KOLHAN UNIVERSITY

Chaibasa, Jharkhand, India

Proposed Syllabus for
Four Year Undergraduate Programme (FYUGP)
of

Bachelor of Science in Information Technology (B.Sc. IT)

Major Papers Syllabus

With Effect From
Academic Year 2022 - 2023

As Per Revised Curriculum and Credit Framework for the FYUGP under the provisions of NEP - 2020

Table of Content

Programme Structure for
Four Year Undergraduate Programme (FYUGP)
of
Bachelor of Information Technology (B.Sc.IT)

Sem.	Course Code	Course Title	L–T–P	Credits	Contact Hours
I	AEC–1	Language and Communication Skills: Hindi Composition		2	
	VAC–1	Value Added Course – 1 *(Two papers are to be selected by the students from the list of available options)*		2+2=4	
	SEC–1	Digital Education		3	
	MDC–1	Multi-Disciplinary Course – 1 *(To be selected by the students from the list of available options)*		3	
	MN–1A	Minor FromDiscipline–1 *(To be selected by the students from the list of available options)*		4	
	MJ–1	(Th): C Programming Language	3–0–1	3	45
		(Pr): C Programming Language Lab		1	30
II	AEC–2	Language and Communication Skills: English Composition		2	
	SEC–2	Communication Skills and Personality Development		3	
	MDC–2	Multi-Disciplinary Course – 2 *(To be selected by the students from the list of available options)*		3	
	MN–2A	Minor From Vocational Studies/Discipline–2 *(To be selected by the students from the list of available options)*		4	
	MJ–2	(Th): Data Structure Using C	3–0–1	3	45
		(Pr): Data Structure Lab		1	30
	MJ–3	(Th): Digital Electronics	3–0–1	3	45
		(Pr): Digital Electronics Lab		1	30
III	AEC–3	Language and CommunicationSkills *(To be selected by the students from the list of available options)*		2	
	SEC–3	Mathematical & Computational Thinking Analysis		3	
	MDC–3	Multi-Disciplinary Course– 3 *(To be selected by the students from the list of available options)*		3	
	MN–1B	Minor FromDiscipline–1 *(To be selected by the students from the list of available options)*		4	

	MJ–4	(Th): Database Management System	3–0–1	3	45
		(Pr): DBMS (SQL) Lab		1	30
	MJ–5	(Th): Object Oriented Programming through C++	3–0–1	3	45
		(Pr): Object Oriented Programming through C++ Lab		1	30
IV	AEC-4	Language and CommunicationSkills *(To be selected by the students from the list of available options)*		2	
	VAC–2	Value Added Course – 2 *(To be selected by the students from the list of available options)*		2	
	MN–2B	Minor From Vocational Studies/Discipline – 2 *(To be selected by the students from the list of available options)*		4	
	MJ–6	(Th): Java Programming	3–0–1	3	45
		(Pr): Java Programming Lab		1	30
	MJ–7	(Th): Operating System Concepts	3–0–1	3	45
		(Pr): Operating System Lab		1	30
	MJ–8	(Th): Numerical Methods	3–1–0	4	60
V	MN–1C	Minor From Discipline–1 *(To be selected by the students from the list of available options)*		4	
	MJ–9	(Th): Python Programming	3–0–1	3	45
		(Pr): Python Programming Lab		1	30
	MJ–10	(Th): Computer Networks		4	60
	MJ–11	(Th): Software Engineering		3	45
	IAP	Internship/Apprenticeship/Field Work/Dissertation/Project	0–0–4	4	120
VI	MN–2C	Minor From Vocational Studies/Discipline–2 *(To be selected by the students from the list of available options)*		4	
	MJ–12	(Th): Web Programming	3–0–1	3	45
		(Pr): Web Programming Lab		1	30
	MJ–13	(Th): Design and Analysis of Algorithm	3–1–0	3	45
		(Pr): Design and Analysis of Algorithm Lab		1	30
	MJ–14	(Th): Cloud Computing	3–1–0	4	60

	MJ–15	(Th): Information Security	3–1–0	4	60
VII	MN–1D	Minor From Discipline–1 *(To be selected by the students from the list of available options)*		4	
	MJ–16	(Th): Artificial Intelligence	3–1–0	3	45
		(Pr): Artificial Intelligence Lab		1	30
	MJ–17	(Th): Machine Learning	3–1–0	3	45
		(Pr): Machine Learning Lab		1	30
	MJ–18	(Th): Data Mining	3–0–1	3	45
		(Pr): Data Mining Lab		1	30
	MJ–19	(Th): Soft Computing	3–1–0	4	60
VIII	MN–2D	Minor From Vocational Studies/Discipline – 2 *(To be selected by the students from the list of available options)*		4	
	MJ–20	(Th): Operations Research	3–1–0	4	60
	RC	Research Internship/Field Work/Dissertation		12	
	OR				
	AMJ–1	(Th): Applied Artificial Intelligence	3–1–0	4	60
	AMJ–2	(Th): Fundamentals of Data Science	3–1–0	4	60
	AMJ–3	(Pr): Applied Artificial Intelligence and Data Science Lab	0–0–4	4	120
			Total Credits	**160**	

Exit Options:

- After II Semester - Exit option with Certificate in Information Technology [with a minimum of 40 credits+4 credits (Summer Internship)].
- After IV Semester - Exit option with Diploma in Information Technology [with a minimum of 80 credits+4 credits (Summer Internship)].
- After VI Semester - Exit Option with Bachelor of Information Technology Degree, B.Sc.IT Degree [with a minimum of 120 credits.
- After VIII Semester - Award of Bachelor of Information Technology Honors Degree, B.Sc.IT Degree [with a minimum of 160 credits.

Programme Educational Objectives and Programme Outcomes of Bachelor of Information Technology (B.Sc.IT)

Programme Educational Objectives:

1. **Fundamental Knowledge** – To provide students with a strong foundation in computer science, programming, mathematics and information technology concepts.

2. **Programming Proficiency** – To develop expertise in various programming languages (C, C++, Java, Python etc.) and development tools. To develop analytical and logical thinking abilities to solve real-world IT problems.

3. **Software Development** – To equip students with skills in software design, development, and testing using various programming languages.

4. **Networking and Security** – To impart knowledge about computer networks, cyber security, and data protection measures.

5. **Database Management** – To teach students with knowledge of design, implementation, and management of databases using modern database management systems.

6. **Emerging Technologies** – To introduce students to new and evolving technologies like AI, Machine Learning, Cloud Computing, and Data Science.

7. **Project-Based Learning** – To enhance practical knowledge through real world projects, case studies, and practical applications.

8. **Ethical and Social Awareness** – To instill ethical responsibility and awareness of IT's social impact.

9. **Higher Education and Research** – To enable students to pursue further studies or research in IT and related fields.

Programme Outcomes:

1. Students gain a solid understanding of fundamental computer science concepts, including programming languages (such as C, C++, and Java), data structures, algorithms, Database Management System, and operating systems.
2. IT graduates develop proficiency in programming and software development. They learn to write, debug, and maintain code for various applications and scenarios.
3. IT programs often cover web technologies, including HTML, CSS, JavaScript, and web development frameworks. Graduates can create dynamic and interactive web applications.
4. Many IT programs include group projects that foster teamwork and collaboration, preparing students for real-world work environments.
5. Students are prepared for various entry-level roles in the IT industry, such as software developer, web developer, database administrator, system analyst, and more.
6. IT can serve as a stepping stone for further education, such as pursuing a master's degree in computer science or related fields, to specialize in a specific area of interest.

Semester – I
Programme Structure for Four Year Undergraduate Programme (FYUGP)
of
Bachelor of Information Technology (B.Sc.IT)

Sem.	Course Code	Course Title	L–T–P	Credits	Contact Hours
I	AEC–1	Language and Communication Skills: Hindi Composition		2	
	VAC–1	Value Added Course – 1 *(Two papers are to be selected by the students from the list of available options)*		2+2=4	
	SEC–1	Digital Education		3	
	MDC–1	Multi-Disciplinary Course – 1 *(To be selected by the students from the list of available options)*		3	
	MN–1A	Minor FromDiscipline–1 *(To be selected by the students from the list of available options)*		4	
	MJ–1	(Th): C Programming Language	3–0–1	3	45
		(Pr): C Programming Language Lab		1	30
			Total Credits	**20**	

Abbreviations:
Th (Theory), **Pr** (Practical), **L–T–P** (Lecture–Tutorial–Practical), **AEC** (Ability Enhancement Course), **VAC**(Value Added Course), **SEC** (Skill Enhancement Course),**MDC** (Multi Disciplinary Course),**MN–1** (Minor FromDiscipline–1), **MN–2**(Minor From Vocational Studies/Discipline–2), **IAP** (Internship/Apprenticeship/Project),**MJ** (Major Disciplinary/Interdisciplinary Courses)

MJ–1 (Th) : C Programming Language		
3 Credit	**45 Class Hours**	**Semester I.**

Objectives:

This course helps the students in understanding a powerful, portable and flexible structured programming language which is suitable for both systems and applications programming. It is a robust language which contains a rich set of built–in functions and operators to write any complex program.

Learning Outcomes:

After completion of this course, a student will be able to–

- Choose the loops and decision-making statements to solve the problem.
- Implement different Operations on arrays.
- Use functions to solve the given problem.
- Understand pointers, structures and unions.
- Implement file Operations in C programming for a given application.

Outline of the Course

Minimum Class Hours		Exam Time (Hours)		Credits		Marks								
						Semester Internal		End Semester		Full Mark		Pass Marks		Total Marks
Th	**Pr**	**Th**	**Pr**	**Th**	**Pr**	**Th**	**Pr**	**Th**	**Pr**	**Th**	**Pr**	**Th**	**Pr**	**Th + Pr**
45	30	3	3	3	1	15	N/A	60	25	75	25	30	10	75+25=100
Marks Distribution of End Semester Practical Examination														
● Experiments – 15 Marks ● Viva-Voce – 05 Marks ● Practical File – 05 Marks														

Semester Examination and Distribution of Marks

End Semester Examination (ESE): 60 Marks

S.No	Questions		Marks
	Group -'A'		
1	Five very short answer type questions (MCQ not to be set)	1 × 5	5
2	Two short answer type questions	5 × 2	10
	Group -'B'		
3	Descriptive type question – three out of five	15 × 3	45
		Total Marks	**60**

Semester Internal Examination (SIE): 15 Marks

S.No	Questions		Marks
	Group -'A'		
1	Five very short answer type questions	1 × 5	5
	Group -'B'		
3	Descriptive type question – one out of two	5 × 1	5
4	Attendance/ overall class performance in the semester		5
		Total Marks	**15**

Detailed Syllabus

Unit1 5 classes	**C fundamentals**: Introduction to C, Character Set, Keywords, Identifiers ,Constants, Variables, Storage class, Data types, Operators & Expressions, Header files, Library files, Pre-processor directives, #include and #define.
Unit2 10 classes	**Decision making and Branching:** Decision making with if statement– Simple if statement, The if …. Else statement, Nesting of if …. Else statement, The else…if ladder, The switch-case statement, The? : Operator. **Decision making and Looping:** The while statement, The do statement, The for statement, Jumps in loops. break, continue, go to statement
Unit3 10 classes	**Arrays:** One - dimensional arrays, Declaration of one – dimensional arrays, Two – dimensional arrays, Declaration of two – dimensional arrays, Multi – dimensional arrays. **Character Arrays and String:** Declaring and initializing string variables, Reading string from terminal, writing string to screen, Putting string together, Comparison of Two strings, String handling functions, Other features of strings
Unit4 8 classes	**User defined functions:** A multi–function program, Definition of function, Function calls, Function declaration, Category of functions, Nesting of functions, Recursion, Passing arrays to functions, Passing strings to functions
Unit5 6 classes	**Structures,UnionsandFileHandling**:Definingastructure,Declaringstructure variables,Accessingstructuremembers,Arraysofstructures,Arrayswithinstructures, Structures within structures, Structures and functions, Union.
Unit6 6 classes	**Pointers:** Understanding pointers, Accessing the address of a variable, declaring pointer variables, Pointer expressions, Array of pointers, Pointers to function, Pointers and structures. **File Management:** Defining and opening a file, Closing a file, Input/Output Operations on files

Text Books:

- Kanetkar Y., **Let Us C** (Third Edition), New Delhi: BPB Publications, 1999
- Gottfried, B. S., **Theory and Problems of Programming with C**, New Delhi: Tata McGraw-Hill Publication, 1997
- Balaguruswamy E. **Programming in ANSI C** (Second Edition), New Delhi: Tata McGraw-Hill Publication, 1992

Reference Books:

- Dennis Ritchie, **The C Programming Language**, New Delhi: Pearson Education
- R. B. Patel, **Fundamental of Computers and Programming in C**, Khanna Book Publishing Compa ny PVT. LTD. Delhi, India, 1st edition, 2008

MJ–1(Pr): C Programming Lab		
1 Credit	**15 Class Hours (30 Hours)**	**Semester I**

Objectives:

- To develop programs in C using basic Programming Constructs
- To develop applications in C using Arrays and Strings
- To design and implement applications in C using Functions, Structures
- To develop applications in C using Files

List of Programs as Assignments:

- Write a C program to find ASCII value of a character entered by the user.
- Write programs using decision-making constructs.
- Write a program to find whether the given year is leap year or not? (Hint: not every centurion year is a leap. For example, 1700, 1800 and 1900 is not a leap year)
- Write a C program to perform the simple Calculator operations, namely, addition, subtraction, multiplication, and division.
- Write a program to check whether a given number is Armstrong number or not?
- Write a program to check whether a given number is odd or even?
- Write a C program to print pattern

1.
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*
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3.
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   *
  ***
 *****
*******
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- Write a program to find out the average of 4 integers.
- Write a program to display array elements using two dimensional arrays.
- Write a program to perform swapping using function.
- Write a program to display all prime numbers between two interval using functions.
- Write a program to reverse a sentence using recursion.
- Write a program to find the factorial of a given number using Recursion.
- Write a program to find the GCD of two numbers using Recursion.
- Write a program to get the largest element of an array using the function.
- Write a program to concatenate two strings.
- Write a program to find the length of String.
- Write a program to find the frequency of a character in a string.
- Write a program to store Student Information in Structure and Display it.
- The annual examination is conducted for10students for five subjects.
- Write a program to read the data and determine the following:
  (a) Total marks obtained by each student.
  (b) The highest marks in each subject and the marks of the student who secured it.
  (c) The student who obtained the highest total marks.
- Insert, update, delete and append telephone details of an individual or a company into a telephone directory using random access file.

Note: Additional lab assignments may be included based on topics covered in the theory paper.

Semester – II
Programme Structure for Four Year Undergraduate Programme (FYUGP)
of
Bachelor of Information Technology (B.Sc.IT)

Sem.	Course Code	Course Title	L–T–P	Credits	Contact Hours
II	AEC–2	Language and Communication Skills: English Composition		2	
	SEC–2	Communication Skills and Personality Development		3	
	MDC–2	Multi-Disciplinary Course – 2 *(To be selected by the students from the list of available options)*		3	
	MN–2A	Minor From Vocational Studies/Discipline–2 *(To be selected by the students from the list of available options)*		4	
	MJ–2	(Th): Data Structure using C	3–0–1	3	45
		(Pr): Data Structure Lab		1	30
	MJ–3	(Th): Digital Electronics	3–0–1	3	45
		(Pr): Digital Electronics Lab		1	30
			Total Credits	**20**	

Abbreviations:
Th (Theory), **Pr** (Practical), **L–T–P** (Lecture–Tutorial–Practical), **AEC** (Ability Enhancement Course), **VAC** (Value Added Course), **SEC** (Skill Enhancement Course), **MDC** (Multi Disciplinary Course, **MN–2** (Minor From Vocational Studies/Discipline–2, **MJ** (Major Disciplinary/Interdisciplinary Courses).

MJ–2 (Th) : Data Structure Using C		
3 Credit	**45 Class Hours**	**Semester II.**

Objectives:

The main objectives of the course are as follows–

- To know details about the Data Structure
- Applications, advantages and limitations of various data structures.
- To know real life use and implementation of various data structures.
- Analyze and compare the different algorithms.

Learning Outcomes:

After completion of this course, a student will be able to–

- Understand the need for Data Structures when building application.
- Design and employ appropriate data structures for solving computing problems.
- Ability to calculate and measure efficiency of algorithms.

Outline of the Course

Minimum Class Hours		Exam Time (Hours)		Credits		Marks								
						Semester Internal		End Semester		Full Mark		Pass Marks		Total Marks
Th	**Pr**	**Th**	**Pr**	**Th**	**Pr**	**Th**	**Pr**	**Th**	**Pr**	**Th**	**Pr**	**Th**	**Pr**	**Th + Pr**
45	30	3	3	3	1	15	N/A	60	25	75	25	30	10	75+25=100
Marks Distribution of End Semester Practical Examination														
● Experiments – 15 Marks ● Viva-Voce – 05 Marks ● Practical File – 05 Marks														

Semester Examination and Distribution of Marks

End Semester Examination (ESE): 60 Marks

S.No	Questions		Marks
	Group -'A'		
1	Five very short answer type questions (MCQ not to be set)	1 × 5	5
2	Two short answer type questions	5 × 2	10
	Group -'B'		
3	Descriptive type question – three out of five	15 × 3	45
		Total Marks	**60**

Semester Internal Examination (SIE): 15 Marks

S.No	Questions		Marks
	Group -'A'		
1	Five very short answer type questions	1 × 5	5
	Group -'B'		
3	Descriptive type question – one out of two	5 × 1	5
4	Attendance/ overall class performance in the semester		5
		Total Marks	**15**

Detailed Syllabus

Unit 1 5 classes	**Algorithms and Analysis of Algorithms**: Definition, Structure and Properties of Algorithms, Development of an Algorithm, Data Structures and Algorithms, Data Structure – Definition and Classification, Efficiency of Algorithms, Asymptotic Notations, Average, Best and Worst case Complexities.
Unit 2 10 classes	**Arrays, Stacks and Queues**: Array Operations, Number of Elements in an Array, Representation of Arrays in Memory, Applications of Array, Stack- Introduction, Stack Operations, and Applications of Stack., Queues- Introduction, Operations on Queues, Circular Queues, Other Types of Queues, Applications of Queues.
Unit 3 10 classes	**Linked List, Linked Stacks and Linked Queues**: Singly Linked Lists, Circularly Linked Lists, Doubly Linked Lists, Applications of Linked Lists. Introduction to Linked Stack and Linked Queues, Operations on Linked Stacks and Linked Queues, Implementations of Linked Representations, Applications of Linked Stacks and Linked Queues.
Unit 4 10 classes	**Trees, Binary Trees, BST, and Graph**: Trees: Definition and Basic Terminologies, Representation of Trees, Binary Trees: Basic Terminologies and Types, Representation of Binary Trees, Binary Tree Traversals Introduction, BST: Definition and Operations, Graph-: Definition and adjacency lists & adjacency matrix Operations.
Unit 5 10 classes	**Sorting and searching**: Introduction, Selection Sort, Insertion Sort, Quick Sort, Bubble Sort, Heap Sort. Searching: Introduction, Sequential Search and Binary Search.

