ARULMIGU PALANIANDAVAR ARTS COLLEGE FOR WOMEN

(AUTONOMOUS)
Re-accredited with B++ by NAAC in 3rd cycle
(Run by Hindu Religious and Charitable Board under the Aegis of
Arulmigu Dhandayuthapani Swamy Thirukovil, Palani)
(Affiliated to Mother Teresa Women's University,   Kodaikanal)
Chinnakalayamputhur(PO), Palani 624 615.

CURRICULUM FRAMEWORK AND SYLLABUS

Master of Science
(Computer Science)

(PROGRAMME CODE: PGCSS)

(Based on the syllabus recommended by TANSCHE)

Degree Programme for the students admitted from the Academic year

2023-2024 Onwards

PG DEPARTMENT OF COMPUTER SCIENCE

ARULMIGU PALANIANDAVAR ARTS COLLEGE FOR WOMEN

INSTITUTIONAL VISION AND MISSION

VISION

- ☐ Enlightenment and Empowerment of Rural Women

MISSION

- ☐ To imbibe research activity and collaborative programs with our local communities.

- ☐ High quality teaching, providing learning environment with practical exposure.

- ☐ Encouragement of a questioning spirit and self-reliance.

- ☐ Strong and support education for the students employability

PG DEPARTMENT OF COMPUTER SCIENCE

VISION

- ☐ Employing women in the field of Information Technology.

- ☐ Molding rural women into Future Leaders.

MISSION

- ☐ Training students in latest trends in IT Field.

- ☐ Motivating students to organize IT related competitions.

- ☐ Conducting special lectures for the students to advance the state of the art in computer science and IT Field.
- ☐ Training students to do projects in recent technologies.

M.Sc(Computer Science)

REGULATION FOR ADMISSION

1. Preamble

Computer Science department was established in 1988 as self supporting department with the curriculum specifically designed to reflect the depth and breadth of computer science. To encourage young rural women students to adopt higher education, M.Sc Computer Science Programme is added in the department in 2005. Expert members from Academia and Industry provide inputs in introducing specialized courses in the curriculum to suit industry needs. To further enhance the quality of the programme, the department adheres TANSCHE 2023-2024 onwards.

2. Eligibility for Admission

Candidates for admission to the M.Sc (Computer Science) course (Full-Time) should possess a B.Sc (Computer Science) / B.Sc(IT) / B.Sc(CT) / BCA or any equivalent degree with a minimum aggregate of 55% marks in Part III Subjects.

3. Duration of the Course

Full-Time M.Sc (Computer Science) Degree course shall be divided into four semesters of two years duration.

4. Eligibility for the Degree

- Candidates for the degree shall besides undergoing the prescribed course of the study, do practical work like case study, project report, prescribed field training etc., under the guidance of staff members and the Head of the Department.
- No candidate shall be eligible for the degree unless she has completed the prescribed course of the study in an Institution and has passed the prescribed examinations.
- No candidate shall be admitted to the examination unless she has put in not less than 60% attendance in terms of total number of working days and has produced a certificate from the Head of the Institution where she has studied that her progress and conduct have been satisfactory.

5. **Passing Rules**

    75% of marks are allotted for external evaluation and 25% of the marks are allotted for internal evaluation in each of the theory subjects.

    60% of marks are allotted for external evaluation and 40% of the marks are allotted for internal evaluation in each of the practical subjects.

    A Candidate is deemed to have passed in a subject if she gets a **minimum of 50%** of the total marks taking the University examination.

6. **Distribution of Marks for External Examinations**

Course	External (75 Marks)	Average of Passing Minimum
PG	38/75(50%)	50/100

7. **Pattern of Evaluation**

    For each paper there will be Internal Assessment (IA) and Semester Examination (External).

	Int.	Ext.	Total
Theory	25	75	100
Practical	40	60	100
Project	40	60	100

8. **Internal Assessment Components**
    Theory

Test	-	15
Assignment	-	5
Seminar	-	5

    25

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9. **Content Delivery methods**

    ● Lecture method

    ● Group Discussion

    ● ICT

10.Pattern of the Question Paper (Internal)

Maximum: 30 marks   Time: 2 Hours

Part – A

I.   Answer the following questions (Either or Choice)   (2*5=10)

Part – B

II.   Answer the following questions (Either or Choice)   (2*10=20)

11.Pattern of the Question Paper (External)

Maximum: 75 marks   Time: 3 Hours

Part – A
I. Answer any FIVE out of EIGHT questions   **(5*2=10)**

Each unit must have ONE or TWO questions

Part – B
II. Answer the following questions (Either or Choice)   **(5*7=35)**

ONE question from each unit

Part – C
III. Answer any THREE out of FIVE questions   **(3*10=30)**

ONE question from each unit

BLOOM'S TAXONOMY BASED ASSESSMENT PATTERN

K1-Remember;   **K2**-Understand;   **K3**-Apply;   **K4**-Analyze; **K5**-Evaluate; **K6**-Create

1. Theory – 75 Marks

Cognitive Level	Section	Marks	Course Outcomes	Description	Total
K2, K3	A (5 Out of 8)	5 x 2 = 10	CO1,CO2	Short Answers	
K4	B (Either or Choice)	5 x 7 = 35	CO2,CO3	Descriptive / Detailed	75
K5,K6	C (3 Out of 5)	3 x 10 = 30	CO4,CO5	Descriptive / Detailed	

2. Practical Examinations:

Knowledge Level	Section	Marks
K3	Practical & Record Work	60
K4		
K5		

TANSCHE REGULATIONS ON LEARNING OUTCOMES-BASED CURRICULUM FRAMEWORK FOR POSTGRADUATE EDUCATION	
Programme	**M.Sc., Computer Science**
Programme Code	**PGCSS**
Duration	**PG - Two Years**
Programme Outcomes (POs)	**PO1: Problem Solving Skill** Apply knowledge of Management theories and Human Resource practices to solve business problems through research in Global context.
	PO2: Decision Making Skill Foster analytical and critical thinking abilities for data-based decision-making.
	PO3: Ethical Value Ability to incorporate quality, ethical and legal value-based perspectives to all organizational activities.
	PO4: Communication Skill Ability to develop communication, managerial and interpersonal skills.
	PO5: Individual and Team Leadership Skill Capability to lead themselves and the team to achieve organizational goals.
	PO6: Employability Skill Inculcate contemporary business practices to enhance employability skills in the competitive environment.
	PO7: Entrepreneurial Skill Equip with skills and competencies to become an entrepreneur.
	PO8: Contribution to Society Succeed in career endeavors and contribute significantly to society.
	PO 9 Multicultural competence Possess knowledge of the values and beliefs of multiple cultures and a global perspective.
	PO 10: Moral and ethical awareness/reasoning Ability to embrace moral/ethical values in conducting one's life.

Programme Specific Outcomes (PSOs)	**PSO1 – Placement** To prepare the students who will demonstrate respectful engagement with others' ideas, behaviors, beliefs and apply diverse frames of reference to decisions and actions.
	PSO 2 – Entrepreneur To create effective entrepreneurs by enhancing their critical thinking, problem solving, decision making and leadership skill that will facilitate startups and high potential organizations.
	PSO3 – Research and Development Design and implement HR systems and practices grounded in research that complies with employment laws, leading the organization towards growth and development.
	PSO4 – Contribution to Business World To produce employable, ethical and innovative professionals to sustain in the dynamic business world.
	PSO 5 – Contribution to the Society To contribute to the development of the society by collaborating with stakeholders for mutual benefit.

Component wise Credit Distribution

Credits	Sem I	Sem II	Sem III	Sem IV	Total
Part A	**20**	**20**	**22**	**20**	**82**
Part B					
(i)Discipline– Centric/Generic Skill					
(ii)Soft Skill		2	2	2	
(iii)Summer Internship/Industrial Training			2		**10**
Part C				1	1
Total	**20**	**22**	**26**	**23**	**91**

MEMBERS PRESENT:

University Nominee:

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13/7/2023

Subject Expert:

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13/07/2023

Entrepreneur Nominee:

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13/02/23

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13/7/2023

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13/07/2023

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CHAIRMAN:

Dr.(Mr). K.Kungumaraj, M.Sc., M.Phil., B.L.I.S., Ph.D.,
Head & Assistant Professor, PG Department of Computer Science
Arulmigu Palaniandavar Arts College for Women,
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MEMBERS OF THE FACULTY:

S.No.	NAME	SIGNATURE
1.	Mrs.C.Aruna, M.Sc., M.Phil	
2.	Miss. P.Pavithra, M.A., M.Phil., B.Ed	
3.	Mrs. P.Kavitha, MCA., M.Phil.,	
4.	Mrs. M.Geetha., M.Sc., M.Phil., B.Ed	
5.	Mrs. J.Sangeetha., M.Sc., M.Phil., M.Ed.,	
6.	Mrs. T.Nandhini, M.Sc., M.Phil	
7.	Mrs. B.Aruna Devi, M.Sc., M.Phil	
8.	Dr.(Mrs). T.Shanmugavadivu., MCA., Ph.D	
9.	Dr.(Mrs). M. Tamilselvi., M.A., M.A., M.Phil., B.Ed., Ph.D, SET, NET	

