-Fi, Wi-Max, Nano Technology, Web Site, Web Portal, Internet security.

UNIT-II **9**

HTML: Introduction to web site, Domains and Hosting, Responsive Web Designing, Types of Websites: Static and Dynamic, HTML5, Basic structure of an HTML document, HTML Tags: Heading, Paragraphs, Line Breaks, Text, Lists, Tables, Frames, Hyperlinks, Images, Multimedia, Forms, and their controls. Creating Style Sheet (CSS): Creating Style Sheet, CSS Properties, CSS Styling, CSS Id and Class, Box Model, CSS Advanced: Grouping, Dimension, Display, Positioning, Floating, Align, Pseudo class, Navigation Bar, Image Sprites, Attribute sector, CSS Colour. Basics of responsive web design using Bootstrap.

UNIT-III **9**

Client-Side Scripting using JAVA Script JAVA script Overview; Constants, Variables, Operators, Expressions & Statements; User Defined & Built-in Functions; Client-Side Form Validation; Using Properties and Methods of Built-in Objects Server-Side Scripting Using JSP, ASP.NET And PHP JSP :Introduction to JSP, JSP Architecture, JSP Directives, JSP Scripting Elements, Default Objects in JSP, JSP Actions, JSP with Beans and JSP with Database, Error Handling in JSP, Session Tracking Techniques in JSP

UNIT-IV **9**

Introduction to Custom Tags.ASP.NET: ASP. Net Coding Modules, ASP.NET Page Directives, Page Events and Page Life Cycle, Post back and Cross page Posting ASP.NET Server Controls, HTML Controls, Validation Controls, Building Databases. PHP (Hypertext Preprocessor)-Introduction, Syntax, Variables, Strings, Operators, If- Else, Loop, Switch, Array, Function, Form, Mail, File Upload, Session, Error, Exception, Filter, PHP ODBC.

EXPERIMENTS

1. Describe the use and function of the following (a) telnet (b) TCP/IP (c) HTTP.
2. Describe the chatting components on the internet.
3. To create a simple html file to demonstrate the use of different tags.
4. To create an html file to link to different html page which contains images, tables, and also link within a page.
5. To create an html page with different types of frames such as floating frame, navigation frame & mixed frame.
6. To create a registration form as mentioned below.
   Procedure: Create an html page named as "registration.html"
   i. set background colors
   ii. use table for alignment
   iii. provide font colors & size
7. Use tables to provide layout to your HTML page describing your university infrastructure Use frames such that page is divided into 3 frames 20% on left to show contents of pages, 60%in center to how body of page, remaining on right to show remarks.
8. Create a single page application using concepts of Angular JS.
9. To create an html page with 2 combo boxes populated with month & year, to display the calendar for the selected month & year from combo box using javascript.
10. To create a html page to display a new image & text when the mouse comes over the existing content in the page.
11. To create an html page to explain the use of various predefined functions in a array & Date object in Javascript.
12. To create an html page to explain the use of various predefined functions in a string and math object in java script.

Textbooks

1. Uttam K. Roy, Web Technologies, 1/e, Oxford University Press, USA
2. M. Srinivasan, Web Technology: Theory and Practice, Pearson Education India
3. Deitel, Deitel and Nieto, Internet and Worldwide Web - How to Program, 5th Edition, PHI,2011.
4. Ralph Moseley & M. T. Savaliya , Developing Web Application- Second Edition, Wiley
5. Miller/Kirst, Web Programming Step by Step, Stepp, 2nd edition, 2009
6. Ullman , PHP for the Web: Visual Quick Start Guide, Pearson Education, 4th edition
7. www.w3c.org
8. www.w3schools.com

Reference books

1. Ivan Bayross , Web Enabled Commercial Application Development Using HTML, DHTML,JAVA Script, Perl & CGI, BPB Publication, 2005

2. Hans Bergsten, JAVA Server Pages, O‟Reilly

BHS- 101/151 Universal Human Values: Understanding Harmony

Course Category : HSS
Prerequisite subject : None
Number of Credits : 4
Contact Hours/Week : Lectures: 3, Tutorial: 1, Practical: 0
Course Assessment Methods : Continuous assessment through tutorials, attendance, home assignments, quizzes, practical work, record, viva voce, one Minor test and one Major Theory Examination
Course Objectives : The objectives of this course are to: -

1. Develop a holistic perspective in students based on self-exploration about themselves (human being), family, society and nature/existence.
2. Develop understanding (or developing clarity) in students about harmony in the human being, family, society and nature/existence.
3. Strengthen self-reflection in students.
4. Develop commitment and courage in students to act.

Course Outcomes : The students will be able to demonstrate the following knowledge, skills, and attitudes upon completion of the course: -

1. Ability to understand the interconnectedness of humanity and nature as well as the importance of values in interpersonal relationships.
2. Ability to recognize their role as global citizens and understand the importance of actively contributing to the betterment of society through responsible actions.
3. Ability to engage in critical reflection on their own values and beliefs, challenging assumptions and biases to foster personal growth and development.
4. Ability to appreciate and respect diversity thereby promoting communication and conflict resolution skills, promoting dialogue and understanding in resolving interpersonal and intergroup conflicts.

UNIT 1 **9**

Introduction to Values: origin, definition, meaning, and types of values; Values in Education System; difference between Values, Morals, and Ethics; Self-Exploration–what is it? - Its content and process; ‘Natural Acceptance’ and ‘Experiential Validation’ as the process for self-exploration; Continuous Happiness and Prosperity- A look at basic human aspirations; Right understanding, Relationship and Physical Facility- the basic requirements for fulfilment of aspirations of every human being with their correct priority; Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario; Method to fulfil the above human aspirations: understanding and living in harmony at various levels.

UNIT 2 **9**

Understanding human being as a co-existence of the sentient ‘I’ and the material ‘Body’; Understanding the needs of Self (‘I’) and ‘Body’ - happiness and physical facility; Understanding the Body as an

instrument of 'I' (I being the doer, seer and enjoyer); Understanding the characteristics and activities of 'I' and harmony in 'I'; Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail; Programs to ensure Sanyam and Health.

UNIT 3 **9**

Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship; Understanding the meaning of Trust; Difference between intention and competence; Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship; Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals; Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family.

UNIT 4 **9**

Understanding the harmony in the Nature; Interconnectedness and mutual fulfilment among the four orders of nature- recyclability and self-regulation in nature; Understanding Existence as Co-existence of mutually interacting units in all-pervasive space; Holistic perception of harmony at all levels of existence; Natural acceptance of human values; Definitiveness of Ethical Human Conduct; Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order; Competence in professional ethics.

Text & Reference Books:

1. Andrews, C. (2006). *Slow is beautiful*. New Society Publishers.
2. Gandhi, M. K. (1909). *Hind Swaraj or Indian Home Rule*. Navjeevan Trust.
3. Gandhi, M. K. (2009). *An Autobiography or The Story of My Experiments with Truth* (Mahadev Desai, Trans.). Navjeevan Mudranalay. (Original work published 1925).
4. Gaur, R. R., Sangal, R., & Bagaria, G. P. (2010). *A Foundation Course in Human Values and Professional Ethics*. Excel Books.
5. Govindrajan, M., Senthilkumar, S., & Natarajan, M. S. (2013). *Professional Ethics and Human Values*. Prentice Hall India.
6. Kumarappa, J. C. (2017). *Economy of Permanence.* Sarva Seva Sangh Prakashan.
7. Naagarazan, R. S. (2022). *A Textbook on Professional Ethics and Human Values*. New Age International.
8. Rolland, R. (2010). *Life of Vivekanad* (4th Ed.). Advait Ashram.
9. Schumacher, E. F. (1973). *Small is beautiful. A study of Economics as if people mattered*. Blond & Briggs.
10. Suresh, J., & Raghavan, B. S. (2003). *Human Values and Professional Ethics*. S Chand

BSM-160	**Engineering Mathematics II**
Course category	: Basic Sciences & Maths (BSM)
Pre-requisite Subject	: NIL
Contact hours/week	: Lecture: 3, Tutorial : 1 , Practical: 0
Number of Credits	: 4
Course Assessment methods	: Continuous assessment through tutorials, attendance, home assignments, quizzes, practical work, record, viva voce, one Minor test and one Major Theory Examination

Course Objectives : The course is aimed to develop the basic mathematical skills of engineering students that are imperative for effective understanding of engineering subjects.

Course Outcomes : The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. To solve the ordinary differential equations.
2. To solve the partial differential equations using Lagrange and charpit's method.
3. To solve and understand the properties of Bessel`s and Legendre`s differential equation.
4. Application of partial differential equation in real life problems
5. To solve ODE and PDE with the help of Laplace transform
6. To inculcate the habit of mathematical thinking and lifelong learning.

Topics Covered

UNIT-I **9**

Ordinary Differential Equations I: Linear differential equations with constant coefficients ($n^{th} order$), complementary function and particular integral. Simultaneous linear differential equations, solution of second order differential equations by changing dependent and independent variables, Method of variation of parameters, Applications of differential equations to engineering problems

UNIT-II **9**

Ordinary Differential Equations II: Series solution of second order differential equations with variable coefficient (Frobeneous method). Bessel and Legendre equations and their series solutions, Properties of Bessel function and Legendre polynomials.

UNIT-III **9**

Partial Differential equations: Partial differential equations of the first order, Lagrange's solution, Charpit's general method of solution, Partial differential equations of the second order: Constant coefficient and reducible to constant coefficient, Classification of linear partial differential equations of second order.

UNIT-IV **9**

Laplace Transform: Laplace Transform, Laplace transform of derivatives and integrals. Unit step function, Laplace transform of Periodic function. Inverse Laplace transform, Convolution theorem, Applications to solve simple linear and simultaneous differential equations and Partial Differential Equations.

Books & References

1. B.S. Grewal: Higher Engineering Mathematics; Khanna Publishers
2. Erwin kreyszig: Advanced Engineering Mathematics, John Wiley & Sons.
3. R. K. Jain and Iyenger: Advanced Engineering Mathematics, Narosa Publications.
4. B.V. Ramana: Higher Engineering Mathematics, Tata Mc. Graw Hill Education Pvt. Ltd.
5. M.D. Raisinghania, Ordinary and Partial Differential Equations. S Chand Publications.

BSM-140/BSM-190 **Environmental Science and Green Chemistry**

Course category: Basic Sciences & Maths (BSM)
Pre-requisite Subject: NIL
Contact hours/week Lecture : 3, Tutorial : 0 , Practical: 2

Number of Credits:	4
Course Assessment methods:	Continuous assessment through tutorials, attendance, home assignments, quizzes, practical work, record, viva voce, one Minor test and one Major Theory Examination
Course Objectives	Understanding the principles and concepts of Chemistry viz. Chemical Bonding, acidity and basicity, Atmospheric Chemistry & Water Chemistry, Spectroscopic analytical methods and Green Chemistry and solving industrial problems using solid foundation in Chemistry.
Course Outcomes:	The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. To develop the concepts of basic chemistry.
2. To make the students aware of global environmental issues e.g. global warming & Green house effect, Ozone depletion, pollution and its prevention and understand various aspects of atmospheric chemistry.
3. To understand the analytical and conceptual skills required for environmental chemistry research.
4. To understand water treatment for all types of uses and need to protect environment.
5. To understand the specifications of pure water and its purification techniques.
6. To develop the knowledge about Green Chemistry and Green Technology.

Unit 1: **9**

Basic Chemical Concepts

Periodic properties of elements, Ionization potential, electron affinity and electronegativity; mole concept, molarity and normality, Chemical Bonding – MO Theory, MO diagram of diatomic molecules, hydrogen bonding, electrophiles, nucleophiles, inductive effect and mesomeric effect. Reaction Mechanism. Acidity and basicity - Concept of pH.

Unit 2: **9**

Atmospheric chemistry & Water Chemistry

The atmosphere of Earth, layers of atmosphere and temperature inversion, Air pollution, Global warming and Greenhouse effect. Acid rain and Ozone layer depletion. Chemical and photochemical Smog. Sources of water, conservation of water, impurities in water and their effects. WHO guideline and BIS guideline for drinking water. Hardness of water, Softening of water by Zeolite process, Lime Soda process, Ion exchange process and Reverse osmosis.