Text Books:

1. BalujaG S, "**Data Structure through C"**, Ganpat Rai Publication, New Delhi, 2015.
2. Horowitz E., Sahni S., Susan A., "**Fundamentals of Data Structures in C"**, 2nd Edition, University
3. Reema Thareja; **Data Structures Using C**; Oxford University Press, India

Reference Books:

- Kamathane;**Introduction to Data structures**; Pearson Education
- Y. Kanitkar; **Data Structures Using C**; BPB

MJ–2 (Th) : Data Structure Lab		
1 Credit	**15 Class Hours (30 Hours)**	**Semester II.**

Objectives:

The main objectives of the course are as follows–

- To be able to practically implement the data structures like stack, queue, linked-list etc.
- To implement linear and non-linear data structures.
- To understand the different operations of binary search trees.

List of Programs as Assignments:

- Program to implement stack using arrays.
- Program to convert infix notation to postfix notation using stacks.
- Program to implement queue using arrays.
- Program to implement circular queue using arrays.
- Program to create add remove & display element from single linked list.
- Program to count number of nodes in linear linked list.
- Program to accept a singly linked list of integers & sort the list in ascending order.
- Program to represent polynomial using linked list.
- Program for the creation of binary tree, provide insertion & deletion in c.
- Program for pre-order, post-order & in-order traversals of a binary tree using non recursive.
- Program to count no, of leaves of binary tree.
- Program to implement bubble sort program using arrays.
- Program to implement merge sort using arrays.
- Program to implement selection sort program using arrays.
- Program to implement insertion sort program using arrays.
- Program to implement linear search using arrays.
- Program to implement binary search using arrays.

Note: Additional lab assignments may be included based on topics covered in the theory paper.

MJ–3 (Th) : Digital Electronics		
3 Credit	**45 Class Hours**	**Semester II.**

Objectives:

- Understand the Truth Table.
- Identify the number of variables and their simplification importance.
- Understand different circuits for the implementation of Boolean equations.
- Describe performance evaluation of computers, computer architecture and organization, computer arithmetic, Memory and CPU design.

Learning Outcomes:

At the end of the course, students will be able to–

- Minimize the circuit diagrams by use of K-Map concepts and Boolean algebra.
- Analyze the outcome of the circuit designed.
- Design and Analysis of a given digital circuit – combinational and sequential.
- Use Boolean simplification techniques to design a combinational hardware circuit.

Outline of the Course

Minimum Class Hours		Exam Time (Hours)		Credits		Marks								
						Semester Internal		End Semester		Full Mark		Pass Marks		Total Marks
Th	**Pr**	**Th**	**Pr**	**Th**	**Pr**	**Th**	**Pr**	**Th**	**Pr**	**Th**	**Pr**	**Th**	**Pr**	**Th + Pr**
45	30	3	3	3	1	15	N/A	60	25	75	25	30	10	75+25=100
Marks Distribution of End Semester Practical Examination														
● Experiments – 15 Marks ● Viva-Voce – 05 Marks ● Practical File – 05 Marks														

Semester Examination and Distribution of Marks

End Semester Examination (ESE): 60 Marks

S.No	Questions		Marks
	Group -'A'		
1	Five very short answer type questions (MCQ not to be set)	1 × 5	5
2	Two short answer type questions	5 × 2	10
	Group -'B'		
3	Descriptive type question – three out of five	15 × 3	45
		Total Marks	**60**

Semester Internal Examination (SIE): 15 Marks

S.No	Questions		Marks
	Group -'A'		
1	Five very short answer type questions	1 × 5	5
	Group -'B'		
3	Descriptive type question – one out of two	5 × 1	5
4	Attendance/ overall class performance in the semester		5
		Total Marks	**15**

Detailed Syllabus

Unit 1 10 classes	**Binary Systems And Data Representation:** Digital Systems, Binary Numbers, Number Base Conversions, Octal and Hexadecimal Numbers, Complements, Subtraction of Unsigned Numbers, Fixed-Point Representation, Floating-Point Representation, Signed Binary Numbers, Binary Codes, Binary Storage and Registers, Binary Logic.
Unit 2 15 classes	**Digital Logic Circuits**: Digital Computers, Logic Gates, Boolean algebra, Complement of a Function, Map Simplification, Product-of-sum simplification, Don't care conditions. **Combinational Logic:** Combinational Logic Circuits &Realization with Logic Gates – Half & Full Adders and codes, Multiplexers, De-multiplexes, Encoders, Decoders, Codes Converters, Sequential Circuits, JK, RS, T, D, Master – Slaves Flip – Flop.
Unit 3 10 classes	**Digital Components**: Integrated Circuits, Registers, Register with parallel load, Shift Registers, Bidirectional Shift Registers, Binary Counters, Binary counter with parallel load, Synchronous and Asynchronous Counters.
Unit 4 10 classes	**Central Processing Unit**: Introduction, General Register Organization, Stack Organization, Register Stack, Memory Stack, , Evaluation of Arithmetic Expressions, Instruction Formats, Addressing Modes, Data Transfer and Manipulation, Program Control, Program Interrupt, Types of Interrupts, Reduced Instruction Set Computer (RISC).
Unit 5 15 classes	**Memory Organization:** Memory Hierarchy, Main Memory, RAM and ROM Chips, Memory Address Map, Auxiliary Memory, Magnetic Disks and Tape, Associative Memory, Hardware Organization, Read/Write Operation, Cache Memory, Associative Mapping, Direct Mapping, Virtual Memory, Address Space and Memory Space, Address Mapping Using Pages, Associative Memory Page Table, Page Replacement, Memory Management Hardware.

Text Books:

- M. Morris Mano- **Digital Design**, 3rd Edn., Pearson Education, New Delhi - 2005.
- B.Ram –**Fundamental of Microprocessors And Microcontrollers** –Dhanpat Rai Publications,Eighth Edition.

Reference Books:

- **"Modern Digital Electronics"** – R.P. Jain
- "**Fundamental of Digital Circuits" –** A.Anand Kumar

MJ–3 (Th) : Digital Electronics Lab		
1 Credit	**15 Class Hours (30 Hours)**	**Semester II.**

Objectives:

- The main objectives of the course is understand, design, and analyze digital circuits and systems using logic gates, combinational and sequential circuits, Boolean algebra, and number systems for efficient digital computation and processing.

List of Programs as Assignments for MJ-3(Pr):

- Explore the working principles of basic logic gates like AND, OR, NOT, NAND, NOR and XOR. Build and analyze logic circuits using truth tables and Boolean expressions.
- Create practical examples of combinational circuits such as encoders, decoders, multiplexers, and demultiplexers using logic gates.
- Learn about flip-flops, registers, and counters.

Note: Additional lab assignments may be included based on topics covered in the theory paper.

Semester – III
Programme Structure for Four Year Undergraduate Programme (FYUGP)
of
Bachelor of Information Technology (B.Sc.IT)

Sem.	Course Code	Course Title	L–T–P	Credits	Contact Hours
III	AEC–3	Language and Communication Skills *(To be selected by the students from the list of available options)*		2	
	SEC–3	Mathematical & Computational Thinking Analysis		3	
	MDC–3	Multi-Disciplinary Course– 3 *(To be selected by the students from the list of available options)*		3	
	MN–1B	Minor FromDiscipline–1 *(To be selected by the students from the list of available options)*		4	
	MJ–4	(Th): Database Management System	3–0–1	3	45
		(Pr): DBMS (SQL) Lab		1	30
	MJ–5	(Th): Object Oriented Programming through C++	3–0–1	3	45
		(Pr): Object Oriented Programming through C++ Lab		1	30
			Total Credits	**20**	

Abbreviations:
Th (Theory), **Pr** (Practical), **L–T–P** (Lecture–Tutorial–Practical), **AEC** (Ability Enhancement Course), **VAC** (Value Added Course), **SEC** (Skill Enhancement Course), **MDC** (Multi Disciplinary Course, **MN–2** (Minor From Vocational Studies/Discipline–2, **MJ** (Major Disciplinary/Interdisciplinary Courses).

MJ–4 (Th): Data Base Management System		
3 Credit	**45 Hours**	**Semester III.**

Objectives: The objective of the course is to enable students to–

- Provide an introduction to the management of database systems.
- Understand the fundamentals of relational systems including data models, database architectures, and database manipulations**.**
- To understand how to create a database
- To know about the manipulate a database using SQL

Learning Outcomes:

At the end of the course, students will be able to:

- Design a database for a given set of requirements.
- Use SQL.
- Apply normalization techniques on given database.
- Improve the database design by normalization.

Outline of the Course

Minimum Class Hours		Exam Time (Hours)		Credits		Marks								
						Semester Internal		End Semester		Full Mark		Pass Marks		Total Marks
Th	**Pr**	**Th**	**Pr**	**Th**	**Pr**	**Th**	**Pr**	**Th**	**Pr**	**Th**	**Pr**	**Th**	**Pr**	**Th + Pr**
45	30	3	3	3	1	15	N/A	60	25	75	25	30	10	75+25=100
Marks Distribution of End Semester Practical Examination														
● Experiments – 15 Marks ● Viva-Voce – 05 Marks ● Practical File – 05 Marks														

Semester Examination and Distribution of Marks

End Semester Examination (ESE): 60 Marks

S.No	Questions		Marks
	Group -'A'		
1	Five very short answer type questions (MCQ not to be set)	1 × 5	5
2	Two short answer type questions	5 × 2	10
	Group -'B'		
3	Descriptive type question – three out of five	15 × 3	45
		Total Marks	**60**

Semester Internal Examination (SIE): 15 Marks

S.No	Questions		Marks
	Group -'A'		
1	Five very short answer type questions	1 × 5	5
	Group -'B'		
3	Descriptive type question – one out of two	5 × 1	5
4	Attendance/ overall class performance in the semester		5
		Total Marks	**15**

Detailed Syllabus

Unit 1 5 classes	**Databases and Database Users**: Introduction, An example, Characteristics of the Database Approach, Advantages of Using DBMS Approach, A Brief History of Database Applications, Components of Database. **Database System Concepts and Architecture**: Data Models, Schemas, and Instances, Three-schema Architecture and Data Independence, Database Languages and Interfaces, The Database System Environment, Centralized and Client-Server Architectures.
Unit 2 8 classes	**Entity-Relationship(ER) Model** Entity Types, Entity Sets, Attributes and Keys, Relationship Types, Relationship Sets, Roles and Structural Constraints, Weak Entity Types, Refining the ER Design for the Sample Database, ER Diagrams, Naming Conventions and Design Issues
Unit 3 10 classes	**Relational Model**: Relational Model Concepts, Relational Model Constraints and Relational Database Schemas, Update Operations, Transactions and Dealing with Constraint Violations, Unary Relational Operations: SELECT and PROJECT, Relational Algebra Operations from SET Theory, Binary Relational Operations: JOIN and DIVISION **Relational-Database Design:** Pitfalls in Relational-Database Design, Functional Dependencies, Decomposition, Desirable Properties of Decomposition, First Normal Form, Second Normal Form, Third normal Form, Boyce-Codd Normal Form, Fourth Normal Form.
Unit 4 12 classes	**Structured Query Language (SQL)**: Introduction, SQL Environment, Classification of SQL Statements, The ISO SQL Data Types, SQL Operators, Integrity Constraints, Data Definition–Creating a Database, Creating a Table, Changing a Table Definition, Removing a Table, Creating an Index, Removing an Index, Views, Granting and Revoking Privileges to Users. **Data Manipulation**: Inserting, Updating & Deleting Data from database, Simple Queries, More Complex SQL Queries, Aggregate Functions, Order by Clause, Group by Clause, Having Clause, Joins, Sub Queries.
Unit 5 10 classes	**Transactions and Concurrency Control:** Transaction Concept, Transaction State, Desirable Properties of Transactions, Concurrent Executions, Serializability, Recoverability, Lock-Based Protocols, Timestamp-Based Protocols and Deadlock Handling.

Text Books:

1. Abraham Silberschatz, Henry F. Korth, S. Sudharshan, **"Database System Concepts"**, 7th Edition, Tata McGraw Hill, 2019
2. Elmasri and Navathe, "**Fundamentals of Database Systems"**, 7th Edition, Addison -Wesley, 2016

MJ–4 (Th) : Database Management System Lab		
1 Credit	**15 Class Hours (30 Hours)**	**Semester III.**

Objectives:

The objective of the course is to enable students to–

- To know about the database requirements and determine the entities involved in the system and their relationship to one another.
- To know about the manipulation of database using SQL commands.

List of Programs as Assignments for MJ-4(Pr):

1. Create a table **Employee** with the following fields:
   (Employee_Id, First_Name, Last_Name, Hire_Date, Job_Id, Salary, Mgr_Id, Department_Id)
   Use appropriate data type and perform following task-
   - Add a new field 'Address Char(10)'.
   - Modify the size of Address column to 20.
   - Insert any 5 records into the table.
   - Display the structure of Employee table.
   - List out details of all employees.
   - Remove the field 'Address' from the table.
   - Change the name of the table from Employee to KU_Emp

2. Create an Emp table with the following fields:
   (EmpNo, EmpName, Job, Basic, DA, HRA, PF, GrossPay, NetPay)
   (Calculate DA as 30% of Basic and HRA as 40% of Basic and PF as 12.5% of Basic)

   - Insert Five Records in the following fields (EmpNo, EmpName, Job, Basic)
   - Calculate DA, HRA, PF, GrossPay (Basic+DA+HRA) and NetPay (GrossPay-PF) of all employees.
   - Display all records.
   - If NetPay is less than <Rs. 10,000 add Rs. 1200 as special allowances.
   - Delete all 'Clerks' having Basic 5000 or less.

3. Create a table named Library with appropriate data type of following structure:
   (Book_id, Title, Author, Subject, Publisher, Quantity, Price, Student_id)
   Apply following constraints on the field

   - Book_id must be Primary Key
   - Title must be Unique
   - Quantity should be more than 100
   - Price should be between Rs. 10 and Rs. 5000

   ❖ View all the constraints from the data dictionary
   ❖ Add Foreign Key constraints to Student_id column which references to Student(Student_id). [Create Student(Roll, Name, Book_id(PK)) before adding

the Foreign Key constraints]

- ❖ Describe the structure of the table.
- ❖ Insert records to verify the constraints.

4. Create Teacher table with the following fields(Name, DeptNo, Date_of_joining, DeptName, Location, Salary)

   - Insert five records
   - Give Increment of 25% salary for Mathematics Department .
   - Perform Rollback command
   - Give Increment of 15% salary for Commerce Department
   - Perform commit command

5. A company wishes to maintain a database to automate its operations. Company is divided into certain departments and each department consists of employees. The following two tables describes the automation schemas: Dept (deptno, dname, loc) Emp (empno, ename, job, mgr, hiredate, sal, comm, deptno)

   - Create above tables with appropriate data types
   - Insert details of three departments and details of 5 employees.
   - List the employee name and salary, whose experience is greater than 10 years.
   - Display unique jobs from the table.
   - Display employees of department no. 20 and 30 who have salary between 20000 and 30000.

6. Consider the table Dept (deptno, dname, loc) Emp (empno, ename, job, mgr, hiredate, sal, comm, deptno) created earlier, write following query:

   - Display the manager who is having maximum number of employees working under him?
   - List the names of employees, who take highest salary in their departments.
   - Create a view Emp_Dept , which contains Employee name, job, salary and department name.

Note: Additional lab assignments may be included based on topics covered in the theory paper.

MJ–5(Th): Object Oriented Programming through C++		
3 Credit	**45 Hours**	**Semester-III.**

Objectives: The objective of the course is to enable students to–

- To learn basic concepts of OOPS.
- Creating C++ programs.
- Understand expressions and control structures.

Course Outcomes:

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

- Understand properties of OOPS.
- Learn the use of constructor and destructor.
- Understand file management.

Outline of the Course

Minimum Class Hours		Exam Time (Hours)		Credits		Marks								
						Semester Internal		End Semester		Full Mark		Pass Marks		Total Marks
Th	**Pr**	**Th**	**Pr**	**Th**	**Pr**	**Th**	**Pr**	**Th**	**Pr**	**Th**	**Pr**	**Th**	**Pr**	**Th + Pr**
45	30	3	3	3	1	15	N/A	60	25	75	25	30	10	75+25=100
Marks Distribution of End Semester Practical Examination														
● Experiments – 15 Marks ● Viva-Voce – 05 Marks ● Practical File – 05 Marks														

Semester Examination and Distribution of Marks

End Semester Examination (ESE): 60 Marks

S.No	Questions		Marks
	Group -'A'		
1	Five very short answer type questions (MCQ not to be set)	1 × 5	5
2	Two short answer type questions	5 × 2	10
	Group -'B'		
3	Descriptive type question – three out of five	15 × 3	45
		Total Marks	**60**

Semester Internal Examination (SIE): 15 Marks

S.No	Questions		Marks
1	Five very short answer type questions	1 × 5	5
	Group -'B'		
3	Descriptive type question – one out of two	5 × 1	5
4	Attendance/ overall class performance in the semester		5
		Total Marks	**15**

Detailed Syllabus

Unit 1 10 classes	**Introduction to Object Oriented Programming:** Basic concept of OOP, Comparison of Procedural Programming and OOP, Benefits of OOP, C++ compilation, Abstraction, Encapsulation, Inheritance, Polymorphism, Difference between C and C++.Tokens , Keywords, C++ identifiers; Variables and Constants: Integer, character and symbolic constants; Dynamic initialization of variables, Reference variables, Basic data types in C++ ,Operators, Types of operators in C++, Precedence and associativity of operators, Manipulators.
Unit 2 5classes	**Decision and Control Structures:** if statement, if-else statement, switch statement, Loop: while, do-while, for; Jump statements: break, continue, go to.
Unit 3 10classes	**Introduction to Classes and Objects :** Classes in C++, class declaration, declaring objects, Defining Member functions, Inline member function, Array of objects, Objects as function argument, Static data member and member function, Friend function and friend class. Constructors and Destructors, Default constructor, Parameterized constructor, Copy constructor and its use, Destructors, Constraints on constructors and destructors, Dynamic initialization of objects.
Unit 4 10classes	**Operator Overloading:** Arguments and return value; overloading unary and binary operators: arithmetic operators, manipulation of strings using operators; Type conversions. Virtual Functions and Polymorphism, Categorization of polymorphism techniques: Compile time polymorphism, Run time polymorphism.
Unit 5 10classes	**File Handling:** File classes, Opening and Closing a file, File modes, Manipulation of file pointers, Functions for I/O operations. Arrays, pointers, structures, unions.

Text Books:

- E. Balagurusamy: **Object oriented programming with C++**
- K.R.Venugopal: **Mastering C++**
- Bjarne Stroustrup: **The C++ programming language**.

Reference Books:

- **"C++ Primer"** – Stanley B. Lippman, Josee Lajoie & Barbara Moo
- **" Programming: Principles and Practice Using C++"** - Bjarne Stroustrup.

