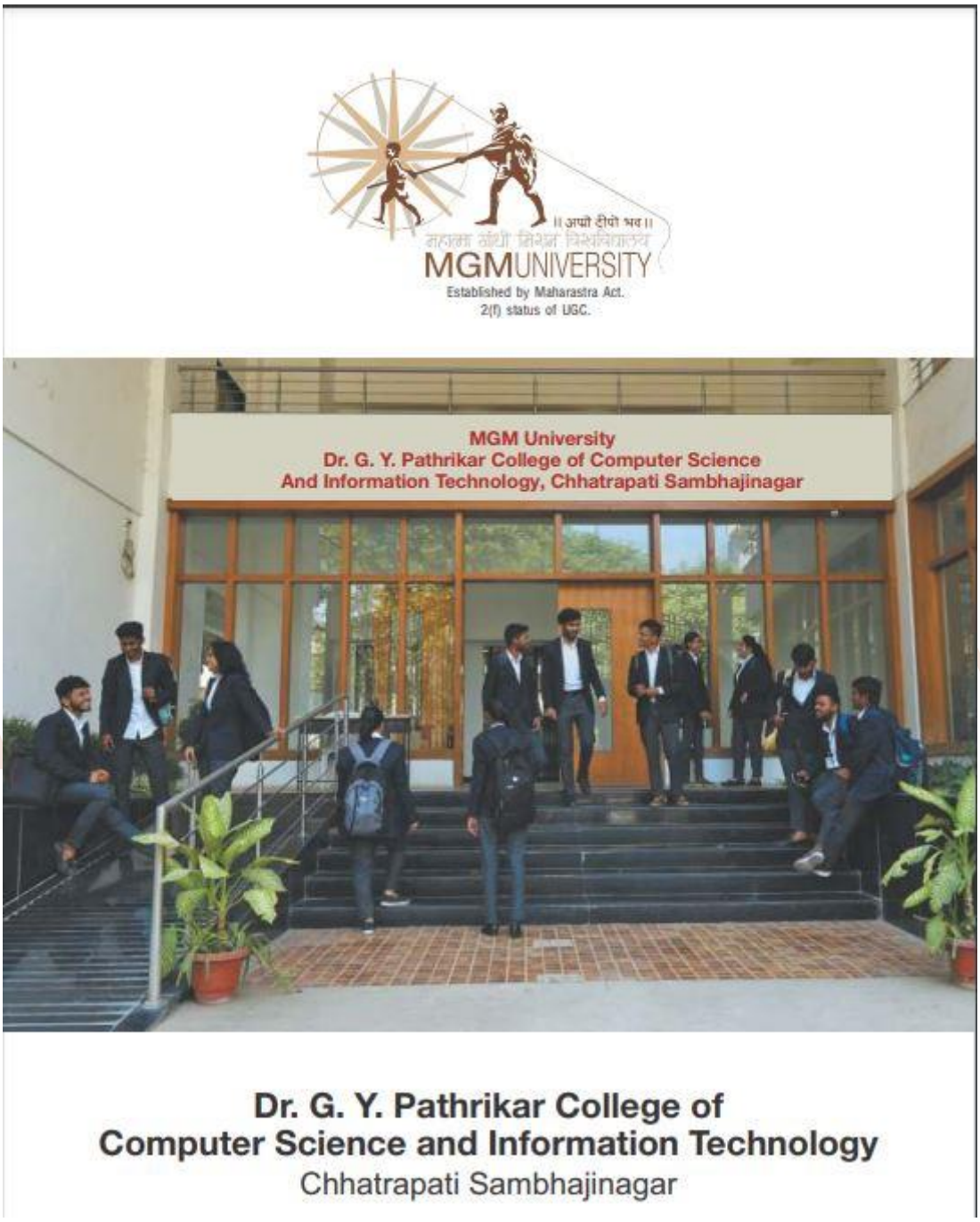

B.Sc. (Hons. / Hons. with Research)
Artificial Intelligence & Machine Learning
(Syllabus)

MGM University

Vision

- To ensure sustainable human development which encourages self-reliant and self-content society.
- To promote activities related to community services, social welfare and also Indian heritage and culture.
- To inculcate the culture of non-violence and truthfulness through vipassanna meditation and Gandhian Philosophy.
- To develop the culture of simple living and high thinking

Mission

- To impart state of art education and technical expertise to students and give necessary training to teachers to create self-reliant society for future.
- To encourage students to participate in Indian and International activities in sports, literature, etc. so that future generation becomes base for free and liberal society
- To educate students in areas like Management, Finance, Human relations to inculcate philosophy of simple living and high thinking value of simple economic society.
- To inculcate culture of non-violence and truthfulness through Vipassana.
- To sustain activities of Indian culture (viz. classical dance, music and fine arts) through establishing institutes like Mahagami, Naturopathy, etc.