Unit 3: **9**

Spectroscopic analytical methods

Absorbance, Transmittance and Beer-lamberts Law. Basic principles of UV-Visible spectroscopy, Fluorescence spectroscopy, Infrared spectroscopy, NMR Spectroscopy. Use of these instrumental techniques for monitoring of environmental pollution. Environmental problems posed by the use of non-biodegradable polymers widely used in day-to-day life. Incineration as the key method for disposal of polymeric waste. Bio-degradable polymers.

Unit 4: **9**

Green Chemistry

Green Chemistry and Green Technology: New trends in Green chemistry; Green Chemistry Methodologies-Microwave heating, ultrasound technique. Green Chemical Synthesis Pathways; Green reagents, Green solvents.

Experiments:

1. Determination of temporary and permanent hardness in water sample using EDTA as standard solution.
2. Determination of alkalinity in the given water sample.
3. Determination of chloride content in the given water sample by Mohr's method.
4. Determination of percentage of available chlorine in bleaching powder sample.
5. Determination of iron content in the given sample using $K_3[Fe(CN)_6]$ as an external indicator.
6. Determination of Electrical conductivity/TDS of a given water sample using conductivity meter.
7. Determination of dissolved Carbon Dioxide of given water sample.
8. Determination of the biochemical oxygen demand of sewage influent.
9. To calculate the lambda max of the given compound by using UV-Visible spectrophotometer.
10. Determination of nickel / cobalt / copper solutions by UV–visible spectrometry.
11. Examples of Green Synthesis /Reactions.
12. Determination of Turbidity of Water
13. Iodoform test
14. Synthesis of a polymer Bakelite or Polyacrylic acid.

Books & References

1. A Textbook of Environment and Ecology, Shashi Chawla, Tata McGraw Hill
2. Environmental Studies, Raj Kumar Singh, Tata McGraw Hill
3. Engineering Chemistry, Wiley India
4. Engineering Chemistry, Tata McGraw Hill
5. Organic Chemistry, Morrison & Boyd, 6th edition, Pearson Education
6. Fundamentals of Environmental Chemistry, Manahan, Stanley E., Boca Raton: CRC Press LLC.
7. Environment and Ecology, R K Khandal, Wiley India
8. An Introductory Text on Green Chemistry: For Undergraduate Students, lndu Tucker Sidhwani, Rakesh K. Sharma, Wiley
9. A text book of Green Chemistry, Shankar Prasad Deo and Nayim Sepay, Techno World Publication.
10. Introduction to Green Chemistry, John Andraos, Albert S. Matlack, CRC Press

BEE-110/160 **Basic Electrical Engineering**

Course category	:	Engineering Fundamentals (EF)
Pre-requisite Subject	:	NIL
Contact hours/week	:	Lecture: 3, Tutorial: 0, Practical: 2
Number of Credits	:	4
Course Assessment methods	:	Continuous assessment through tutorials, attendance, home assignments, quizzes, practical work, record, viva voce, one Minor test and one Major

Theory Examination

Course Objectives : **1.** To demonstrate and understand the basic knowledge of electrical quantities such as current, voltage, power, energy, and frequency to understand the impact of technology in a global and societal context.

2. To demonstrate and understand the basic concepts of analysis of simple DC and AC circuits used in electrical engineering and apply the basic concepts in Electrical engineering for multi-disciplinary tasks.

Course Outcomes: The students are expected to be able to demonstrate the following knowledge, skills, and attitudes after completing this course:

1. Understand the basic properties of electrical elements, and solve problem based on basic electrical circuits & DC network theorems.
2. Understand the fundamental behaviour of AC circuits and solve AC circuit problems.
3. Apply the knowledge gained to explain the behaviour of the circuit at series & parallel resonance of circuit & the effect of resonance.
4. Classify different electrical measuring equipment's and understanding their principles.
5. Understand the basic concepts of magnetic circuits.
6. Explain construction and working principle of transformer.

Topic Covered

UNIT I

D C Circuit Analysis and Network Theorems: **9**

Circuit Concepts: Concepts of network, Active and passive elements, Voltage and current sources, Concept of linearity and linear network, Unilateral and bilateral elements, R, L and C as linear elements, Source transformation, Kirchhoff's laws, Loop and nodal methods of analysis, Star-delta transformation, Network theorems: Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum Power Transfer theorem.

UNIT II **9**

Introduction to AC Circuits:

AC fundamentals, Analysis of single phase series, parallel and series-parallel RLC Circuits, Resonance in series and Parallel circuit.

Three Phase AC Circuits: Three phase system-its necessity and advantages, Star and delta connections, Balanced supply and balanced load, Line and phase voltage/current relations, three-phase power, and its measurement.

UNIT III **9**

Measuring Instruments:

Fundamentals of measurement & instrumentation, Units, Dimensions and Standards. Error Analysis, types of errors & its analysis. Measuring instruments, construction and working principles of PMMC, Moving Iron and Electro-dynamometer type voltmeters & ammeters, Use of shunts and multipliers.

UNIT IV **9**

Magnetic Circuits and Transformers:

Magnetic circuit concepts, analogy between electric & magnetic circuits, B-H curve, Hysteresis, and eddy current losses.

Single Phase Transformer: Principle of operation, Construction, EMF equation, Power losses, Efficiency, O.C & S.C Test and Introduction to auto transformer.

Experiments

1. Verification of Kirchhoff's Law.
2. Verification of Norton's Theorem.
3. Verification of Thevenin's Theorem.
4. Verification of Superposition Theorem.
5. Verification of Maximum Power Transfer Theorem.
6. Verification of Series R-L-C circuit.
7. Verification of Parallel R-L-C circuit.
8. Measurement of Power and Power factor of three phase inductive load by two wattmeter method.
9. To perform O.C. and S.C. test of a single-phase transformer.

Textbooks:

1. Fundamentals of Electric Circuits, C.K. Alexander and M.N.O. Sadiku; TATA McGraw-Hill.
2. Principles of Electrical Engineering, V. Del Toro; Prentice Hall International.
3. Electrical and Electronics Technology, Edward Hughes; Pearson.
4. Basic Electrical Engineering, D P Kothari, I.J. Nagarath; Tata McGraw Hill
5. Electrical Technology, B. L. Thareja and A. K. Thareja; S. Chand.

BIT-154 OBJECT ORIENTED PROGRAMMING with C++

Course category : Program Skill (PS)
Pre-requisite Subject : NIL
Contact hours/week : Lecture : 2, Tutorial : 0 , Practical: 4
Number of Credits : 4
Course Assessment methods : Continuous assessment through tutorials, attendance, home assignments, quizzes, practical work, record, viva voce, one Minor test and one Major Theory Examination

Course Objective: Students will gain an understanding of the fundamentals of C++ Programming, object oriented concepts in C++, inheritance, polymorphism, exception handling and file handling.

Course Outcomes: The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course.

1. Write code for Conditional statements, Loops, Array, Function, and Pointer
2. Write object-oriented programming using classes and objects.
3. Write code for Constructors and Destructors
4. Write code for Inheritance.
5. Write code for Function Overloading and Operator Overloading
6. Write code for Dynamic or Run-time Polymorphism (Overriding)
7. Write code for Exception handling and Templates.
8. Write code for file handling and various file operations.

Topics Covered

UNIT I **9**

Tokens, Keywords, Identifiers and Constants, Basic Data Types, User-Defined and Derived Data Types, Type Casting, Implicit Conversion, Operators and Expressions, Operator Precedence, Simple statements, Conditional statements, Iterative statements, Array, Function, Pointer, Structure.

UNIT II **9**

Basic Concepts of Object Oriented Programming, Object Oriented Programming Paradigm, Benefits of OOP, Object Oriented Languages, Class and Objects, Scope Resolution Operator, Access specifiers, Data members, Accessing class members, Data hiding, Member function, Inline function, Friend function, Passing objects as arguments, Returning objects from functions.

UNIT III **9**

Constructors and its types, Destructor, Constructor overloading, Order of construction and destruction, Inheritance, Single, Multilevel, Multiple, Hierarchical, Hybrid Inheritance, Base class, Derived class, Virtual function, Polymorphism: Function Overloading, Operator Overloading, Overloading Unary Operators, Overloading Binary Operators, Overriding

UNIT IV **9**

Exception Handling, Throwing and Catching Mechanism, Templates, File handling, Types of files, End of File, Basic file operations: creating, opening, closing, reading, writing and appending a file, copying a file to another, Object oriented system development.

EXPERIMENTS:

Write programs to illustrate the following concepts:

1. Operators and expressions
2. Simple statements, Conditional statements and Iterative statements
3. Arrays
4. Functions
5. Pointers
6. Structures
7. Objects and Classes
8. Inline Function, Friend function and Virtual Functions
9. Scope Resolution Operator
10. Constructors and Destructors
11. Inheritance
12. Function Overloading
13. Operator Overloading
14. Dynamic or Run-time Polymorphism (Overriding)
15. Exception Handling
16. File operations.

Books & References:

1. P. Deitel and H. Deitel, “C++ How to Program”, Pearson.
2. E. Balagurusamy, “Object Oriented Programming with C++”, TMH Publication.
3. Yashavant Kanetkar, “Let us C++”, BPB Publications

4. Robert Lafore, “Object Oriented Programming in Turbo C++”, Galgotia Publication.
5. B. Trivedi, "Programming with ANSI C++", Oxford University Press.
6. Ira Pohl, "Object Oriented Programming using C++", Pearson Education, Second Edition Reprint
7. B. Stroustrup, "The C++ Programming language", Pearson Education.
8. Timthy Budd, “An Introduction to Object Oriented Programming with C++,” Addition-Wesley.
9. Kip R. Irvine, “C++ and Object-Oriented Programming,” Prentice Hall.

BHS- 102/152 : TECHNICAL WRITING AND PROFESSIONAL COMMUNICATION (TW&PC)

Course Category : HSS
Prerequisite subject : None
Number of Credits : 4
Contact Hours/Week : Lectures: 2, Tutorial: 1, Practical: 2
Course Assessment Methods : Continuous assessment through tutorials, attendance, home assignments, quizzes, practical work, record, viva voce, one Minor test and one Major Theory Examination
Course Objectives : The objectives of this course are to: -
The course aims-

1. To sensitize the students to understand the role and importance of communication for personal and professional success.
2. To enable the learners to enhance their writing skills in techno-cultural and professional echo-system.
3. To equip learners to differentiate technical writing from general writing.
4. To equip them with technical writing skills.
5. To enable learners to exhibit knowledge, skills, attitude and judgment in and around human communication that facilitate their ability to work collaboratively with others in an interpersonal environment.

Course Outcomes : The students will be able to demonstrate the following knowledge, skills, and attitudes upon completion of the course: -

1. Overcome the problems she/he shall faces in oral and written communication.
2. Acquire knowledge of and methods for using technical communication, such as reports, proposals, technical letters, etc.
3. Use and Practice compositions correctly.
4. Give presentations in different sessions and make self-appraisal.
5. Learn and understand the various facets of Communication Skills, such as (LSRW) Listening, Speaking, Reading, and writing, and identify, formulate, and solve real-life problems with a positive attitude; also inculcate, the habit of learning and developing communication and soft skills.

Unit 1: Language and Communication 6

Language Vs communication: Communication as coding and decoding – signs, symbols & pictograph – verbal and non–verbal symbols – Language & communication; Types of Communication- functional,

situational, verbal, and non-verbal, interpersonal, group, interactive, public, Mass Communication. Thinking and Articulation, critical, creative aspects of articulation.

Skills of Language Acquisition: Natural Language Acquisition Skills: Listening, Speaking, Reading & Writing {LSRW}; Language Acquisition Through Training: Listening, Speaking, Reading, Writing, Grammar & Vocabulary {LSRWGV}

Phrase, Clause & Sentence in Professional Drafting-Simplicity, Clarity and Conciseness of a Presentation, Differentiating between Professional and Creative Writing, Blending of Artistic/Professional Writing, Avoiding gender, racial, and other forms of bias in Professional Writing. Pre-writing, Drafting, and Re-writing.