MJ–5(Pr): Object Oriented Programming through C++ Lab		
1 Credit	**30 Class Hours**	**Semester-III.**

Objectives:

The objective of the course is to enable students to–

- To get a clear understanding of object-oriented concepts.
- To understand object-oriented programming through C++.
- To develop real life applications using Object Oriented Programming Concepts.

List of Programs as Assignments for MJ-5:

- Write a C++ Program to display Names, Roll No., and grades of 3 students who have appeared in the examination. Declare the class of name, Roll No. and grade. Create an array of class objects. Read and display the contents of the array.
- Write a C++ program to declare Struct. Initialize and display contents of member variables.
- Write a C++ program to declare a class. Declare pointer to class. Initialize and display the contents of the class member.
- Given that an EMPLOYEE class contains following members: data members: Employee number, Employee name, Basic, DA, IT, Net Salary and print data members.
- Write a C++ program to read the data of Nemployee and compute Net salary of each employee (DA=52% of Basic and Income Tax (IT) =30% of the gross salary).
- Write a C++ to illustrate the concepts of console I/O operations.
- Write a C++ program to use scope resolution operator. Display the various values of the same variables declared at different scope levels.
- Write a C++ program to allocate memory using new operator.
- Write a C++ program to create multilevel inheritance. (Hint: Classes A1, A2, A.
- Write a C++ program to use pointer for both base and derived classes and call the member function. Use Virtual keyword.

Note: Additional lab assignments may be included based on topics covered in the theory paper.

Semester – IV
Programme Structure for Four Year Undergraduate Programme (FYUGP)
of
Bachelor of Information Technology (B.Sc.IT)

Sem.	Course Code	Course Title	L–T–P	Credits	Contact Hours
IV	AEC-4	Language and CommunicationSkills *(To be selected by the students from the list of available options)*		2	
	VAC–2	Value Added Course – 2 *(To be selected by the students from the list of available options)*		2	
	MN–2B	Minor From Vocational Studies/Discipline – 2 *(To be selected by the students from the list of available options)*		4	
	MJ–6	(Th): Java Programming Language	3–0–1	3	45
		(Pr): Java Programming language Lab		1	30
	MJ–7	(Th): Operating System Concepts	3–0–1	3	45
		(Pr): Operating System Lab		1	30
	MJ–8	(Th): Numerical Methods	3–1–0	4	60
			Total Credits	**20**	

Abbreviations:
Th(Theory), **Pr**(Practical), **L–T–P** (Lecture–Tutorial–Practical), **AEC** (Ability Enhancement Course), **VAC** (Value Added Course), **SEC** (Skill Enhancement Course), **MDC** (Multi Disciplinary Course), **MN–2** (Minor From Vocational Studies/Discipline–2), **MJ** (Major Disciplinary/Interdisciplinary Courses).

MJ–6 (Th): Java Programming		
3 Credit	**45 Hours**	**Semester IV.**

Objectives: The objective of the course is to enable students to–

- Improve their programming skills in core Java
- Use the Java packages, applets for software development
- Use the knowledge of object-oriented programming through Java

Learning Outcomes:

By the end of the course, students will be able to:

- Elaborate the use of JDK of various versions for programming
- Identify the latest know-how related to the new developments in the field of Java.
- Apply the knowledge gained for their project work as well as to develop some GUI applications.

Outline of the Course

Minimum Class Hours		Exam Time (Hours)		Credits		Marks								
						Semester Internal		End Semester		Full Mark		Pass Marks		Total Marks
Th	**Pr**	**Th**	**Pr**	**Th**	**Pr**	**Th**	**Pr**	**Th**	**Pr**	**Th**	**Pr**	**Th**	**Pr**	**Th + Pr**
45	30	3	3	3	1	15	N/A	60	25	75	25	30	10	75+25=100
Marks Distribution of End Semester Practical Examination														
● Experiments – 15 Marks ● Viva-Voce – 05 Marks ● Practical File – 05 Marks														

Semester Examination and Distribution of Marks

End Semester Examination (ESE): 60 Marks

S.No	Questions		Marks
	Group -'A'		
1	Five very short answer type questions (MCQ not to be set)	1 × 5	5
2	Two short answer type questions	5 × 2	10
	Group -'B'		
3	Descriptive type question – three out of five	15 × 3	45
		Total Marks	**60**

Semester Internal Examination (SIE): 15 Marks

S.No	Questions		Marks
	Group -'A'		
1	Five very short answer type questions	1 × 5	5
	Group -'B'		
3	Descriptive type question – one out of two	5 × 1	5
4	Attendance/ overall class performance in the semester		5
		Total Marks	**15**

Detailed Syllabus

Unit 1 10 classes	**Introduction of Java:** History and Features of Java, Java Runtime Environment, Java Virtual Machine, Java Development Kit, Java Compiler And Interpreter. Tokens, Data Types, Strings, Variable declaration & initialization, Types of variables, Java Operators and Expressions, Type Conversion, Input/ Output in Java, Command Line Arguments. Decision construct, Looping construct, Arrays , Strings
Unit 2 10 classes	**Classes, Objects and Methods :** Defining a Class, Fields declaration, Method declaration, Creating object, Anonymous object in Java, Accessing class members, Access or Visibility Modifier, this keyword, Method overloading, Constructors, static members. **Inheritance :** Inheritance Basics, Super and Sub class, Types of Inheritance, Overriding methods, super keyword, final (variables, methods and classes), Static and Dynamic Binding, Abstract methods and classes.
Unit 3 10 classes	**Packages, Multithreading and Exception Handling :** **Packag**e: Introduction, Java API Packages, Using System Packages, Naming Conventions, Creating Packages, Accessing Packages, Using a Package, Adding a Class to a Package, Hiding Classes. **Multithreading**: Introduction, Creating Threads, Extending the Thread Class, Stopping and Blocking a Thread, Life Cycle of a Thread, Using Thread Methods, Thread Exceptions, Thread Priority, and Synchronization. **Exception Handling**: Introduction, Types of Errors, Exceptions, Syntax of Exception Handling Code, Multiple Catch Statements, Using finally Statement.
Unit 4 10 classes	**Database Connectivity:** Connectivity using JDBC with MS-Access, Oracle and My-SQL, Threads in JAVA Collection Framework: Collection overview, Collection hierarchy, the collection interface-list interface, set interface, Collection classes-Array List class, linked list class, HashMap Class.
Unit 5 5 classes	**Applet and JSP:** Introduction to Applet, Life cycle of Applet, Introduction to JSP, advantages of JSP.

Text Books:

- E. Balagurusamy; **Programming with JAVA;** McGraw Hill, New Delhi
- Herbert Schildt; **Java:The Complete Reference**; McGraw Hill

Reference Books:

- Raj Kumar Buyya;**Object Oriented Programming with JAVA**; McGraw Hill
- Ken Arnold, James Gosling;**The Java Programming Language**; Addison Wisely
- Wiley;**Java 6 Programming Black Book**;Kogent Learning Solutions

MJ–6 (Pr): Java Programming Lab		
1 Credit	**30 Class Hours**	**Semester IV.**

Objectives:

The objective of the course is to enable students to–

- To teach the students basics of Java programs and its execution.
- Use arrays for data storage and manipulation.
- To organize classes and interfaces in to a single unit using packages.
- Learn how to establish database connections and manage connections.

List of Programs as Assignments for MJ-6(Pr):

- WAJP to take input through command line argument and do the following:
  - Check whether the number is prime.
  - Generate the reverse a number.
- WAJP to compute and display the count of occurrence of 4 in a number. E.g. 4564 will compute 2.
- WAJP to sort a list of numbers in ascending order.
- Write a program in Java to take input of two 3×3 matrices through command line argument and then:
  - Add them up and display the result
  - Subtract them and display the result
  - Multiply them and display product
- WAJP to count the number of words, characters in a sentence.
- WAJP to handle the Exception using try and multiple catch block; the exceptions that you will handle are, number format error, array bound error and divide by zero.
- WAJP to design a class called **Account** using the inheritance and static that show all function of bank (withdrawal, deposit) and generate account number dynamically.
- Develop an Applet that receives an integer in one text field & compute its factorial value & returns it in another text filed when the button "Compute" is clicked.
- Write a program that creates a user interface to perform integer divisions. The user enters two numbers in the text fields, Num1 and Num2. The division of Num1 and Num2 is displayed in the Result field when the Divide button is clicked. If Num1 or Num2 were not an integer, the program would throw a NumberFormatException. If Num2 were Zero, the program would throw an Arithmetic Exception Display the exception in a message dialog box.
- Write a java program that implements a multi-thread application that has three threads. First thread generates random integer every 1 second and if the value is even, second thread computes the square of the number and prints. If the value is odd, the third thread will print the value of cube of the number.
- Write a java program that connects to a database using JDBC and does add deletes, modify and retrieve operations.
- Write a java program to create an abstract class named Shape that contains two integers and an empty method named printArea(). Provide three classes named Rectangle, Triangle and Circle such that each one of the classes extends the class Shape. Each one of the classes contain only the method printArea( ) that prints the area of the given shape.

Note: Additional lab assignments may be included based on topics covered in the theory paper.

MJ–7 (Th): Operating System Concepts		
3 Credit	**45 Hours**	**Semester IV**

Objectives:

The objective of this course is to introduce the students to a layer of software called the Operating Systems, whose job is to manage all the devices of a computer system and provide user programs with a simple interface to the hardware. This paper will familiarize the students with the concepts of process management, process synchronization, and the potential problem of deadlocks.

Learning Outcomes:

After completion of this course, a student will be able to–

- Understand the basic working process of an operating system.
- Understand the importance of process and scheduling.
- Understand the issues in deadlock.

Outline of the Course

Minimum Class Hours		Exam Time (Hours)		Credits		Marks								
						Semester Internal		End Semester		Full Mark		Pass Marks		Total Marks
Th	**Pr**	**Th**	**Pr**	**Th**	**Pr**	**Th**	**Pr**	**Th**	**Pr**	**Th**	**Pr**	**Th**	**Pr**	**Th + Pr**
45	30	3	3	3	1	15	N/A	60	25	75	25	30	10	75+25=100
Marks Distribution of End Semester Practical Examination														
● Experiments – 15 Marks ● Viva-Voce – 05 Marks ● Practical File – 05 Marks														

Semester Examination and Distribution of Marks

End Semester Examination (ESE): 60 Marks

S.No	Questions		Marks
	Group -'A'		
1	Five very short answer type questions (MCQ not to be set)	1 × 5	5
2	Two short answer type questions	5 × 2	10
	Group -'B'		
3	Descriptive type question – three out of five	15 × 3	45
		Total Marks	**60**

Semester Internal Examination (SIE): 15 Marks

S.No	Questions		Marks
	Group -'A'		
1	Five very short answer type questions	1 × 5	5
	Group -'B'		
3	Descriptive type question – one out of two	5 × 1	5
4	Attendance/ overall class performance in the semester		5
		Total Marks	**15**

Detailed Syllabus

Unit 1 9 classes	**Introduction :**Definition of Operating Systems, Functions of Operating Systems, Generations of Operating System, Types of Operating System (Batch Operating System, Mainframe Operating System, Time Sharing Operating System, Real–Time Operating System, Distributed Operating System, Operating System Services, System Calls, Types of System Calls, System Programs, Operating System Structure: Simple Structure, Layered Approach, System Boot.
Unit 2 8 classes	**Processes:** Process Concept (The Process, Process State, Process Control Block), Process Scheduling (Scheduling Queues, CPU Scheduling, Context Switch), Operations on Processes (Process Creation, Process Termination). **Process Scheduling:** Basic Concepts (CPU–I/O Burst Cycle, CPU Scheduler, Preemptive and Non-preemptive Scheduling, Dispatcher), Scheduling Criteria, Scheduling Algorithms (First–Come, First–Served Scheduling, Shortest–Job–First Scheduling, Priority Scheduling, Round–Robin Scheduling, Multilevel Queue Scheduling, Multilevel Feedback Queue Scheduling).
Unit 3 10 classes	**Deadlock Handling:** System Model, Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock.
Unit 4 10 classes	**Memory Management Strategies:** Introduction to Memory Management, Swapping, Memory Management Technique-{Contiguous Memory Allocation (Fixed Size Partitioning, Variable Size Partitioning, Partitioning Algorithms, Fragmentation), Non–contiguous Memory Allocation (Paging, Segmentation, Segmentation with Paging)} **File Management:** File Concept, Access Methods, Directory & Disk Structure, File System Mounting, File Sharing, Protection, File System Structure, File System Implementation, Directory Implementation, Allocation Methods, Free Space Management.
Unit 5 8 classes	**Case Study- The Linux System:** Linux History, Design Principles, Kernel Modules, Process Management, Scheduling (except Symmetric Multiprocessing), Memory Management (except Virtual Memory), File Systems, Input & Output.

Text Books:

- Abraham Silberschatz,Peter B. Galvin, Greg Gagne;**Operating System Concepts** (Tenth Edition); New York: John Wiley and Sons, 2018
- William Stallings; **Operating Systems** (Fourth Edition), New Delhi: Prentice-Hall India, 2003

Reference Books:

- Harvey M. Deitel; **Operating Systems**(Second Edition); New Delhi: Pearson Education
- Pramod Chandra P. Bhatt;**An Introduction to Operating Systems Concept**; New Delhi: Prentice-Hall India

MJ–7 (Pr) : Operating System Lab		
1 Credit	**30 Class Hours**	**Semester IV.**

Objectives:

The main objectives of the course are as follows–

- To make students familiar with the Microsoft Windows and Linux command–line environment. This course serves as a platform for the subsequent labs related to Process Management, Process Scheduling, etc.

Basic Linux Commands

- Briefly explain the following basic Linux commands with examples:
    - man, history, pwd, who, finger, passwd, exit, logout, shutdown, mkdir, cd, ls, cat, cp, cmp, mv, paste, rm, rmdir, find, more, head, tail, echo, sed, grep, date, time, cal, diff, file, sort, chmod, chown, and etc.

- Launch a process (or, program or, application) in the foreground from terminal/command prompt. After launching the process, stop it during the execution.
- Display the list of running in foreground, running in background, force stopped, and pending processes.

- Resume the force stopped and pending processes while keeping them running in the background
- Launch a process in the background directly.
- How can you prioritize a process as per your requirement?

Note: Additional lab assignments may be included based on topics covered in the theory paper.

MJ–8 (Th): Numerical Methods		
4 Credit	**60 Class Hours**	**Semester IV.**

Objectives: The objective of the course is to enable students –

- To choose, develop and apply the appropriate numerical techniques for your problem.
- To provide a basic understanding of the derivation, analysis, and use of these numerical methods**.**

Course Outcomes:
At the end of the course, students will be able to–

- Perform interpolation, approximation, and integration of Functions
- Solve initial values problems governed by ordinary differential equations

Outline of the Course

Minimum Class Hours		Exam Time (Hours)		Credits		Marks								
						Semester Internal		End Semester		Full Mark		Pass Marks		Total Marks
Th	**Pr**	**Th**	**Pr**	**Th**	**Pr**	**Th**	**Pr**	**Th**	**Pr**	**Th**	**Pr**	**Th**	**Pr**	**Th + Pr**
60	N/A	3	N/A	4	N/A	25	N/A	75	N/A	100	N/A	40	N/A	100+N/A=100

Semester Examination and Distribution of Marks

End Semester Examination (ESE): 75 Marks

S.No	Questions		Marks
	Group -'A'		
1	Five very short answer type questions (MCQ not to be set)	1 × 5	5
2	Two short answer type questions	5 × 2	10
	Group -'B'		
3	Descriptive type question –four out of six	15 × 4	60
		Total Marks	**75**

Semester Internal Examination (SIE): 25 Marks

S.No	Questions		Marks
	Group -'A'		
1	Five very short answer type questions	1 × 5	5
2	One short answer type questions	5 × 1	5
	Group -'B'		
3	Descriptive type question – one out of two	10 × 1	10
4	Attendance/ overall class performance in the semester		5
		Total Marks	**25**

***Note**: Students will be allowed to use non-programmable scientific calculator in the End Semester External and Internal Examinations. However, sharing of calculator will not be permitted in the examination.*

Detailed Syllabus

Unit 1 5 classes	**Errors in Numerical Calculations** Numbers and their accuracy, Errors and their Computations- Absolute, Relative and Percentage Error.
Unit 2 8 classes	**Solution of Algebraic and Transcendental Equations** Introduction, Bisection Method, Newton-Raphson Method, Method of False Position and Secant Method.
Unit 3 10 classes	**Interpolation** Introduction, Finite Differences-Forward, Backward Difference, Newton's Forward Difference Interpolation, Newton's Backward Difference Interpolation, Lagrange's Interpolation Formula.
Unit 4 12 classes	**Unit IV: Numerical Differentiation and Integration** Introduction, Numerical Differentiation, Numerical Integration – Trapezoidal Rule, Simpson's 1/3 Rule, Simpson's 3/8 Rule. **Numerical Solution of Ordinary Differential Equations** Solution by Taylor's Series, Euler's method
Unit 5 10 classes	**Unit VI: Numerical Solution of Linear System of Equations** Direct Methods- Matrix Inversion Method, Gauss-Jordan Method, Gaussian Elimination Method.

Text Books:

- S.S. Sastry ,'**Introductory methods of Numerical Analysis**', 5th Edition, Prentice Hall of India, New
- B.S. Grewal, '**Numerical Methods in Engineering & Science**', Khanna Publishers, Delhi

Semester – V
Programme Structure for Four Year Undergraduate Programme (FYUGP)
of
Bachelor of Information Technology (B.Sc.IT)

Sem.	Course Code	Course Title	L–T–P	Credits	Contact Hours
V	MN–1C	Minor From Discipline–1 *(To be selected by the students from the list of available options)*		4	
	MJ–9	(Th): Python Programming	3–0–1	3	45
		(Pr): Python Programming Lab		1	30
	MJ–10	(Th): Computer Networks	3–1–0	4	60
	MJ–11	(Th): Software Engineering	3–1–0	4	60
	IAP	Internship/Apprenticeship/Field Work/Dissertation/Project	0–0–4	4	120
			Total Credits	**20**	

Abbreviations:
Th(Theory), **Pr**(Practical), **L–T–P** (Lecture–Tutorial–Practical), **AEC** (Ability Enhancement Course), **VAC** (Value Added Course), **SEC** (Skill Enhancement Course), **MDC** (Multi Disciplinary Course), **MN–1** (Minor From Discipline–1, **MJ** (Major Disciplinary/Interdisciplinary Courses).

MJ–9 (Th): Python Programming		
3 Credit	**45 Hours**	**Semester V**

Objectives:

- Understand computer programming concept using python language. Explore basic data types, control structures and standard library functions. Explore the basic data structures: List, Tuple, Sets, Dictionaries available in python. Learning Object oriented concept of programming and its implementation in python.

Learning Outcomes:

At the end of the course, students will be able to–

- Solve the basic mathematical problem using python programming.
- Use basic data types control structures and utility functions from standard library for faster programming.
- Use the basic and user defined data structures as per the need of problem. Design and implement the problem using OOP concept of python.