विद्यापीठ गीत

अत्त दिप भव भव प्रदिप भव,

स्वरूप रूप भव हो

ज्ञान सब्ब विज्ञान सब्ब भव ,

सब्ब दिप भव हो

अत्ताहि अत्त नो नाथो ,

अत्ताहि अत्त नो गति

अत्त मार्गपर अप्रमादसे है तुझे चलना

सब्ब का कल्याण हो ,

वो कार्यकुशल करना

सब्ब का उत्तम मंगल , पथप्रदर्शक हो

अत्त दिप भव भव प्रदिप भव ,

स्वरूप रूप भव हो

ज्ञान सब्ब विज्ञान सब्ब भव ,

सब्ब दिप भव हो

बुद्धमं शरनं गच्छामि :

धम्मं शरनं गच्छामि :

संघं शरनं गच्छामि :

Dr. G. Y. Pathrikar College of Computer Science & Information Technology

MGM college of Computer Science and Information Technology was established in 2001 offering undergraduate and postgraduate degree program in Computer Science and Information Technology. College was renamed as Dr.G.Y.Pathrikar College of Computer Science and Information Technology in 2003 in memory of great educationalist, one of the founder member and Ex-Secretary MGM, Dr.G.Y.Pathrikar Sir.

It is first self-financed ISO certified institution offering program dedicated to Computer science and Information technology in Maharashtra and has achieved status of 2f/12b. Ours was the only and first college to be re-accredited as A+ grade with NAAC in the year 2017. Experienced and qualified faculty with Ph.D is strength of our college. Starting with 77 student's College has crossed total students strength of 10,000 passing out. Student are doing well in various MNCs like Infosys, Tech-Mahindra, Wipro, Capgemini, Cognizant etc. Many have their own Startups. Some of the students have completed their Masters and Ph.D. program from foreign countries like US, UK, Australia. Now we are constituent college of MGM University, Chhatrapati Sambhajinagar.

Vision

To be an academic institution in dynamic equilibrium in social, ecological and economical environment striving continuously for excellence in total quality education, research and technological service to the nation.

Mission

- To create and sustain a community of learning in which students acquire knowledge and learn to apply it professionally with due consideration for ethical, and economical issues.
- To upgrade our students in all respect with the help of latest infrastructure in the area of Computer Science and Information Technology in order to build the National Capabilities.
- To understand the culture of Non-violance, truth, peace through Gandhian Philosophy.

Programs offered at Dr. G. Y. Pathrikar College of Computer Science & Information Technology

Undergraduate Programmes	Postgraduate Programmes	PhD Programmes
B.Sc. (Computer Science) Honours / Honours with Research	M.Sc(Computer Science)	Ph.D. in Computer Science and Information Technology
B.Sc(Information Technology) Honours/ Honours with Research	M.Sc(Information Technology)	
BCA(Science) Honours / Honours with Research	M.Sc(Data Science)	
B.Sc(Animation) Honours / Honours with Research	M.Sc(Animation)	
Integrated M.Sc. Data Science		
BCA(Digital Marketing) Honours		
B.Sc(Robotics) Honours		

Name of Program – B.Sc. (Hons. / Hons. With Research) AI & ML

Duration – Four Years

Eligibility -

- He / She Must have passed the Higher Secondary Examination conducted by H.S.C. Board Government of Maharashtra with Science / Technical Subjects or an Examination of any statutory University and Board recognized as equivalent thereto.

OR

- Candidates having offered prescribed vocational courses, (MCVC).

OR

- Three Years Course in Diploma Engineering conducted by the Board of Technical Education, Maharashtra State. He / She must have passed at qualifying examination.

Name of Faculty: Basic and Applied Science
Name of the College/Institute/Department/School: Dr. G. Y. Pathrikar College of Computer Science and Information Technology
Name of the Programme: B.Sc. (Hons. / Hons. With Research) AI & ML
Programme Type (UG/PG): UG
Duration: Four Years

List of Options to select from Bucket of Courses provided in various categories:

Major	
Artificial Intelligence & Machine Learning	
Core Major	**Core Elective**

Minor options for basic and applied science Faculty	**GYP**	**IBT**	**UDBAS**
	Cyber Security	Food Technology and Processing	Chemistry
	Robotics	Microbiology	Geo-Informatics
	Data Analytics	Biotechnology	Mathematics
	Block-Chain Technologies	Bioinformatics	Statistics
		Food Nutrition and Dietetics	Material Science

Minor options from Other Faculty	**Faculty of Engineering and Technology**	**Faculty of Social Sciences & Humanities**	**Faculty of Design**	**Faculty of Management and Commerce**	**Interdisciplinary Faculty**	**Performing Arts**
	Data Science	Filmmaking	Product Design	Financial Management	Cosmetic Technology	Theatre Arts
	IoT	Photography	Interior Design	E-Commerce	Education	Dance
	Geo-informatics and Applications	Mass Communication and Journalism	Contemporary Arts	International Business Management	Yog Sciences	Music
	EV Technology	Psychology	Visual Communication	Hospitality Mgmt	Physical Education	Folk Art
	Drone Technology	Economics	Fashion Technology	Travel and Tourism	Home Science	
	Robotics Technology	English		Art of Leadership		
	Chemical Technology	Social Work		Art of Business		
	AI&ML					
	Universal Human Values					
	Energy management					