Unit 2: Towards Technical Writing **6**

Technical Paper Writing: Professional Paper Elements-Front Matter of a Paper, Main Text of a Paper, End Matter of a Paper: Organizing References and Bibliography, Order of a thesis and Paper Elements, Concluding Remarks. **Methods of Research Paper Writing:** Identification of Author and His Writing-Author's name and Affiliation, Joint Authorship of a Paper, Identification of Writing- Title, Keywords, Synopsis, Preface and Abstract. Drafting Research Article & Methodology.

Thesis/Dissertation Writing: Thesis Elements-Front Matter of a Thesis, Main Text of a Thesis, End Matter of a Thesis, Specimen—Thesis and Research Paper, Chapters and Sections-Introductory Chapters and Sections, Statement of the Problems, Plan and Scope, Core Chapters and Sections-Theoretical Analysis and Synthesis, Basic Assumption and Hypothesis. **Professional Presentation & Seminar Delivery Tools**: Designing the Presentation; Establishing the Objectives. Making Professional PowerPoint Presentations, Signaling Structure of Presentation through Sentences and Crisp Phrases, Preparing Notes for Professional/Technical Presentation, Text Animation, White Board, Flip Charts, Diagrams, Preparing Cards. Seminar Presentations: Purpose modes and methods. Nascent Emerging Platforms for On-line Presentations viz. Zoom, Webex, Team& Meet etc.

Unit 3: Drafting Skills & Career Correspondence **6**

Professional Drafting: Letters vs. e-mails, Formal and Informal emails, Parts of e-mails, Types of e-mails, Managing tone of E-mails and business Letters, Examples of Letters and E-mail, Professional Correspondence through E-mail, Job Applications and cover Letters. Introduction to DOs (Demi- Official Letters) **Career & Correspondence:** Developing a Professional C.V, Bio Data & Resume. Report Writing, Kinds of Reports, Length of Report, Parts of a Report, Terms of Reference, Collection of Facts, Outlines of Report, Examples of Report, Technical Proposal, Elements of Proposal, Examples of Proposal, drafting of proposal.

Unit 4: Professional Practices with ICT Interface **6**

Conducting Professional Meeting: Pre-meeting Preparation, During Meeting: Action Taken Report (ATR) & New Agenda Points, Post Meeting Follow ups. Notice, Circular, Agenda & Meeting Minutes.

Introduction to Generation–Z, Cyber Identity & Professional Netiquettes for Netizens: Drafting E-mails, Blogs on social media, Videoconferencing. Managing Profiles on social media. What to Write and Share on social media. Telephone Etiquettes & Phubbing.

List of Practical:

1. Introduction to Vowel and Consonant Sounds
2. Monophthongs and Diphthongs
3. Syllable, Word Stress & Intonation
4. Harnessing Non-verbal Communication Skills in Cross-Cultural Environment for the establishment of an ideal Ecosystem to ensure Professional Success
5. Developing Speech, and Proofreading the Same
6. Argumentative Skills & Group Dynamics
7. Preparing CV, Biodata & Resume
8. Types of Interview and Interview Skills
9. GD, PI & Telephonic Interview
10. Presentation Skills, Extempore, Debate and Video Conferencing
11. Netiquettes while Writing Blogs on social media.
12. Ethical Usages of Generative AI

Text / Reference Books

1. Acharya Anita. (2012) Interview Skills- Tips & Techniques. Yking Books, Jaipur.
2. Basu, B. N., (2008) Technical Writing. PHI Learning Pvt. Ltd.., New Delhi.
3. Chauhan, N. K & Singh, S. N. (2013) Formal Letters, Pankaj Publication International, New Delhi.
4. Chhabra T.N. (2018) Business Communication. Sun India Publication New Delhi.
5. Dubey Arjun et.al. (2016) Communication for Professionals. Alfa Publications, Delhi.
6. Gibaldi, Joseph (2021). The MLA Handbook for Writers of Research Papers. Ed. IXth, Modern Language Association of America, NY, US.
7. Gurumani, N. (2010) Scientific Thesis Writing and Paper Presentation, MJP Publishers, Chennai.
8. Hamilton Richard. (2009) Managing Writers. Penguin, India.
9. Mc Graw S. J. (2008) Basic Managerial Skills for All. Ed. 08th, Prentice Hall of India, New Delhi.
10. Murphy & Hildebrandt. (2008) Effective Business Communication. Tata McGraw Hill NewDelhi.
11. Pandey, S.P., Singh, S. N. & Kumar, Raman, (2023) Exploring Digital Humanities: Challenges & Opportunities, MacBrain Publishing House, New Delhi.

BIT-155 DESIGN THINKING FOR SOFTWARE DEVELOPMENT

Course category : Audit Course (AC)
Pre-requisite Subject : NIL
Contact hours/week : Lecture: 0, Tutorial:0, Practical:2
Number of Credits : 0
Course Assessment methods : Continuous assessment through tutorials, attendance, home assignments, quizzes, practical work, record, viva voce, one Minor test and one Major Theory Examination

Course Outcomes: The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course.

1. Understand the fundamental concepts of design thinking of Software Engineering and its applications.
2. Design and develop and analyse the various model of software development for a project by imparting creativity and problem-solving ability.
3. Design and develop the SRS for a project, ISO 9000 Models, SEI-CMM Model etc.

4. List and define the test cases, fundamental concepts of testing to be applied on various projects.
5. Design and define the cost estimations, size estimations using various techniques.
6. Understand the working concept of CASE tool, Reverse Engineering, Re-Engineering, Software Risk analysis and Management etc.

UNIT-I

Design process: Traditional design, Design thinking, Existing sample design projects, Study on designs around us, Compositions/structure of a design, Innovative design: Breaking of patterns, Reframe existing design problems, Principles of creativity Empathy: Customer Needs, Insight-leaving from the lives of others/standing on the shoes of others, Observation.

UNIT-II

Design team-Team formation, Conceptualization: Visual thinking, Drawing/sketching, new concept thinking, Patents and Intellectual Property, Concept Generation Methodologies, Concept Selection, Concept Testing, Opportunity identification Prototyping: Principles of prototyping, Prototyping technologies, Prototype using simple things, Wooden model, Clay model, 3D printing; Experimenting/testing**.**

UNIT-III

Software Process Introduction, S/W Engineering Paradigm, Life Cycle Models (Waterfall, Incremental, Spiral, Evolutionary, Prototyping), Software Requirements, Functional and Non-Functional–Software Document, Requirement Engineering Process, Feasibility Studies Software, Prototyping–Prototyping in Software, Process–Data–Functional and Behavioural Models–Structured Analysis and Data Dictionary.

UNIT-IV

Basic Concept of Software Design, Architectural Design, Low Level Design: Modularization, Design Structure Charts, Pseudo Codes, Flow Charts, Coupling and Cohesion Measures, Design Strategies: Function Oriented Design, Object Oriented Design, Top-Down and Bottom-Up

Design. Software Measurement and Metrics: Various Size Oriented Measures: Halstead's Software Science, Function Point (FP) Based Measures, Cyclomatic Complexity Measures: Control Flow Graph.

EXPERIMENTS

1. Design and Develop Software Programmes based on different software models.
2. Estimation of Project Metrics
3. Modelling UML Use Case Diagrams and Capturing Use Case Scenarios
4. E-R Modelling from the Problem Statements
5. Identifying Domain Classes from the Problem Statements
6. State chart and Activity Modelling
7. Modelling UML Class Diagrams and Sequence diagrams
8. Modelling Data Flow Diagrams
9. Estimation of Test Coverage Metrics and Structural Complexity
10. Designing Test Suites.

Based on above: Student should practice and develop at least one project from given list as:

a. Result Management System
b. Library management system
c. Inventory control system
d. Accounting system
e. Fast food billing system
f. Bank loan system
g. Blood bank system
h. Railway reservation system
i. Automatic teller machine
j. Video library management system
k. Hotel management system
l. Hostel management system
m. E-ticking
n. Share online trading
o. Hostel management system
p. Resource management system
q. Court case management system

Books & References

1. Tim Brown, Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation, HarperCollins Publishers Ltd.
2. Idris Mootee, Design Thinking for Strategic Innovation,2013, John Wiley & Sons Inc
3. Ulrich &Eppinger, Product Design and Development, 3rd Edition, McGraw Hill, 2004
4. R. S. Pressman, Software Engineering: A Practitioners Approach, McGraw Hill.
5. Rajib Mall, Fundamentals of Software Engineering, PHI Publication.
6. K. K. Aggarwal and Yogesh Singh, Software Engineering, New Age International Publishers.

Skill-Based Courses to Qualify for UG Certificate (Engg.) in Information Technology

BIT-105	**:**	**IT Tools and Applications**
Course category	:	Skills-enhancement
Pre-requisite Subject	:	NIL
Contact hours/week	:	Lecture: 2, Tutorial: 0, Practical: 2
Number of Credits	:	3
Course Assessment methods	:	Continuous assessment through tutorials, attendance, home assignments, quizzes and One Minor tests and One Major Theory Examination
Course Objectives	:	The primary objective of an IT Tools subject is to provide students with a comprehensive understanding of common IT tools and their applications in various business and personal contexts. This includes foundational knowledge of hardware and software components, operating systems, office productivity

software and database concepts. The course aims to equip students with practical skills in using these tools effectively for everyday tasks and problem-solving.

Course Outcomes : The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course-

1. Able to understand basic concepts Information System, and different types of Information Systems
2. Understand to use word-processor to generate documents with appropriate formatting, layout, review and referencing.
3. Able to manage data in worksheets and workbooks and analyze it using spreadsheet functions and inbuilt formulas.
4. understand to draw analysis on data using spreadsheets to make decisions.
5. Illustrate to make meaningful representations of data in the form of charts and pivot tables.
6. Able to manage data in database tables and use the same for generating queries, forms and reports.

Topics Covered

UNIT-I 6

Computer Organization: Characteristics of Computers, Input, Output, Storage units, CPU. Central Processing Unit - Processor Speed, Cache, Memory, RAM, ROM Memory- Secondary Storage Devices: Floppy and Hard Disks, Optical Disks CD-ROM, DVD Input Devices - Keyboard, Mouse, joystick, Scanner, web cam, Output Devices- Monitors, Printers – Dot matrix, inkjet, laser, Computer Software-Relationship between Hardware and Software; System Software, Application Software, Compiler.

UNIT-II 6

Operating System: Microsoft Windows- An overview of different versions of Windows, Basic Windows elements, File management through Windows. Using essential accessories: System tools – Disk clean-up, Disk defragmenter, Calculator, Notepad, Paint, and WordPad. Application Management: Installing, uninstalling, running applications. Windows control panel- keyboard, mouse, file explorer, font, region, network settings

UNIT-III 6

Word Processing: Word processing concepts: saving, closing, opening an existing document, editing text, Finding and replacing text, printing documents, creating and Printing Merged Documents, Character and Paragraph Formatting, Page Design and Layout. Editing and Profiling Tools: Checking and correcting spellings. Handling Graphics, Creating tables. Spreadsheet: Spreadsheet Concepts, Creating, Saving and Editing a Workbook, Inserting, Deleting Work Sheets, entering data in a cell / formula Copying and Moving from selected cells.

Presentation: Creating, Opening and Saving Presentations, Working in Different Views, Working with Slides, Adding and Formatting Text, Formatting Paragraphs.

UNIT-IV 6

Information Technology application: Application of information Technology in Railways, Airlines, Banking, Insurance, Inventory Control, Financial systems, Hotel Management, Education, Video games, Mobile phones, Information kiosks, special effects in Movies.