Outline of the Course

Minimum Class Hours		Exam Time (Hours)		Credits		Marks								
						Semester Internal		End Semester		Full Mark		Pass Marks		Total Marks
Th	**Pr**	**Th**	**Pr**	**Th**	**Pr**	**Th**	**Pr**	**Th**	**Pr**	**Th**	**Pr**	**Th**	**Pr**	**Th + Pr**
45	30	3	3	3	1	15	N/A	60	25	75	25	30	10	75+25=100
Marks Distribution of End Semester Practical Examination														
● Experiments – 15 Marks ● Viva-Voce – 05 Marks ● Practical File – 05 Marks														

Semester Examination and Distribution of Marks

End Semester Examination (ESE): 60 Marks

S.No	Questions		Marks
	Group -'A'		
1	Five very short answer type questions (MCQ not to be set)	1 × 5	5
2	Two short answer type questions	5 × 2	10
	Group -'B'		
3	Descriptive type question – three out of five	15 × 3	45
		Total Marks	**60**

Semester Internal Examination (SIE): 15 Marks

S.No	Questions		Marks
	Group -'A'		
1	Five very short answer type questions	1 × 5	5
	Group -'B'		
3	Descriptive type question – one out of two	5 × 1	5
4	Attendance/ overall class performance in the semester		5
		Total Marks	**15**

Detailed Syllabus

Unit 1 8 classes	**Introduction to Python:** Introduction, The History of Python, Features of python language, Getting Started with Python, Programming Style and Documentation, Programming Errors. **Elementary Programming:** Introduction, Writing a Simple Program, Reading Input from the Console, Identifiers, Variables, Assignment Statements, and Expressions, Simultaneous Assignments, Named Constants, Numeric Data Types and Operators, Evaluating Expressions and Operator Precedence, Augmented Assignment Operators, Type Conversions and Rounding.
Unit 2 7 classes	**Control Structures: Selections:** Introduction, Boolean Types, Values, and Expressions, **if** Statements, Two-Way **if-else** Statements, Nested **if** and Multi-Way **if-else if-else** Statements**,** Logical Operators, Conditional Expressions, **Loops**: Introduction, The **while** Loop, The **for** Loop, Nested Loops, Keywords **break** and **continue**
Unit 3 10 classes	**Functions:** Introduction, Defining a Function, Calling a Function, Functions with/without Return Values, Positional and Keyword Arguments, Passing Arguments by Reference Values, Modularizing code, The Scope of Variables, Default Arguments, Returning Multiple Values. **Lists:** Introduction, List Basics, Copying Lists, Passing Lists to Functions, Returning a List from a Function, Searching Lists, Sorting, Processing Two-Dimensional Lists, Passing Two-Dimensional Lists to Functions, Multidimensional Lists.
Unit 4 10 classes	**Tuples, Sets, and Dictionaries:** Introduction, Tuples: Creating Tuples, Basic Tuple Operations, Indexing and Slicing in Tuples, Tuple methods, Sets: Creating Sets, Manipulating and Accessing Sets, Subset and Superset, Set Operations, Comparing the Performance of Sets and Lists, Dictionaries: Creating a Dictionary, Adding, Modifying, and Retrieving Values, Deleting Items, Looping Items, The Dictionary Methods.
Unit 5 10 classes	**Objects and Classes:** Introduction, Defining Classes for Objects, Immutable Objects vs. Mutable Objects, Hiding Data Fields, Class Abstraction and Encapsulation. Inheritance and Polymorphism: Introduction, Super classes and Subclasses, Overriding Methods, The **object** Class, Polymorphism and Dynamic Binding, The **is instance** function. Class Relationships: Association, Aggregation, composition. **Files and Exception Handling:** Introduction, text input and output: opening a file, Writing Data, Reading All Data from a File, Exception Handling.

Text Books:

- **"Introduction to Problem Solving with Python"** - E. Balagurusamy, TMH
- **"Problem Solving and Programming with Python"**, Reema Thareja, Oxford University Press

Reference Books:

- **"Python Programming"**- Reema Thareja
- **"Learn Python In one Day"** – Krishna Rungta

MJ–9(Pr) : Python Programming Lab		
1 Credit	**30 Hours**	**Semester V**

List of Programs as Assignments for MJ-9(Practical):

- Write a program that displays "Hello to Python programming".
- Write a program to read two integers and perform arithmetic operations on them (addition, subtraction, multiplication and division).
- Write a program to read the marks of three subjects and find the average of them.
- Write a program to convert temperature from centigrade (read it as float value) to Fahrenheit.
- Write a Program to Check If a Given Year Is a Leap Year.
- Program to Find the GCD of Two Positive Numbers.
- WAP that prompts the user to enter a four-digit integer and displays the number in reverse order.
- Write Python Program to Find the Sum of Digits in a Number
- WAP to Display the Fibonacci Sequences up to nth Term Where n is provided by the User.
- Write a Program to Check Whether a Number Is Prime or Not.
- Write a Program to Find the Factorial of a Number.
- Write a Program to Demonstrate the Return of Multiple Values from a Function Definition.
- Program to Demonstrate the Use of Default Parameters
- Write Program to Demonstrate the Scope of Variables.
- Write a program to check whether a given String is palindrome or not.
- Write a program to create a list of integer numbers. Sort the elements using any sorting method.
- Write a program to create a lists of integer numbers and perform the linear and binary search.
- Write a Program to Find the Transpose of a Matrix.
- Write a program to perform the matrices multiplication.
- Write a program to create a dictionary for countries name as key and currency as value. Traverse the dictionary with key: value Pairs in using for Loop.
- Write a program to create tuples, and perform the following operations: Merging of tuples, Splitting of a tuple, comparison of two tuples.
- Write a program with "My Rectangle" class having the dimensions as data members and area() as a method member. Calculate the area of each rectangle object created by user.
- Design a class with name "My Complex" to represent the complex number including the constructor overloading, methods to perform the arithmetic operation over the two complex numbers. Write the complete python program for the above design.
- Design a class with name "Distance" to represent the distance in feet and inch. Include the method to calculate the addition of two distances. Write the complete python program for the above design.
- Write a complete program to implement the Employee and its subclasses (Salaried Employee, Daily waged Employee, Commission based employee) given in Hierarchical and multilevel manner. The program should exhibit the use of super key word to invoke the super class constructor.
- Write a program to open a file and perform the reading and writing operation with the file.
- Write a program to count the frequencies of each word from a file.
- Write a program to append a file with the content of another file.
- Write a program to compare two file.
- Write a program to delete and insert a sentence at specified position in a file.
- Write a program to handle an exception using exception handling mechanism of the python.
- Write a program to raise an exception explicitly using raise keyword.

Note: Additional lab assignments may be included based on topics covered in the theory paper.

MJ–10 : Computer Network		
4 Credit	**60 Hours**	**Semester V**

Objectives: The objective of the course is to enable students –

- To provide fundamental concepts and reference models (OSI and TCP/IP) and its functionalists
- To gain comprehensive knowledge about the principles, protocols, and significance of Layers in OSI and TCP/IP
- To know the implementation of various protocols and cryptography techniques

Learning Outcomes:

After completion of this course, a student will be able to–

- Gain insight about basic network theory and layered communication architectures
- Propose algorithms at the appropriate layer for any communication network task
- Provide solutions to various problems in network theory

Outline of the Course

Minimum Class Hours		Exam Time (Hours)		Credits		Marks								
						Semester Internal		End Semester		Full Mark		Pass Mark		Total Marks
Th	**Pr**	**Th**	**Pr**	**Th**	**Pr**	**Th**	**Pr**	**Th**	**Pr**	**Th**	**Pr**	**Th**	**Pr**	**Th + Pr**
60	N/A	3	N/A	4	N/A	25	N/A	75	N/A	100	N/A	40	N/A	100+N/A=75

Semester Examination and Distribution of Marks

End Semester Examination (ESE) : 75 Marks

S.No	Questions		Marks
	Group -'A'		
1	Five very short answer type questions (MCQ not to be set)	1 × 5	5
2	Two short answer type questions	5 × 2	10
	Group -'B'		
3	Descriptive type question – four out of six	15 × 4	60
		Total Marks	**75**

Semester Internal Examination (SIE) : 25 Marks

S.No	Questions		Marks
	Group -'A'		
1	Five very short answer type questions	1 × 5	5
2	One short answer type questions	5 × 1	5
	Group -'B'		
3	Descriptive type question – one out of two	10 × 1	10
4	Attendance/ overall class performance in the semester		5
		Total Marks	**25**

Detailed Syllabus

Unit 1 10 classes	**Introduction to computer networks:** Network Component and Categories - Topologies - Transmission Media - Reference Models: ISO/OSI Model and TCP/IP Model.
Unit 2 10 classes	**Physical Layer:** Digital and Analog Signals - Periodic Analog Signals - Transmission Impairments - Digital data transmission techniques - Analog data transmission techniques - Multiplexing and Spread Spectrum.
Unit 3 15 classes	**Data Link Layer:** Error Detection and Correction - Parity - LRC - CRC - Hamming Code - Flow Control and Error Control - Stop and wait - ARQ - Sliding window - HDLC - Multiple Access Protocols - CSMA - CSMA/CD and CSMA/CA - IEEE 802.3 Ethernet.
Unit 4 15 classes	**Network Layer:** Packet Switching and Datagram approach - IP Addressing methods - Subnetting - Routing - Distance Vector Routing - RIP - Link State Routing - OSPF - BGP - Multicast Routing - MOSPF - DVMRP - Broadcast Routing.
Unit 5 10 classes	**Transport Layer:** Transport Services - UDP - TCP - Congestion Control - Quality of Services (QOS) - Application Layer: Domain Name Space (DNS) - Electronic Mail - WWW - Cryptography Techniques.

Text Books:

- Andrew S. Tanenbaum, David J. Wetherall, "**Computer Networks"**, Fifth Edition, Prentice Hall, 2011.
- Behrouz A. Foruzan, "**Data Communication and Networking",** Fifth Edition, Science Engineering & Math Publications, 2013.

Reference Books:

- W. Stallings, "**Data and Computer Communication"**, Tenth Edition, Pearson Education, 2014.

MJ–11 (Th): Software Engineering		
4 Credits	**60 Hours**	**Semester V**

Objectives: The objective of the course is to enable students –

- To understand the Software Engineering Practice and the Software Engineering Process Models
- To understand Design Engineering, Web applications
- To gain knowledge of the software testing
- To understand Software Project Management

Learning Outcome:

After completion of this course, a student will be able to–

- Assess each module given the overall Software engineering practice
- Enhance the software project management skills
- Comprehend the systematic methodologies involved in SE
- Design and develop a software product in accordance with SE principles

Outline of the Course

Minimum Class Hours		Exam Time (Hours)		Credits		Marks								
						Semester Internal		End Semester		Full Mark		Pass Marks		Total Marks
Th	**Pr**	**Th**	**Pr**	**Th**	**Pr**	**Th**	**Pr**	**Th**	**Pr**	**Th**	**Pr**	**Th**	**Pr**	**Th + Pr**
60	N/A	3	N/A	4	N/A	25	N/A	75	N/A	100	N/A	40	N/A	100+N/A=100

Semester Examination and Distribution of Marks

End Semester Examination (ESE): 75 Marks

S.No	Questions		Marks
	Group -'A'		
1	Five very short answer type questions (MCQ not to be set)	1 × 5	5
2	Two short answer type questions	5 × 2	10
	Group -'B'		
3	Descriptive type question –four out of six	15 × 4	60
		Total Marks	**75**

Semester Internal Examination (SIE): 25 Marks

S.No	Questions		Marks
	Group -'A'		
1	Five very short answer type questions	1 × 5	5
2	Two short answer type questions	5 × 2	10
	Group -'B'		
3	Descriptive type question – one out of two	5 × 1	5
4	Attendance/ overall class performance in the semester		5
		Total Marks	**25**

Detailed Syllabus

Unit 1 9 classes	**Introduction:** Role of Software Engineer - Software Components - Software Characteristics - Software Crisis - Software Engineering Processes - Similarity and Differences from Conventional Engineering Processes - Quality Attributes. Assessment: How Software Engineering Changes? Software Development Life Cycle (SDLC) Models: Water Fall Model, Prototype Model, Spiral Model, Evolutionary Development Models, Iterative Enhancement Models.
Unit 2 8 classes	**Requirement Engineering Process:** Elicitation - Analysis - Documentation - Review and Management of User Needs - Feasibility Study - Information Modeling - Data Flow Diagrams - Entity Relationship Diagrams - Designing the architecture. Assessment: Impact of Requirement Engineering in their problem, Decision Tables, SRS Document, IEEE Standards for SRS, Architectural design, component level design, user interface design, WebApp Design, Submission of SRS Document for Team Project.
Unit 3 10 classes	**Quality concepts - Review techniques - Software Quality Assurance (SQA):** Verification and Validation - SQA Plans - Software Quality Frameworks. Assessment: Framing SQA Plan, ISO 9000 Models, SEI-CMM Model and their relevance to project Management.
Unit 4 10 classes	**Testing** Objectives - Unit Testing - Integration Testing - Acceptance Testing - Regression Testing - Testing for Functionality and Testing for Performance - Top-Down and Bottom-Up Testing - Software Testing Strategies - Strategies: Test Drivers and Test Stubs - Structural Testing (White Box Testing) - Functional Testing (Black Box Testing) - Testing conventional applications - object oriented applications - Web applications - Formal modelling and verification - Software configuration management - Product metrics. Assessment: Team Analysis in Metrics Calculation.
Unit 5 8 classes	**Project Management Concepts** - Process and Project Metrics - Estimation for Software projects - Project Scheduling - Risk Management - Maintenance and Re-engineering. Assessment: Preparation of Risk mitigation plan.

Text Books:

- Rajib Mall, '**Fundamentals of Software Engineering'**, Prentice Hall of India, New Delhi
- Pressman, "**Software engineering A Practitioner's Approach"**, MGH**.**

IAP: Internship/Apprenticeship/Project		
4 Credits	**120 Hours**	**Semester V**

Course Description:

This IAP course aims at providing students with the opportunity to procure practical experience in a professional setting related to their field of study. The students will go in for various tasks such as research, writing, project management, and more, under the guidance of experienced professionals. The program focuses on bridging the gap between academic learning and real-world application, helping students to explore potential career paths. The program will help students in developing essential skills for their careers while also providing them opportunities to actively engage in an on-site experiential learning.

In this Internship/Apprenticeship/Project course the students will have the option to undergo an Apprenticeship or Internship training of 8–week or 2–month duration. The students who do not opt either for Internship or Apprenticeship training will be required to carry out a Field Project based on a topic to be assigned by the concerned department.

Learning Objectives:

- Apply academic knowledge and skills to the real-world tasks and projects in a professional environment.
- Enhance professional skills in research, writing, communication, and project management.
- Gain insight into potential career paths and industries relevant to the student's field of study.
- Strengthen critical thinking and problem-solving skills through engagement with practical challenges and assignments.

Learning Outcomes:

At the end of the Internship/Apprenticeship/Project course, students will be able to–

- Demonstrate the ability to apply academic theories and skills to practical tasks and projects.
- Exhibit proficiency in professional communication, including writing reports, emails, and presenting ideas effectively.
- Manage and complete projects efficiently, demonstrating strong organizational and time–management skills.
- Conduct thorough and efficient research using appropriate methods and sources.
- Build and maintain a network of professional contacts that can support career development.

The Internship/Apprenticeship avenues may include the following:

- Local industry, business organisations, health areas and research laboratories.
- Local governments such as Panchayats, Municipalities and other such bodies, offices of Parliamentarians or other elected representatives, government and non-government social service organisations.
- Media organisations, publication houses, academic institutions, literary and cultural organisations, artists and craft persons.

The students should undertake their Apprenticeship or Internship training preferably in their related discipline in order to enhance their learning.

On successful completion of Internship/Apprenticeship the students will be required to:

- Produce a certificate of having undergone an Internship/Apprenticeship training of 8–week or two–month duration.
- Submit a report of about 40 to 50 pages based on their Internship/Apprenticeship training.

Alternatively, the students who do not opt either for Internship or Apprenticeship training will be required to carry out a Field Project on a topic to be assigned by the concerned department.

The students will prepare their Project/Dissertation of about 40 to 50 pages on their assigned topic sunder the supervision of a faculty.

Examination and Evaluation: The students opting for Internship/Apprenticeship will prepare a Report and submit the same to the department along with a proper certificate of 8–weeks or 2–month duration.

Thestudentsoptingtoundergoaprojectordissertationonthetopicassignedbytheconcerned department will submit a Dissertation/Project report of about 40–50 pages.

The Project Reports/Dissertations submitted by the students will be examined by an external examiner who will also conduct a viva voce examination of the students to assess their understanding of the Dissertation/ Project Report prepared by them.

Internship/ProjectReport or Project/Dissertation	**75marks**
Viva-voce	**25 marks**
Total	**100 Marks**

Semester – VI

Programme Structure for Four Year Undergraduate Programme (FYUGP) of Bachelor of Information Technology (B.Sc.IT)

Sem.	Course Code	Course Title	L–T–P	Credits	Contact Hours
VI	MN–2C	Minor From Vocational Studies/Discipline–2 *(To be selected by the students from the list of available options)*		4	
	MJ–12	(Th): Web Programming Language	3–0–1	3	45
		(Pr): Web Programming Language Lab		1	30
	MJ–13	(Th): Design and Analysis of Algorithm	3–0–1	3	45
		(Pr): Design and Analysis of Algorithm Lab		1	30
	MJ–14	(Th): Cloud Computing	3–1–0	4	60
	MJ–15	(Th): Information Security	3–1–0	4	60
Total Credits				**20**	

Abbreviations:
Th (Theory), **Pr** (Practical), **L–T–P** (Lecture–Tutorial–Practical), **MN–2** (Minor From Discipline–1, **MN–2** (Minor From Vocational Studies/Discipline–2), **MJ** (Major Disciplinary/Interdisciplinary Courses).