Name of Faculty: Basic and Applied Science
Name of the College/Institute/Department/School: Dr. G. Y. Pathrikar College of Computer Science and Information Technology
Name of the Programme: B.Sc. (Hons. / Hons. With Research) AI & ML
Programme Type (UG/PG): UG
Duration: Four Years

First Year- Semester I												
Course Category	**Course Code**	**Course Title**	**Nature of Course**	**No. of Credits**	**Teaching (Contact hrs/ week)**		**Evaluation Scheme (Marks)**			**Minimum Passing (Marks)**		
					L	**P**	**Internal**	**External**	**Total**	**Internal**	**External**	**Total**
Core		Operating System	Lecture	2	2		30	20	50		8	20
Core		Programming logic and Design	Lecture	2	2		30	20	50		8	20
Core		Practical based on Operating System	Practical	1		2	30	20	50		8	20
Core		Practical based on Programming logic and Design	Practical	1		2	30	20	50		8	20
MIN		Indian Psychology and yoga	Lecture	2	2	-	30	20	50		8	20
AEC		Basket of AEC From University	Lecture	2	2	-	30	20	50		8	20
OE		Basket of OE From University	Lecture	2	2	-	30	20	50		8	20
OE		Basket of OE From University	Lecture	2	2	-	30	20	50		8	20
VSC		Office Automation	Practical	2		4	30	20	50		8	20
SEC		Mathematical Foundation	Lecture	2	2	-	30	20	50		8	20
VEC		Basket of VEC From University	Lecture	2	2	-	30	20	50		8	20
CC		Basket of CC From University	Practical	2	-	4	50	-	50	20	-	20
Total				**22**	**16**	**12**	**380**	**220**	**600**			

First Year- Semester II												
Course Category	**Course Code**	**Course Title**	**Nature of Course**	**No. of Credits**	**Teaching (Contact hrs/ week)**		**Evaluation Scheme (Marks)**			**Minimum Passing (Marks)**		
					L	**P**	**Internal**	**External**	**Total**	**Internal**	**External**	**Total**
Core		Data Structure	Lecture	2	2		30	20	50		8	20
Core		Computer Architecture	Lecture	2	2		30	20	50		8	20
Core		Practical based on Data Structure	Practical	1		2	30	20	50		8	20
Core		Practical based on Computer Architecture	Practical	1		2	30	20	50		8	20
MIN		Basket of MIN From University	Lecture	2	2	-	30	20	50		8	20
AEC		Basket of AEC From University	Lecture	2	2	-	30	20	50		8	20
OE		Basket of OE From University	Lecture	2	2	-	30	20	50		8	20
OE		Basket of OE From University	Lecture	2	2	-	30	20	50		8	20
VSC		Advance Excel	Practical	2		4	30	20	50		8	20
SEC		Statistical Methods	Lecture	2	2	-	30	20	50		8	20
VEC		Basket of VEC From University	Lecture	2	2	-	30	20	50		8	20
CC		Basket of CC From University	Practical	2	-	4	50	-	50	20	-	20
Total				**22**	**16**	**12**	**380**	**220**	**600**			

Note:

Nature of Course : L- Lecture, P-Practical, S-Seminar, J-Project, I-Internship, D-Dissertation,

Course Category: MM-Major Mandatory, ME-Major Elective, MI-Minor, OE-Generic / Open electives, VSC-Vocational skill course, SEC-Skill Enhancement course, AEC-Ability Enhancement course, IKS-Indian Knowledge system, VEC-Value Education course, OJT-On Job Training / Internship / Apprenticeship, FP-Field project, CEP-Community engagement and service, CC-Co – curricular course, RM-Research methodology, RP-Research project

Level 4.5 Award of UG certificate with 40 credits and an additional 4-credits core NSQF course / internship OR continue with major and minor

Syllabus
Semester-I

Course Code: **Course Category:** Major Mandatory		**Course Name:** Operating System
Credits: 2	**Teaching Scheme:** L-2, P-0	**Evaluation Scheme:** CA-30, ESE-20
Pre-requisites: Basics working of Computer System and their Applications		
Course Objectives: 1. Student can understand the concept of process management and scheduling, and various issues in Inter Process Communication and the role of OS in inter process communication. Student get familiar with 2. How to implementation Memory management policies and virtual memory. Student can understand the working of an OS as a process manager, memory manager and I/O Manager		
Course Outcomes: At the end of the course, the students will be able to -		
CO1: To study the Importance & types of Operating System		
CO2: To Understand the Process Management and concept of Concurrency		
CO3: To understand the process of Deadlock & Memory Management.		
CO4: Focusing on different types of file system and related concept.		