Books & References-

1. Miller M, "Absolute Beginners Guide to Computer Basics", Pearson Education, 2009

2. V. Raja Raman, "Introduction to Information Technology", PHI Learning; 3rd edition (30 March 2018)
3. Linda Foulkes, "Learn Microsoft Office 2019: A comprehensive guide to getting started with Word, PowerPoint, Excel, Access, and Outlook", Packt Publishing Limited; Illustrated edition (29 May 2020)

List of Experiments-

1. Basic Computer Operations
2. Word Processing (e.g., MS Word / Google Docs)
3. Spreadsheet Software (e.g., MS Excel / Google Sheets)
4. Presentation Software (e.g., MS PowerPoint / Google Slides)
5. Internet and Web Browsing
6. Email and Online Communication

BIT-106	**:**	**LINUX and Shell Programming**
Course category	:	Skills-enhancement
Pre-requisite Subject	:	NIL
Contact hours/week	:	Lecture: 2, Tutorial: 0, Practical: 2
Number of Credits	:	3
Course Assessment methods	:	Continuous assessment through tutorials, attendance, home assignments, quizzes and One Minor tests and One Major Theory Examination.
Course Objectives	:	To introduce the fundamentals of the Linux operating system, including its architecture, file system, and essential commands. To develop proficiency in navigating the Linux environment and managing files, directories, users, and permissions. To familiarize students with shell types, scripting basics, and automation of routine tasks using shell scripts.
Course Outcomes	:	The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course- 1. Understanding the installation and Booting Process. 2. Understand the usage of Operating System commands 3. Understand Linux fundamentals, including file system structure, command-line navigation, and basic commands. 4. Understanding basics of the Shell programming language 5. Develop proficiency in shell scripting techniques for automating tasks and managing system resources. 6. Apply knowledge of Linux permissions, processes, and environment variables to solve real-world problems efficiently.

Topics Covered

UNIT-I **6**

Introduction to Linux: Linux operating system, History and Evolution of Linux, Linux Distributions and Installation, Key features of Linux distributions (e.g., Ubuntu, CentOS), Command-line interface (CLI) vs. graphical user interface (GUI).

UNIT-II **6**

Basics of File system: File System Structure and Purpose in Linux, Organization and Naming Conventions, **Working with Files and Directories:** pwd, cd, ls, cp, mv, rm, mkdir, rmdir, touch, etc., **Managing File Permissions and Ownership:** Understanding and Setting Access Rights, Changing Owners and Groups, **Modifying Permissions:** Using Chmod, Chown, and Chgrp Commands, **Viewing and Editing Files:** cat, less, more, nano, vi.

UNIT-III **6**

Introduction to Shell Scripting: Using the Shell-Command Line Structure-Met characters-Creating New Commands-Command, Arguments and Parameters-Program Output as Arguments-Shell Variables--More on I/O, Redirection-Looping in Shell Programs, Writing and Executing Shell Scripts, Variables and Data Types Control Structures: if-else, loops (for, while), **Input and Output Redirection:** stdin, stdout, stderr, pipes, Functions and Modular Programming, Debugging Shell Scripts.

UNIT-IV **6**

Advanced Shell Scripting: Command-Line Arguments and Options, Conditional Expressions, String Manipulation, **File Handling:** Reading from and Writing to Files, Process Management: ps, pgrep, kill, etc., Environment Variables and Configuration Files, Introduction to Regular Expressions.

Books & References-

1. Mastering Linux Shell Scripting - Second Edition: A practical guide to Linux command-line, Bash scripting, and Shell programming
2. Shell Programming - In Unix, Linux and OS X 4 Edition by Stephen G. Kochan, Patrick Wood

List of Experiments:

1. Navigate through directories using cd, ls, pwd, mkdir, and rmdir.
2. Write a simple script to greet the user.
3. Create a script to calculate the factorial of a number.
4. Write a script to check if a file exists and display its contents if it does.
5. Write a script to automate user management tasks like adding, modifying, or deleting users.
6. Create a script to monitor system resource usage (CPU, memory, disk space) and send alerts if thresholds are exceeded.
7. Rewrite scripts using more efficient constructs or external tools where appropriate.
8. Experiment with different shell interpreters (e.g., bash, sh, dash) to compare performance.
9. Experiment with creating custom functions and libraries for reuse in multiple scripts.
10. Explore inter-process communication techniques using pipes, named pipes, or sockets.
11. Dive into advanced shell scripting features like arrays, associative arrays, and regular expressions.
12. Write a script to audit system configurations for security vulnerabilities.
13. Implement a script to enforce password policies or monitor user authentication attempts.
14. Experiment with cryptographic operations like encryption, decryption, and hashing in shell scripts.

Syllabus
Second Year

BSM-213/263 : Discrete Mathematics

Course category	:	Basic Sciences & Maths (BSM)
Pre-requisite Subject	:	NIL
Contact hours/week	:	Lecture: 3, Tutorial: 1, Practical: 0
Number of Credits	:	4
Course Assessment methods	:	Continuous assessment through tutorials, attendance, home assignments, quizzes and One Minor tests and One Major Theory Examination
Course Objectives	:	The course is aimed to a strong mathematical foundation for computer science subjects such as data structures, algorithms, and database theory, as well as mathematical disciplines like linear and abstract algebra, combinatorics, probability, logic and set theory, and number theory.
Course Outcomes	:	The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. Use of logical notation to define different functions such as set, function and relation.
2. Use of basic properties of group theory in computer science.
3. Use of induction hypotheses to prove formulae.
4. To know the basic techniques in combinatorics and counting.
5. Identify and apply properties of combinatorial structures.
6. To inculcate the habit of mathematical thinking and lifelong learning.

Topics Covered

9

UNIT-I

Set Theory, Relation and Function: Operations on sets, relations and functions, binary relations, partial ordering relations, equivalence relations, principles of mathematical induction. Finite and infinite sets, countable and uncountable sets, Cantor's diagonal argument and the power set theorem, Schröder-Bernstein theorem.

UNIT-II 9

Propositional logic: Syntax, semantics, valid, satisfiable and unsatisfiable formulas, encoding and examining the validity of some logical arguments.

Proof techniques: Forward proof, proof by contradiction, contrapositive proofs, proof of necessity and sufficiency.

UNIT-III 9

Algebraic Structures: Algebraic structures with one binary operation - semigroups, monoids and groups, congruence relation and quotient structures. Free and cyclic monoids and groups, permutation groups, substructures, normal subgroups. Algebraic structures with two binary operations - rings, integral domains and fields. Boolean algebra and Boolean ring.

UNIT-IV 9

Combinatorics: Basic counting techniques: inclusion and exclusion, pigeon-hole principle, permutation, combination, summations. Introduction to recurrence relations and generating functions.

Books & References

1. Kenneth H Rosen, Discrete Mathematics and its Applications, TMH.
2. C L Liu, Elements of Discrete Mathematics, Second Edition, Tata McGraw-Hill.
3. Bernard Kolman, Robert C Busby, and Sharon Cutler Ross, Discrete Mathematical Structures, fifth edition, Prentice-Hall of India.

4. Ralph P Grimaldi, Discrete and Combinatorial Mathematics, Pearson Education Asia.
5. J P Tremblay and R Manohar, Discrete Mathematical Structures with Applications to Computer Science, Tata McGraw-Hill.

BIT-205	**AI TOOLS AND APPLICATIONS**
Course category	: EF
Pre-requisite Subject	: NIL
Contact hours/week	: Lecture: 3, Tutorial:0, Practical: 2
Number of Credits	: 4
Course Assessment methods	: Continuous assessment through tutorials, attendance, home assignments, quizzes, two minor tests, and one major theory exam.
Course Objectives	: This course introduces the foundational concepts of AI Tools and its applications in today's scenario, Generative AI and Augmented Reality
Course Outcomes	: The students are expected to be able to demonstrate the following knowledge, skills, and attitudes after completing this course.

1. Understand the Basics of AI Tools and Applications.
2. Apply AI Tools for Content Creation and Automation.
3. Apply AI Tools for Generative Artificial Intelligence.
4. Apply AI Tools for Augmented Reality.

Topics Covered

9

UNIT-I
Basics of AI Tools and Applications:

Overview: Introduction of AI, Machine Learning, Deep Learning, and Natural Language Processing; ***Some AI Tools, their Importance, Applications and Future Trends:*** ChatGPT, Google Gemini, Claude, Microsoft Copilot, DALL.E, Synthesia, OpenAI, LLAMA, Chatbase, Falcon, CLIP, YOLO, MidJourney, BERT, SpaCy, Hugging Face, TextBlob, OpenCV, Google AI, Google Vision AI, Deepgram, Dialogflow, Rasa, Microsoft Bot Framework, Tars, Google Analytics, Tableau, Power BI, BigQuery ML, Alteryx, Jasper, Copy.ai, Writesonic, Frase, Surfer.

UNIT-II 9
AI Tools for Content Creation and Automation:

Using AI Tools for Content Creation: Text Generation tools: ChatGPT, Gemini, Claude; : *PPT Creating tools:* ChatGPT, Canva, Prezi, Beautiful.ai, Powtoon, Visme, SlidesAI, Tome. *Research supporting tools:* ChatGPT, Gemini, Claude, Mendeley, Connected Papers, Zotero, Scrivener, ResearchRabbit; *Creating blog content*: ChatGPT, Copy.ai, Surfer SEO, Writesonic, HubSpot Content Assistant, Jasper Chat; ***Using AI Tools for Image and Video Generation:*** Microsoft Bing, Google Gemini, DALL·E, MidJourney; ***Using AI for Automation:*** Using AI for automating tasks like email management: ContactMonkey, Compaign Monitor, Zendesk, Mailchimp, Brevo; *Customer service chatbots*: Chatbase, ChatGPT, Gemini, Claude, Copilot

UNIT-III 9
AI Tools for Generative Artificial Intelligence:

Basics of Generative AI: Generative Adversarial Network (GAN), Generator, Discriminator, Generative Texts, Generative Images, Generative Videos, Generative Codes; ***Tools and frameworks:*** DALL-E, MidJourney, Stable Diffusion, OpenAI, ChatGPT. ***Applications:*** Image and video synthesis, text-to-image generation, automated content creation; Building any ChatGPT powered application***; Ethical considerations:*** Bias, copyright issues, societal impact of Generative AI.

UNIT-IV 9

AI Tools for Augmented Reality:

Fundamentals: Augmented Reality (AR) vs. Virtual Reality (VR); ***Role of AI in AR:*** Enhancing user interaction, real-time object recognition, and scene understanding, ***Applications in industries:*** Retail, healthcare, gaming, and education, ***Case studies:*** Using AI in AR for object tracking, facial recognition, and gesture control, ***Frameworks and Tools for Development AR platforms:*** Unity and Unreal Engine for creating AR environments, ***AI plugins:*** Unity ML-Agents and TensorFlow Lite for real-time data processing, ***3D content creation tools***: Blender, Gravity Sketch for AR design.

EXPERIMENT:

1. Explore ChatGPT, Claude, and Google Gemini to generate a text summary of a given topic.
2. Compare the outputs of DALL.E and MidJourney for text-to-image conversion tasks.
3. Use YOLO (You Only Look Once) for real-time object detection on a video feed.
4. Create and compare datasets using OpenCV for image classification.
5. Explore Hugging Face's BERT for sentiment analysis of a given text dataset.
6. Use Canva or Visme to create a presentation based on a provided text document.
7. Generate blog content using Writesonic, Jasper, and Copy.ai and compare readability scores.
8. Automate email categorization using tools like Mailchimp or Zendesk.
9. Create a research literature map using Connected Papers or ResearchRabbit.
10. Use Microsoft Bing or DALL.E to generate images based on text prompts and refine outputs with MidJourney.
11. Build a text-to-image generation application using DALL-E or Stable Diffusion.
12. Train a simple Generative Adversarial Network (GAN) to create synthetic images.
13. Use ChatGPT to generate a script for a video and create the video using Synthesia.
14. Implement ethical AI practices by analyzing bias in outputs generated by GPT-based models.
15. Develop a ChatGPT-powered chatbot for a basic FAQ system.
16. Create a basic AR environment using Unity or Unreal Engine and add AI-powered real-time object tracking.
17. Design a facial recognition AR application using TensorFlow Lite.
18. Use Blender to create a 3D model and integrate it into an AR environment.
19. Analyze AR applications in healthcare, such as AR for surgical assistance or rehabilitation.
20. Develop a simple AR-based educational app, using gesture control for navigation.