HEAD OF THE DEPARTMENT   **PRINCIPAL**

Credit Distribution for PG Programme

Semester–I	C	H	Semester-II	C	H	Semester-III	C	H	Semester–IV	C	H
Core - I Analysis and Design of Algorithm	5	7	Core-IV Data Mining and Warehousing	5	6	Core - VII Digital Image Processing	5	6	Core - XI Advanced Software Engineering	5	6
Core - II Object Oriented Analysis and Design & C++	5	7	Core - V Advanced Operating Systems	5	6	Core - VIII Cloud Computing	5	6	Core - XII Internet of Things	5	6
Core – III Python Programming	4	6	Core – VI Advanced Java programming	4	6	Core – IX Network Security and Cryptography	5	6	Project with viva voce	7	10
Elective -I Discipline Centric 1. Python Programming Lab 2. Advanced Web Technology Lab	3	5	Elective – III Discipline Centric 1. Artificial Intelligence and Machine Learning 2.Mobile Computing	3	4	Core – X Data Science and Analytics	4	6	Elective - VI (Industry / Entrepreneurship) 20% Theory 80% Practical 1. Web Application Development and hosting Lab 2.Internet of Things Lab	3	4
Elective-II Generic: 1. Algorithm and OOPS Lab 2. WAP and XML Lab	3	5	Elective -IV Generic: 1. Advanced Java Programming Lab 2. Machine Learning Lab	3	4	Elective - V Discipline Centric 1. Digital Image Processing Lab using MATLAB 2. Dot NET Programming Lab	3	3	Skill Enhancement course / Professional Competency Skill Training for Competitive Examinations	2	4
			Skill Enhancement I (NME) Data Mining using R- Lab	2	4	3.6 Skill Enhancement II (NME) Cloud Computing Lab	2	3	Extension Activity	1	
						3.7 Internship/ Industrial Activity	2	-			
	20	30		22	30		26	30		23	30
Total Credit Points -91											

M.Sc. COMPUTER SCIENCE CURRICULUM DESIGN

Course Code/Sub.Code	Title of the Course	Credits	Hours		Maximum Marks		
			Theory	Practical	CIA	ESE	Total
FIRST SEMESTER							
Core – I	Analysis and Design of Algorithm	5	7	-	25	75	100
Core – II	Object Oriented Analysis And Design & C++	5	7	-	25	75	100
Core – III	Python Programming	4	6	-	25	75	100
Elective -I	1. Python Programming Lab 2. Advanced Web Technology Lab	3	-	5	40	60	100
Elective-II	1. Algorithm and OOPS Lab 2. WAP and XML Lab	3	-	5	40	60	100
Total		**20**	**20**	**10**			**500**
SECOND SEMESTER							
Core – IV	Data Mining and Warehousing	5	6	-	25	75	100
Core – V	Advanced Operating Systems	5	6	-	25	75	100
Core – VI	Advanced Java programming	4	6	-	25	75	100
Elective –III	1. Artificial Intelligence and Machine Learning 2. Mobile Computing	3	4	-	25	75	100
Elective-IV	1. Advanced Java Programming Lab 2. Machine Learning Lab	3	-	4	40	60	100
Skill Enhancement I (NME)	Data Mining using R- Lab	2	-	4	40	60	100
Total		**22**	**22**	**8**			**600**

Course Code/ Sub.Code	Title of the Course	Credits	Hours		Maximum Marks		
			Theory	Practical	CIA	ESE	Total
THIRD SEMESTER							
Core – VII	Digital Image Processing	5	6	-	25	75	100
Core – VIII	Cloud Computing	5	6	-	25	75	100
Core – IX	Network Security and Cryptography	5	6	-	25	75	100
Core – X	Data Science and Analytics	4	6	-	25	75	100
Elective-V	1. Digital Image Processing Lab using MATLAB 2. Dot NET Programming Lab	3	-	3	40	60	100
Skill Enhancement –II (NME)	Cloud Computing Lab	2	-	3	40	60	100
Internship / Industrial Activity		2				100	100
Total		**26**	**24**	**6**			**700**
FOURTH SEMESTER							
Core – XI	Advanced Software Engineering	5	6	-	25	75	100
Core – XII	Internet of Things	5	6		25	75	100
	Project Work and Viva voce	7	-	10	40	60	100
Elective-VI	1. Web Application Development and hosting Lab 2. Internet of Things Lab	3	-	4	40	60	100
Skill Enhancement course / Professional Competency Skill	Training for Competitive Examinations	2	4	-	25	75	100
	Extension Activity	1			100		100
Total		**23**	**16**	**14**			**600**

Total Credits : 91

DISTRIBUTION OF CORE AND ELECTIVE

CORE	**:**	**13 (12 Theory + 1 Project)**
ELECTIVE	**:**	**06 (01 Theory + 05 Lab)**
SKILL ENHANCEMENT COURSE (NME)	**:**	**02**
PROFESSIONAL COMPETENCY SKILL	**:**	**01**
INTERNSHIP / INDUSTRIAL ACTIVITY	**:**	**01**
EXTENSION ACTIVITY	**:**	**01**
TOTAL MARKS	**:**	**2400**
TOTAL CREDITS	**:**	**91**

LIST OF ELECTIVE PAPERS

ELECTIVE-I:

1. Python Programming Lab

2. Advanced Web Technology Lab

ELECTIVE-II:

1. Algorithm and OOPS Lab

2. WAP and XML Lab

ELECTIVE-III:

1. Artificial Intelligence and Machine Learning

2. Mobile Computing

ELECTIVE-IV:

1. Advanced Java Programming Lab

2. Machine Learning Lab

ELECTIVE-V:

1. Digital Image Processing Lab using MATLAB

2. Dot NET Programming Lab

ELECTIVE-VI:

1. Web Application Development and hosting Lab

2. Internet of Things Lab

I – SEMESTER

Course code		ANALYSIS & DESIGN OF ALGORITHMS	L	T	P	C
Core/Elective/Supportive		**Core-I**		7		5
Pre-requisite		Basic Data Structures & Algorithms				

Learning Objectives:

The main objectives of this course are to:

1. Enable the students to learn the Elementary Data Structures and algorithms.
2. Presents an introduction to the algorithms, their analysis and design
3. Discuss various methods like Basic Traversal and Search Techniques, Divide and conquer method, Dynamic programming, Backtracking
4. Understood the various design and analysis of the algorithms.
5. Synthesize efficient algorithms in common engineering design situations

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1.	Get knowledge about algorithms and determines their time complexity. Demonstrate specific search and sort algorithms using divide and conquer technique.	K1,K2
2.	Gain good understanding of Greedy method and its algorithm.	K2,K3
3.	Able to describe about graph using dynamic programming technique.	K3,K4
4.	Demonstrate the concept of backtracking & branch and bound technique.	K5,K6
5.	Explore the traversal and searching technique and apply it for trees and graphs.	K6

K1-Remember;**K2**-Understand;**K3**-Apply;**K4**-Analyze;**K5**-Evaluate; **K6**-Create

Unit:1	INTRODUCTION	15 hours

Introduction: - Algorithm Definition and Specification – Space complexity-Time Complexity-Asymptotic Notations - Elementary Data Structure: Stacks and Queues – Binary Tree - Binary Search Tree - Heap – Heap sort- Graph.

Unit:2	TRAVERSAL AND SEARCH TECHNIQUES	15 hours

Basic Traversal And Search Techniques: Techniques for Binary Trees-Techniques for Graphs - Divide and Conquer: - General Method – Binary Search – Merge Sort – Quick Sort.

Unit:3	GREEDY METHOD	15 hours

The Greedy Method:-General Method–Knapsack Problem–Minimum Cost Spanning Tree– Single Source Shortest Path.

Unit:4	DYNAMIC PROGRAMMING	15 hours

Dynamic Programming-General Method–Multistage Graphs–All Pair Shortest Path–Optimal Binary Search Trees – 0/1 Knapsacks – Traveling Salesman Problem – Flow Shop Scheduling.