Contents –

Unit	Content	Teaching hours
1	**OPERATING SYSTEMS OVERVIEW:** Introduction, operating system operations, process management, memory management, storage management, protection and security, distributed systems. OPERATING SYSTEMS STRUCTURES: Operating system services and systems calls, system programs, operating system structure, operating systems generations.	6
2	**PROCESS MANAGEMENT:** Process concepts, process state, process control block, scheduling queues, process scheduling, multithreaded programming. **CONCURRENCY AND SYNCHRONIZATION:** Process synchronization, critical section problem, Peterson's solution, synchronization hardware, semaphores, classic problems of synchronization, readers and writers problem, dining philosopher's problem, monitors.	8
3	**DEADLOCKS:** System model, deadlock characterization, deadlock prevention, detection and avoidance, recovery from deadlock banker's algorithm. MEMORY MANAGEMENT: Swapping, contiguous memory allocation, paging, structure of the page table, segmentation, virtual memory, demand paging, page-replacement algorithms, allocation of frames, thrashing.	8
4	**FILE SYSTEM:** Concept of a file, access methods, directory structure, file system mounting, file sharing, protection. File system implementation: file system structure, file system implementation, directory implementation, allocation methods, free-space management, efficiency and performance**.**	8

Text Books:
1. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne (2006), Operating System Principles, 7th edition, Wiley India Private Limited, New Delhi.
Reference Books:
2. Operating System, Stuart E. Mandnick, JohnJ. Donovan Tata McGraw Hill Publication. 3. Operating System, H.M. Deitel ,Pearson Publication

Syllabus
Semester-I

Course Code: **Course Name:** Programming Logic and Design **Course Category:** Major Mandatory		
Credits: 2	**Teaching Scheme:** L-2, P-0	**Evaluation Scheme:** CA-30, ESE-20
Pre-requisites: Understanding of the Programming Concept and problem solving steps.		
Course Objectives: • Programming Paradigm help students to create properly designed programs. Learning algorithms and practicing coding. • Come up with varieties of solutions to a single problem. • Programming concepts enforces good style and logical thinking		
Course Outcomes: At the end of the course, the students will be able to -		
CO1: Recognize and Understand components of Computer System, Programming and most importantly summarize the advantages of structured program		
CO2: Describe the Modularization and basic structure of program.		
CO3: Implements and Analyze the usage of flowcharts and pseudo code so as to become comfortable with logic development tools and understand their interrelationship.		
CO4: Determine and explore the workings of decision making, looping, and array manipulation.		

Contents –

Unit	Content	Teaching hours
1	**An Overview of Computers and Programming:** Computer System, Programming Logic, Program Development Cycle, Pseudo code Statements & Flowchart, Programming and User Environments, Evolution of Programming Model. **Elements of High-Quality Programs:** Declaring and Using Variables and Constants, Operators: Performing Arithmetic Operations, Modularization: Modularizing a Program and its Advantages, Creating Hierarchy Charts, Features of Good Program Design.	6
2	**Understanding Structure:** The Disadvantages of Unstructured Spaghetti Code, Three Basic Structures - sequence, selection and loop, using a Priming Input to Structure a Program, Reasons for Structure, Recognizing Structure, Structuring and Modularizing Unstructured Logic.	8
3	**Making Decisions:** Boolean Expressions and the Selection Structure, Using Relational Comparison Operators, Understanding AND Logic, OR Logic & NOT Logic, Making Selections within Ranges, Precedence Combining AND & OR operators. Looping: Advantages of Looping, Loop Control Variable, Nested Loop, Avoiding Common Loop Mistakes, Using a 'for' Loop, Common Loop Applications.	8
4	**Arrays:** Storing Data in Arrays, How an Array Can Replace Nested Decisions, Using Constants with Arrays Searching an Array for an Exact Match, Using Parallel Arrays, Searching an Array for a Range Match, Remaining within Array Bounds, Using a for Loop to Process an Array.	8

Text Books:
Programming Logic and Design Joyce Farrell Cengage Learning Seventh
Programming Language Design Concepts David A Watt Wiely India
Reference Books: 1. E. Balaburuswamy Programming in C, Tata Macgraw Hill 2. Y.P. Kanetkar Let us C, BPB publication
Online Resources: 1. NPTEL / SWAYAM lectures.

Semester-I

Course Code: MDI41MMP101 **Course Name:** Practical based on Operating System **Course Category:** Major Mandatory		
Credits: 1	**Teaching Scheme:** L-0, P-2	**Evaluation Scheme:** CA-30, ESE-20
Pre-requisites: Basics of mathematics and working of Computer System		
Course Objectives: 1. To impart basic introduction to Operating System 2. To identify the Operating System and its Processing Life Cycle		
Course Outcomes: At the end of the course, the students will be able to -		
CO1: To study the Importance & types of Operating System		
CO2: To implement the Process Management and concept of Concurrency		
CO3: To apply the process of Deadlock & Memory Management using Programming language.		
CO4: Study of file system and related concept.		

Contents –

Unit	Content	Teaching hours
1	Different types of Operating System & it's features.	2
2	Process Creation and Management (Process Management)	2
3	CPU Scheduling Algorithm (Process Scheduling)	2
4	Thread Creation and Execution (Multithreading)	2
5	Solving Critical Section Problem Using Semaphores (Synchronization)	2
6	Deadlock Detection Algorithm (Deadlocks)	2
7	Paging Mechanism (Memory Management)	2
8	Page Replacement Algorithm (Virtual Memory)	2
9	File Operations (File System)	2
10	Implementing Directory Structure (File System)	2
11	Project	10

Text Books:

1. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne (2006), Operating System Principles, 7th edition, Wiley India Private Limited, New Delhi.