Books & References

1. "Artificial Intelligence: A Guide to Intelligent Systems" by Michael Negnevitsky, "Life 3.0" by Max Tegmark
2. "Generative Deep Learning: Teaching Machines to Paint, Write, Compose, and Play" by David Foster.
3. "Hands-On Generative Adversarial Networks with PyTorch" by John Hany.
4. "Augmented Reality: Principles and Practice" by Dieter Schmalstieg and Tobias Hollerer.
5. ChatGPT, OpenAI's Official Documentation

BIT-206 : JAVA PROGRAMMING

Course category	:	PC
Pre-requisite Subject	:	NIL
Contact hours/week	:	Lecture: 3, Tutorial:0, Practical: 2
Number of Credits	:	4
Course Assessment methods	:	Continuous assessment through attendance, tutorial, home assignments, quizzes, practical work, viva voce, minor test, major theory and practical examination.
Course Objectives	:	To make students ready for industry in programming using object oriented concepts with Java.
Course Outcomes	:	The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course.

1. Analyze and explain the behavior of programs involving the fundamental program constructs
2. Identify and correct syntax and logic errors in short programs
3. Design and implement a class based on attributes and behaviors of objects
4. Describe the parameter passing mechanisms in terms of formal parameters, actual parameters, non-object parameters and object parameters

Topics Covered

UNIT-I 9

Introduction-Java IDE-JRE-JVM-Object oriented programming concepts – objects – classes – methods and messages – abstraction and encapsulation –abstract classes – Objects and classes in Java – defining classes – methods - access specifiers – static members –finalize method, Arrays – Strings - Packages –- constructors –Inheritance and its types – class hierarchy – polymorphism- dynamic binding – final keyword – abstract classes

UNIT-II 9

Exception Handling-The Object class – Reflection – interfaces – object cloning – inner classes – proxies - I/O Streams - Graphics programming – Frame – Components – working with 2D shapes- Introduction to Applets- Java Libraries for Applets

UNIT-III 9

Event Handling – event handlers – adapter classes – actions – mouse events – AWT event hierarchy – introduction to Swing – Model-View-Controller design pattern – buttons – layout management– Swing Components – exception handling – exception hierarchy – throwing and catching exceptions.

UNIT-IV 9

Motivation for generic programming – generic classes – generic methods – generic code and virtual machine – inheritance and generics – reflection and generics - Multi-threaded programming – interrupting threads – thread states – thread properties – thread synchronization – Executors – synchronizers. JDBC: The connectivity Model, JDBC/ODBC Bridge, java.sql package, connectivity to remote database.

EXPERIMENT:

1. Basic programs of simple statements, conditional statements, iterative statements and arrays
2. Programs having object-oriented concepts like Inheritance and Interface
3. Programs for Exception Handling and Event Handling
4. Programs of Threads and Multithreading
5. Programs related to Applets and Swings
6. Programs including JAVA Beans and Servlets

Books & References

Textbooks

1. Naughton, Schildt, The Complete Reference JAVA2, TMH.
2. Balaguruswamy E, Programming in JAVA, TMH
3. Cay S. Horstmann and Gary Cornell, "Core Java: Volume I – Fundamentals", Eighth Edition, Sun Microsystems Press
4. K. Arnold and J. Gosling, "The JAVA programming language", Third edition, Pearson Education, 2000.

Reference books

1. Margaret Levine Young, The Complete Reference Internet, TMH.
2. Dustin R. Callway, Inside Servlets, Addison Wesley.
3. Mark Wutica, JAVA Enterprise Edition, QUE.
4. Steven Holzner, JAVA2 Black book, Dreamtech.
5. Timothy Budd, "Understanding Object-oriented programming with Java", Updated Edition, Pearson Education, 2000.
6. C. Thomas Wu, "An introduction to Object-oriented programming with Java", Fourth Edition, Tata McGraw-Hill Publishing company Ltd., 2006

BIT-207		**DATA STRUCTURES**
Course category	:	PC
Pre-requisite Subject	:	NIL
Contact hours/week	:	Lecture: 3, Tutorial:0, Practical: 2
Number of Credits	:	4
Course Assessment methods	:	Continuous assessment through tutorials, attendance, home assignments, quizzes, practical work, record, viva voce and 2-Minor tests and One Major Theory & Practical Examination
Course Objectives	:	To provide the knowledge of basic data structures and their implementations. Understand the importance of data structures in the context of writing efficient programs. As well as to gain the ability to use appropriate data structures in problem solving.
Course Outcomes	:	The students are expected to be able to demonstrate the following knowledge, skills, and attitudes after completing this course.

1. Describe how arrays, records, linked lists, stacks, queues, trees, and graphs are represented in memory, used by the algorithms and their common applications.
2. Write programs that use arrays, records, linked structures, stacks, queues, trees, and graphs.
3. Compare and contrast the benefits of dynamic and static data structures implementations.
4. Identity the alternative implementations of data structures with respect to its performance to solve a real-world problem.
5. Demonstrate organization of information using Trees and Graphs and to perform different operations on these data structures.
6. Design and implement an appropriate organization of data on primary and secondary memories for efficient its efficient retrieval.
7. Discuss the computational efficiency of the principal algorithms for sorting, searching, and hashing.
8. Describe the concept of recursion, its application, its implementation, and removal of recursion.

Topics Covered

9

UNIT-I

Introduction: Basic Terminology, Elementary Data Organization, Structure Operations, Complexity and Time-Space Tradeoff.

Arrays: Definition, Representation and Analysis, Single and Multi-Dimension Array, Address Calculation, Application of Arrays, Character, String in C, Character String Operation, Arrays Parameters, Ordered List, Sparse Matrices and Vectors.

Stacks: Array Representation and Implementation of Stack, Operations on Stacks: Push &Pop, Array Representation of Stack, Linked Representation of Stack, Operations Associated with Stacks, Application of Stack, Conversion of Infix to Prefix and Postfix Expressions, Evaluation of Postfix Expressions using Stack, Application of Recursion in Problem like Tower of Hanoi.

UNIT-II 9

Queues: Array and Linked Representation and Implementation of Queues, Operations on Queue: Create, Add, Delete, Full and Empty, Circular Queues, D-Queues and Priority Queues.

Linked List: Representation and Implementation of Singly Linked Lists, Two-Way Header List, Traversing and Searching of Linked List, Overflow and Underflow, Insertion and Deletion to / from Linked Lists, Insertion and Deletion Algorithms, Doubly Linked List, Linked List in Array, Polynomial Representation and Addition, Generalized Linked List, Garbage Collection and Compaction.

UNIT-III 9

Trees: Basic Terminology, Binary Trees, Binary Tree Representation, Algebraic Expressions, Complete Binary Tree, Extended Binary Trees, Array and Linked Representation of Binary Trees, Traversing Binary Trees, Threaded Binary Trees, Traversing Threaded Binary Trees, Huffman Algorithm.

Binary Search Trees: Binary Search Tree (BST), Insertion and Deletion in BST, Complexity of Search Algorithm, Path Length, AVL Trees, B-Trees.

UNIT-IV 9

Searching and Hashing: Sequential Search, Binary Search, Comparison and Analysis, Hash Table, Hash Functions, Collision Resolution Strategies, Hash Table Implementation.

Sorting: Insertion Sort, Bubble Sorting, Quick Sort, Two Way Merge Sort, Heap Sort, Sorting on

Different Keys, Practical Consideration for Internal Sorting.

Graphs: Terminology &Representations, Graphs &Multi-Graphs, Directed Graphs, Sequential Representations of Graphs, Adjacency Matrices, Traversal, Connected Component and Spanning Trees, Minimum Cost Spanning Trees.

EXPERIMENT:

Write C/C++ Programs to illustrate the concept of the following:

1. Sorting Algorithms-Non-Recursive.
2. Sorting Algorithms-Recursive.
3. Searching Algorithm.
4. Stack.
5. Queue.
6. Linked List.
7. Graph.

Books & References

Textbooks

1. Horowitz and Sahani, Fundamentals of Data Structures, Galgotia Publication, New Delhi.
2. R. Kruseetal, Data Structure and Pragram Design in C, Pearson Education Asia Delhi.
3. A. M.Tenenbaum, Data Structures using C & C++, PHI, India.
4. K Loudon, Mastering Algorithms with C, Shroff Publication and Distributor Pvt. Ltd.
5. Bruno R Preiss, Data Structure and Algorithms with Object Oriented Design Pattern in C++, John Wiley & Sons.
6. Adam Drozdek, "Data Structures and Algorithms in C++", Thomson Asia Pvt. Ltd Singapore.

Reference books

6. Lewis, H.R., Denenberg, L., Data Structures and their Algorithms. Published by Addison-Wesley, UK, 1991.
7. Oluwadare, S.A., Agbonifo, O.C., Fundamentals of Data structures and Algorithms. Lecture Notes, 2013.

BIT-208		**: COMPUTER ORGANIZATION & ARCHITECTURE**
Course category	:	PC
Pre-requisite Subject	:	NIL
Contact hours/week	:	Lecture: 3, Tutorial:0, Practical: 2
Number of Credits	:	4
Course Assessment methods	:	Continuous assessment through tutorials, attendance, home assignments, quizzes and One Minor tests and One Major Theory Examination
Course Objectives	:	To understand the structure, function, and characteristics of computer systems, the designing of various functional units and components of computers, and the identification of the elements of modern instructions sets and their impact on processor design, explain the function of each element of the memory hierarchy.
Course Outcomes	:	The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. To understand the basic structure and operation of digital computer.

2. To study the design of arithmetic and logic unit and implementation of fixed point and floating-point arithmetic operations.
3. To study the two types of control unit techniques and the concept of Pipelining.
4. To study the hierarchical memory system including cache memories and virtual memory.
5. To study the different ways of communicating with 1/0 devices.
6. To study the different ways of communicating with 1/0 interfaces.

Topics Covered

9

UNIT-I

Register Transfer Language, Bus and Memory Transfers, Bus Architecture, Bus Arbitration, Arithmetic Logic, Shift Micro-Operation, Arithmetic Logic Shift Unit, Design of Fast Address, IEEE Standard for Floating Point Numbers.

UNIT-II 9

Control Design: Hardwired &Micro Programmed Control Unit, Processor **Design: Processor Organization:** General Register Organization, Stack Organization, Addressing Mode, Instruction Format, Data Transfer & Manipulations, Program Control, Reduced Instruction Set Computer, Pipelining.

UNIT-III 9

Arithmetic - Addition & Subtraction of Signed Numbers - Multiplication - Integer Division - Floating Point Operations, Decimal Arithmetic Unit, Decimal Arithmetic Operations.

UNIT-IV 9

Input-Output Organization: 1/0 Interface, Modes of Transfer, Interrupts &Interrupt Handling, Direct Memory Access, Input-Output Processor, Serial Communication.

Memory Organization: Memory Hierarchy, Main Memory (RAM and ROM Chips), Auxiliary Memory, Cache Memory, Virtual Memory.

EXPERIMENT:

1. Implementing HALF ADDER, FULL ADDER using basic logic gates.
2. Implementing Binary -to -Gray, Gray -to -Binary code conversions.
3. Implementing 3-8-line DECODER.
4. Implementing 4x1 and 8x1 MULTIPLEXERS.
5. Verify the excitation tables of various FLIP-FLOPS.
6. Design of an 8-bit Input/ Output system with four 8-bit Internal Registers.
7. Design of an 8-bit ARITHMETIC LOGIC UNIT
8. Design the data path of a computer from its register transfer language description.
9. Design the control unit of a computer using either hardwiring or microprogramming based on its register transfer language description.
10. Implement a simple instruction set computer with a control unit and a data path.

Books & References

Textbooks

1. Computer System Architecture, M. Mano.
2. Carl Hamacher, Zvonko Vranesic, Safwat Zaky Computer Organization, McGraw-Hill, Fifth Edition,' Reprint 2012.
3. John P. Hayes, Computer Architecture and Organization, Tata McGraw Hill, Third Edition, 1998.

Reference books

1. William Stallings, Computer Organization and Architecture-Designing for Performance, Pearson Education, Seventh edition, 2006.
2. Behrooz Parahami, "Computer Architecture", Oxford University Press, Eighth Impression, 2011.
3. David A. Patterson and John L. Hennessy, "Computer Architecture-A Quantitative Approach", Elsevier, a division of reed India Private Limited, Fifth edition, 2012.