MJ–12 (Th): Web Programming		
3 Credit	**45 Hours**	**Semester VI**

Objectives: The objective of the course is to enable students to–

- To learn about basics of web programming
- Learn HTML, Java Script, XML for scripting
- Learn web based programming using ASP.NET
- Learn PHP based programming
- Learn Making static and dynamic websites

Learning Outcomes:

At the end of the course, students will be able to–

- Know the fundamentals of web programming
- Identify .NET technology and framework
- Elaborate on the web based programming
- Perform web based programming. Design static and dynamic websites

Outline of the Course

Minimum Class Hours		Exam Time (Hours)		Credits		Marks								
						Semester Internal		End Semester		Full Mark		Pass Marks		Total Marks
Th	**Pr**	**Th**	**Pr**	**Th**	**Pr**	**Th**	**Pr**	**Th**	**Pr**	**Th**	**Pr**	**Th**	**Pr**	**Th + Pr**
45	30	3	3	3	1	15	N/A	60	25	75	25	30	10	75+25=100
Marks Distribution of End Semester Practical Examination														
● Experiments – 15 Marks ● Viva-Voce – 05 Marks ● Practical File – 05 Marks														

Semester Examination and Distribution of Marks

End Semester Examination (ESE): 60 Marks

S.No	Questions		Marks
	Group -'A'		
1	Five very short answer type questions (MCQ not to be set)	1 × 5	5
2	Two short answer type questions	5 × 2	10
	Group -'B'		
3	Descriptive type question – three out of five	15 × 3	45
		Total Marks	**60**

Semester Internal Examination (SIE): 15 Marks

S.No	Questions		Marks
	Group -'A'		
1	Five very short answer type questions	1 × 5	5
	Group -'B'		
3	Descriptive type question – one out of two	5 × 1	5
4	Attendance/ overall class performance in the semester		5
		Total Marks	**15**

Detailed Syllabus

Unit 1 8 classes	**Web Page Designing** HTML - List - Tables - Images - Forms - Frames - Cascading Style sheets,* XML Document type definition - XML Schemas,* Document Object model.
Unit 2 7 classes	**Understanding XML:** Overview of XML, Creating XML Documents, Rules for Well-Formed XML, Adding Comments, CDATA Sections, Creating a DTD-The Concept of a Valid XML Document, Creating a DTD for an existing XML File.
Unit 3 10 classes	**PHP:** Understanding PHP Basics, Working with variables and constants, Managing PHP Program Flow. Working with Functions, Arrays, Files, Working with Forms and Database, Exploring Cookies, Sessions, and PHP Security.
Unit 4 10 classes	**ASP .NET:** Building Web Forms Using ASP .NET, Exploring ASP .NET Server Controls, Using ASP.NET Server Controls to Create Web Forms, Understanding the Code behind the Page. Working with User Controls, Exposing User Control Properties and Methods, Using ASP .NET Server Controls in User Controls, Using Validation Controls to Improve Web Forms, Uploading Files to a Web Server.
Unit 5 10 classes	**Java Script –** Features of Java Scripts, Variables, Operators, Control statements - Functions - Arrays - Objects - Events - Dynamic HTML with Java Script - Ajax.* Introduction to Java Beans, Working with Java Beans **JDBC** Database Connectivity with MySQL - Servlets - JSP –PHP

Text Books:

- **"Web Technologies(Black Book)"** – Kogent Learning Solutions Inc., Dreamtech Press
- XavierC., "**Web Technology & Design"**, New Age International Publishers, 1st Edn, New Delhi, 2004.

Reference Book:

- RossIvan Bay, **"Web Enable Commercial Application Using HTML, DHTML"**, BPB Publication
- BaiXue, Ekedahl Michael, FarrellJoyce, GosselinDon, ZakDiane, KaparthiShashi, MacintyrePeter, Morrissey Bill, **"The Web Warrior Guide to Web Programming"**, India Edition, Thomson Education.

Further Readings:

- JohnV.Guttag; **Introduction to Computation and Programming using Python**; PHI Learning
- Jason Montojo, Jennifer Campbell, Paul Gries;**An Introduction to Computer Science using Python 3**; SPD

MJ-12 (Pr): Web Programming Lab		
1 Credit	**30 Class Hours**	**Semester VI**

Objective:

The objective of the course is to enable students to–

- Learn the basics of HTML, CSS, JavaScript, and frameworks.
- Implement dynamic and responsive web designs.
- Gain experience with client-side and server-side programming.
- Learn to integrate databases like MySQL, MongoDB, etc.
- Develop complete web applications using modern technologies.

List of Programs as Assignments for MJ-12:

- Write a JavaScript code to find the sum of N natural Numbers. (Use user-defined function)
- Write a JavaScript code block using arrays and generate the current date in words, this should include the day, month and year.
- Create a form for Student information. Write ASP.Net code to find Total, Average, Result and Grade.
- Write a simple program in ASP.Net for i) generating Prime number ii) generate Fibonacci series.
- Write a program in PHP to read and write file using form control.
- Write a program in PHP to add, update and delete using student database.
- Write a program in PHP for setting and retrieving a cookie
- Write a PHP program to Create a simple webpage of a college.
- Write a program in PHP for exception handling for i) divide by zero ii) checking date format.

Note: Additional lab assignments may be included based on topics covered in the theory paper.

MJ–13 (Th): Design and Analysis of Algorithm		
3 Credit	**45 Hours**	**Semester VI**

Objectives:

- The objective of this course is to provide students with a solid foundation in algorithm analysis and design techniques. The course aims to develop students' skills in solving computational problems, analysing algorithm complexity, and designing efficient algorithms.

Learning Outcome:

After completion of this course, a student will be able to–

- Understand the fundamentals of algorithm analysis and design.
- Analyse the time and space complexity of algorithms.
- Apply algorithmic techniques to solve computational problems.
- Design and implement efficient algorithms for real-world scenarios.
- Evaluate and compare different algorithmic approaches for problem solving.

Outline of the Course

Minimum Class Hours		Exam Time (Hours)		Credits		Marks								
						Semester Internal		End Semester		Full Mark		Pass Marks		Total Marks
Th	**Pr**	**Th**	**Pr**	**Th**	**Pr**	**Th**	**Pr**	**Th**	**Pr**	**Th**	**Pr**	**Th**	**Pr**	**Th + Pr**
45	30	3	3	3	1	15	N/A	60	25	75	25	30	10	75+25=100
Marks Distribution of End Semester Practical Examination														
● Experiments – 15 Marks ● Viva-Voce – 05 Marks ● Practical File – 05 Marks														

Semester Examination and Distribution of Marks

End Semester Examination (ESE) : 60 Marks

S.No	Questions		Marks
	Group -'A'		
1	Five very short answer type questions (MCQ not to be set)	1 × 5	5
2	Two short answer type questions	5 × 2	10
	Group -'B'		
3	Descriptive type question – three out of five	15 × 3	45
		Total Marks	**60**

Semester Internal Examination (SIE) : 15 Marks

S.No	Questions		Marks
	Group -'A'		
1	Five very short answer type questions	1 × 5	5
	Group -'B'		
3	Descriptive type question – one out of two	5 × 1	5
4	Attendance/ overall class performance in the semester		5
		Total Marks	**15**

Detailed Syllabus

Unit 1 9 classes	**Introduction to Algorithms** Basics of algorithms and problem-solving techniques, Asymptotic analysis: Big-O notation, time and space complexity, Algorithm design paradigms.
Unit 2 8 classes	**Sorting and Searching Algorithms** Bubble Sort, Selection Sort, Insertion Sort, Merge Sort, Quick Sort, Heap Sort, Linear and Binary Search
Unit 3 10 classes	**Divide and Conquer Algorithms** Binary search, Merge sort, Closest pair problem, Karatsuba multiplication.
Unit 4 10 classes	**Dynamic Programming and Greedy Algorithms** Fibonacci series, Knapsack problem, Dijkstra's algorithm, Prim's algorithm, Huffman coding.
Unit 5 8 classes	**Graph Algorithms and NP-Completeness** Depth-First Search (DFS) and Breadth-First Search (BFS), Shortest path algorithms, Introduction to NP-Completeness and the P vs. NP problem

Text Books:

- "Introduction to the **Design and Analysis of Algorithms"** by Anany Levitin.
- "Algorithm Design Manual" by Steven S. Skiena.

Reference Books:

- **"Design and Analysis of Algorithms" –** S.Sridhar
- **"Algorithm Design"** – M.H.Alsuwaiyel

MJ–13 (Pr): Design and Analysis of Algorithm Lab		
1 Credit	**30 Class Hours**	**Semester VI**

Objectives: The objective of the course is to enable students to–

- Implement Algorithmic Concepts and apply sorting, searching, and optimization techniques practically
- Analyze Time and Space Complexity.
- Solve computational problems using various algorithmic approaches.
- Implement Divide and Conquer, Greedy, Dynamic Programming, and Backtracking methods.

List of Programs as Assignments for MJ-13:

- Write C / C++ Programs to implement Insertion Sort
- Write C / C++ Programs to implement Merge Sort
- Write C / C++ Programs to implement Quick Sort
- Write C / C++ Programs to implement Heap Sort
- Write C / C++ Programs to implement Hashing
- Write C / C++ Programs to implement Fractional Knapsack
- Write C / C++ Programs to implement Matrix Chain Multiplication
- Write C / C++ Programs to implement Longest Common Subsequence
- Write C / C++ Programs to implement Huffman Code
- Write C / C++ Programs to implement Prim's Algorithm
- Write C / C++ Programs to implement Krushkal's Algorithm
- Write C / C++ Programs to implement Dijkstra's Algorithm

Note: Additional lab assignments may be included based on topics covered in the theory paper.

MJ–14 (Th): Cloud Computing		
4 Credit	**60 Hours**	**Semester VI**

Objective:

- The objective of this course is to provide graduate students with the comprehensive and in-depth knowledge of Cloud Computing concepts, technologies, architecture and applications by introducing and researching state-of-the-art in Cloud Computing fundamental issues, technologies, applications and implementations.

Learning Outcome:

After completion of this course, a student will be able to–

- Understand the key dimensions of the challenges and benefits of Cloud Computing.
- Describe the principles of Parallel and Distributed Computing and evolution of cloud computing from existing technologies
- Implement different types of Virtualization technologies and Service Oriented Architecture systems.
- Choose among various cloud technologies for implementing applications.
- Install and use current cloud technologies.

Outline of the Course

Minimum Class Hours		Exam Time (Hours)		Credits		Marks								
						Semester Internal		End Semester		Full Mark		Pass Marks		Total Marks
Th	**Pr**	**Th**	**Pr**	**Th**	**Pr**	**Th**	**Pr**	**Th**	**Pr**	**Th**	**Pr**	**Th**	**Pr**	**Th + Pr**
60	N/A	3	N/A	4	N/A	25	N/A	75	N/A	100	N/A	40	N/A	100+N/A=100

Semester Examination and Distribution of Marks

End Semester Examination (ESE) : 75 Marks

S.No	Questions		Marks
	Group -'A'		
1	Five very short answer type questions (MCQ not to be set)	1 × 5	5
2	Two short answer type questions	5 × 2	10
	Group -'B'		
3	Descriptive type question – four out of six	15 × 4	60
		Total Marks	**75**

Semester Internal Examination (SIE) : 25 Marks

S.No	Questions		Marks
	Group -'A'		
1	Five very short answer type questions	1 × 5	5
2	One short answer type questions	5 × 1	5
	Group -'B'		
3	Descriptive type question – one out of two	10 × 1	10
4	Attendance/ overall class performance in the semester		5
		Total Marks	**25**

Detailed Syllabus

Unit 1 10 classes	**Introduction to Cloud Computing** Introduction: Cloud-definition, benefits, usage scenarios, History of Cloud Computing, Cloud Architecture, Types of Clouds, Players in Cloud Computing, issues in Clouds
Unit 2 10 classes	**Types of Cloud Services and Providers** Types of Cloud services, Software as a Service, Platform as a Service, Infrastructure as a Service, Database as a Service, Monitoring as a Service, Communication as services. Service Providers- Google, Amazon, Microsoft Azure, IBM, Sales force.
Unit 3 10 classes	**Collaborating Using Cloud Services** Collaborating Using Cloud Services Email Communication over the Cloud, CRM Management, Project Management, Event Management, Task Management, Calendar, Schedules, Word Processing, Presentation, Spreadsheet, Databases, Desktop, Social Networks and Groupware
Unit 4 10 classes	**Virtualization for Cloud and Cloud Security** Virtualization for Cloud Need for Virtualization, Pros and cons of Virtualization, Types of Virtualizations, System VM, Process VM, Virtual Machine monitor, Virtual machine properties, HLL VM, Hypervisors, Xen, KVM, VMWare, Virtual Box, Hyper-V
Unit 5 5 classes	**Application of clouds in:** Health care, Biology, CRM, ERP, Social Networking, Productivity and Geosciences. Cloudlets for Mobile Cloud Computing.

Text Books:

- **"Cloud Computing: Concepts, Technology & Architecture"** by Thomas Erl, Ricardo Puttini, and Zaigham Mahmood
- **"Cloud Computing: A Practical Approach"** by Anthony T. Velte, Toby J. Velte, and Robert Elsenpeter

Reference Books:

- **"Enterprise Cloud Computing: Concepts, Technology & Architecture"** by Gautam Shroff
- "**Cloud Computing"**-: Dr. Kumar Saurabh

MJ–15 (Th): Information Security		
4 Credit	**60 Hours**	**Semester VI**

Objective:

The objective of the course is to enable students to–

- The objective of this course is to provide students with a comprehensive understanding of network security concepts and techniques. The course aims to develop students' skills in identifying network vulnerabilities, implementing security measures, and ensuring the confidentiality, integrity, and availability of networked systems.

Learning Outcome:

After completion of this course, a student will be able to–

- Understand the principles and concepts of network security.
- Identify potential security threats and vulnerabilities in networked systems.
- Implement security measures to protect network infrastructure.
- Apply encryption and authentication techniques to secure network communication.
- Analyze and respond to security incidents in networked environments

Outline of the Course

Minimum Class Hours		Exam Time (Hours)		Credits		Marks								
						Semester Internal		End Semester		Full Mark		Pass Marks		Total Marks
Th	**Pr**	**Th**	**Pr**	**Th**	**Pr**	**Th**	**Pr**	**Th**	**Pr**	**Th**	**Pr**	**Th**	**Pr**	**Th + Pr**
60	N/A	3	N/A	4	N/A	25	N/A	75	N/A	100	N/A	40	N/A	100+N/A=100

Semester Examination and Distribution of Marks

End Semester Examination (ESE): 75 Marks

S.No	Questions		Marks
	Group -'A'		
1	Five very short answer type questions (MCQ not to be set)	1 × 5	5
2	Two short answer type questions	5 × 2	10
	Group -'B'		
3	Descriptive type question – four out of six	15 × 4	60
		Total Marks	**75**

Semester Internal Examination (SIE): 25 Marks

S.No	Questions		Marks
	Group -'A'		
1	Five very short answer type questions	1 × 5	5
2	One short answer type questions	5 × 1	5
	Group -'B'		
3	Descriptive type question – one out of two	10 × 1	10
4	Attendance/ overall class performance in the semester		5
		Total Marks	**25**

Detailed Syllabus

Unit 1 9 classes	**Introduction to Network Security** Basics of network security: confidentiality, integrity, availability, Security threats and vulnerabilities, Security controls and defence mechanisms.
Unit 2 8 classes	**Cryptography and Encryption** Cryptographic algorithms and techniques, Symmetric and asymmetric encryption, Digital signatures and certificates.
Unit 3 10 classes	**Network Security Protocols** Secure Socket Layer (SSL) and Transport Layer Security (TLS), IPsec and Virtual Private Networks (VPNs), Secure Shell (SSH) and Secure File Transfer Protocol (SFTP).
Unit 4 10 classes	**Network Access Control and Firewalls** Access control mechanisms: authentication, authorization, accounting, Network firewalls: types and configurations, Intrusion Detection and Prevention Systems (IDPS).
Unit 5 8 classes	**Network Security Management and Emerging Technologies** Security policy and risk management, Security incident response and handling, Emerging technologies in network security: AI-based security, etc.

Text Books:

- **"Network Security: Private Communication in a Public World"** by Charlie Kaufman, Radia Perlman, and Mike Speciner.
- **"Principles of Computer Security: CompTIA Security+ and Beyond"** by Wm. Arthur Conklin, Greg White, Dwayne Williams, Chuck Cothren, and Roger L. Davis.

Semester – VII

Programme Structure for Four Year Undergraduate Programme (FYUGP) of Bachelor of Information Technology (B.Sc.IT)

Sem.	Course Code	Course Title	L–T–P	Credits	Contact Hours
VII	MN–1D	Minor From Discipline–1 *(To be selected by the students from the list of available options)*		4	
	MJ–16	(Th): Artificial Intelligence	3–0–1	3	45
		(Pr): Artificial Intelligence Lab		1	30
	MJ–17	(Th): Machine Learning	3–0–1	3	45
		(Pr): Machine Learning Lab		1	30
	MJ–18	(Th): Data Mining	3–0–1	3	45
		(Pr): Data Mining Lab		1	30
	MJ–19	(Th): Soft Computing	3–1–0	4	60
Total Credits				**20**	

Abbreviations:
Th(Theory), **Pr**(Practical), **L–T–P** (Lecture–Tutorial–Practical), **AEC** (Ability Enhancement Course), **VAC** (Value Added Course), **SEC** (Skill Enhancement Course), **MDC** (Multi Disciplinary Course), **MN–1** (Minor From Discipline–1, **MJ** (Major Disciplinary/Interdisciplinary Courses).

MJ–16 (Th): Artificial Intelligence		
3 Credit	**45 Hours**	**Semester VII**

Objectives: The objective of the course is to enable students –

- To know the basic functions of different AI branches.
- To understand the functionalities of neural networks.
- To know the application of fuzzy logic.
- To find the basic functions of soft computing.

Learning Outcomes:

After completion of this course, a student will be able to–

- Understand the various characteristics of problem solving agents and apply problem solving through search for AI applications.
- Appreciate the concepts of knowledge representation using Propositional logic and Predicate calculus and apply them for inference/reasoning.
- Understand basics of computer vision and Natural Language Processing and understand their relevance in AI applications.

Outline of the Course

Minimum Class Hours		Exam Time (Hours)		Credits		Marks								
						Semester Internal		End Semester		Full Mark		Pass Marks		Total Marks
Th	**Pr**	**Th**	**Pr**	**Th**	**Pr**	**Th**	**Pr**	**Th**	**Pr**	**Th**	**Pr**	**Th**	**Pr**	**Th + Pr**
45	30	3	3	3	1	15	N/A	60	25	75	25	30	10	75+25=100
Marks Distribution of End Semester Practical Examination														
● Experiments – 15 Marks ● Viva-Voce – 05 Marks ● Practical File – 05 Marks														

Semester Examination and Distribution of Marks

End Semester Examination (ESE) : 60 Marks

S.No	Questions		Marks
	Group -'A'		
1	Five very short answer type questions (MCQ not to be set)	1 × 5	5
2	Two short answer type questions	5 × 2	10
	Group -'B'		
3	Descriptive type question – three out of five	15 × 3	45
		Total Marks	**60**

Semester Internal Examination (SIE) : 15 Marks

S.No	Questions		Marks
	Group -'A'		
1	Five very short answer type questions	1 × 5	5
	Group -'B'		
3	Descriptive type question – one out of two	5 × 1	5
4	Attendance/ overall class performance in the semester		5
		Total Marks	**15**

Detailed Syllabus

Unit 1 10 classes	**Introduction to Al**: What is AI? Intelligent Agents: Agents and environment, the concept of Rationality, the nature of the environment, the structure of agents; Problem-solving: Problem-solving agents; Uninformed search strategies: DFS, BFS; Informed Search: Best First Search, A* search, AO* search, Means End Analysis. Adversarial Search & Games: Two-player zero-sum games, Minimax Search, Alpha-Beta pruning.
Unit 2 8 classes	**Knowledge-based Agents**: The Wumpus world as an example world, Logic, Propositional logic, First-order predicate logic, Propositional versus first-order inference, Unification and lifting, Forward chaining, Backward chaining, Resolution, Truth maintenance systems. **Knowledge in Learning:** What is learning? Types of Learning,: Rote Learning, Learning by Taking Advice, Learning in Problem Solving, Learning from Examples, Winston's Learning Program, Decision Trees.
Unit 3 12 classes	**Introduction to Planning:** Blocks World problem, Strips; Handling Uncertainties: Non-monotonic reasoning, Probabilistic reasoning, Fuzzy logic; Robotics: Fundamentals of Robotics, Robot Kinematics; Computer Vision: Introduction to image processing and classification, object detection.
Unit 4 15 classes	**Natural Language Processing:** Introduction, Syntactic Processing, Semantic Analysis, Discourse and Pragmatic Processing; Expert Systems: Architecture and role of expert systems, two case studies of Expert Systems; Introduction to Machine learning: Supervised learning, unsupervised learning, reinforcement learning; Neural Networks: Introduction, basics of ANN, Deep Learning with basics of CNN, RNN, LSTM and their applications.