Unit:5	**BACKTRACKING**	13 hours
Backtracking:- General Method – 8 – Queens Problem–Sum Of Subsets–Graph Coloring– Hamiltonian Cycles – Branch And Bound: - The Method.		
Unit:6	**Contemporary Issues**	**2 hours**
Expert lectures, online seminars– webinars		
	Total Lecture hours	**75 hours**

Text Books	
1.	Ellis Horowitz, "Computer Algorithms", Galgotia Publications.
2.	Alfred V.Aho,John E.Hopcroft, Jeffrey D.Ullman, " Data Structures and Algorithms".
Reference Books	
1.	Goodrich," Data Structures & Algorithms in Java",Wiley 3rd edition.
2.	Skiena, "The Algorithm Design Manual", Second Edition,Springer,2008
3.	Anany Levith, "Introduction to the Design and Analysis of algorithm", Pearson Education Asia, 2003.
4.	Robert Sedgewick, Phillipe Flajolet, "An Introduction to the Analysis of Algorithms", Addison-Wesley Publishing Company,1996.
Related Online Contents [MOOC ,SWAYAM ,NPTEL, Websites etc.]	
1.	https://nptel.ac.in/courses/106/106/106106131/
2.	https://www.tutorialspoint.com/design_and_analysis_of_algorithms/index.htm
3.	https://www.javatpoint.com/daa-tutorial

Mapping with Programming Outcomes										
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	M	S	M	S	S	M	L	S	M
CO2	S	S	S	S	S	M	S	M	S	M
CO3	S	S	S	S	S	M	S	M	S	M
CO4	S	S	S	S	S	M	S	M	S	M
CO5	S	S	S	S	S	M	S	M	S	M

*S-Strong;   M-Medium;   L-Low

Mapping with Programme Specific Outcomes					
CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	2
CO4	3	3	3	3	3
CO5	3	2	3	3	3
Weightage of course contributed to each PSO	15	14	15	15	14
Weighted % of Course Contribution to POs	3.0	2.8	3.0	3.0	2.8

[*]**S-Strong-3; M-Medium-2; L-Low-1**

I – SEMESTER

Course code		OBJECT ORIENTED ANALYSIS AND DESIGN & C++	L	T	P	C
Core/Elective/Supportive		**Core-II**		7		5
Pre-requisite		Basics of C++and Object Oriented Concepts				

Learning Objectives:

The main objectives of this course are to:

1. Present the object model, classes and objects, object orientation, machine view and model management view.
2. Enables the students to learn the basic functions, principles and concepts of object oriented analysis and design.
3. Enable the students to understand C++ language with respect to OOAD

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1.	Understand the concept of Object-Oriented development and modeling techniques	K1,K2
2.	Gain knowledge about the various steps performed during object design	K2,K3
3.	Abstract object-based views for generic software systems	K3
4.	Link OOAD with C++ language	K4,K5
5.	Apply the basic concept of OOPs and familiarize to write C++ program	K5,K6

K1-Remember;**K2**-Understand;**K3**-Apply;**K4**-Analyze;**K5**-Evaluate; **K6**-Create

Unit:1	OBJECT MODEL	15 hours

The Object Model: The Evolution of the Object Model – Elements of the Object Model – Applying the Object Model. Classes and Objects: The Nature of an Object – Relationship among Objects**.**

Unit:2	CLASSES AND OBJECTS	15 hours

Classes and Object: Nature of Class – Relationship Among classes – The Interplay of classes and Objects. Classification: The importance of Proper Classification –identifying classes and objects –Key Abstractions and Mechanism.

Unit:3	C++ INTRODUCTION	15 hours

Introduction to C++ - Input and output statements in C++-Declarations-control structures– Functions in C++.

Unit:4	INHERITANCE AND OVERLOADING	13 hours

Classes and Objects–Constructors and Destructors–operators overloading–Type Conversion-Inheritance – Pointers and Arrays.

Unit:5	POLYMORPHISM AND FILES	15 hours

Memory Management Operators-Polymorphism–Virtual functions–Files–Exception Handling – String Handling -Templates.		
Unit:6	**Contemporary Issues**	**2 hours**
Expert lectures, online seminars –webinars		
	Total Lecture hours	**75 hours**

	Text Books	
1.	"Object Oriented Analysis and Design with Applications", Grady Booch, Second Edition, Pearson Education.
2.	"Object-Oriented Programming with ANSI & Turbo C++",Ashok N.Kamthane, First Indian Print -2003, Pearson Education.

	Reference Books	
1.	E.Balagurusamy "Object Oriented Programming with C++" ,TMH, Second Edition,2003.

	Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1.	https://onlinecourses.nptel.ac.in/noc19_cs48/preview
2.	https://nptel.ac.in/noc/courses/noc16/SEM2/noc16-cs19/
3.	https://www.tutorialspoint.com/object_oriented_analysis_design/ooad_object_oriented_analysis.htm

Mapping with Programming Outcomes										
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	S	S	M	S	M	S	M	S	S
CO2	S	S	S	M	S	M	S	M	S	S
CO3	S	S	S	M	S	M	S	M	S	S
CO4	S	S	S	M	S	M	S	M	S	S
CO5	S	S	S	M	S	M	S	M	S	S

*S-Strong; M-Medium; L-Low

Mapping with Programme Specific Outcomes					
CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	3	3	3	3
CO2	3	3	2	3	3
CO3	3	3	3	3	2
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage of course contributed to each PSO	15	15	14	15	14
Weighted % of Course Contribution to POs	3.0	3.0	2.8	3.0	2.8

[*]**S-Strong-3; M-Medium-2; L-Low-1**

I – SEMESTER

Course code		**PYTHON PROGRAMMING**	**L**	**T**	**P**	**C**
Core/Elective/Supportive		**Core-III**		6		4
Pre-requisite		Basics of any OOPs Programming Language				

Learning Objectives:

The main objectives of this course are to:

1. Presents an introduction to Python, creation of web applications, network applications and working in the clouds
2. Use functions for structuring Python programs
3. Understand different Data Structures of Python
4. Represent compound data using Python lists, tuples and dictionaries

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1.	Understand the basic concept soft Python Programming	K1,K2
2.	Understand File operations, Classes and Objects	K2,K3
3.	Acquire Object Oriented Skills in Python	K3,K4
4.	Develop web applications using Python	K5
5.	Develop Client Server Networking applications	K5,K6

K1-Remember;**K2**-Understand;**K3**-Apply;**K4**-Analyze;**K5**-Evaluate; **K6**-Create

Unit:1	**INTRODUCTION**	**15 hours**

Python: Introduction–Numbers–Strings–Variables–Lists–Tuples–Dictionaries–Sets– Comparison.

Unit:2	**CODE STRUCTURES**	**15 hours**

Code Structures: if, elseif, and else – Repeat with while – Iterate with for – Comprehensions – Functions – Generators – Decorators – Namespaces and Scope – Handle Errors with try and except – User Exceptions.

Unit:3	**MODULES, PACKAGES AND CLASSES**	**15 hours**

Modules, Packages, and Programs: Standalone Programs – Command-Line Arguments – Modules and the import Statement – The Python Standard Library. **Objects and Classes:** Define a Class with class – Inheritance – Override a Method – Add a Method – Get Help from Parent with super– Inself Defense –Get and Set Attribute Values with Properties –Name Mangling for Privacy – Method Types – Duck Typing – Special Methods –Composition.

Unit:4	**DATA TYPES AND WEB**	**13 hours**

Data Types: Text Strings–Binary Data. **Storing and Retrieving Data:** File Input/ Output–Structured Text Files – Structured Binary Files - Relational Databases – No SQL Data Stores.

Web: Web Clients –Web Servers.

Unit:5	SYSTEMS AND NETWORKS	15 hours

Systems: Files–Directories–Programs and Processes–Calendars and Clocks.

Concurrency: Queues– Processes–Threads–Green Threads and event–twisted–Redis.

Networks: Patterns – The Publish-Subscribe Model – TCP/IP – Sockets – Zero MQ –Internet Services – Web Services and APIs – Remote Processing – Big Fat Data and Map Reduce – Working in the Clouds.

Unit:6	Contemporary Issues	2 hours

Expert lectures, online seminars – webinars

	Total Lecture hours	75 hours

Text Books

1.	Bill Lubanovic, "Introducing Python", O'Reilly, First Edition-Second Release,2014.
2.	Mark Lutz," Learning Python", O'Reilly, Fifth Edition, 2013.
3.	Reema Thareja, " Python Programming using Problem Solving Approach", 1st Edition, Oxford University Press, 2017.

Reference Books

1.	David M. Beazley, "Python Essential Reference (Developer's Library), Fourth Edition,2009.
2.	Sheetal Taneja, Naveen Kumar, "Python Programming ",A Modular Apporoach Pearson Publications.

Related Online Contents [MOOC, SWAYAM ,NPTEL, Websites etc.]

1.	https://www.programiz.com/python-programming/
2.	https://www.tutorialspoint.com/python/index.htm
3.	https://onlinecourses.swayam2.ac.in/aic20_sp33/preview

Mapping with Programming Outcomes										
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	M	S	S	S	M	M	S	M
CO2	S	S	S	S	S	S	S	M	S	M
CO3	S	S	S	S	S	S	S	M	S	M
CO4	S	S	S	S	S	S	S	M	S	M
CO5	S	S	S	S	S	S	S	M	S	M

*S-Strong; M-Medium; L-Low

Mapping with Programme Specific Outcomes					
CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	3	3	3	3
CO2	3	3	2	3	3
CO3	3	3	3	3	2
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage of course contributed to each PSO	15	15	14	15	14
Weighted % of Course Contribution to Pos	3.0	3.0	2.8	3.0	2.8

*S-Strong-3; M-Medium-2; L-Low-1

I – SEMESTER

Course code		PYTHON PROGRAMMING LAB	L	T	P	C
Core/Elective/Supportive		**Elective-I**			5	3
Pre-requisite		Basics of any OOProgramming Language				

Learning Objectives:
The main objectives of this course are to:

1. This course presents an overview of elementary data items, lists, dictionaries, sets and tuples
2. To understand and write simple Python programs
3. To Understand the OOPS concepts of Python
4. To develop web applications using Python

Expected Course Outcomes:	
On the successful completion of the course, student will be able to:	
1.	Able to write programs in Python using OOPS concepts	K1,K2
2.	To understand the concepts of File operations and Modules in Python	K2,K3
3.	Implementation of lists, dictionaries, sets and tuples as programs	K3,K4
4.	To develop web applications using Python	K5,K6
5.	To Implement Error handling using Python	K5,K6

K1-Remember;**K2**-Understand;**K3**-Apply;**K4**-Analyze;**K5**-Evaluate; **K6**-Create

LISTOF PROGRAMS	75 hours

Implement the following in Python:

1. Programs using elementary data items, lists, dictionaries and tuples

2. Programs using conditional branches.

3. Programs using loops.

4. Programs using functions.

5. Programs using exception handling.

6. Programs using inheritance.

7. Programs using polymorphism.

8. Programs to implement file operations.

9. Programs using modules.

10. Programs for creating dynamic and interactive web pages using forms.

Total Lecture hours	75 hours

Text Books
1.	Bill Luba novic," Introducing Python" ,O'Reilly, First Edition-Second Release,2014.