BIT-211	**GAME THEORY AND APPLICATIONS**
Course category	: EF
Pre-requisite Subject	: NIL
Contact hours/week	: Lecture: 3, Tutorial:1, Practical: 0
Number of Credits	: 4
Course Assessment methods	: Continuous assessment through tutorials, attendance, home assignments, quizzes, two minor tests, and one major theory exam
Course Objectives	: This course introduces the foundational concepts of game theory and its applications in decision-making scenarios involving multiple agents. Topics include combinatorial games, zero-sum games, non-zero-sum games, and advanced techniques like linear programming and Nash equilibria.
Course Outcomes	: The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. Understand the principles of combinatorial and strategic games.
2. Analyze two-person zero-sum games using mathematical techniques.
3. Apply linear programming to solve game theory problems.
4. Explore non-zero-sum games, k-person games, and concepts like Nash equilibrium.

Topics Covered

UNIT-I 9

Combinatorial Games:

Introduction to combinatorial games, Definition and the fundamental theorem for combinatorial games, Classic games: Nim, Hex, and other examples, Tree games and their analysis, Grundy functions and their computation, Advanced concepts: Bogus Nim-sums.

UNIT-II 9

Two-Person Zero-Sum Games:

Normal form games and their representation, Saddle points and equilibrium pairs, Maximin and minimax strategies, Mixed strategies and their applications, Solving 2×2, 2×n, m×2, and 3×3 matrix games, Linear programming and game theory solutions: Simplex method, Fundamental theorem of duality, Application to two-person zero-sum games.

UNIT-III 9

Advanced Linear Programming Techniques

Slack variables and canonical linear programming problems, Pivoting and optimization, The Big M method and Bland's rules to prevent cycling, Duality and its application in the simplex method, Solving game matrices and related problems.

UNIT-IV 9

Non-Zero-Sum Games and Multi-Player Games

Introduction to non-zero-sum and k-person games, Nash equilibria: Definition and computation, Graphical methods for finding Nash equilibria (2×2 matrices), Challenges with Nash equilibria in non-zero-sum games, The Nash arbitration procedure, Coalitions and games in coalition form, The Shapley value and imputations, Advanced topics: Strategic equivalence, stable sets, and their applications.

Books & References

1. 'Game Theory: Analysis of Conflict' by Roger B. Myerson
2. 'An Introduction to Game Theory' by Martin J. Osborne
3. 'Strategies and Games: Theory and Practice' by Prajit K. Dutta
4. 'Theory of Games and Economic Behavior' by John von Neumann and Oskar Morgenstern
5. 'Game Theory: A Nontechnical Introduction' by Morton D. Davis

BIT-256	**DATABASE MANAGEMENT SYSTEM**
Course category	: PC
Pre-requisite Subject	: NIL
Contact hours/week	: Lecture: 3, Tutorial:0, Practical:2
Number of Credits	: 4
Course Assessment methods	: Continuous assessment through tutorials, attendance, home assignments, quizzes, two minor tests, and one major theory exam
Course Objectives	: This course introduces the foundational concepts of game theory and its applications in decision-making scenarios involving multiple agents. Topics include combinatorial games, zero-sum games, non-zero-sum games, and advanced techniques like linear programming and Nash equilibria.
Course Outcomes	: Student Understand the basic syntax, semantics, and pragmatics of SQL & PL/SQL. Analyze the problems and apply DBMS concepts and techniques to develop appropriate programs/projects to solve the problems.

1. List and define the fundamental concepts of database management system and role of DBMS in an organization.
2. Manually execute a given database design and transaction over it.
3. Manually infer the type of a given database transaction.
4. Implement simple algorithms and data structures as database transaction.
5. Design large databases that are modular and have reusable components.
6. Explain on a simple problem how to apply concurrency control over concurrent database transactions.
7. Implement the concept of DBMS and RDBMS during the development of various application packages.

Topics Covered

UNIT-I 9

Introduction: An Overview and motivation of Database Management System, Characteristics of database approach, Advantages of using DBMS approach, Database System vs File System,

Database System Concept and Architecture, Data Model & its types, Schema and Instances, Data Independence, Database Language and Interfaces, Data Definitions Language, DML, Overall Database Structure.

Data Modelling using Entity Relationship Model: E-R Model Concepts, Notation for E-R Diagram, Mapping Constraints, Keys, Concepts of Super Key, Candidate Key, Primary Key, Generalization, Aggregation, Reduction of an ER Diagrams to Tables, Extended ER Model, Relationship of Higher Degree.

UNIT-II 9

Relational Data Model and Language: Relational Data Model Concepts, Consistency constraints, Integrity Constraints, Entity Integrity, Referential Integrity, Keys Constraints, Domain Constraints, Relational Algebra, Relational Calculus, Tuple and Domain Calculus.

Introduction on SQL: Characteristics of SQL, Advantage of SQL, SQL Data Type and Literals, Types of SQL Commands, SQL Operators and their Procedure, Tables, Views, and Indexes, Queries and Sub Queries, Aggregate Functions, Insert, Update and Delete Operations, Joins, Unions, Intersection, Minus, Cursors, Triggers, Procedures in SQL/PL SQL.

UNIT-III 9

Database Design & Normalization: Database Anomalies, Types of Anomalies, Functional Dependencies, Normalization, Normal Forms, First, Second, Third Normal Forms, BCNF, Fourth and Fifth Normal Forms, Closure of a set of FDs and MVDs, Armstrong's axioms, Minimal or Canonical cover of FDs, Inclusion Dependence, Loss Less Join Decompositions, Dependency Preserving Composition, Normalization using FD, MVD, and JDS, Examples on Normalization based on FDs and MVDs, Domain Key Normal Form (DKNF), Alternative Approaches to Database Design.

UNIT-IV 9

Transaction Processing Concept: Transaction System, Testing of Serializability, Serializability of Schedules, Conflict & View Serializable Schedule, Recoverability, Recovery from Transaction Failures, Log Based Recovery, Checkpoints, Deadlock Handling.

Distributed Database: Characteristics of Distributed Database, Advantages and disadvantages of distributed database, Distributed Data Storage.

Concurrency Control Techniques: Concurrency Control, Locking Techniques for Concurrency Control, Time Stamping Protocols for Concurrency Control, Validation Based Protocol, Multiple Granularity, Multi Version Schemes, Recovery with Concurrent Transaction.

Experiment:

1. Exercises to be based on SQL/PLSQL/Oracle etc.
2. Applications involving vendor development systems, stores management system, finance Management, Library Management System etc.
3. Creation and querying of database tables for following cases.
    - ✓ Write SQL queries using logical operations (=, <,>, etc).
    - ✓ Write SQL queries using SQL operators.
    - ✓ Write SQL queries using character, number, date, and group functions.
    - ✓ Write SQL queries for extracting data from more than one table.
    - ✓ Write SQL queries for sub queries, nested queries.
    - ✓ Write program using PL/SQL.
    - ✓ Concepts for ROLL BACK, COMMIT & CHECK POINTS.
    - ✓ Create VIEWS, CURSORS and TRGGERS & write ASSERTIONS.

- ✓ Create FORMS and REPORTS.

4. Design of tables by normalization and dependency analysis.
5. Writing application software with host language interface.

Books & References

1. Date C J, An Introduction to Database Systems, Addison Wesley
2. Korth, Silbertz, Sudarshan, Database Concepts, McGraw Hill
3. Elmasri, Navathe, Fundamentals of Database Systems, Addison Wesley
4. Leon & Leon, Database Management Systems, Vikas Publishing House
5. Bipin C. Desai, An Introduction to Database Systems, Galgotia Publications
6. Majumdar & Bhattacharya, Database Management System, TMH
7. Ramkrishnan, Gehrke, Database Management System, McGraw Hill
8. Kroenke, Database Processing Fundamentals, Design and Implementation, Pearson Education.
9. Ramon a. Mato-Toledo, Pauline K. Cushman, Database Management Systems, Schaums Outline series, TMH, New Delhi Special Indian Edition 2007
10. Ivan Bayross, Mastering Database Technologies, BPB Publications, New Delhi - First Indian Edition 2006, Reprinted 2011.

BIT-257 DESIGN & ANALYSIS OF ALGORITHM

Course category	:	PC
Pre-requisite Subject	:	NIL
Contact hours/week	:	Lecture: 3, Tutorial:0, Practical:2
Number of Credits	:	4
Course Assessment methods	:	Continuous assessment through tutorials, attendance, home assignments, quizzes, two minor tests, and one major theory exam
Course Objectives	:	To understand the importance of algorithm and how to analyze the complexity of algorithms. To analyse the complexity of an algorithm in terms of time and space complexities
Course Outcomes	:	The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course.

1. Argue the correctness of algorithms using inductive proofs and invariants.
2. Analyze worst-case running times of algorithms using asymptotic analysis.
3. Describe the divide-and-conquer paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize divide-and-conquer algorithms. Derive and solve recurrences describing the performance of divide-and-conquer algorithms.
4. Describe the dynamic-programming paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize dynamic-programming algorithms and analyze them.
5. Describe the greedy paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize greedy algorithms and analyze them.
6. Explain the different ways to analyze randomized algorithms (expected running time, probability of error). Analyze randomized algorithms. Compare between different data structures. Pick an appropriate data structure for a design situation.
7. Explain what an approximation algorithm is, and the benefit of using approximation algorithms. Be familiar with some approximation algorithms.

8. Understand concept of sorting networks

Topics Covered

UNIT-I 9

Introduction: Algorithms, Analyzing Algorithms, Asymptotic Notation, Complexity of Algorithms, Growth of Functions, Performance Measurements, Solving Recurrence Equations Sorting and Order Statistics - Shell Sort, Heap Sort, Comparison of Sorting Algorithms, Sorting in Linear Time.

UNIT-II 9

Divide and Conquer with examples such as Sorting- Quick Sort, Merge Sort, Matrix Multiplication, Convex hull and Searching. Advanced Data Structures: Red-Black trees, B – trees, 2-3 Trees, Binomial Heaps, and Fibonacci Heaps.

UNIT-III 9

Greedy methods with examples such as Optimal Reliability Allocation, Knapsack, Minimum Spanning Trees – Prim's and Kruskal's algorithms, Single Source Shortest Paths - Dijkstra's and Bellman Ford algorithms. Dynamic programming with examples such as Fibonacci Numbers, Multistage Graphs, Resource Allocation, Kanpsack, All Pair Shortest Paths – Warshal's and Floyd's algorithms.

UNIT-IV 9

Backtracking Algorithms- Graph Coloring, n-Queen Problem, Hamiltonian Cycles and Sum of Subsets.

Selected Topics: String Matching, Theory of NP-completeness, Polynomial Time, Polynomial time Verification and Reducibility, NP – Hard - NP-Complete problems with examples. Approximation Algorithms Randomized Algorithms, Algebraic Computation and Fast Fourier Transform.

Experiment:

1. To analyze time complexity of Insertion Sort, Merge Sort and Quick Sort.
2. To Implement Strassen's Matrix Multiplication.
3. To implement Merge Sort using Divide and Conquer approach.
4. To implement Quick Sort using Divide and Conquer approach.
5. To implement Knapsack Problem.
6. To implement Activity Selection Problem
7. To implement Dijkstra's Algorithm
8. To implement Bellman Ford's Prim's
9. To implement Kruskal's Algorithms.
10. To implement Largest Common Subsequence.
11. To implement Matrix Chain Multiplication.
12. To implement Multistage Graph Algorithms
13. To implement n-Queen Algorithms.
14. To implement Naïve String Matching Algorithm.
15. To implement Rabin Karp String Matching Algorithm.

Books & References

Textbooks:

1. Thomas H. Coreman, Charles E. Leiserson and Ronald L. Rivest, Introduction to Algorithms, PHI.
2. RCT Lee, SS Tseng, RC Chang and YT Tsai, "Introduction to the Design and Analysis of Algorithms", McGraw Hill, 2005.

3. Ellis Horowitz and SartajSahni, Fundamentals of Computer Algorithms, Computer Science Press, Maryland, 1978
4. Berman, Paul," Algorithms", Cengage Learning.
5. Aho, Hopcraft, Ullman, "The Design and Analysis of Computer Algorithms" Pearson Education, 2008.