Text Books:

- Russell, S. and Norvig, P., **"Artificial Intelligence - A Modern Approach"**, 3rd edition, Prentice Hall
- Nilsson Nils J, **"Artificial Intelligence: A new Synthesis,** Morgan Kaufmann Publishers Inc. San Francisco, CA, ISBN: 978-1-55-860467-4.
- Dan W Patterson, "**Introduction to Artificial Intelligence & Expert Systems"**, PHI Learning 2010.

MJ–16 (Pr): Artificial Intelligence Lab		
1 Credit	**30 Class Hours**	**Semester VII**

Objective: The objective of the course is to enable students to–

- Learn basic AI concepts.
- Implement AI algorithms using Python.
- Solve problems using AI techniques.
- Understand AI applications like NLP and computer vision.
- Develop small AI Projects.

List of Programs as Assignments for MJ-16:

1. Understand fundamentals of knowledge representation
2. Acquire knowledge on the basic concepts and techniques of Machine Learning.
3. Gain knowledge on the basics of computational Intelligence techniques.
4. Build a simple chatbot to answer basics questions.
5. Create a program that suggests whether to carry an umbrella based on weather.

Note: Additional lab assignments may be included based on topics covered in the theory paper.

MJ–17 (Th): Machine Learning		
3 Credit	**45 Hours**	**Semester VII**

Objectives: The objective of the course is to enable students –

- To provide fundamental concepts and techniques of machine learning.
- To gain comprehensive knowledge about the principles of machine learning.

Learning Outcomes:

After completion of this course, a student will be able to–

- Differentiate between supervised and unsupervised learning tasks.
- Differentiate between linear and non-linear classifiers.
- Describe theoretical basis of SVM
- Implement various machine learning algorithms learnt in the course.

Outline of the Course

Minimum Class Hours		Exam Time (Hours)		Credits		Marks								
						Semester Internal		End Semester		Full Mark		Pass Marks		Total Marks
Th	**Pr**	**Th**	**Pr**	**Th**	**Pr**	**Th**	**Pr**	**Th**	**Pr**	**Th**	**Pr**	**Th**	**Pr**	**Th + Pr**
45	30	3	3	3	1	15	N/A	60	25	75	25	30	10	75+25=100
Marks Distribution of End Semester Practical Examination														
● Experiments – 15 Marks ● Viva-Voce – 05 Marks ● Practical File – 05 Marks														

Semester Examination and Distribution of Marks

End Semester Examination (ESE) : 60 Marks

S.No	Questions		Marks
	Group -'A'		
1	Five very short answer type questions (MCQ not to be set)	1 × 5	5
2	Two short answer type questions	5 × 2	10
	Group -'B'		
3	Descriptive type question – three out of five	15 × 3	45
		Total Marks	**60**

Semester Internal Examination (SIE) : 15 Marks

S.No	Questions		Marks
	Group -'A'		
1	Five very short answer type questions	1 × 5	5
	Group -'B'		
3	Descriptive type question – one out of two	5 × 1	5
4	Attendance/ overall class performance in the semester		5
		Total Marks	**25**

Detailed Syllabus

Unit 1 10 classes	**Introduction to Machine Learning and Types** Introduction: Well-Posed learning problems, Basic concepts, Designing a learning system, Issues in machine learning. Types of machine learning: Learning associations, Supervised learning, Unsupervised learning, Reinforcement learning
Unit 2 10 classes	**Decision Tree Learning** Decision tree representation, appropriate problems for decision tree learning, Univariate Trees (Classification and Regression), Multivariate Trees, Basic Decision Tree Learning algorithms, Hypothesis space search in decision tree learning, Inductive bias in decision tree learning, Issues in decision tree learning.
Unit 3 10 classes	**Bayesian Learning** Bayes theorem and concept learning, Bayes optimal classifier, Gibb's algorithms, Naive Bayes Classifier, Bayesian belief networks, The EM algorithm
Unit 4 10 classes	**Artificial Neural Network** Neural network representation, Neural Networks as a paradigm for parallel processing, Linear discrimination, pairwise separation, Gradient Descent, Logistic discrimination, Perceptron, Training a perceptron, Multilayer perceptron, Back propagation Algorithm. Recurrent Networks, dynamically modifying network structure
Unit 5 15 classes	**Genetic Algorithms and Data Mining Techniques** Genetic Algorithms: Basic concepts, Hypothesis space search, Genetic programming, Models of evolution and learning, Parallelizing Genetic Algorithms. Data Mining Techniques for Analysis: Classification: Decision tree induction, Bayes classification, Rule-based classification, Support Vector Machines, Classification Using Frequent Patterns, k-Nearest-Neighbour, Fuzzy-set approach Classifier, Clustering: K-Means, k-Medoids, Agglomerative versus Divisive Hierarchical Clustering Distance Measures in Algorithmic Methods, Mean-shift Clustering

Text Books:

- Mitchell T.M., "**Machine Learning"**, McGraw Hill
- Bishop C., **Pattern Recognition and Machine Learning,** Springer-Verlag

MJ–17 (Th): Machine Learning Lab		
1 Credit	**30 Class Hours**	**Semester VII**

Objective:

The objective of the course is to enable students to–

- Understand basic machine learning concepts.
- Learn to use ML libraries like Scikit-learn and TensorFlow.
- Implement supervised and Unsupervised learning algorithms.
- Improve model accuracy using optimization techniques.

List of Programs as Assignments for MJ-17:

1. Install and set up Python and essential libraries like NumPy and pandas.
2. Introduce scikit-learn as a machine learning library.
3. Write a program to Load and explore the dataset of .CVS and excel files using pandas.
4. Write a program to visualize the dataset to gain insights using Matplotlib or Seaborn by plotting scatter plots, bar charts.
5. Write a program to Handle missing data, encode categorical variables, and perform feature scaling.
6. Write a program to implement a linear regression model for regression tasks and Train the model on a dataset with continuous target variables.
7. Write a program to implement a decision tree classifier using scikit-learn and visualize the decision tree and understand its splits.
8. Write a program to Implement K-Means clustering and Visualize clusters.

Note: Additional lab assignments may be included based on topics covered in the theory paper.

MJ–18 (Th) DATA MINING		
3 Credit	**45 Hours**	**Semester VII**

Objectives:

- To introduce concepts of data mining techniques and its applications in knowledge extraction from databases.

Learning Outcomes:

After completion of this course, a student will be able to–

- Explain the concepts in data mining, recognizing issues in Data Mining
- Practice the preprocessing operations of Data
- Define the methodologies in Data interpretation, transformation and reduction
- Perform Association Rule Mining, Classify and Cluster the data sets into groups

Outline of the Course

Minimum Class Hours		Exam Time (Hours)		Credits		Marks								
						Semester Internal		End Semester		Full Mark		Pass Marks		Total Marks
Th	**Pr**	**Th**	**Pr**	**Th**	**Pr**	**Th**	**Pr**	**Th**	**Pr**	**Th**	**Pr**	**Th**	**Pr**	**Th + Pr**
45	30	3	3	3	1	15	N/A	60	25	75	25	30	10	75+25=100
Marks Distribution of End Semester Practical Examination														
● Experiments – 15 Marks ● Viva-Voce – 05 Marks ● Practical File – 05 Marks														

Semester Examination and Distribution of Marks

End Semester Examination (ESE): 60 Marks

S.No	Questions		Marks
	Group -'A'		
1	Five very short answer type questions (MCQ not to be set)	1 × 5	5
2	Two short answer type questions	5 × 2	10
	Group -'B'		
3	Descriptive type question – three out of five	15 × 3	45
		Total Marks	**60**

Semester Internal Examination (SIE): 15 Marks

S.No	Questions		Marks
	Group -'A'		
1	Five very short answer type questions	1 × 5	5
	Group -'B'		
3	Descriptive type question – one out of two	5 × 1	5
4	Attendance/ overall class performance in the semester		5
		Total Marks	**15**

Detailed Syllabus

Unit 1 15 classes	**Introduction** Basic Data Mining Tasks: [Some things on data warehousing , ETL Tools] Classification, Regression - Time Series Analysis- Prediction - Clustering – Summarization - Association Rules - Sequence Discovery. Data Mining Versus Knowledge Discovery in Databases - The Development of Data Mining, Data Mining Issues, Data Mining Metrics, Social Implications of Data Mining, Data Mining from a Database Perspective. **Data Mining Techniques:** Statistical Perspective on Data Mining, Similarity Measures - Decision Trees.
Unit 2 10 classes	**Classification** **Statistical-Based Algorithms**: Regression – Bayesian Classification. Distance-Based Algorithms: Simple Approach - K Nearest Neighbors. Decision Tree-Based Algorithms: ID3 – C4.5 - CART - Scalable DT techniques.
Unit 3 10 classes	**Clustering** **Similarity and Distance Measures** – Outliers. Hierarchical Algorithms: Agglomerative Algorithms - Divisive Clustering. Partitional Algorithms: Minimum Spanning Tree - Squared Error Clustering Algorithm - K -Means Clustering - Nearest Neighbor Algorithm
Unit 4 10 classes	**Association Rules** **Itemsets –** Basic Algorithms: Apriori Algorithm, Sampling algorithm, Partitioning. Parallel and Distributed algorithms (be specific): Data Parallelism – Task Parallelism. Comparing approaches – Incremental rules

Text Books:

- Margaret H Dunham, **"Data Mining Introductory and Advanced Topics"**, Pearson Education, 2012
- Jiawei Han and Micheline Kamber, "**Data Mining - Concepts and Techniques"**, Third Edition, Elsevier, 2012
- Pang-Ning Tan, Michael Steinbach, Vipin Kumar: **Introduction to Data Mining,** Addison Wesley, Second edition, 2018

MJ–18 (Pr) Data Mining Lab		
1 Credit	**30 Class Hours**	**Semester VII**

Objective:

The objective of the course is to enable students to–

- Understand the basic data mining concepts. Learn to preprocess and clean data.
- Apply data mining techniques like classification, clustering, and association rule mining.
- Use data mining tools like Python or R.
- Apply data mining for decision-making and predictions.

List of Programs as Assignments for MJ-18:

1. Understand the data sets and data preprocessing using ETL tools.
2. Demonstrate the working of algorithms for data mining tasks such association rule mining, classification, clustering and regression.

Note: Additional lab assignments may be included based on topics covered in the theory paper.

MJ–19 (Th): SOFT COMPUTING		
4 Credit	**60 Hours**	**Semester VII**

Objective:

The objective of the course is to enable students –

- To know the basic functions of different AI branches.
- To understand the functionalities of neural networks.
- To know the application of fuzzy logic.
- To find the basic functions of soft computing.

Learning Outcome:

After completion of this course, a student will be able to–

- Solve numerical on Fuzzy sets and Fuzzy Reasoning.
- Solve problems on Genetic Algorithms
- Explain concepts of neural networks
- Develop neural networks models for various applications.

Outline of the Course

Minimum Class Hours		Exam Time (Hours)		Credits		Marks								
						Semester Internal		End Semester		Full Mark		Pass Marks		Total Marks
Th	**Pr**	**Th**	**Pr**	**Th**	**Pr**	**Th**	**Pr**	**Th**	**Pr**	**Th**	**Pr**	**Th**	**Pr**	**Th + Pr**
60	N/A	3	N/A	4	N/A	25	N/A	75	N/A	100	N/A	40	N/A	100+N/A=100

Semester Examination and Distribution of Marks

End Semester Examination (ESE): 75 Marks

S.No	Questions		Marks
	Group -'A'		
1	Five very short answer type questions (MCQ not to be set)	1 × 5	5
2	Two short answer type questions	5 × 2	10
	Group -'B'		
3	Descriptive type question – four out of six	15 × 4	60
		Total Marks	**75**

Semester Internal Examination (SIE): 25 Marks

S.No	Questions		Marks
	Group -'A'		
1	Five very short answer type questions	1 × 5	5
2	One short answer type questions	5 × 1	5
	Group -'B'		
3	Descriptive type question – one out of two	10 × 1	10
4	Attendance/ overall class performance in the semester		5
		Total Marks	**25**

Detailed Syllabus

Unit 1 10 classes	**Introduction to Artificial Intelligence:** Artificial intelligence systems Neural Network, Fuzzy Logic & Genetic Algorithm. Fuzzy Set Theory: Fuzzy Versus Crisp, Crisp Set, Fuzzy Set, Crip Relation, Fuzzy Relations.
Unit 2 8 classes	**Genetic Algorithms:** Basic Concepts, Creation Of Offspring, Working Principle, Encoding, Fitness Function, Reproduction**.**
Unit 3 12 classes	**Genetic Modelling:** Inheritance Operations, Cross Over, Inversion And Deletion, Mutation Operator, Bit Wise Operators, Generation Cycle, Convergence Of Genetic Algorithm, Application, Multi-Level Optimization, Real Life Problems, Difference And Similarities Between GA And Other Traditional Methods, Advanced In GA.
Unit 4 15 classes	**Fundamentals Of Neural Networks:** Basic Concepts Of Neural Network, Human Brain, Model Of An Artificial Neuron, Neural Network Architectures, Characteristic Of Neural Networks, Learning Method, Taxonomy Of Neural Network Architectures, History Of Neural Network Research, Early Neural Network Architectures, Some Application Domains
Unit 5 15 classes	**Back Propagation:** Network Architecture Of Back Propagation Network, Back Propagation Learning, Illustration, Applications, Effect Of Tuning Parameters Of The Back Propagation Neural Network, Selection Of Various Parameters In BPN, Variations Of Standard Back Propagation Algorithm. Associative Memory And Adaptive Resonance Theory, Autocorrelations.

Text Books:

- Rajasekharan S. &Vijayalakshmi G. A. **"Neural Network Fuzzy Logic and Gentic Algorithm Synthesis and Applications"**, Prentice Hall of India PLT, Pai, 2004.
- Jang JyhShing R, Sun C. T., Mizutani E. "**Neuro Fuzzy and Soft Computing –A Computational Approach to Learning and Machine Intelligence"**, Prentice Hall of India, 1997.

Semester – VIII

Programme Structure for Four Year Undergraduate Programme (FYUGP) of Bachelor of Information Technology (B.Sc.IT)

Sem.	Course Code	Course Title	L–T–P	Credits	Contact Hours
VIII	MN–2D	Minor From Vocational Studies/Discipline–2 *(To be selected by the students from the list of available options)*		4	
	MJ–20	(Th): Operations Research	3–1–0	4	60
	AMJ–1	(Th): Applied Artificial Intelligence	3–1–0	4	60
	AMJ–2	(Th): Fundamentals of Data Science	3–1–0	4	60
	AMJ–3	(Pr): Applied Artificial Intelligence and Fundamentals of Data Science Lab	0–0–4	4	120
Total Credits				**20**	

Abbreviations:
Th (Theory), **Pr** (Practical), **L–T–P** (Lecture–Tutorial–Practical), **MN–2** (Minor From Discipline–1, **MN–2** (Minor From Vocational Studies/Discipline–2), **MJ** (Major Disciplinary/Interdisciplinary Courses), **AMJ** (Advance Major Disciplinary/ Interdisciplinary Courses).

MJ–20(Th) :Operations Research		
4 Credit	**60 Hours**	**Semester VIII**

Objectives: The objective of the course is to enable students –

- To understand the fundamental concepts of Operations Research and its application in computing.
- To apply optimization techniques like Linear Programming, Game Theory, and Network Models in IT.
- To implement OR techniques using programming languages like Python and R.
- To explore OR applications in software engineering, AI, and data analytics.
- To enhance problem-solving and decision-making skills using OR models.

Learning Outcomes:

After completion of this course, a student will be able to–

- Understand the basic concepts and importance of Operations Research.
- Solve optimization problems using Linear Programming techniques.
- Apply Network and Game Theory models in computing and decision-making.
- Use Queuing Theory and Simulation for IT and business applications.
- Manage projects efficiently using PERT and CPM techniques.

Outline of the Course

Minimum Class Hours		Exam Time (Hours)		Credits		Marks								
						Semester Internal		End Semester		Full Mark		Pass Marks		Total Marks
Th	**Pr**	**Th**	**Pr**	**Th**	**Pr**	**Th**	**Pr**	**Th**	**Pr**	**Th**	**Pr**	**Th**	**Pr**	**Th + Pr**
60	N/A	3	N/A	4	N/A	25	N/A	75	N/A	100	N/A	40	N/A	100+N/A=100

Semester Examination and Distribution of Marks

End Semester Examination (ESE): 75 Marks

S.No	Questions		Marks
	Group -'A'		
1	Five very short answer type questions (MCQ not to be set)	1 × 5	5
2	Two short answer type questions	5 × 2	10
	Group -'B'		
3	Descriptive type question – four out of six	15 × 4	60
		Total Marks	**75**

Semester Internal Examination (SIE): 25 Marks

S.No	Questions		Marks
	Group -'A'		
1	Five very short answer type questions	1 × 5	5
2	One short answer type questions	5 × 1	5
	Group -'B'		
3	Descriptive type question – one out of two	10 × 1	10
4	Attendance/ overall class performance in the semester		5
		Total Marks	**25**

Detailed Syllabus

Unit 1 10 classes	**Introduction to OR and Linear Programming** Introduction to OR: Origin of Operation Research, Historical Standpoint, Methodology, Different Phases, Characteristics, Scope and Application of OR Research. Linear Programming: Linear Programming Problem Formulation – Graphical solution – Simplex Method – Artificial variables technique – Big –M method
Unit 2 18 classes	**Transportation and Assignment Problems** Transportation Problems: Definition, Linear Form, Solution Method: Northwest corner Method, least cost method, Unbalanced problems and Degeneracy in transportation, Modified Distribution Method Assignment Problems: Formulation, Solutions to Assignment Problems by Hungarian Method, Unbalanced, Maximization Assignment Problems
Unit 3 20 classes	**Network Analysis** Shortest path problems: Problem formulation and applications, Dijkstra's algorithm for single-source shortest paths, Algorithm description and implementation, Time complexity analysis, Floyd-Warshall algorithm for all-pairs shortest paths, Algorithm description and implementation, Time complexity analysis Minimum spanning tree problems: Problem formulation and applications, Kruskal's algorithm, Algorithm description and implementation, Time complexity analysis Prim's algorithm: Algorithm description and implementation, Time complexity analysis Maximum flow problems: Problem formulation and applications, Ford-Fulkerson algorithm, Algorithm description and implementation, Time complexity analysis
Unit 4 12 classes	**Game Theory:** Two-person zero-sum games, Saddle point and minimax theorem, Pure and mixed strategies, solving games using graphical methods and linear programming. **Applications of game theory in various fields:** Economics (oligopoly, Bargaining, auctions), Business (pricing strategies, competitive analysis), Politics and international relations (conflict resolution, arms race), Biology and ecology (evolutionary game theory)

Text Books:

- **"Operations Research: An Introduction**" – Hamdy A. Taha
- **"Introduction to Operations Research"** – Hillier & Lieberman
- **"Python for Operations Research"** – Prof. J. Kallrath

AMJ–1 :Applied Artificial Intelligence		
4 Credit	**60 Hours**	**Semester VIII**

Objective:

The objective of the course is to enable students –

- To know the potential use of AI which can have impact on our everyday life
- To get an exposure to applications of AI in different domains.
- To have understanding of ethical use of AI for a better tomorrow.