2.	Mark Lutz,“ Learning Python”, O'Reilly, Fifth Edition, 2013.
Reference Books	
1.	David M. Beazley, “ Python Essential Reference ”, Developer's Library, Fourth Edition, 2009.
2.	Sheetal Taneja, Naveen Kumar, ”Python Programming-A Modular Approach”,Pearson Publications.
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1.	https://www.programiz.com/python-programming/
2.	https://www.tutorialspoint.com/python/index.htm
3.	https://onlinecourses.swayam2.ac.in/aic20_sp33/preview

Mapping with Programming Outcomes										
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	S	M	S	S	S	M	M	S	S
CO2	S	S	S	S	S	S	S	M	S	M
CO3	S	S	S	S	S	S	S	M	S	S
CO4	S	S	S	S	S	S	S	M	S	S
CO5	S	M	S	S	S	M	S	M	S	S

*S-Strong; M-Medium; L-Low

Mapping with Programme Specific Outcomes					
CO/PSO	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**
CO 1	3	3	3	3	3
CO 2	3	3	2	3	3
CO 3	3	3	3	3	2
CO 4	3	3	3	3	3
CO 5	3	3	3	3	3
Weightage of course contributed to each PSO	15	15	14	15	14
Weighted % of Course Contribution to POs	3.0	3.0	2.8	3.0	2.8

*S-Strong-3; M-Medium-2; L-Low-1

I – SEMESTER

Course code		ADVANCED WEB TECHNOLOGY LAB	L	T	P	C
Core/Elective/Supportive		**Elective-I**			5	3
Pre-requisite		Basics of HTML,JAVA SCIRPT & CSS				

Learning Objectives:

The main objectives of this course are to:
1. Learn how to create web pages using HTML, CSS and JavaScript.
2. Implement dynamic web pages using JavaScript, Jquery and Angular Java script
3. To create web applications using PHP and MySQL
4. Create web pages using XML and Cascading Style Sheets
5. Create XML documents and Schemas

Course code
Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1.	Design dynamic web pages using JavaScript, Jquery and Angular Java script	K1,K2
2.	Develop Web pages using HTML, CSS and XML	K2,K3
3.	Create web application using PHP and MySQL	K3,K4
4.	Develop interactive web pages using Jquery	K5,K6
5.	Design and Develop fully functional dynamic web applications	K5,K6

K1-Remember;**K2**-Understand;**K3**-Apply;**K4**-Analyze;**K5**-Evaluate; **K6**-Create

LIST OF PROGRAMS	

Implement the following in HTML,CSS,PHP,JAVASCRIPT:

1. Develop a web page to display your education details in a tabular format.
2. Develop a web page to display your CV on a web page.
3. Design a Homepage having three links: About Us, Our Services and   Contact Us. Crea separate web pages for the three links.
4. Design a web page to demonstrate the usage of inline CSS, internal CSS and external CSS.
5. Design an XML document and create a style sheet in CSS & display the document in the browser.
6. Develop a web page to Create image maps.
7. Design a web page to perform input validation using Angular Javascript.
8. Develop a web page in PHP to fetch details from the database.
9. Design a web page to hide paragraph using JQuery
10. Create a web page and add Javascript to handle mouse events and form Events.

Text Books

1.Jeffrey C.Jackson, "Web Technologies A Computer Science Perspective" First Edition Jan 2007.

2.Achyut Godbole,Atul Kahate Web Technologies Third Edition,July 2017

Reference Books

1. Thomas A. Powell, " The complete reference: HTML & CSS" fifth edition, July 2017.

2. Uttam K.Roy, "Web Technologies", Illustrated Edition, November 2010.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1. https://www.edx.org/professional-certificate/harvardx-computer-science-for-web-programming

2. https://www.w3schools.com

3. https://www.php.net.in

Mapping with Programming Outcomes									
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	M	S	S	S	S	M	M	S	M	M
CO2	S	S	M	S	S	S	M	S	S	S
CO3	S	S	S	M	M	S	M	M	S	M
CO4	S	M	S	M	S	M	M	S	S	M
CO5	M	M	S	M	S	M	M	S	M	M

*S-Strong; M-Medium; L-Low

Mapping with Programme Specific Outcomes					
CO/PSO	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**
CO 1	3	3	3	3	3
CO 2	3	3	2	3	3
CO 3	3	3	3	3	2
CO 4	3	3	3	3	3
CO 5	3	2	3	3	3
Weightage of course contributed to each PSO	15	14	14	15	14
Weighted % of Course Contribution to Pos	3.0	2.8	2.8	3.0	2.8

[*]**S-Strong-3; M-Medium-2; L-Low-1**

I – SEMESTER

Course code		**ALGORITHM AND OOPS LAB**	L	T	P	C
Core/Elective/Supportive		**Elective-II**			5	3
Pre-requisite		Basic Programming of C++ language				

Learning Objectives:
The main objectives of this course are to:

1. This course covers the basic data structures like Stack, Queue, Tree, List.
2. This course enables the students to learn the applications of the data structures using various techniques
3. It also enable the students to understand C++ language with respect to OOAD concepts
4. Application of OOPS concepts.
5. To implement OOPS concepts.

Expected Course Outcomes:
On the successful completion of the course ,student will be able to:

1.	Understand the concepts of object oriented with respect to C++	K1,K2
2.	Able to understand and implement OOPS concepts	K3,K4
3.	Implementation of data structures like Stack, Queue, Tree, List using C++	K4,K5
4.	Application of the data structures for Sorting, Searching using different techniques.	K5,K6
5.	Analyzing the handling formatted input and output and unformatted	K4,K5

K1-Remember;**K2**-Understand;**K3**-Apply;**K4**-Analyze;**K5**-Evaluate; **K6**-Create

LIST OF PROGRAMS	75 hours

1. Write a program to solve the tower of Hanoi using recursion.
2. Write a program to traverse through binary search tree using traversals.
3. Write a program to perform various operations on stack using linked list.
4. Write a program to perform various operations in circular queue.
5. Write a program to sort an array of an elements using quick sort.
6. Write a program to solve number of elements in ascending order using heap sort.
7. Write a program to solve the knapsack problem using greedy method
8. Write a program to search for an element in a tree using divide & conquer strategy.
9. Write a program to place the 8 queen son an 8X8 matrix so that no two queens Attack.
10. Write a C++ program to perform Virtual Function
11. Write a C++ program to perform Parameterized constructor
12. Write a C++ program to perform Friend Function
13. Write a C++ program to perform Function Overloading
14. Write a C++ program to perform Single Inheritance.
15. Write a C++ program to perform Employee Details using files.

	Expert lectures ,online seminars –webinars	
	Total Lecture hours	**75 hours**

Text Books	
1.	Goodrich, " Data Structures & Algorithms in Java ", Wiley 3rd edition.
2.	Skiena," The Algorithm Design Manual ", Second Edition, Springer, 2008

Reference Books	
1.	Anany Levith, " Introduction to the Design and Analysis of algorithm ", Pearson Education Asia, 2003.
2.	Robert Sedgewick, Phillipe Flajolet, " An Introduction to the Analysis of Algorithms ", Addison-Wesley Publishing Company,1996.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]
1.	https://onlinecourses.nptel.ac.in/noc19_cs48/preview
2.	https://nptel.ac.in/noc/courses/noc16/SEM2/noc16-cs19/
3.	https://www.tutorialspoint.com/object_oriented_analysis_design/ooad_object_oriented_analysis.htm

Mapping with Programming Outcomes										
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	S	M	S	S	S	M	M	S	S
CO2	S	S	S	S	S	S	S	M	S	S
CO3	S	S	S	S	S	S	S	M	S	S
CO4	S	S	S	S	S	S	S	M	S	S
CO5	S	S	S	S	S	S	S	M	S	S

*S-Strong; M-Medium; L-Low

Mapping with Programme Specific Outcomes					
CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	3	3	3	3
CO2	3	3	2	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage of course contributed to each PSO	15	15	14	15	15
Weighted % of Course Contribution to POs	3.0	3.0	2.6	3.0	3.0

[*]**S-Strong-3; M-Medium-2; L-Low-1**

I – SEMESTER

Course code		WAP AND XML LAB	L	T	P	C
Core/Elective/Supportive		**Elective-II**			5	3
Pre-requisite		Basic Programming of C++ language				

Learning Objectives:
1. The main objectives of this course are to:
2. Learn how to create web pages using HTML, CSS and JavaScript.
3. Implement dynamic web pages using JavaScript, Jquery and Angular Java script
4. Create web pages using XML and Cascading Style Sheets
5. Create XML documents and Schemas