Reference books:

1. Berlion, P. Izard, P., Algorithms-The Construction, Proof and Analysis of Programs, 1986. Johan Wiley & Sons.
2. Bentley, J.L., Writing Efficient Programs, PHI
3. Ellis Horowitz, SartajSahni, and SanguthevarRajasekaran, Computer Algorithms, W. H. Freeman, NY, 1998
4. Goodman, S.E. &Hedetnien, introduction to Design and Analysis of Algorithm1997, MGH.
5. Knuth, D.E , Fundamentals of Algorithms: The Art of Computer Programming Vol,1985

BIT-258 PYTHON PROGRAMMING

Course category	:	PC
Pre-requisite Subject	:	NIL
Contact hours/week	:	Lecture: 3, Tutorial:0, Practical:2
Number of Credits	:	4
Course Assessment methods	:	Continuous assessment through tutorials, attendance, home assignments, quizzes, practical work, record, viva voce, Minor Test and Major Theory Examination
Course Objectives	:	Students will gain an understanding of the fundamentals of Python programming, object oriented concepts in Python, inheritance, polymorphism, exception handling, file handling and some advanced concepts in Python.
Course Outcomes	:	The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. Write simple, conditional and iterative statements in Python
2. Create arrays and use array methods in Python
3. Create functions and implement recursion in Python
4. Create and use Python classes and objects
5. Write code for Constructors, Destructors, Inheritance, Polymorphism and Exception handling
6. Write code for file handling and various file operations
7. Solve various real time problems using Python
8. Solve problems of Data Science and Machine Learning with Python

Topics Covered

UNIT-I 9

Programming Basics and Decision Making

Fundamentals: Key features and applications of Python, Python Editors and Compilers (Interpreters), Using different offline and online Python IDE, Interacting with Python programs, Data types: Numeric, Boolean, Strings, Lists, Sets, Tuples, Dictionary; **Variables:** Declaration and initialization; Other concepts: Operators, Expressions, Indentation, Comments, Casting;

Simple Statements: Taking inputs from user, Displaying outputs; Conditional statements: If…Else.

UNIT-II 9

Control Flow and Other Programming Concepts

Iterative statements: For Loops, While Loops, Break, Continue; **Array:** Looping Array elements, Array methods; **Functions:** Local and Global Variables, Built-in functions, User defined functions, Declaration of a function, Defining the function, Calling of the function, Functions with arguments, Recursion.

UNIT-III 9

OOP and File Handling.

Object Oriented Programming: Classes and objects, attributes and methods, constructors and destructors, inheritance, polymorphism,

Exception Handling: Try…Except; **Management of text files:** Type of files, various file operations on text files, creating a text file, opening a file, closing a file, reading a text file, writing into a text file, copying a file to another file.

UNIT-IV 9

Advance Concepts Problem solving: Use of Python to solve real time problems, How Python helps to research problems, Creating various types of graphs corresponding to any data to show different kinds of results and analysis;

Data Analysis: Understanding problems of data science and machine learning, Creating codes in Python for various data analysis problems, Other advance programs

Experiment:

1. Writing codes using simple statements, operators and expressions
2. Writing codes using conditional statements
3. Writing codes using iterative statements
4. Writing programs for creating arrays, looping array elements and using array methods
5. Writing programs to use various standard modules
6. Writing codes to create functions and implement recursion
7. Writing object oriented code for Constructors and Destructors
8. Writing object oriented code for implementing Inheritance
9. Writing object oriented code for implementing Polymorphism
10. Writing program for implementing Exception Handling
11. Write codes for various file operations
12. Developing codes for solving various real time problems
13. Developing codes for solving problems of Data Science and Machine Learning
14. Writing codes to create various types of graphs corresponding to any data
15. Writing other advance programs in Python

Books & References

1. Alex Martelli, “Python in a Nutshell”
2. Allen Downey, “Think Python”
3. Ken Lambert, “Fundamentals of Python: First Programs”
4. Willi Richert, Luis Pedro Coelho, “Building Machine Learning Systems with Python”
5. Cody Jackson ,”Learning to Program Using Python”
6. Ljubomir Perkovic, “Introduction to Computing Using Python”
7. https://www.w3schools.com/python/default.asp
8. https://www.w3resource.com/python/python-tutorial.php
9. https://www.geeksforgeeks.org/python-tutorial/

10. https://www.geeksforgeeks.org/python-programming-language/

EIT-101	**:**	**Introduction to Arduino Programming**
Course category	:	Professional Elective (PE)
Pre-requisite Subject	:	NIL
Contact hours/week	:	Lecture: 3 Tutorial: 0 Practical: 2
Number of Credits	:	4
Course Assessment methods	:	Continuous assessment through tutorials, attendance, home assignments, quizzes and One Minor tests and One Major Theory Examination
Course Objectives	:	This course aims to introduce students to the fundamentals of Arduino programming and embedded system design. It equips learners with the ability to write, upload, and debug Arduino code using C/C++ within the Arduino IDE. Students will gain hands-on experience interfacing sensors and actuators, enabling real-world data acquisition and control.
Course Outcomes	:	The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. Understand the fundamentals of Arduino and its ecosystem.
2. Develop code using conditional and iterative statements with Arduino.
3. Learn to write, compile, and upload code using the Arduino IDE.
4. Interface sensors and actuators with Arduino for real-world applications.
5. Develop and debug embedded systems using Arduino boards.

UNIT-I 9

Introduction to Arduino and Embedded Systems: What is Arduino? Overview of microcontrollers, Types of Arduino boards (Uno, Mega, Nano), Arduino IDE installation and setup, Basic components: LEDs, resistors, breadboards, Writing and uploading your first sketch.

UNIT-II 9

Programming Concepts and Digital I/O: Data types, variables, and functions in Arduino, Digital I/O: pinMode, digitalWrite, digitalRead, Control structures: if, for, while, switch, Blinking LEDs, Push Buttons, Debouncing and simple logic circuits.

UNIT-III 9

Analog I/O and Sensors: Analog input/output: analogRead, analogWrite, Interfacing analog sensors (e.g., temperature, light), Pulse Width Modulation (PWM), Serial communication (Serial.begin, Serial.print), Reading sensor data via serial monitor.

UNIT-IV 9

Advanced Interfaces: Interfacing actuators: motors, buzzers, relays, LCD interfacing (16x2 or I2C LCD), I2C and SPI basics, Introduction to IoT with Arduino and ESP8266.

Books & References

Textbooks:

1. Jeremy Blum, "Exploring Arduino: Tools and Techniques for Engineering Wizardry", Wiley, 2nd Edition, 2019, ISBN: 9781119405375
2. Richard Blum, "Arduino Programming in 24 Hours, Sams Teach Yourself", Sams Publishing, 1st

Edition, 2014, ISBN: 9780672337123

Reference Books:

3. Massimo Banzi and Michael Shiloh, "Getting Started with Arduino", Maker Media, 3rd Edition, 2014, ISBN: 9781449363338
4. Michael Margolis, "Arduino Cookbook: Recipes to Begin, Expand, and Enhance Your Projects", O'Reilly Media, 2nd Edition, 2011, ISBN: 9781449313876
5. Michael McRoberts, "Beginning Arduino", Apress, 2nd Edition, 2013, ISBN: 9781430250166

List of Experiments

1. Getting started with Arduino: Blinking an LED
2. Controlling multiple LEDs using digital pins
3. Reading digital input from a push-button
4. Analog sensor input: Read values from a temperature or light sensor
5. PWM control: Fading an LED using analogWrite
6. Serial communication: Display sensor values on the serial monitor
7. Interfacing a buzzer and creating tone-based alerts
8. Interfacing a 16x2 LCD to display sensor readings
9. DC motor control using a transistor and Arduino
10. Building a temperature-controlled fan or smart light system

EIT-103	:	**Cryptography**
Course category	:	Professional Elective (PE)
Pre-requisite Subject	:	NIL
Contact hours/week	:	Lecture: 3, Tutorial: 0, Practical: 2
Number of Credits	:	4
Course Assessment methods	:	Continuous assessment through tutorials, attendance, home assignments, quizzes and One Minor tests and One Major Theory Examination
Course Objectives	:	A cryptography course aims to equip students with a solid understanding of cryptographic techniques and their application in securing information and communications. The course typically covers fundamental concepts like encryption, decryption, and key management, as well as various cryptographic algorithms and protocols.
Course Outcomes	:	The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course:

1. Classify the symmetric encryption techniques and illustrate various public key cryptographic techniques
2. Understand security protocols for protecting data on networks and be able to digitally sign emails and files
3. Understand vulnerability assessments and the weakness of using passwords for authentication
4. To be able to perform simple vulnerability assessments and password audits
5. Summarize the intrusion detection and its solutions to overcome the attacks.

UNIT-I 9

Introduction to security attacks, services and mechanism, Classical encryption techniques substitution ciphers and transposition ciphers, cryptanalysis, Modern Block Ciphers: Block ciphers principles, Shannon's theory of confusion and diffusion, fiestal structure, Data encryption standard (DES), Strength of DES, Idea of differential cryptanalysis.

UNIT-II 9

Extended Euclidean Algorithm, Advanced Encryption Standard (AES) encryption and decryption Fermat's and Euler's theorem, Principals of public key crypto systems, RSA algorithm, security of RSA, Message Authentication Codes: Authentication requirements, authentication functions, message authentication code, hash functions, security of hash functions, Secure hash algorithm (SHA).

UNIT-III 9

Digital Signatures: Digital Signatures, Elgamal Digital Signature Techniques, Digital signature standards (DSS), proof of digital signature algorithm, Key Management and distribution: Symmetric key distribution, Diffie-Hellman Key Exchange, Public key distribution.

UNIT-IV 9

IP Security: Architecture, Authentication header, Encapsulating security payloads, combining security associations, key management. Introduction to Secure Socket Layer, Electronic mail security: pretty good privacy (PGP), S/MIME, System Security: Introductory idea of Intrusion, Intrusion detection, Viruses and related threats, firewalls.

Books & References:

1. William Stallings, "Cryptography and Network Security: Principals and Practice", Education.
2. Behrouz A. Frouzan: Cryptography and Network Security, McGraw Hill .
3. C K Shyamala, N Harini, Dr. T.R.Padmnabhan Cryptography and Security ,Wiley
4. Bruce Schiener, "Applied Cryptography". John Wiley & Sons
5. Bernard Menezes," Network Security and Cryptography", Cengage Learning.
6. AtulKahate, "Cryptography and Network Security", McGraw Hill

Experiments:

1. Breaking the Shift Cipher
2. Breaking the Mono-alphabetic Substitution Cipher
3. Message Authentication Codes
4. Cryptographic Hash Functions and Applications
5. Symmetric Key Encryption Standards (DES)
6. Symmetric Key Encryption Standards (AES)
7. Diffie-Hellman Key Establishment
8. Digital Signatures

EIT- 104	:	**Artificial Intelligence**
Course category	:	Professional Elective (PE)
Pre-requisite Subject	:	NIL
Contact hours/week	:	Lecture: 3, Tutorial: 0, Practical: 2
Number of Credits	:	4
Course Assessment	:	Continuous assessment through tutorials, attendance, home assignments,

methods		quizzes and One Minor tests and One Major Theory Examination.
Course Objectives	:	Introduce the fundamentals of Artificial Intelligence. Develop problem-solving skills using AI techniques. Understand knowledge representation and reasoning mechanisms. Introduce machine learning principles and expert systems. Explore advanced AI topics and ethical considerations.
Course Outcomes	:	The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course:

1. Understand the fundamentals of Artificial Intelligence.
2. Apply search strategies to solve problems.
3. Represent knowledge and perform logical reasoning.
4. Design and develop machine learning and expert systems.
5. Explore advanced AI techniques and applications.

UNIT-I 9

Introduction to Artificial Intelligence: Definition and history of AI, Foundations and goals of AI, Intelligent agents and their types, Environment types (fully/partially observable, deterministic/stochastic), Problem-solving agents, **Search strategies:** Uninformed Search (BFS, DFS, Depth-limited, Iterative deepening), Informed Search (Greedy, A*, heuristics).