Reference Books:

2. Operating System, Stuart E. Mandnick, JohnJ. Donovan Tata McGraw Hill Publication.
3. Operating System, H.M. Deitel ,Pearson Publication

Semester-I

Course Code: **Course Name:** Programming Logic and Design **Course Category:** Major Mandatory		
Credits: 2	**Teaching Scheme:** L-2, P-0	**Evaluation Scheme:** CA-30, ESE-20
Pre-requisites: Understanding of the Programming Concept and problem solving steps.		
Course Objectives: • Programming Paradigm help students to create properly designed programs. Learning algorithms and practicing coding. • Come up with varieties of solutions to a single problem. • Programming concepts enforces good style and logical thinking		
Course Outcomes: At the end of the course, the students will be able to -		
CO1: Recognize and Understand components of Computer System, Programming and most importantly summarize the advantages of structured program		
CO2: Describe the Modularization and basic structure of program.		
CO3: Implements and Analyze the usage of flowcharts and pseudo code so as to become comfortable with logic development tools and understand their interrelationship.		
CO4: Determine and explore the workings of decision making, looping, and array manipulation.		

Contents –

Unit	Content	Teaching hours
1	Introduction to C, Syntax and basic structure of C program, Execution of C program.	2
2	Get students familiar with different datatypes in C, operators and expressions in C.	2
3	Understanding decision making using forms of IF statements	2
4	Understanding decision making using forms of switch, goto, break, continue etc. statements	2
5	Perform different programs to understand the concept of Array.	2
6	To apply the knowledge of array to upgrade it on multidimensional array	2
7	Programs to understand the concepts of loops in the programming.(For loop)	2
8	Programs to understand the concepts of loops in a program. (do and while loop)	2
9	Perform array Initialization and Storage of Array	2
10	Perform the Array Operations	2
11	Project	10

Text Books:
Programming Logic and Design Joyce Farrell Cengage Learning Seventh
Programming Language Design Concepts David A Watt Wiely India
Reference Books: 1. E. Balaburuswamy Programming in C, Tata Macgraw Hill

2. Y.P. Kanetkar Let us C, BPB publication
Online Resources: 1. NPTEL / SWAYAM lectures.

Semester-I

Course Code: **Course Name:** Office Automation **Course Category:** Vocational Skill Course		
Credits: 2	**Teaching Scheme:** L-0, P-4	**Evaluation Scheme:** CA-30, ESE-20
Pre-requisites: Introduction to Computer System		
Course Objectives: To understand and learn Office automation tools		
Course Outcomes: At the end of the course, the students will be able to -		
CO1: The course aims to provide exposure to work with Text Processing techniques		
CO2: The course aims to provide exposure to work with PowerPoint Presentation Techniques		
CO3: The course aims to provide exposure to work with Data accessing techniques		
CO4: The course aims to provide exposure to work with Excel Data Handling Techniques		

Contents –

Unit	Content	Teaching hours
1	Generate equations, sample calculations, and basic diagrams in Microsoft Word	2
2	Perform calculations in Microsoft Excel using both manually inputting formulas and built-in functions	2
3	Create Graph and Tables and Integrate both graphs and tables created in Microsoft Excel into a report file in Microsoft Word.	2
4	To create a Power Point presentation including Audio, Video and animation effect using PowerPoint.	2
5	To create any document Using Word Processing Tool and different styles.	2
6	To create any document Using Presentation Tool	2
7	To Create a graph of any numeric data in Microsoft office and give appropriate Label.	2
8	To draw any digital electronic circuit diagram using Microsoft word	2
9	Introduction to MS Access	2
10	Create & edit Database & tables in Access	2
11	Project	10

Text Books: Bittu Kumar · 2017,Mastering MS Office ISBN 9789350578780, V&S Publishers
Reference Books: Dr. S.S. Srivastava MS-Office
Online Resources: 1. NPTEL / SWAYAM lectures. https://www.rgycsm.org/uploads/books/MICROSOFT-OFFICE-BOOK.pdf

Syllabus
Semester-I

Course Code: **Course Name:** Mathematical Foundation **Course Category:** Skill Enhancement course		
Credits: 2	**Teaching Scheme:** L-2, P-0	**Evaluation Scheme:** CA-30, ESE-20
Pre-requisites: Basics of Mathematical Concepts		
Course Objectives: Towards the end of the course, we will also cover a subset of topics from graph theory. Part of the course is also devoted to understanding what goes into mathematics.		
Course Outcomes: At the end of the course, the students will be able to -		
CO1: Principles and processes of Set Theory		
CO2: Operations of Set Theory		
CO3: Provides students with essential mathematical skills		
CO4: Learn Graph, Tree, Relations and functions		