Learning Outcomes:

After completion of this course, a student will be able to–

- Learn about the applications of AI in healthcare
- Learn about the applications of AI in the agriculture sector
- Learn about the applications of AI in business and modern industry
- Know about some of the recent developments in AI

Outline of the Course

Minimum Class Hours		Exam Time (Hours)		Credits		Marks								
						Semester Internal		End Semester		Full Mark		Pass Marks		Total Marks
Th	**Pr**	**Th**	**Pr**	**Th**	**Pr**	**Th**	**Pr**	**Th**	**Pr**	**Th**	**Pr**	**Th**	**Pr**	**Th + Pr**
60	N/A	3	N/A	4	N/A	25	N/A	75	N/A	100	N/A	40	N/A	100+N/A=100

Semester Examination and Distribution of Marks

End Semester Examination (ESE) : 75 Marks

S.No	Questions		Marks
	Group -'A'		
1	Five very short answer type questions (MCQ not to be set)	1 × 5	5
2	Two short answer type questions	5 × 2	10
	Group -'B'		
3	Descriptive type question – four out of six	15 × 4	60
		Total Marks	**75**

Semester Internal Examination (SIE) : 25 Marks

S.No	Questions		Marks
	Group -'A'		
1	Five very short answer type questions	1 × 5	5
2	One short answer type questions	5 × 1	5
	Group -'B'		
3	Descriptive type question – one out of two	10 × 1	10
4	Attendance/ overall class performance in the semester		5
		Total Marks	**25**

Detailed Syllabus

Unit 1 10 classes	**Application of AI in Healthcare:** AI in Medical Imaging, AI Diagnostic Tools, AI-Driven Drug Development, Accelerating Drug Discovery using AI, Predicting Disease Outbreaks, Personalized Medicine and treatment, Electronic Health Records management, Patient Data Privacy and Security issues, AI-Driven Telemedicine, AI for Public Health, Early Disease Detection, Preventive Measures AI-Enhanced Medical Education, Simulation and Virtual Training.
Unit 2 15 classes	**Application of AI in Agriculture:** AI-based decision support systems for crop management, crop health and yield prediction, crop disease detection, precision agriculture and precision livestock farming, Soil management: monitoring soil health, predictive modelling, precision irrigation, harvest forecasting, agricultural robots and drones, AI-assisted livestock monitoring and disease detection.
Unit 3 15 classes	**Application of AI in Business and Industry:** Business process automation, improved decision-making, AI-based Predictive Analytics in Business, Fraud Detection in Financial transactions, personalized Customer services, product recommendation.AI for Industry 4.0, industrial process automation, predictive maintenance, quality control, and demand forecasting, supply chain optimization.
Unit 4 10 classes	AI-powered chatbots, ChatGPT, Generative AI, creation of text, image, visual, and audio contents, code generation, concept of large AI models, Ethical issues, bias and fairness of training data, transparency and accountability, Explainable AI.

Text Books:

- Nasr, M., Islam, M. M., Shehata, S., Karray, F., &Quintana, Y. (2021)**."Smart healthcare in the age of AI: recent advances, challenges, and future prospects"**. IEEE Access, 9, 145248-145270.
- Chengoden, R., Victor, N., Huynh-The, T., Yenduri, G., Jhaveri, R. H., Alazab, M., ...&Gadekallu, T. R. (2023)." **Metaverse for healthcare: A survey on potential applications, challenges and future directions"**. IEEE Access.

AMJ–2 : Fundamentals of Data Science		
4 Credit	**60 Hours**	**Semester VIII**

Objective: The objective of the course is to enable students –

- To understand the data science fundamentals and process.
- To learn to describe the data for the data science process.
- To learn to describe the relationship between data.
- To utilize the Python libraries for Data Wrangling.
- To present and interpret data using visualization libraries in Python

Learning Outcomes:

After completion of this course, a student will be able to–

- Understand the fundamental concepts and principles of data science.
- Apply data manipulation techniques using appropriate tools and libraries.
- Analyze and visualize data to extract insights and make data-driven decisions.
- Apply statistical methods and machine learning algorithms to analyze data.
- Communicate data findings effectively through data visualization and storytelling.

Outline of the Course

Minimum Class Hours		Exam Time (Hours)		Credits		Marks								
						Semester Internal		End Semester		Full Mark		Pass Marks		Total Marks
Th	**Pr**	**Th**	**Pr**	**Th**	**Pr**	**Th**	**Pr**	**Th**	**Pr**	**Th**	**Pr**	**Th**	**Pr**	**Th + Pr**
60	N/A	3	N/A	4	N/A	25	N/A	75	N/A	100	N/A	40	N/A	100+N/A=100

Semester Examination and Distribution of Marks

End Semester Examination (ESE) : 75 Marks

S.No	Questions		Marks
	Group -'A'		
1	Five very short answer type questions (MCQ not to be set)	1 × 5	5
2	Two short answer type questions	5 × 2	10
	Group -'B'		
3	Descriptive type question – four out of six	15 × 4	60
		Total Marks	**75**

Semester Internal Examination (SIE) : 25 Marks

S.No	Questions		Marks
	Group -'A'		
1	Five very short answer type questions	1 × 5	5
2	One short answer type questions	5 × 1	5
	Group -'B'		
3	Descriptive type question – one out of two	10 × 1	10
4	Attendance/ overall class performance in the semester		5
		Total Marks	**25**

Detailed Syllabus

Unit 1 10 classes	**Introduction to Data Science** Data Science: Benefits and uses – facets of data - Data Science Process: Overview – Defining research goals – Retrieving data – Data preparation - Exploratory Data analysis – build the model– presenting findings and building applications - Data Mining - Data Warehousing – Basic Statistical descriptions of Data.
Unit 2 10 classes	**Describing Data** Types of Data - Types of Variables -Describing Data with Tables and Graphs – Describing Data with Averages - Describing Variability - Normal Distributions and Standard (z) Scores
Unit 3 15 classes	**Describing Relationships** Correlation –Scatter plots –correlation coefficient for quantitative data – computational formula for correlation coefficient – Regression –regression line – least squares regression line – Standard error of estimate – interpretation of r2 – multiple regression equations –regression towards the mean
Unit 4 15 classes	**Python Libraries For Data Wrangling** Basics of Numpy arrays –aggregations –computations on arrays –comparisons, masks, Boolean logic – fancy indexing – structured arrays – Data manipulation with Pandas – data indexing and selection – operating on data – missing data – Hierarchical indexing – combining datasets – aggregation and grouping – pivot tables
Unit 5 10 classes	**Data Visualization** Importing Matplotlib – Line plots – Scatter plots – visualizing errors – density and contour plots – Histograms – legends – colors – subplots – text and annotation – customization – three dimensional plotting - Geographic Data with Basemap - Visualization with Seaborn.

Text Books:

- **“Python for Data Analysis”:** Data Wrangling with Pandas, NumPy, and I Python" by Wes McKinney.
- **"Data Science for Business: What You Need to Know about Data Mining and Data-Analytic Thinking"** by Foster Provost and Tom Fawcett

AMJ -3: Artificial Intelligence and Data Science Lab		
4 Credit	**(120 Class Hours)**	**Semester VIII**

Objective:

The objective of the course is to enable students to–

- Understand the history, goal, basic concept, application, impact of AI.
- Learn the informed and uninformed search methods.
- Understand the fundamentals of knowledge representation.
- To understand the fundamentals of Data Science and its role in decision-making.
- To analyze large datasets using statistical and machine learning techniques.
- To develop predictive models for business, healthcare, finance, and other domains.
- To use programming languages like Python and R for data analysis.
- To implement big data technologies for handling large-scale data efficiently.
- To explore AI and machine learning applications in data science.

Learning Outcomes:

After completion of this course, a student will be able to–

- Demonstrate an understanding of the history, goal, basic concept, application, impact of AI and its foundations.
- Apply basic principles of AI in problem–solving that require perception, knowledge representation, inference, and learning.
- Demonstrate awareness and a fundamental understanding of various applications of AI and Machine Learning techniques in real–world problem solving.
- Understand the basic concepts and applications of Data Science.
- Analyze large datasets using statistical and machine learning techniques.
- Apply data visualization tools to interpret insights effectively.
- Use programming languages like Python and R for data analysis.
- Implement big data technologies for processing large datasets.
- Ensure ethical data handling and privacy in data-driven solutions.

Outline of the Course

Minimum Class Hours		Exam Time (Hours)		Credits		Marks								
						Semester Internal		End Semester		Full Mark		Pass Marks		Total Marks
Th	**Pr**	**Th**	**Pr**	**Th**	**Pr**	**Th**	**Pr**	**Th**	**Pr**	**Th**	**Pr**	**Th**	**Pr**	**Th + Pr**
N/A	120	N/A	3	N/A	4	N/A	N/A	N/A	100	N/A	100	N/A	40	N/A+100=100

Marks Distribution of End Semester Practical Examination

● Experiments – 60 Marks ● Viva-Voce – 20 Marks ● Practical File – 20 Marks

List of Programs as Assignments for AMJ-1

1. Develop a machine learning-based sentiment analysis model (Python-based Scikit Learn tools)
2. Develop a simple weather prediction system using a regression tool (Python-based Scikit Learn tools).
3. Develop a Diabetes prediction system using ANN (Python-based Scikit Learn tools)
4. Develop a chatbot using existing tools
5. Use chatGPT for various tasks: Writing Essay, Letters, Poem, Coding Assistant, Compose song lyrics, Generate Movie Scripts,
6. Write a program in Python to develop a CNN-based AI system to classify medical images and detect tumors with high accuracy.
7. Write a program in Python to develop an AI-based crop recommendation system using a machine-learning model that predicts the best crop based on environmental factors like nitrogen, phosphorus, potassium, temperature, humidity, pH, and rainfall.
8. Write a program in Python to develop an AI-based Sales Prediction System using machine learning that forecasts future sales based on historical data.

List of Programs as Assignments for AMJ-2

1. Download, install and explore the features of NumPy, SciPy, Jupyter, and Pandas packages.
2. Working with Numpy arrays
3. Working with Pandas data frames
4. Reading data from text files, Excel and the web and exploring various commands for doing descriptive analytics on the Iris data set.
5. Use the diabetes data set from UCI and Pima Indians Diabetes data set for performing the following:
    a. Univariate analysis: Frequency, Mean, Median, Mode, Variance, Standard Deviation, Skewness and Kurtosis.
    b. Bivariate analysis: Linear and logistic regression modeling
    c. Multiple Regression analysis d. Also compare the results of the above analysis for the two data sets.
6. Apply and explore various plotting functions on UCI data sets.
    a. Normal curves
    b. Density and contour plots
    c. Correlation and scatter plots
    d. Histograms
    e. Three dimensional plotting
7. Visualizing Geographic Data with Basemap

Note: Additional lab assignments may be included based on topics covered in the theory paper.

KOLHAN UNIVERSITY

Chaibasa, Jharkhand, India

Proposed Syllabus for
Four Year Undergraduate Programme (FYUGP)
of

Bachelor of Science in Information Technology (B.Sc. IT)

Minor Papers Syllabus

With Effect From
Academic Year 2022 - 2023

As Per Revised Curriculum and Credit Framework for the FYUGP under the provisions of NEP - 2020

Syllabus structure of Minor of Bachelor of Information Technology (B.Sc.IT)
under FYUGP NEP2020
KOLHAN UNIVERSITY, CHAIBASA

Sem	Code	Bachelor of Information Technology (B.Sc.IT) Course Name	Marks Scheme SIE *	Marks Scheme ESE **	Credits
I	MN – 1A	Fundamentals of Information Technology	15	60	4
		Lab on MS Office	x	25	
II	MN – 2A	Entrepreneurship Development	15	60	4
		Entrepreneurship Development Lab	x	25	
III	MN – 1B	Logical Organization of Computer	25	75	4
IV	MN – 2B	Web Technology	15	60	4
		Web Technology Lab	x	25	
V	MN – 1C	E-Commerce And Digital Marketing	25	75	4
VI	MN – 2C	Software Testing	25	75	4
VII	MN – 1D	Management Information Systems	25	75	4
VIII	MN – 2D	Multimedia Application	15	60	4
		Multimedia Application Lab	x	25	

** Semester Internal Exam*

*** End Semester Exam*

MN-1A:Fundamentals of Information Technology		
3 Credits	**45 Class Hours**	**Semester I.**

Course Objectives:

- Understand the basics of information technology.
- Understand Computer Architecture.
- Identify the number of variables and their simplification importance.
- Understand different types Input/Output Peripherals devices.
- Identify Register Transfer, Micro-operations and Central Processing Unit
- Describe performance evaluation of computers, computer architecture and organization, computer arithmetic, Memory, and CPU design.

Course Outcome:

- Students will learn the architecture of computers, peripheral devices, knowledge of fundamental concepts of computers and information technology.

Unit1 (5 classes)	**Introduction to Computer.** Introduction; Digital and Analog Computers; Characteristics of Computer; History of Computer; Generations of Computer; Classification of Computer; TheComputer System; Application of Computers.
Unit2 (15 classes)	**Computer System Hardware.** Computer Architecture Introduction, Central Processing Unit (CPU) Memory, Communication between Various Units of a Computer System, Memory- RAM, ROM. Input/ Output Peripherals Introduction, Keyboard, Pointing Devices, Speech Recognition, Digital Camera, Scanners, Optical Scanners. Introduction, Classification of Output, Hard Copy Output Devices, Printers, Plotters, Computer Output Microfilm (COM), Soft Copy Output Devices, Monitors, Audio Output, Projectors, Terminals.
Unit3 (8 classes)	**Computer Software.** Introduction;TypesofSoftware;SystemSoftware;ApplicationSoftware;Software Acquisition; Operating System (Introduction, Objectives of Operating System, Types of OS, Functions of OS, Process Management, Memory Management, File Management.
Unit4 (7classes)	**Computer Memory.** Introduction; Memory Representation; Memory Hierarchy; CPU Registers; Cache Memory; Primary Memory; Secondary Memory; Access Types of Storage Devices; Magnetic Tape; Magnetic Disk; Optical Disk; Magneto-Optical Disk; How the Computer uses its memory

Unit 5 (5 classes)	**The Internet and Internet Services** Introduction; History of Internet; Uses of Internet; Introduction to Internet of Things (IoT), Cloud Computing, Introduction to E-commerce
Unit6 (5 classes)	**Working with windows**: Introduction of windows, Components of MS Office, how to create a Folder, Copying and cutting files, Renaming, Programs, Documents, Mail merge

Books:

- Introduction to Computer Science, ITL Education solution Limited, R&D Wing, PEARSON Education and Edition 2004

Reference Books:

- V. Rajaraman Fundamental of Computers, Prentice Hall of India Pvt.Ltd., NewDelhi –2nd edition, 1996.
- PeterNortorns,"IntroductiontoComputer",TMH,2004

MN–1A(Pr):Lab of MS Office		
1 Credit	**15 Class Hours (30 Hours)**	**Semester I**

COMPUTER SOFTWARE TOOLS (MSWORD, EXCEL)

MSWORD: **5 classes**

- Creating, editing, saving and printing text documents
- Font and paragraph formatting
- Simple character formatting
- Inserting tables, smart art, page breaks
- Using lists and styles
- Working with images
- Using Spelling and Grammar check
- Mail Merge

MS EXCEL: **5 classes**

- Spreadsheet basics
- Creating, editing, saving and printing Spreadsheet
- Working with functions & formulas
- Graphically representing data: Charts & Graphs
- Speeding data entry: Using Data Forms

MSPOWERPOINT: **5 classes**

- Opening, viewing, creating, and printing slides
- Applying auto layouts
- Adding Custom Animation
- Using Slides transition

Graphically representing data: Charts & Graphs

Note: Additional lab assignments may be included based on topics covered in the theory paper.

MN-2A: Entrepreneurship Development		
3 Credits	**45 Class Hours**	**Semester II.**

Course Objectives:

- It provides exposure to the students to the entrepreneurial cultural and industrial growth so as to prepare them to set up and manage their own small units.

Detailed Syllabus:

Unit-1 (8 Classes)	**Introduction: The entrepreneur** Definition, emergence of entrepreneurial class; Definition and concern of Entrepreneurship, role of social economic environment; classification, Characteristics and importance of entrepreneur; leadership; risk taking ; decision making and business planning, Role of entrepreneur
Unit-2 (8 Classes)	**Promotion of a venture:** Opportunities analysis; external environmental analysis (economic, social and technological, competitive factors), legal requirements of establishment of a new unit and rising of funds; Venture capital sources and documentation required.
Unit-3 (10 Classes)	**Entrepreneurial Behavior:** Innovation and entrepreneur (Concept, Creativity, Invention & Innovation, Strategy for Innovation, Effective Commercialization, Innovation and Intellectual Property Rights), entrepreneurial behavior and Psycho-theories. Entrepreneurial Development Programmes (EDP): EDP, their role, relevance and achievements; role of government in organizing EDP's critical evaluation.
Unit-4 (12 Classes)	**Entrepreneurship & Innovation:** Overview of project identification, search of a business idea, Identification of project, Business Opportunities, Understanding Design Thinking {concept and scope, key factors of design thinking, benefits, phases (Empathize, Define, Ideate, Prototype, Test)} Creativity: Creativity, identification creative tools (S-C-A-M-P-E-R), Vertical thinking, lateral thinking, Critical Thinking, Phases of decision making, Critical thinking and objectivity, Applying structured knowledge to unstructured problems, Domain criteria, traditional and out-of-the-box thinking.
Unit-5 (7 Classes)	**Legal and ethical considerations:** Legal forms of business organization, ethical Issues and social responsibilities of an entrepreneur

Books:

- Vasant, DCSAI; Entrepreneurship, Himalaya Publishing House, 2003.
- Taneja &S.L. Gupta.; Entrepreneurship Development, 2003.
- Pandey , I.M.; venture capital- The Indian Experience, Prentice Hall of India, 2003.