UNIT-II 9

Knowledge Representation and Reasoning: Knowledge representation techniques, Propositional and First-Order Logic, Inference in FOL, Resolution, unification, Semantic networks, frames, Ontologies, Rule-based systems and production systems.

UNIT-III 9

Machine Learning and Expert Systems: Overview of Machine Learning, Supervised, Unsupervised, and Reinforcement learning, Basic ML algorithms (Linear Regression, Decision Trees, Naïve Bayes, k-NN, etc.), **Expert systems:** Architecture, Inference engine, Knowledge base, Applications.

UNIT-IV 9

Advanced Topics and Applications: Natural Language Processing (NLP), Robotics and Perception, Planning and Scheduling, Computer Vision basics, **AI in real-world applications:** Healthcare, Finance, Autonomous systems, Ethics in AI and societal impact.

Books & References:

1. S. Russel and P. Norvig, “Artificial Intelligence – A Modern Approach”, Second Edition, Pearson Education, 2012.
2. David Poole, Alan Mackworth, Randy Goebel, “Computational Intelligence: a logical approach”, Oxford University Press, 2012.
3. G. Luger, “Artificial Intelligence: Structures and Strategies for complex problem solving”, Fourth Edition, Pearson Education, 2012
4. J. Nilsson, “Artificial Intelligence: A new Synthesis”, Elsevier Publishers, 1998

Experiments:

1. Implement Breadth-First Search (BFS) and Depth-First Search (DFS) for a Puzzle Problem.
2. Implement A* Search Algorithm Using Heuristics.
3. Create a Simple Reflex Agent and a Goal-Based Agent Simulation.
4. Represent Knowledge Using Propositional Logic and Evaluate Inference Rules.
5. Implement Unification and Resolution Algorithm in First-Order Logic.
6. Build a Semantic Network and Perform Reasoning.
7. Implement Basic Machine Learning Algorithms (e.g., Linear Regression, Decision Tree).
8. Design a Simple Expert System Using Rule-Based Reasoning.
9. Perform Named Entity Recognition and Tokenization Using NLP Toolkit (spaCy/NLTK).
10. Explore Real-World AI Applications in Healthcare or Finance Using a Public Dataset.

EIT-201	:	**Web Development with Django**
Course category	:	Professional Elective (PE)
Pre-requisite Subject	:	NIL
Contact hours/week	:	Lecture: 3 Tutorial: 0 Practical: 2
Number of Credits	:	4
Course Assessment methods	:	Continuous assessment through tutorials, attendance, home assignments, quizzes and One Minor tests and One Major Theory Examination
Course Objectives	:	This course introduces students to web development using the Django framework, a high-level Python web framework that promotes rapid development and clean, pragmatic design. It aims to equip learners with the skills to build dynamic, data-driven web applications.
Course Outcomes	:	The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. Understand the fundamentals of Django and its ecosystem.
2. Learn to write, compile, and upload code using Django.
3. Design web pages with Django for real-world applications.
4. Design Forms and Tables for any web page with Django.
5. Develop any web application using Django.

Topic Covered

UNIT-I 9

Introduction to Web and Django Framework: Basics of web development (HTML, CSS, HTTP), Introduction to Django and MVC/MVT architecture, Setting up Django environment, Creating first Django project and app, URL dispatcher and views.

UNIT-II 9

Django Models and Database Integration: Introduction to Django ORM, Creating and managing models, Database migrations, Query Sets and model relationships (One To One, Many To Many, Foreign Key), Admin interface customization.

UNIT-III 9

Templates, Forms, and User Management: Django template language (DTL), Static files and template inheritance, Creating and processing forms, Built-in form validation and custom validation,

User authentication (Login, Logout, Signup).

UNIT-IV 9

Django REST Framework and Deployment: Introduction to Django REST Framework (DRF), Creating serializers and API views, Class-based views and routers, Testing and debugging, Deployment with Gunicorn, Nginx, and Heroku or PythonAnywhere.

Books & References

Textbooks:

1. Audrey Roy Greenfeld, Daniel Roy Greenfeld "Two Scoops of Django 3.x", Two Scoops Press, 2020.
2. William S. Vincent "Django for Beginners", WelcomeToCode, 2020.

Reference Books:

1. Peter Baumgartner, Yann Malet "High Performance Django", CreateSpace Independent, 2015.
2. Julia Elman, Mark Lavin "Lightweight Django", O'Reilly Media, 2014.

List of Experiments

1. Create a simple Django project with one app and URL mapping.
2. Design a personal profile app using models and views.
3. Build a student registration form with model-based validation.
4. Customize the Django admin panel to manage model data.
5. Create a blog application with posts, categories, and comments.
6. Add user authentication and session handling (login/logout).
7. Implement template inheritance and static file usage.
8. Use Django ORM for complex queries and data filtering.
9. Develop a simple RESTful API using Django REST Framework**.**

Skill-Based Courses to Qualify for UG Diploma (Engg.) in Information Technology

BIT-209 **Web Programming with Java Script**

Course category	:	Skills-enhancement
Pre-requisite Subject	:	NIL
Contact hours/week	:	Lecture: 2, Tutorial: 0, Practical: 2
Number of Credits	:	3
Course Assessment methods	:	Continuous assessment through practical, attendance, home assignments, quizzes and One Minor test and One Major Theory Examination
Course Objectives	:	This course aims to introduce students to web development using Java technologies. It covers the basics of HTML, CSS, JavaScript, Servlets, JSP, and JDBC, enabling students to design and develop interactive, data-driven web applications. The course also focuses on applying Java EE concepts and MVC architecture to build real-world web solutions.
Course Outcomes	:	1. Understand and apply basic web technologies like HTML, CSS, and JavaScript for front-end development.

2. Develop server-side applications using Java Servlets and JSP.
3. Manage sessions and cookies for user tracking in web applications.
4. Connect web applications to databases using JDBC for data manipulation.
5. Design and implement web applications following the MVC architecture.
6. Use JSTL and Expression Language to simplify JSP development.

Topics Covered

6

UNIT-I

Fundamentals of Web and Front-End Technologies:

Overview of Internet, WWW, HTTP/HTTPS, Introduction to Web Browsers and Web Servers, HTML5: Structure, Forms, Elements, Media, CSS3: Styling, Selectors, Box Model, Layouts, JavaScript Basics: Variables, Functions, Events, DOM Manipulation, Introduction to Client-Side vs Server-Side Scripting.

UNIT-II 6

Java Servlets and HTTP Communication:

Java EE Overview and Servlet Basics, Servlet Lifecycle: init (), service(), destroy(),Handling HTTP Requests and Responses (GET/POST),Session Management: Cookies, URL Rewriting, Hidden Fields, HTTP Session, Request Dispatcher, Servlet Chaining, Servlet Context and Servlet Config, Filters and Event Listeners (Basics)

UNIT-III 6

Java Server Pages (JSP) and MVC Architecture:

Introduction to JSP and Lifecycle, Scripting Elements: Declarations, Scriptlets, Expressions, JSP Directives and Implicit Objects, Exception Handling in JSP, JSP with JavaBeans, Introduction to MVC Design Pattern, Integrating Servlets and JSP in MVC Architecture

UNIT-IV 6

JDBC and Web Application Integration:

JDBC Overview and Architecture, Steps for Database Connectivity in Java, Performing CRUD Operations using JDBC, Statement vs Prepared Statement, Connection Pooling (Basic Concept),Simple Web Application using JSP, Servlet, JDBC, Introduction to JSTL (Java Server Pages Standard Tag Library)

Books & References

1. Kogent Learning Solutions Inc., “Web Programming using Java”, Dreamtech Press, 2008.
2. Bryan Basham, Kathy Sierra, and Bert Bates,“Head First Servlets and JSP”, 2nd Edition, O'Reilly Media, 2008.
3. Marty Hall and Larry Brown, “Core Servlets and JavaServer Pages: Volume 1: Core Technologies”, 2nd Edition, Prentice Hall, 2003.

List of Experiments:

1. Introduction to Web Technologies and Tools (Apache Tomcat, NetBeans/Eclipse, MySQL).
2. Designing a Personal Webpage using HTML and CSS.
3. Client-Side Form Validation using JavaScript.
4. Creating a Basic Java Servlet.
5. Handling HTML Form Data using Servlet (GET and POST Methods).
6. Session Management using Cookies and HTTP Session.
7. Creating Dynamic Web Pages using JSP.
8. Database Connectivity using JDBC.
9. Mini Project using MVC Architecture.
10. Implementing JSTL and Expression Language (EL) in JSP.

BIT-210	**:**	**E-Commerce and its Applications**
Course category	:	Skills-enhancement
Pre-requisite Subject	:	NIL
Contact hours/week	:	Lecture: 2, Tutorial: 0, Practical: 2
Number of Credits	:	3
Course Assessment methods	:	Continuous assessment through tutorials, attendance, home assignments, quizzes and One Minor tests and One Major Theory Examination
Course Objectives	:	To introduce the basic concepts, models, and types of E-Commerce and their relevance in the digital economy. To understand the infrastructure and technologies that support E-Commerce, including the Internet, web servers, and electronic payment systems. To examine the legal, ethical, and security issues related to online business transactions. To explore various E-Commerce applications in different sectors such as retail, banking, education, and supply chain management. To develop an understanding of digital marketing, online advertising, and customer relationship management in an E-Commerce context. To enable students to analyze the strategic and operational aspects of setting up and managing an online business. To encourage awareness of current trends and innovations in E-Commerce, including mobile commerce and social commerce.
Course Outcomes	:	The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course-

1. Understand the fundamental concepts and types of E-Commerce.
2. Analyze the technical infrastructure and platforms that support E-Commerce.
3. Evaluate various electronic payment systems and their security issues.
4. Understand and apply security, ethical, and legal aspects of E-Commerce.
5. Apply E-Commerce concepts to real-world business scenarios.

Topics Covered

UNIT-I **6**

Introduction: Definition and concept of E-Commerce, E-Commerce vs Traditional Commerce, Categories of E-Commerce: B2B, B2C, C2C, C2B, B2G, G2C, Advantages and Limitations of E-Commerce, E-Commerce framework, Growth of E-Commerce and global impact, E-Commerce Business Models: Revenue models, Value propositions.

UNIT-II **6**

E-Commerce Infrastructure and Technology: Internet and WWW as E-Commerce Infrastructure, Hardware and Software for E-Commerce, Client-Server Architecture, Web Hosting and Domain Registration, Types of Websites: Static vs Dynamic, E-Commerce Website Development Tools, Payment Gateways and E-Payment Systems, E-Commerce Security Requirements, Encryption, SSL, Digital Signatures, Firewalls

UNIT-III **6**

Types of Electronic Payment Systems: Credit Cards, Debit Cards, Smart Cards, E-Wallets, Net Banking, Mobile Payment Systems (e.g., UPI, Paytm, Google Pay), Security Issues in E-Payment Systems, Digital Signatures and Certificates, Secure Electronic Transaction (SET), SSL (Secure Socket Layer), Risk management in E-Payments, Legal and ethical issues in E-Payment

UNIT-IV **6**

E-Commerce Security Needs and Dimensions: Confidentiality, Integrity, Availability, **Threats in E-Commerce:** Phishing, Hacking, Malware, DoS Attacks, Firewalls and Cryptography, Cyber Laws and IT Act 2000 (India), Legal Issues in Online Business, Intellectual Property Rights (IPR) in E-Commerce, Privacy Issues and Cyber Ethics.

Books & References-

1. Stair, R. M. & Reynolds, G. W. "PRINCIPLES OF INFORMATION SYSTEMS", 5e, Singapore Thomson Learning.
2. Rayport, J. F. & Jaworski, B. J. "INTRODUCTION TO E-COMMERCE", New York McGraw-Hill Irwin.
3. O'Brien, J. "MANAGEMENT INFORMATION SYSTEMS MANAGING INFORMATION TECHNOLOGY IN THE BUSINESS ENTERPRISE", New Delhi Tata McGraw-Hill.

List of Experiments:

1. Developing Methodology (ER Diagram, Data Flow Diagram etc) of any E Commerce Application
2. Designing its Web Application Interface
3. Implementing Payment System in that Application
4. Implementing Security in that Application
5. Implementing AI in that Application