Contents –

Unit	Content	Teaching hours
1	**Set Theory and Operations:** Types of Set: Finite, Infinite, Singleton, Empty, Subset, Proper Subset, Universal Set, Power Set, Venn Diagram, Operations on Set: Union of Sets, Intersection of Sets, Complement of Set, Cartesian Product, Difference and Symmetric Difference of Set, Principal of Inclusion and Exclusion. Introduction to Matrices: Types of Matrices, Matrix, Operations, Adjoint and Inverse of a Matrix, Rank of a Matrix and Special Matrices.	6
2	**Graph Theory and Tree:** Introduction to Graph, Application of Graph, Finite and Infinite Graph, Incidence and Degree, Null Graph, Isolated and Pendent Vertex, Isomorphism, Subgraph, Walks, Path and Circuit, Union and Intersection Operation. Graph, Planner Graph, Trees, Pendant Vertices on Tree, Binary Tree, Spanning Tree.	8
3	**Relations** Relations: Properties of Binary Relations, Relation Matrix and Digraph, Operations on Relations, Partition and Covering, Transitive Closure, Equivalence, Compatibility and Partial Ordering Relations.	8
4	**Functions:** Objective Functions, Composition of Functions, Inverse Functions,Permutation Functions, Recursive Functions, Lattice and its Properties.	8

Text Books: 1. Narsingh Deo Graph Theory With Applications To Engineering And Computer Science, Prentice – Hall
2. J. L. Mott, A.Kandel, T.P. Baker, Discrete Mathematics for Computer Scientists and Mathematicians, Prentice Hall of India, 2nd Edition
Reference Books: 1. BernandKolman, Robert C. Busby, Sharon Cutler Ross, Discrete Mathematical Structures, PHI
Online Resources: 1. NPTEL / SWAYAM lectures.

Semester: SECOND

Syllabus
Semester-II

Course Code: **Course Name:** Data Structure **Course Category:** Major Mandatory
Credits:2 **Teaching Scheme:** L-2, P-0 **Evaluation Scheme:** CA-30, ESE-20
Pre-requisites: Basic understanding of Data and its applications
Course Objectives: Student get familiar with basic concepts about stacks, queues, lists, trees and graphs Student can implement practically searching and sorting techniques.
Course Outcomes: At the end of the course, the students will be able to -
CO1: Student can analyze algorithms and the correctness of algorithm, can summarize searching and sorting techniques and describe stack, queue and linked list operation with knowledge of tree and graphs concepts
CO2: Students demonstrate an ability to apply knowledge of computing and mathematics appropriate to the discipline including computer science theory.
CO3: Students get competent in applying design and development principles in the development of software systems of varying complexity
CO4: Students will implement various sorting, searching, and hashing algorithms. Students will build a substantial, complex data structure

Contents –

Unit	Content	Teaching hours
1	**Introduction**: Basic Terminology, Data Item, fields, Records, Files, Entity, Attributes, Data organization and Data Structure. **Arrays:** Representation of Linear Arrays, Traversing, Insertion and Deletions, sorting and Searching Algorithms, Multidimensional Arrays 2D and M-D concept, Record, Record Structure, Representation in Memory.	6
2	**Linear Data Structure:** Stack, Queue, Linked list, Priority Queue, Deque, Doubly linked list, circular linked list Searching and sorting Techniques.	8
3	**Non Linear Data Structure:** Graphs: Introduction to Graph Theory, Graph isomorphism, Graph data structures: Adjacency lists, Adjacency matrices Elementary graph Algorithms: BFS, DFS, Topological sort, strongly connected components.	8
4	**Trees:** Introduction To Trees, Binary Trees , Complete Binary Trees , Extended Binary Trees: 2-Trees , Representing Binary Trees In Memory Tree Operations, Traversing Binary Trees (Preorder, Inorder And Postorder), Binary Trees. Traversal Algorithms Using Stacks Binary Search Trees, Searching And Inserting In Binary Search Trees	8

Text Books: 1. Seymour Lipschutz, Data Structures, Tata McGraw Hill Publication.
2. Thomas H. Cormen, Charles E. Leiserson, Ronaild L. Rivest, Clifford Stein Introduction to Algorithm, PHI Publication
Reference Books: 1. Jean Paul Tremblay and Pal G. Soresion, An Introduction to Data Structure And application, McGraw Hill Publication
2. Tannenbaum, Data Structure, PHI Publication
Online Resources: 1. NPTEL / SWAYAM lectures.

Syllabus
Semester-II

Course Code: **Course Name:** Computer Architecture **Course Category:** Major Mandatory		
Credits: 2	**Teaching Scheme:** L-2, P-0	**Evaluation Scheme:** CA-30, ESE-20
Pre-requisites: Basic Knowledge of Digital Electronics and Computer System architecture		
Course Objectives: Basic introduction of computer system architecture, the structure of computer, working of Gates and its functionality.		
Course Outcomes: At the end of the course, the students will be able to -		
CO1: Student understands of the basic structure and operation of a digital computer.		
CO2: To learn the architecture and assembly language Programming of microprocessor.		
CO3: Learn Arithmetic Circuits Structures		
CO4: To study the different Processors.		