Expected Course Outcomes:	
On the successful completion of the course ,student will be able to:	
1. Understand the concepts of HTML	K1,K2
2. Able to understand and implement Java Script.	K3,K4
3. Implementation of various XML Files.	K4,K5
4. Application of WAP and its Techniques.	K5,K6
5. To build and consume web services	K5,K6

K1-Remember;**K2**-Understand;**K3**-Apply;**K4**-Analyze;**K5**-Evaluate; **K6**-Create

LIST OF PROGRAMS	75 hours
1. Create an XML file for any domain with multiple sublevel complexities.	
2. Create a DTD and XML schema for the XML file.	
3. Tabulate the xml content using XSL.	
4. Validate a XML file using java script	
5. Write a java program to parse an XML file using DOM.	
6. Write a java program to parse an XML file using SAX.	
7. Write a program to implement XML – RPC.	
8. Write a program to implement a web service using java.	
9. Write a program to implement a web service using .NET.	
10. WAP program for "Hello World"	
11. WAP program for paragraphs and Line Breaks	
12. WAP program for Text formatting	
Expert lectures ,online seminars –webinars	

	Total Lecture hours	**75 hours**

Text Books	
1.	For Unit I, II, III Charles Arehart and Others. "Professional WAP with WML, WML script, ASP, JSP, XML, XSLT, WTA Push and Voice XML" Shroff Publishers and Distributers Pvt. Ltd 2000.
2.	Eliotte Rusty Harold "XML TM Bible", Books India (P) Ltd, 2000

	Reference Books
1.	Ray Rischpater Wireless Web Development, Second Edition, Dscover Wireless HTML,WAP 2.0,XML,Palm's WCA.
2.	Mike Jasnowski "Java ,XML, and Web Services Bible"
	Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]
1.	https://onlinecourses.nptel.ac.in/noc19_cs48/preview
2.	https://nptel.ac.in/noc/courses/noc16/SEM2/noc16-cs19/
3.	https://www.tutorialspoint.com/object_oriented_analysis_design/ooad_object_oriented_analysis.htm

Mapping with Programming Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	M	M	S	S	M	M	S	S
CO2	S	S	S	S	S	S	S	M	S	S
CO3	S	S	M	S	S	S	M	M	S	S
CO4	S	S	S	S	S	S	S	M	S	S
CO5	S	S	S	S	S	S	S	M	S	S

*S-Strong; M-Medium; L-Low

Mapping with Programme Specific Outcomes

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	3	3	3	3
CO2	3	3	2	3	3
CO3	3	3	3	3	3
CO4	3	2	3	3	3
CO5	3	3	3	3	3
Weightage of course contributed to each PSO	15	14	14	15	15
Weighted % of Course Contribution to POs	3.0	2.8	2.8	3.0	3.0

*S-Strong-3; M-Medium-2; L-Low-1

II SEMESTER

Course code		DATA MINING AND WARE HOUSING	L	T	P	C
Core/Elective/Supportive		**Core**		6		5
Pre-requisite		Basics of RDBMS & Algorithms				

Learning Objectives:
The main objectives of this course are to:
1. Enable the students to learn the concepts of Mining tasks, classification, clustering and Data Warehousing.
2. Develop skills of using recent data mining software for solving practical problems.
3. Develop and apply critical thinking, problem-solving, and decision-making skills.

Expected Course Outcomes:	
On the successful completion of the course, student will be able to:	
1.	Understand the basic data mining techniques and algorithms	K1,K2
2.	Understand the Association rules, Clustering techniques and Data warehousing contents	K2,K3
3.	Compare and evaluate different data mining techniques like classification, prediction, Clustering and association rule mining	K4,K5
4.	Design data warehouse with dimensional modeling and apply OLAP operations	K5,K6
5.	Identify appropriate data mining algorithms to solve real world problems	K5,K6

K1-Remember;**K2**-Understand;**K3**-Apply; **K4**-Analyze;**K5**-Evaluate; **K6**-Create

Unit:1	**BASICS AND TECHNIQUES**	**12 hours**

Basic data mining tasks – data mining versus knowledge discovery in databases – data mining issues – data mining metrics – social implications of data mining – data mining from a database perspective.

Data mining techniques: Introduction – a statistical perspective on data mining – similarity measures – decision trees – neural networks – genetic algorithms.

Unit:2	**ALGORITHMS**	**12 hours**

Classification: Introduction –Statistical –based algorithms -distance–based algorithms-decision tree-based algorithms-neural network–based algorithms–rule-based algorithms–combining techniques.

Unit:3	**CLUSTERING AND ASSOCIATION**	**12 hours**

Clustering: Introduction–Similarity and Distance Measures–Outliers–Hierarchical Algorithms -Partitional Algorithms.

Association rules: Introduction - large item sets - basic algorithms – parallel & distributed algorithms – comparing approaches- incremental rules – advanced association rules techniques – measuring the quality of rules.

Unit:4	**DATA WAREHOUSING AND MODELING**	**11 hours**

Data warehousing: introduction-characteristics of a data warehouse–data marts–other aspects
Of data mart .Online analytical processing: introduction –OLTP & OLAP systems
Data modeling –star schema for multidimensional view –data modeling – multi factor schema or snow flake schema – OLAP TOOLS – State of the market – OLAP TOOLS and the internet.

Unit:5	APPLICATIONS OF DATA WAREHOUSE	11 hours

Developing a data WAREHOUSE: why and how to build a data warehouse –data warehouse architectural strategies and organization issues - design consideration – data content – metadata distribution of data – tools for data warehousing – performance considerations – crucial decisions in designing a data warehouse.
Applications of data warehousing and data mining in government: Introduction - national data warehouses – other areas for data warehousing and data mining.

Unit:6	Contemporary Issues	2 hours

Expert lectures, online seminars –webinars

	Total Lecture hours	60 hours

Text Books	
1.	Margaret H.Dunham," Data Mining: Introductory and Advanced Topics ", Pearson education, 2003.
2.	C.S.R. Prabhu, " Data Warehousing Concepts, Techniques, Products and Applications ", PHI, Second Edition.
Reference Books	
1.	ArunK.Pujari, " Data Mining Techniques ", Universities Press(India) Pvt. Ltd.,2003.
2.	Alex Berson, Stephen J.Smith," Data Warehousing, Data Mining and OLAP ", TMCH, 2001.
3.	Jiawei Han & Micheline Kamber, "Data Mining Concepts & Techniques", 2001, Academic press.
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1.	https://www.javatpoint.com/data-warehouse
2.	https://nptel.ac.in/noc/courses/noc20/SEM1/noc20-cs12/
3.	https://www.btechguru.com/training--it--database-management-systems--file-structures--introduction-to-data-warehousing-and-olap-2-video-lecture--12054--26--151.html

Mapping with Programming Outcomes									
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	S	S	S	S	M	M	M	M
CO2	S	S	S	S	S	S	S	M	S	S
CO3	S	S	S	S	S	S	S	M	S	S
CO4	S	S	S	S	S	S	S	M	S	S
CO5	S	S	S	S	S	S	S	M	S	S

*S-Strong; M-Medium; L-Low

Mapping with Programme Specific Outcomes					
CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	3	3	2	2
CO2	3	3	2	2	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	2	2
Weightage of course contributed to each PSO	15	15	14	12	13
Weighted % of Course Contribution to POs	3.0	3.0	2.8	2.4	2.6

*S-Strong-3; M-Medium-2; L-Low-1

II – SEMESTER

Course code		ADVANCED OPERATING SYSTEMS	L	T	P	C
Core/Elective/Supportive		**Core**		6		5
Pre-requisite		Basics of OS & its functioning				

Learning Objectives:

The main objectives of this course are to:

1. Enable the students to learn the different types of operating systems and their functioning.
2. Gain knowledge on Distributed Operating Systems
3. Gain insight into the components and management aspects of real time and mobile operating systems.
4. Learn case studies in Linux Operating Systems

Expected Course Outcomes:	
On the successful completion of the course ,student will be able to:	
1.	Understand the design issues associated with operating systems	K1,K2
2.	Master various process management concepts including scheduling, deadlocks and distributed file systems	K3,K4
3.	Prepare Real Time Task Scheduling	K4,K5
4.	Analyze Operating Systems for Handheld Systems	K5,K6
5.	Analyze Operating Systems like LINUX and Ios	K5,K6

K1-Remember;**K2**-Understand;**K3**-Apply;**K4**-Analyze;**K5**-Evaluate; **K6**-Create

Unit:1	**BASICS OF OPERATING SYSTEMS**	**12 hours**

Basics of Operating Systems: What is an Operating System? – Main frame Systems –Desktop Systems – Multiprocessor Systems – Distributed Systems – Clustered Systems –Real-Time Systems – Handheld Systems – Feature Migration – Computing Environments -Process Scheduling – Cooperating Processes – Inter Process Communication- Deadlocks –Prevention – Avoidance – Detection – Recovery.

Unit:2	**DISTRIBUTED OPERATING SYSTEMS**	**12 hours**

Distributed Operating Systems: Issues – Communication Primitives – Lamport's Logical Clocks – Deadlock handling strategies – Issues in deadlock detection and resolution-distributed file systems –design issues.