MN–2A (Pr): Entrepreneurship Development Lab		
1 Credit	**15 Class Hours (30 Hours)**	**Semester II.**

Practical Work

1	Case studies of successful entrepreneurs
2	Conducting mock interviews: testing initiatives, team spirit and leadership
3	Conducting meeting: purpose, procedure, participation, physical arrangements, recording and writing of minutes.
4	Share Your Story: Identify area of innovation and prepare a project of design thinking in the area of Your choice and present it through Sketch modeling (Preparing project proposal)
5	Conduct Market survey to know the demand for different products.
6	Presentations by the students (Individual, Groups)

Note: Additional lab assignments may be included based on topics covered in the theory paper.

MN-1B: Logical Organization of Computer		
4 Credits	**60 Class Hours**	**Semester III.**

Course Objectives:

- Describe performance evaluation of computers, computer architecture and organization, computer arithmetic, Memory and CPU design.

Course Outcomes:

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

- Understand the Truth Table.
- Identify the number of variables and their simplification importance.
- Understand different circuits for the implementation of Boolean equations.
- Describe performance evaluation of computers, computer architecture and organization, computer arithmetic, Memory and CPU design.

Detailed Syllabus:

Unit-1 (8 Classes)	**Data Representation**: Data Types, Number System, Complements, Subtraction of Unsigned Numbers, Fixed-Point Representation, Floating-Point Representation, Other Binary Codes, Other Decimal Codes, Error Detection Code.
Unit-2 (10 Classes)	**Digital Logic Circuits**: Digital Computers, Logic Gates, Boolean algebra, Complement of a Function, Map Simplification, Product-of-sum simplification, Combinational Circuits, Half Adder, Full Adder, Flip-Flops.
Unit-3 (12 Classes)	**Digital Components**: Integrated Circuits, Decoders, Encoders, Multiplexers, Registers, Register with parallel load, Shift Registers, Bidirectional Shift register with parallel load, Binary Counters, Binary counter with parallel load
Unit-4 (15 Classes)	**Central Processing Unit**: Introduction, General Register Organization, Stack Organization, Register Stack, Memory Stack, Instruction Formats, Addressing Modes, Data Transfer and Manipulation, Program Control, Program Interrupt, Types of Interrupts, Reduced Instruction Set Computer (RISC).

Unit-5 **(15 Classes)**	**Memory Organization:** Memory Hierarchy, Main Memory, RAM and ROM Chips, Memory Address Map, Memory Connection to CPU, Auxiliary Memory, Magnetic Disks and Tape, Associative Memory. Hardware Organization, Read/Write Operation, Cache Memory, Associative Mapping, Direct Mapping, Set-Associative Mapping, Virtual Memory, Address Space and Memory Space, Address Mapping Using Pages, Associative Memory Page Table, Page Replacement, Memory Management Hardware.

Text Books:

- Mano M., "Computer System Architecture", Prentice Hall of India, New Delhi, 1995.
- Ram. B., "Computer Fundamentals: Architecture and Organization", 3rdEdition, New Age International Publication, New Delhi, 2000

MN-2B: Web Technology		
3 Credits	**45 Class Hours**	**Semester IV.**

Course Objectives:

- To learn about basics of web programming
- Learn HTML, Java Script, XML for scripting
- Learn Making static and dynamic websites

Course Outcomes

- Know the fundamentals of web programming
- Perform web based programming.
- Design static and dynamic websites

Detailed Syllabus:

Unit-1 **5 classes**	**HTML**: Introduction to HTML, HTML Tags, HTML Documents, Header Section, Body Section, Headings, Link Documents using Anchor Tag, Formatting Characters, Font tag, Images and Pictures, Listing, Tables in HTML.
Unit-2 **12 classes**	**CSS:** Style sheet and its properties, inline, embedded, External & Imported Style sheet. **Forms, Frames and Embedding Multimedia:** Introduction to Frame, <frameset> and <frame> Tag with its Attributes, Creating Frames, Linking Frames, <noframes> tag, Complex Framesets, Floating or Inline Frame. **Forms :** <Form> Tag and its Attributes, <Input> Tag and its Attributes, **Form Controls:** Text Controls, Password Fields, Radio Buttons, Checkboxes, Reset and Submit Buttons, Form Control-Selection, Option Processing and Text Area, Hidden Fields.
Unit-3 **8 classes**	**XML:** Overview of XML, Creating XML Documents, Rules for Well-Formed XML, Discerning Structure, Working with Mixed content, Adding Comments, CDATA Sections, Creating a DTD-The Concept of a Valid XML Document, Creating a DTD for an existing XML File.
Unit-4 **10 classes**	**Java Script:** Data Types, Variables, Operators, Conditional Statements, Array Objects, Date Objects, String Objects**,** Use of Java Script in Web Pages, Advantages of Java Script, Type Casting, Array, Operators and Expression, Conditional Checking, Function
Unit-5 **10 classes**	**PHP:** Preparing the Use PHP, Exploring PHP for the First Time, Understanding PHP Basics, Displaying PHP Output, Managing PHP Program Flow. Planning a PHP Web Application, Creating and Using a Logon Window, Managing System Data, Updating a PHP Web Application.

Text Books:

- Harvey M. Deitel, Paul J. Deitel, Abbey Deitel; **Internet and World Wide Web: How to Program** (Fifth Edition); Pearson Education, 2012
- Thomas A. Powell, **HTML & CSS: The Complete Reference** (Fifth Edition); McGraw Hill, 2010 Don Gosselin;
- **Comprehensive Java Script**; Web Warrior Series, Course Technologies Inc

MN-2B: Web Technology (Lab)		
1 Credits	**30 Class Hours**	**Semester IV.**

Course Objectives:

- To learn about basics of web programming
- Learn HTML, Java Script, XML for scripting
- Learn PHP based programming
- Learn Making static and dynamic websites

Course Outcomes:

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

- Know the fundamentals of web programming
- Elaborate on the web based programming
- Perform web based programming.
- Design static and dynamic websites

List of Programs as Assignments:

- India is a large country. Different regions observe variations in climate. The spoken language of one state is quite different from that of another. They wear different types of garments. They celebrate different festivals and perform varied religious rites. People belonging to diverse cultures belong to different religious faiths. In spite of these diversities, Indians feel a sense of unity and oneness among them. Thus, we conclude that India is a land of Unity in Diversity.
    - All the headings should be H2 and green colour.
    - Main heading should be H1 and centre aligned.

  - The background should be yellow colour.
  - There are 10 paragraphs so each of them should be made using P tag.
  - The Introduction and Conclusion paragraphs should have "Times New Roman" font, the size should be 12 and colour should be blue.
  - All the remaining paragraphs text should be pink and magenta coloured in an alternate way.
  - There should be one meaningful picture in the web page with specific dimension.

- Create a webpage with the following:
  - A superscript and subscript tag
  - Pre tag
  - Paragraph tag
  - Anchor tag
  - Image tag
  - Definition list tag
  - Horizontal line tag
  - Break tag
  - Heading tag

- Create a webpage with a form loaded into it and take input of three strings through three textboxes and then concatenate them without using any built-in function.

- Write a JavaScript program to calculate and display the aggregate and percentage of three subjects' (Physics, Chemistry and Mathematics) marks along with the name of a student. The name and individual marks input shall be taken by textbox in the webpage.

- Write a JavaScript program to search the element 4 in the array [2, 6, 4, 10, 4,0, -2] using any method.

- Create a webpage to take input of a string and check whether it is a palindrome or not.

- Write a program using JavaScript to take input of an array of numbers like [-4, 5, 6, -1,10] and then sort it in descending order.

- Create a webpage to take input of a string and reverse that without using any user defined function.

- Write a JavaScript program to search 10 in the array [2, 6, -5, 10, 11, 0, -2] using a binary search method.

- Create a webpage to take input of a string and then slice it into three separate strings and display that.

- Create a webpage to take input of a string and check whether it is a palindrome or not.

Note: Additional lab assignments may be included based on topics covered in the theory paper.

MN-1C: E-Commerce and Digital Marketing

4 Credits	60 Class Hours	Semester V.

Course Objectives:

- To understand the increasing significance of E-Commerce and its applications in Business.
- To provide an insight into Digital Marketing activities on various Social Media platforms and its emerging significance in Business
- To understand Latest Trends, Practices in E-Commerce and Digital Marketing,

Course Contents:

Unit-1 (10 Classes)	**An overview of E-Business, Models, Types** • Conceptual Framework of E-Commerce, General Model of Business; Defining E-commerce, Characteristics, advantages and disadvantages, adoption and impact of E- Business., Electronic Data Interchange (EDI); Types of e-Transactions – B2B, B2C, C2C, C2B etc., Electronic Storefronts, E-Marketplace
Unit-2 (12 Classes)	**E-Business Technology and E Security** • Web Presence – domain registration, website development, developing static and dynamic webpages and hosting, registering the Website with Search Engines. • Web server hardware and software; Data centre services. • Security – service providers, digital certificates, encryption, SSL, Digital signatures.
Unit-3 (10 Classes)	**Electronic Payment Systems:** • Overview of electronic Payment Technology, Online payment mechanism; Electronic Payment systems, payment Gateway, EFT, NEFT, RTGS, SWIFT, NFC, Green Channel. • **Legal issues:** Laws for E-Commerce, Issues of Trademarks & Domain Names
Unit-4 (14 Classes)	**Digital Marketing – I** • Introduction to Digital Marketing, Advantages and Limitations of Digital Marketing. Keyword research, Competitor analysis in digital marketing. • Various Activities of Digital Marketing: Search Engine Algorithm, Search Engine Optimization and stages, Search Engine Marketing, Content Marketing and Content Influencer Marketing, Remarketing, Campaign Marketing, E-mail Marketing, Display Advertising, Blog Marketing, Viral Marketing, Podcasts and Vodcasts.
Unit-5 (14 Classes)	**Digital Marketing – II** • The P.O.E.M. framework. • Digital Marketing on Various Social Media Platforms. • Online Advertisement, Online Marketing Research, Online PR. • Web Analytics. • Promoting Web Traffic. • Latest Developments and Strategies in Digital Marketing.

Reference Book:

1. Agarwala & Agarwala, E-Commerce
2. Bajaj & Nag, E-Business (TMH: New Delhi)
3. E-Commerce: An Indian Perspective Paperback – Import, 30 Nov 2015-by P. T. Joseph
4. Gupta, Seema (2018). Digital Marketing.McGraw Hill Education (India) Private Ltd.
5. Frost, Raymond D., Alexa Fox, and Judy Strauss (2018). E- Marketing. Routledge
6. Agarwal anita, Kotian Vasant Rahul, Agarwal Tushar, Kannan Vijayalaxmi. 2016, E-Commerce and Digital Marketing, Himalaya Publishing House Pvt. Ltd.,

MN-2C: Software Testing		
4 Credits	**60 Class Hours**	**Semester VI**

Course Objectives:

- The objective of this course is to provide students with an understanding of software testing principles, techniques, and methodologies. The course aims to develop students' skills in designing test cases, executing tests, and reporting defects.

Course Outcome: By the end of this course, students should be able to:

- Understand the importance of software testing in the software development life cycle.
- Apply different testing techniques and methodologies.
- Design and execute test cases to verify software functionality.
- Identify and report software defects effectively.
- Understand the role of automated testing tools in software testing.

Detailed Syllabus:

Unit-1 **10 classes**	**Introduction to Software Testing** Fundamentals of software testing, Testing Life cycle and testing methodologies, Types of testing: functional, non-functional, etc.
Unit-2 **10 classes**	**Test Planning and Test Case Design** Test planning and test strategy development, Test case design techniques: black-box, white-box, etc., Test data preparation and test environment setup.
Unit-3 **15 classes**	**Test Execution and Defect Management** Test execution and defect reporting, Test automation and test scripts, Defect management and tracking.
Unit-4 **10 classes**	**Performance and Security Testing** Performance testing: load, stress, and scalability testing, Security testing: vulnerabilities and penetration testing, Usability testing and user experience evaluation
Unit-5 **15 classes**	**Test Automation Tools and Emerging Trends** Introduction to test automation tools (e.g., Selenium, J Unit), Continuous integration and continuous testing, Emerging trends in software testing.

Text Books:

- Foundations of Software Testing" by Dorothy Graham, Erik Van Veenendaal, Isabel Evans, and Rex Black.
- "The Art of Software Testing" by Glenford J. Myers

MN-1D: Management Information Systems		
4 Credits	**60 Class Hours**	**Semester VII**

Course Objectives: This course envisions imparting to students:

- To know the role of Information Systems in Business Today.
- To know what is an Information System.
- To understand how Businesses Use Information Systems:
- To know the basics of Information Systems, Organizations, and Strategy.
- To know the basics of Information Technology and Computers uses in Management Information Systems.

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

- Identify the role of Information Systems in Business Today.
- Analyse what is an Information System.
- Assess Information Systems, Organizations, and Strategy.
- Elaborate on the uses Computers and IT in Management Information Systems.
- Apply the impacts of MIS in Business Decision Makings.

Detailed Syllabus:

Unit-1 **10 classes**	**Information Systems in Global Business Today:** The role of Information System in Business Today, How Information Systems are Transforming Business, What's New in Management Information Systems?, Globalization Challenges and Opportunities: A Flatted World, The Emerging Digital Firm, Strategic Business Objectives of Information Systems, Perspectives on Information Systems, What is an Information System?, Dimensions of Information Systems, It Isn't Just Technology: A Business Perspective on Information Systems.
Unit-2 **10 classes**	**E-Business: How Businesses Use Information Systems:** Business Processes and Information Systems, Business Processes, How Information Technology Enhances Business Processes, Types of Information Systems, Transaction Processing Systems, Management Information Systems and Decision-Support Systems, Systems That Span the Enterprise, Enterprise Applications, Intranets and Extranets, Collaboration and Communication Systems: "Interaction" Jobs in a Global Economy, E-Business, The Information Systems Function in Business.
Unit-3 **15 classes**	**Information Systems, Organizations, and Strategy:** Organizations and Information Systems, What Is an Organization?, Features of Organizations, How Information Systems Impact Organizations and Business Firms, Economic Impacts, Organizational and Behavioural Impacts, The Internet and Organizations, Implications for the Design and Understanding of Information Systems, Using Information Systems to Achieve Competitive Advantage.

Unit-4 **10 classes**	**IT Infrastructure and Emerging Technologies:** IT Infrastructure, Defining IT Infrastructure, Evolution of IT Infrastructure, Technology Drivers of Infrastructure Evolution, Infrastructure Components, Computer Hardware Platforms, Operating System Platforms, Enterprise Software Applications, Data Management and Storage, Networking/ Telecommunication Platforms, Internet Platforms, Consulting and System Integration Services, Contemporary Hardware Platform Trends, The Emerging Mobile Digital Platform.
Unit-5 **15 classes**	**Enhancing Decision Making:** Decision Making and Information Systems, Business Value of Improved Decision Making, Types of Decisions, The Decision Making process, Managers and Decision Making in The Real World, Systems for Decision Support, Management Information System(MIS), Decision-Support Systems(DSS), Web-Based Customer Decision-Support Systems, Group Decision-Support Systems(GDSS), Executive Support Systems(ESS).

Text Book

- Laudon K. and Laudon J.,"Management Information Systems", Prentice Hall Publication.

Reference Books

- Murdick, Ross and Claggett, "Information Systems for Modern Management", PHI Publication.
- Jawadekar W. S., "Management Information Systems", Tata McGraw Hill Publication.
- GoyalD. P., "Management Information Systems Managerial Perspectives", Macmillan India Ltd.

MN-2D: Multimedia Application		
3 Credits	**45 Class Hours**	**Semester VIII**

Course Objectives:

- The objective of this course is to provide students with an understanding of multimedia technology and its applications in various domains. The course aims to develop students' skills in designing and developing multimedia content, integrating multimedia elements, and applying multimedia technologies.

Course Outcomes:

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

- Understand the concepts and components of multimedia technology.
- Design and develop multimedia content using appropriate tools and techniques.
- Integrate various multimedia elements such as text, images, audio, and video.
- Apply multimedia technologies in interactive applications and presentations.
- Evaluate and optimize multimedia content for different platforms and devices.

Detailed Syllabus:

Unit-1 **10 classes**	**Introduction to Multimedia Technology** Overview of multimedia technology and its components, Multimedia elements: text, images, audio, video, Multimedia file formats and compression techniques Concepts of Hypertext and Hypermedia, Applications of Multimedia: Education, Entertainment, Advertising, Web, etc
Unit-2 **10 classes**	**Multimedia Authoring Tools and Techniques** Multimedia authoring software and tools(e.g., Adobe Flash, Director, Authorware), Design principles for multimedia content, Multimedia scripting and programming languages, Storyboarding and project planning, Designing user interfaces and navigation flow
Unit-3 **15 classes**	**Image and Video Processing in Multimedia** Image and video acquisition and editing, Image and video compression techniques, Image and video enhancement and effects
Unit-4 **10 classes**	**Audio and Animation in Multimedia** Digital audio concepts and formats, Audio editing and processing techniques, Animation principles and techniques

Unit-5 **15 classes**	**Advanced Multimedia Application Development** Integration of multimedia elements in interactive applications, Multimedia in web design and development, Optimization and delivery of multimedia content Virtual Reality and Augmented Reality, Interactive books and hyper documents, Digital gamification and e-learning, Real-time multimedia systems and case studies

Text Books:

- Multimedia: Making It Work" by Tay Vaughan.
- Multimedia Systems: Algorithms, Standards, and Industry Practices" by Parag Havaldar and Gerard Medioni.

MN-2D: Multimedia Application(Lab)		
1 Credits	**30 Class Hours**	**Semester VIII**

List of Assignments:

- Create a formatted document using different font styles, colors, and sizes.
- Use HTML or any multimedia tool to display styled text with hyperlinks and effects.

- Design simple graphics using software like Photoshop, GIMP, or Illustrator.
- Convert images between different formats (JPEG, PNG, GIF) and observe quality changes.
- Create and compare bitmap and vector images.

- Record a short voice clip and edit it using Audacity or any sound editing tool.
- Apply effects like fade-in, fade-out, echo, or noise reduction.
- Convert between audio formats (MP3, WAV, OGG).

- Edit a short video using tools like Adobe Premiere Pro, OpenShot, or Filmora.
- Compress and export video in different formats (MP4, AVI, MOV).

- Create a simple 2D animation using Adobe Animate or Pencil2D.
- Design a frame-by-frame animation of a moving object (like a bouncing ball).

- Create navigation buttons, menu bars, and content screens.
- Add simple scripts to make the app interactive (like play/pause audio or open next slide).
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- Create a mini multimedia project (e.g., an animated story, a multimedia resume, or an educational app).
- Include text, images, audio, video, and interactivity.
- Present and demonstrate your project in class.

Note: Additional lab assignments may be included based on topics covered in the theory paper.