Contents –

Unit	Content	Teaching hours
1	**Computer Arithmetic:** Number System: Decimal System Binary Number System, Hexadecimal Number System. Octal Number System, Number Conversion: Decimal to Other, Binary to Other, Octal to Other, Hexadecimal to Other, BCD Numbers, ASCII Code, Computer Arithmetic: Addition, Subtraction. Logic Gates & Boolean Algebra Positive & Negative Logic, Truth Table, Logic Gates: AND, OR, NOT, NAND, NOR and Exclusive- Universal Gates. Postulates & Theorems of Boolean Algebra (Idempotent, Complementation, Commutative, Associative, Distributive, De-Morgan's Theorem)	10
2	**Arithmetic Circuits:** Combinational Circuits, Implementing Combinational logic. Arithmetic Circuits: Half-Adder, Full-Adder, Half-Sub tractor, Full-Sub tractor. Fundamentals of Microprocessors:Comparisonof8-bit, 16-bitand32-bitmicroprocessor.8086 Pin Configuration 8086InternalArchitectures Execution Unit & Bus Interface Flag Registers, Introduction to Addressing Modes.	10
3	**8086 Interrupt and Interrupt Applications:** Interrupts of 8086 Hardware Interrupts, Software Interrupts, Latest Trends in Microprocessor: RISC and CISC Architectures, Design: Multicore Processor and Multicore Processing, Multicore Technology and Intel, Dual Core and Core Duo Processors Corei3,i5, Mobile Processors.	10

Text Books: 1. Anil K. Maini, Digital Electronics: Principles, Devices and Applications, Wiley Publication
2. Lyla B Das Microprocessors & Multi core systems, Pearson Publication
Reference Books: 1. Douglas V Hall, Microprocessor and Interfacing, Tata McGraw Hill
2. M. Morris Mano, Microprocessor and Interfacing

Semester-II

Course Code: **Course Name:** Practical based on Design and Analysis of Algorithms **Course Category:** Major Mandatory
Credits: 1 **Teaching Scheme:** L-0, P-2 **Evaluation Scheme:** CA-30, ESE-20
Pre-requisites: Basic understanding of Data and its applications
Course Objectives: Student get familiar with basic concepts about stacks, queues, lists, trees and graphs Student can implement practically searching and sorting techniques.
Course Outcomes: At the end of the course, the students will be able to -
CO1: Student can analyze algorithms and the correctness of algorithm, can summarize searching and sorting techniques and describe stack, queue and linked list operation with knowledge of tree and graphs concepts.
CO2: Students demonstrate an ability to apply knowledge of computing and mathematics appropriate to the discipline including computer science theory.
CO3: Students get competent in applying design and development principles in the development of software systems of varying complexity
CO4: Students will implement various sorting, searching, and hashing algorithms. Students will build a substantial, complex data structure

Contents –

Unit	Content	Teaching hours
1	Write and execute programs for insertion and deletion of n item from the Queues	2
2	Implement a program to display a Linked List.	2
3	Implement a program for Circular Doubly Linked List	2
4	Write and execute a program for binary search algorithm	2
5	Write and execute BFS and DFS Traversing	2
6	Write and execute Tree traversals	2
7	Write and execute a program for Bubble sort Algorithm	2
8	Write and execute programs for traversing of n item from the linked list	2
9	Write and execute a program for implementation of insertion sort	2
10	Write and execute a program for demonstration of merge sort	2
11	Project	10

Text Books: 1. Seymour Lipschutz, Data Structures, Tata McGraw Hill Publication.
Thomas H. Cormen, Charles E. Leiserson, Ronaild L. Rivest, Clifford Stein Introduction to Algorithm, PHI Publication
Reference Books: 1. Jean Paul Tremblay and Pal G. Soresion, An Introduction to Data Structure And application, McGraw Hill Publication
2. Tannenbaum, Data Structure, PHI Publication
Online Resources: 1. NPTEL / SWAYAM lectures.

Semester-II

Course Code: **Course Name:** Practical based on Computer Architecture **Course Category:** Major Mandatory
Credits:1 **Teaching Scheme:** L-0, P-2 **Evaluation Scheme:** CA-30, ESE-20
Pre-requisites: Basic Knowledge of Digital Electronics and Computer System architecture
Course Objectives: Basic introduction of computer system architecture, the structure of computer, working of Gates and its functionality.
Course Outcomes: At the end of the course, the students will be able to -
CO1: Student understands of the basic structure and operation of a computer.
CO2: Student learns about the architecture and assembly language Programming of microprocessor.
CO3: Student learns about the Arithmetic Circuits Structures
CO4: Student learns about different Processors.

Contents –

Unit	Content	Teaching hours
1	To Perform Number systems Conversations	2
2	To Perform Binary Arithmetic operations	2
3	To Verify the truth table of Basic Logic Gates	2
4	To Verify the truth table of Universal Logic Gates	2
5	To Verify the truth table of Special Purpose Logic Gates	2
6	State and Prove Demorgan's Theorem	2
7	To Study and Verify Combinational Logic Circuits (Half adder)	2
8	To Study and Verify Combinational Logic Circuits (Full adder)	2
9	To Study General Purpose Registers of 8086 Microprocessor	2
10	To Study Special Purpose Registers of 8086 Microprocessor	2
11	Project	10

Text Books: 1. Anil K. Maini, Digital Electronics: Principles, Devices and Applications, Wiley Publication
Lyla B Das Microprocessors & Multi core systems, Pearson Publication
Reference Books: 1. Douglas V Hall, Microprocessor and Interfacing, Tata McGraw Hill
2. M. Morris Mano, Microprocessor and Interfacing
Online Resources: 1. NPTEL / SWAYAM lectures.