Unit:3	**REALTIME OPERATING SYSTEM**	**10 hours**

Real time Operating Systems : Introduction – Applications of Real Time Systems – Basic Model of Real Time System – Characteristics – Safety and Reliability - Real Time Task Scheduling

Unit:4	**HANDHELD SYSTEM**	**12 hours**

Operating Systems for Handheld Systems: Requirements–Technology Overview–Handheld Operating Systems–Palm OS-Symbian Operating System-Android–Architecture of android– Securing handheld systems

Unit:5	**CASE STUDIES**	**12 hours**

Case Studies : Linux System: Introduction – Memory Management – Process Scheduling – Scheduling Policy - Managing I/O devices – Accessing Files- IOS : Architecture and SDK Framework - Media Layer - Services Layer - Core OS Layer - File System.

Unit:6	Contemporary Issues	2 hours
Expert lectures, online seminars–webinars		
	Total Lecture hours	60 hours

Text Books

1.	Abraham Silberschatz; Peter Baer Galvin; Greg Gagne,"Operating System Concepts", Seventh Edition, John Wiley & Sons, 2004.
2.	Mukesh Singhal and Niranjan G. Shivaratri, "Advanced Concepts in Operating Systems – Distributed, Database, and Multiprocessor Operating Systems", Tata McGraw-Hill, 2001.

Reference Books

1.	Rajib Mall,"Real-Time Systems:Theoryand Practice",Pearson EducationIndia,2006.
2.	Pramod Chandra P.Bhatt, An introduction to operating systems, concept and practice, PHI, Third edition, 2010.
3.	Daniel.P.Bovet&MarcoCesati,"UnderstandingtheLinuxkernel",3rdedition,O"Reilly,2005
4.	NeilSmyth,"iPhoneiOS4DevelopmentEssentials–Xcode",FourthEdition,Payload media, 2011.

Related Online Contents[MOOC ,SWAYAM, NPTEL, Websites etc.]

1.	https://onlinecourses.nptel.ac.in/noc20_cs04/preview
2.	https://www.udacity.com/course/advanced-operating-systems--ud189
3.	https://minnie.tuhs.org/CompArch/Resources/os-notes.pdf

Mapping with Programming Outcomes										
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	S	S	S	S	M	M	M	M
CO2	S	M	S	S	S	S	S	M	S	M
CO3	S	M	S	S	S	S	S	M	S	M
CO4	S	M	S	S	S	S	S	M	S	M
CO5	S	M	S	S	S	S	S	M	S	M

*S-Strong; M-Medium; L-Low

Mapping with Programme Specific Outcomes					
CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	2	2	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage of course contributed to each PSO	15	14	14	15	15
Weighted % of Course Contribution to POs	3.0	2.8	2.8	3.0	3.0

*S-Strong-3; M-Medium-2;   L-Low-1

II – SEMESTER

Course code		ADVANCED JAVA PROGRAMMING	L	T	P	C
Core/Elective/Supportive		**Core-VI**		4		6
Pre-requisite		Basics of Java & its Usage				

Learning Objectives:
The main objectives of this course are to:

1. Enable the students to learn the basic functions, principles and concepts of advanced java programming.
2. Provide knowledge on concepts needed for distributed Application Architecture.
3. Learn JDBC, Servlet packages, JQuery, Java Server Pages and JAR file format

Expected Course Outcomes:	
On the successful completion of the course, student will be able to:	
1.	Understand the advanced concepts of Java Programming	K1,K2
2.	Understand JDBC and RMI concepts	K2,K3
3.	Apply and analyze Java in Database	K3,K4
4.	Handle different event in java using the delegation event model, event listener and class	K5,K6
5.	Design interactive applications using Java Servlet, JSP and JDBC	K5,K6

K1-Remember;**K2**-Understand;**K3**-Apply; **K4**-Analyze;**K5**-Evaluate; **K6**-Create

Unit:1	**BASICS OF JAVA**	**12 hours**

Java Basics Review: Components and event handling–Threading concepts–Networking features – Media techniques

Unit:2	**REMOTE METHOD INVOCATION**	**12 hours**

Remote Method Invocation-Distributed Application Architecture- Creating stubs and skeletons-Defining Remote objects- Remote Object Activation-Object Serialization-Java Spaces

Unit:3	**DATABASE**	**10 hours**

Java in Databases-JDBC principles–database access-Interacting-database search–Creating multimedia databases – Database support in web applications

Unit:4	**SERVLETS**	**12 hours**

Java Servlets: Java Servlet and CGI programming- A simple java Servlet-Anatomy of a java Servlet-Reading data from a client-Reading http request header-sending data to a client and writing the http response header-working with cookies
Java Server Pages: JSP Overview-Installation-JSP tags-Components of a JSP page-Expressions-Script lets-Directives-Declarations-A complete example

Unit:5	**ADVANCED TECHNIQUES**	**12 hours**

JAR file format creation–Internationalization–Swing Programming–Advanced java
Techniques

Unit:6	**Contemporary Issues**	**2 hours**
Expert lectures, online seminars –webinars		
	Total Lecture hours	**60 hours**

Text Books

1.	JamieJaworski,"JavaUnleashed",SAMSTechmediaPublications,1999.
2.	Campione, Walrath and Huml,"TheJavaTutorial",AddisonWesley,1999.

Reference Books	
1.	JimKeogh,"TheCompleteReferenceJ2EE",Tata McGrawHillPublishingCompanyLtd,2010.
2.	David Sawyer Mc Farland,"Java Script And JQuery- The Missing Manual", Oreilly Publications, 3rd Edition,2011.
3.	Deitel and Deitel, "Java How to Program", Third Edition, PHI/Pearson Education Asia.

Related Online Contents[MOOC, SWAYAM, NPTEL, Websites etc.]	
1.	https://www.javatpoint.com/servlet-tutorial
2.	https://www.tutorialspoint.com/java/index.htm
3.	https://onlinecourses.nptel.ac.in/noc19_cs84/preview

Mapping with Programming Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	S	M	M	M	S
CO2	S	S	S	S	S	S	S	M	S	S
CO3	S	S	S	S	S	S	S	M	S	S
CO4	S	S	S	S	S	S	S	M	S	S
CO5	S	S	S	S	S	S	S	M	S	S

*S-Strong; M-Medium; L-Low

Mapping with Programme Specific Outcomes

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	3	3	3	3
CO2	3	3	3	2	2
CO3	2	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage of course contributed to each PSO	14	15	15	14	14
Weighted % of Course Contribution to POs	2.8	3.0	3.0	2.8	2.8

*S-Strong-3; M-Medium-2; L-Low-1

II – SEMESTER

Course code		ARTIFICIAL INTELLIGENCE& MACHINE LEARNING	L	T	P	C
Core/Elective/Supportive		**Elective-III**		4		3
Pre-requisite		Basics of AI & an Introduction about ML				

Learning Objectives:
The main objectives of this course are to:

1. Enable the students to learn the basic functions of AI, Heuristic Search Techniques.
2. Provide knowledge on concepts of Representations and Mappings and Predicate Logic.
3. Introduce Machine Learning with respect Data Mining, Big Data and Cloud.
4. Study about Applications & Impact of ML.

Expected Course Outcomes:	
On the successful completion of the course, student will be able to:	
1.	Demonstrate AI problems and techniques	K1,K2
2.	Understand machine learning concepts	K2,K3
3.	Apply basic principles of AI in solutions that require problem solving, inference, perception, knowledge representation, and learning	K3,K4
4.	Analyze the impact of machine learning on applications	K4,K5
5.	Analyze and design a real world problem for implementation and understand the dynamic behavior of a system	K5,K6

K1-Remember;**K2**-Understand;**K3**-Apply;**K4**-Analyze;**K5**-Evaluate; **K6**-Create

Unit:1	INTRODUCTION	12 hours

Introduction: AI Problems - Al techniques - Criteria for success. Problems, Problem Spaces, Search: State space search - Production Systems - Problem Characteristics - Issues in design of Search.

Unit:2	SEARCH TECHNIQUES	12 hours

Heuristic Search techniques: Generate and Test - Hill Climbing- Best-First, Problem Reduction, Constraint Satisfaction, Means-end analysis. Knowledge representation issues: Representations and mappings -Approaches to Knowledge representations -Issues in Knowledge representations - Frame Problem.

Unit:3	PREDICATE LOGIC	12 hours

Using Predicate logic: Representing simple facts in logic - Representing Instance and Isa relationships - Computable functions and predicates - Resolution - Natural deduction. Representing knowledge using rules: Procedural Vs Declarative knowledge- Logic programming -Forward Vs Backward reasoning -Matching-Control knowledge.

Unit:4	MACHINE LEARNING	12 hours

Understanding Machine Learning: What Is Machine Learning?-Defining Big Data-Big Data in Context with Machine Learning-The Importance of the Hybrid Cloud-Leveraging the Power of Machine Learning-The Roles of Statistics and Data Mining with Machine Learning-Putting Machine Learning in Context-Approaches to Machine Learning.

Unit:5	**APPLICATIONS OF MACHINE LEARNING**	**10 hours**

Looking Inside Machine Learning: The Impact of Machine Learning on Applications -Data Preparation-The Machine Learning Cycle.