Semester-II

Course Code: **Course Name:** Advance Excel **Course Category:** Vocational skill course		
Credits: 2	**Teaching Scheme:** L-0, P-4	**Evaluation Scheme:** CA-30, ESE-20
Pre-requisites: Basics of Data and Excel functions		
Course Objectives: The Advanced Microsoft Excel course is designed to enhance the analytical and complex data management skills of learners by delving into the deeper functionalities of Excel.		
Course Outcomes: At the end of the course, the students will be able to -		
CO1: Working with Advanced Data handling Excel Functions		
CO2: Understand the Main functions in Excels for Statistical Data measurement		
CO3: Apply the Excel functions for Data Analysis		
CO4: Data interpretation and Data Visualization using Advanced Excel functions		

Contents –

Unit	Content	Teaching hours
1	functions and features of Microsoft Excel	2
2	Highlights And Main Functions: Home, Insert, Page Layout & Formulas	2
3	Highlights And Main Functions: Data, Review, View, Add-Inns	2
4	Working with Data: Entering, Editing, Copy, Cut, Paste, Paste Special	2
5	Manipulating Data, using Data Names and Ranges, Filters and Sort and Validation Lists	2
6	Advanced Formulas and Functions, Advanced Worksheet Features	2
7	Advanced Data Analysis using PivotTables and Pivot Charts	2
8	Measure of central tendency: Mean, median, mode	2
9	Measure of dispersion: variance, standard deviation, Coefficient of variation	2
10	Advanced Data Visualizations in Excel	2
11	Project	10

Text Books: All-In-One:: Master the New Features of Excel 2019 By Lokesh Lalwani ISBN-9789388511582 Publisher Walter de Gruyter GmbH
Reference Books: 1. Data Analysis with Microsoft Excel by Kenneth N. Berk, Partrick Carey ISBN-0534362788 Publisher S.Chand (G/L) & Company Ltd
Online Resources: 1. NPTEL / SWAYAM lectures.

Semester-II

Course Code: **Course Name:** Statistical Methods **Course Category:** Skill Enhancement Course		
Credits: 2	**Teaching Scheme:** L-2, P-0	**Evaluation Scheme:** CA-30, ESE-20
Pre-requisites: Basic Knowledge of Mathematical Foundation		
Course Objectives: The emphasis of course is on descriptive statistics. It gives an idea about the various statistical methods, measures of central tendency, measure of dispersion and correlation. Statistics is matter of science and logic. It mainly indulge on mathematics and logic.		
Course Outcomes: At the end of the course, the students will be able to -		
CO1: Understand the elementary statistical methods.		
CO2: Apply the measures of central tendency, measure of dispersion and co-relation to solve our day-today life problem.		
CO3: Analyze the data to represent it graphically or tabulate and interpret it to generate information.		
CO4: Compare data to tabulate statistical information given in descriptive form.		

Contents –

Unit	Content	Teaching hours
1	**Statistical Methods:** Definition, scope and importance of Statistics, concepts of statistical population and sample. Data & Types of data: Primary and Secondary data, qualitative & quantitative data, Numerical (discrete, continuous), Categorical and Ordinal. Cross-section, time series, failure, industrial, directional data. Attributes, variables, Processing of Data: Completeness, Consistency, Accuracy and Editing. Accuracy of Measurement. Classification, Tabulation and Graphical.	6
2	**Representation:** Preparation of Tables, Presentation of Data: Variable, Random Variable, Frequency, And Frequency Distribution. Diagrammatic representation of Measures of Skewness and Kurtosis: Data: Line and Bar Diagram, Histogram, Component Bar diagram, Pie Chart, Line Graph, Frequency polygon and Ogive.	8
3	**Measures of Central Tendency:** Characteristics of Good measure of Central Tendency. Concept of central tendency- for Group and Ungroup data. Mean: Arithmetic mean (A.M.): simple and weighted Merits and demerits. Geometric mean (G.M.): computation for G M, Merits demerits and applications of G.M. Harmonic Mean (H.M.): computation for frequency, non-frequency data, merits and demerits of H.M., Median: Definition, Median for grouped and nongrouped data, Properties and Merits & demerits, Mode: Definition, Mode for grouped & Non-grouped data, Graphical Method for finding mode, Merits and demerits.	8
4	**Measures of Dispersions:** Purposes of Measure of Dispersion, Properties of Good measures of Dispersion. Range, Quartile Deviation & Mean Deviation: Variance: Standard Deviation: Coefficient of Variation: Bivariate data: Definition, scatter diagram, simple, partial and multiple correlation (3 variables only), rank correlation. Simple linear regression.	8

Text Books: 1. B.L. Agarwal, Basic Statistics, New Age International (P) Limited.
2. S. C. Gupta & V. K. Kapoor Fundamental of Mathematical Statistics, Sultan Chand & Sons
Reference Books: 1. S. C. Gupta Fundamental of Statistics