Unit:6	**Contemporary Issues**	**2 hours**
	Expert lectures, online seminars –webinars	
	Total Lecture hours	**60 hours**

Text Books		
1.	Elaine Rich and Kevin Knight, "Artificial Intelligence ", Tata McGraw Hill Publishers company Pvt Ltd, Second Edition, 1991.
2.	George FLuger," Artificial Intelligence", 4th Edition, Pearson Education Publ, 2002.

Reference Books	
1.	Machine Learning For Dummies®, IBM Limited Edition by Judith Hurwitz, Daniel Kirsch.

Related Online Contents[MOOC, SWAYAM, NPTEL, Websites etc.]	
1.	https://www.ibm.com/downloads/cas/GB8ZMQZ3
2.	https://www.javatpoint.com/artificial-intelligence-tutorial
3.	https://nptel.ac.in/courses/106/105/106105077/

Mapping with Programming Outcomes									
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	S	S	S	S	S	M	M	M	S
CO2	S	S	S	S	S	S	S	M	S	S
CO3	S	S	S	S	S	S	S	M	S	S
CO4	S	S	S	S	S	S	S	M	S	S
CO5	S	S	S	S	S	S	S	M	S	S

*S-Strong; M-Medium; L-Low

Mapping with Programme Specific Outcomes					
CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	3	3	3	3
CO2	3	3	3	2	3
CO3	3	2	2	3	3
CO4	3	2	3	3	3
CO5	3	3	3	3	3
Weightage of course contributed to each PSO	15	13	14	14	15
Weighted % of Course Contribution to POs	3.0	2.6	2.8	2.8	3.0

*S-Strong-3; M-Medium-2; L-Low-1

II SEMESTER

Course code		MOBILE COMPUTING	L	T	P	C
Core/Elective/Supportive		**Elective--III**		4		3
Pre-requisite		Basic knowledge of Computer Networks and Data Communications.				

Learning Objectives:
The main objectives of this course are to:

1. Contribute to the diagnostics, troubleshooting, documenting and monitoring of technical problems using appropriate methodologies and tools.
2. To learn about the telecommunications and broadcasting systems.
3. Understanding the concepts of Wireless LANs.
4. Learn the features of different mobile OS and Mobile Applications.

Expected Course Outcomes:
On the successful completion of the course, student will be able to:

1.	Understand the concept of communication medium and multiplexing in telephone network	K1,K2
2.	Comprehend the routing mechanism and frequency allocation in GSM	K2,K3
3.	Deploy the GPRS concept for packet data transfer in mobile by using GPRS	K3,K4
4.	Acquire the knowledge on WAP, CDMA, 3G network and spectrum techniques in wireless network	K4,K5
5.	Contribute to the diagnostics, troubleshooting, documenting and monitoring of technical problems using appropriate methodologies and tools.	K5,K6

K1-Remember;**K2**-Understand;**K3**-Apply;**K4**-Analyze;**K5**-Evaluate; **K6**-Create

Unit:1	INTRODUCTION	15hours

Introduction: Mobility of Bits and Bytes-Wireless The beginning-Mobile computing-Dialog Control-Networks-Middleware and Gateways-Applications and Services-Developing Mobile Computing Applications –Security in Mobile Computing –Standards-why is it necessary-Standard Bodies-Players in the wireless space. **Mobile computing Architecture**: History of computers-History of Internet-Internet the Ubiquitous Network - Architecture for Mobile computing - Three-tier Architecture - Design considerations for mobile computing - mobile computing through Internet.

Unit:2	Mobile Computing Through Telephony	15hours

Mobile Computing Through Telephony: Evolution of Telephony - Multiple Access Procedures – mobile computing through telephone – developing an IVR Application - voice XML - Telephony Application Programming Interface. Emerging Technologies: Introduction -Bluetooth - radio Frequency Identification – wireless broadband - mobile IP - Internet Protocol version 6 - Java card.

Unit:3	Global System For Mobile Communications	15hours

Global System For Mobile Communications: Global system for Mobile communications – GSM Architecture – GSM Entities – call routing in GSM – PLMN Interfaces – GSM address and Identifiers – Network aspects in GSM - GSM Frequency Allocation – Authentication and security. General Packet Radio Service: Introduction – GPRS and packet Data Network - GPRS Network operations – Data Services in GPRS – Applications for GPRS -Limitations of GPRS - Billing and charging in GPRS

Unit:4	Wireless Application Protocol	15hours

Wireless Application Protocol Introduction – WAP – MMS - GPRS applications. CDMA and 3G: Introduction - Spread spectrum technology – IS95 – CDMA versus GSM – Wireless Data – Third Generation Networks – Applications on 3G

Unit:5	Wireless LAN	13hours

Introduction – wireless LAN advantages – IEEE 802.11 standards – wireless LAN architecture – mobility in wireless LAN – deploying wireless LAN – Mobile adhoc Networks and sensor Networks – Wireless LAN Security – WiFi versus 3G.

Unit:6	Contemporary Issues	2 hours

Expert lectures, online seminars –webinars

	Total Lecture hours	75hours

Text Books

1. **TEXT BOOK**
   Asoke K Talukder, Roopa R Yavagal, *Mobile Computing, Technology Applications and Service creation*, Tata McGraw - Hill Publishing company New Delhi 2007

Reference Books

1. Jochen Schiller, *Mobile Communication,* 2nd edition Pearson 2003.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1.	https://www.javatpoint.com/mobile computing-tutorial
2.	https://onlinecourses.swayam2.ac.in/cec20_cs07/preview
3.	https://onlinecourses.nptel.ac.in/noc19_cs69/preview

Mapping with Programming Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	M	S	S	S	M	M	M	M
CO2	S	S	S	S	S	S	S	M	S	S
CO3	S	S	S	S	S	S	S	M	S	S
CO4	S	S	S	S	S	S	S	M	S	S
CO5	S	S	S	S	S	S	S	M	S	S

*S-Strong; M-Medium; L-Low

Mapping with Programme Specific Outcomes					
CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	3	3	3	3
CO2	3	3	3	3	2
CO3	2	2	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage of course contributed to each PSO	14	14	15	15	14
Weighted % of Course Contribution to POs	2.8	2.8	3.0	3.0	2.8

*S-Strong-3; M-Medium-2; L-Low-1

II – SEMESTER

Course code		**ADVANCED JAVA LAB**	L	T	P	C
Core/Elective/Supportive		**Elective-IV**			4	3
Pre-requisite		Basics in Java Programming				

Learning Objectives:
The main objectives of this course are to:

1. To enable the students to implement the simple programs using JSP,JAR
2. To provide knowledge on using Servlets , Applets
3. To introduce JDBC and navigation of records
4. To understand RMI & its implementation
5. To introduce to Socket programming

Expected Course Outcomes:
On the successful completion of the course, student will be able to:

1.	Understand to the implement concepts of Java using HTML forms, JSP &JAR	K1,K2
2.	Must be capable of implementing JDBC and RMI concepts	K3,K4
3.	Able to write Applets with Event handling mechanism	K4,K5
4.	To Create interactive web based applications using servlets and jsp	K5,K6
5.	To validate Remote methods in an application using RMI.	K5,K6

K1-Remember;**K2**-Understand;**K3**-Apply;**K4**-Analyze;**K5**-Evaluate; **K6**-Create

LISTOF PROGRAMS	**75 hours**

1. Display a welcome message using Servlet.
2. Design a Purchase Order form using Html form and Servlet.
3. Develop a program for calculating the percentage of marks of a student using JSP.
4. Design a Purchase Order form using Html form and JSP.
5. Prepare a Employee pay slip using JSP.
6. Write a program using JDBC for creating a table ,Inserting, Deleting records and list out the records.
7. Write a program using Java servlet to handle form data.
8. WriteasimpleServletprogramtocreateatableofalltheheadersitreceivesalongwiththeirassociate dvalues.
9. Write a program in JSP by using session object.
10. Write a program to build a simple Client Server application using RMI.
11. Create an applet for a calculator application.
12. Program to send a text message to another system and receive the text message from the system (use socket programming).

Expert lectures, online seminars –webinars

	Total Lecture hours	**75hours**

	Text Books
1.	JamieJaworski,"JavaUnleashed",SAMSTechmediaPublications,1999.
2.	Campione, Walrath and Huml,"TheJavaTutorial",AddisonWesley,1999.
	Reference Books
1.	JimKeogh,"TheCompleteReferenceJ2EE",TataMcGrawHillPublishingCompany Ltd,2010.
2.	David Sawyer McFarland,"Java Script And JQuery- The Missing Manual", Oreilly Publications, 3rd Edition,2011.
	Related Online Contents[MOOC, SWAYAM, NPTEL, Websites etc.]
1.	https://www.javatpoint.com/servlet-tutorial
2.	https://www.tutorialspoint.com/java/index.htm
3.	https://onlinecourses.nptel.ac.in/noc19_cs84/preview

Mapping with Programming Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	M	S	S	S	M	M	S	M
CO2	S	S	S	S	S	S	S	M	S	S
CO3	S	S	S	S	S	S	S	M	S	S
CO4	S	S	S	S	S	S	S	S	S	S
CO5	S	S	S	S	S	S	S	S	S	S

*S-Strong; M-Medium; L-Low

Mapping with Programme Specific Outcomes

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 6
CO1	3	3	3	3	2
CO2	3	3	2	3	3
CO3	3	3	3	3	2
CO4	3	2	3	2	3
CO5	3	3	2	3	3
Weightage of course contributed to each PSO	15	14	13	14	13
Weighted % of Course Contribution to POs	3.0	2.8	2.6	2.8	2.6

*S-Strong-3   M-Medium-2 L-Low-1

II SEMESTER

Course code		MACHINE LEARNING LAB	L	T	P	C
Core/Elective/Supportive		**Elective-IV**			4	3
Pre-requisite		Basics of Algorithm				

Learning Objectives:
1. The main objectives of this course are to: To formulate machine learning problems corresponding to different applications.   2. To understand a range of machine learning algorithms along with their strengths and weaknesses.   3. To apply machine learning algorithms to solve problems of moderate complexity.   4. To apply CNN to solve problems of moderate complexity.   5. To apply LSTM and RNN to solve problems.

Expected Course Outcomes:	
On the successful completion of the course, student will be able to:	
1. To understand and implement the mathematical and statistical prospective machine learning algorithms through python programming	**K1-K6**
2. To recognize and develop the machine learning models through python in built functions	**K1-K6**
3. To understand, impart and develop the machine learning models for real-time dataset	**K1-K6**
4. To understand a wide variety of learning algorithms	**K1-K6**
5. To comprehend , impart and implement the deep learning models for real-time applications	**K1-K6**
K1-Remember;**K2**-Understand;**K3**-Apply;**K4**-Analyze;**K5**-Evaluate; **K6**-Create	

LIST OF PROGRAMS	**75hours**
1. Write a program to compute the Central Tendency Measures: Mean, Median, Mode, Measu of Dispersion: Variance, Standard Deviation 2. Implement a Linear Regression and Multiple Linear Regression with a Real Dataset 3. Implementation of Logistic Regression using sklearn 4. Implement a binary classification model. 5. Classification with Nearest Neighbours and NavieBaye Algorithm 6. Implementation Decision tree for classification using sklearn and its parameter tuning 7. Implement the k-means algorithm. 8. Implement an Image Classifier using CNN. 9. Implement an Auto encoder. 10. Implement a Simple LSTM.	
Expert lectures, online seminars –webinars	
Total Lecture hours	**75hours**

	Text Books
1.	Elaine Rich and Kevin Knight, "Artificial Intelligence ", Tata McGraw Hill Publishers company Pvt Ltd, Second Edition, 1991.
2.	George FLuger," Artificial Intelligence", 4th Edition, Pearson Education Publ, 2002.
	Reference Books
1.	Machine Learning For Dummies® , IBM Limited Edition by Judith Hurwitz, Daniel Kirsch.
2.	Jason Bell, "Machine Learning: Hands-On for Developers and Technical Professionals", Wiley Publication,2015.
	Related Online Contents[MOOC, SWAYAM, NPTEL, Websites etc.]
1.	https://www.javatpoint.com/servlet-tutorial
2.	https://www.tutorialspoint.com/java/index.htm
3.	https://onlinecourses.nptel.ac.in/noc19_cs84/preview

Mapping with Programming Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	M	S	S	S	M	M	S	M
CO2	S	S	S	S	S	S	S	M	S	S
CO3	S	S	S	S	S	S	S	S	S	S
CO4	S	S	S	S	S	S	S	S	S	S
CO5	S	S	S	S	S	S	S	S	S	S

*S-Strong; M-Medium; L-Low

Mapping with Programme Specific Outcomes					
CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	2	3	3	2
CO2	3	3	2	3	3
CO3	3	3	3	3	2
CO4	3	2	3	2	3
CO5	3	3	2	3	3
Weightage of course contributed to each PSO	15	13	13	14	13
Weighted % of Course Contribution to POs	3.0	2.6	2.6	2.8	2.6

*S-Strong-3; M-Medium-2; L-Low-1

II – SEMESTER

Course code		**PRACTICAL: DATA MINING USING R**	**L**	**T**	**P**	**C**
Core/Elective/Supportive		**Skill Enhancement-I / NME**			4	2
Pre-requisite		Basics of DM Algorithms & R Programming				

Learning Objectives:
The main objectives of this course are to:

1. To enable the students to learn the concepts of Data Mining algorithms namely classification, clustering, regression….
2. To understand & write program using the DM algorithms
3. To apply statistical interpretations for the solutions
4. Able to use visualizations techniques for interpretations

Expected Course Outcomes:	
On the successful completion of the course, student will be able to:	
1.	Able to write programs using R for Association rules, Clustering techniques	K1,K2
2.	Able to use different visualizations techniques using R	K2,K3
3.	To analyze data and generate reports based on the data	K4,K5
4.	To apply different data mining algorithms to solve real world applications	K5,K6
5.	To implement data mining techniques like classification, prediction	K5,K6
K1-Remember;**K2**-Understand;**K3**-Apply;**K4**-Analyze;**K5**-Evaluate; **K6**-Create	

LISTOF PROGRAMS	**75hours**

1. Implement Apriori algorithm to extract association rule of data mining.

2. Implement k-means clustering technique.

3. Implement anyone Hierarchal Clustering.

4. Implement Classification algorithm.

5. Implement Decision Tree.

6. Linear Regression.

7. Data Visualization.

	Total Lecture hours	**75hours**

Text Books	
1.	MargaretH.Dunham,"DataMining:IntroductoryandAdvancedTopics",Pearson education,2003.
2.	C.S.R. Prabhu, "Data Warehousing Concepts, Techniques, Products and Applications", PHI, Second Edition
Reference Books	

1.	Arun K. Pujari, "Data Mining Techniques", Universities Press(India)Pvt. Ltd.,2003.
2.	Alex Berson, Stephen J. Smith," Data Warehousing, Data Mining and OLAP",TMCH, 2001.

	Related Online Contents[MOOC, SWAYAM, NPTEL, Websites etc.]
1	https://www.javatpoint.com/data-warehouse
2	https://nptel.ac.in/noc/courses/noc20/SEM1/noc20-cs12/
3	https://www.btechguru.com/training--it--database-management-systems--file-structures--introduction-to-data-warehousing-and-olap-2-video-lecture--12054--26--151.html

Mapping with Programming Outcomes
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	M	S	S	S	M	M	S	S
CO2	S	S	S	S	S	S	S	M	S	M
CO3	S	S	S	S	S	S	S	S	S	S
CO4	S	S	S	S	S	S	S	M	S	S
CO5	S	S	S	S	S	S	S	S	S	S

*S-Strong; M-Medium; L-Low

Mapping with Programme Specific Outcomes					
CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	3	3	3	2
CO2	3	3	2	3	3
CO3	3	3	3	3	2
CO4	3	2	3	2	3
CO5	3	3	2	3	3
Weightage of course contributed to each PSO	15	14	13	14	13
Weighted % of Course Contribution to POs	3.0	2.8	2.6	2.8	2.6

*S-Strong-3; M-Medium-2; L-Low-1

III SEMESTER

Course code		DIGITAL IMAGE PROCESSING	L	T	P	C
Core/Elective/Supportive		**Core-VII**		6		5
Pre-requisite		Basics of Image Processing				

Learning Objectives:
The main objectives of this course are to:

1. Learn basic image processing techniques for solving real problems.
2. Gain knowledge in image transformation and Image enhancement techniques.
3. Learn Image compression and Segmentation procedures.

Expected Course Outcomes:	
On the successful completion of the course, student will be able to:	
1. Understand the fundamentals of Digital Image Processing	K1,K2
2. Understand the mathematical foundations for digital image representation, image acquisition, image transformation, and image enhancement	K2,K3
3. Apply, Design and Implement and get solutions for digital image processing problems	K3,K4
4. Apply the concepts of filtering and segmentation for digital image retrieval	K4,K5
5. Explore the concepts of Multi-resolution process and recognize the objects in an efficient manner	K5,K6

K1-Remember;**K2**-Understand;**K3**-Apply;**K4**-Analyze;**K5**-Evaluate; **K6**-Create

Unit:1	INTRODUCTION	12hours

Introduction: What is Digital image processing – the origin of DIP – Examples of fields that use DIP – Fundamentals steps in DIP – Components of an image processing system. Digital Image Fundamentals: Elements of Visual perception – Light and the electromagnetic spectrum – Image sensing and acquisition – Image sampling and Quantization – Some Basic relationship between Pixels – Linear & Nonlinear operations.

Unit:2	IMAGE ENHANCEMENT	12hours

Image Enhancement in the spatial domain:- Background – some basic Gray level Transformations – Histogram Processing – Enhancement using Arithmetic / Logic operations – Basics of spatial filtering – Smoothing spatial filters – Sharpening spatial filters – Combining spatial enhancement methods.

Unit:3	IMAGE RESTORATION	12hours

Image Restoration: A model of the Image Degradation / Restoration Process – Noise models – Restoration is the process of noise only – Spatial Filtering – Periodic Noise reduction by frequency domain filtering – Linear, Portion – Invariant Degradations – Estimating the degradation function – Inverse filtering – Minimum mean square Error Filtering.

Unit:4	IMAGE COMPRESSION	11hours

Image Compression : Fundamentals–Image compression models–Elements of Information Theory – Error Free compression – Lossy compression – Image compression standards.		
Unit:5	**IMAGE SEGMENTATION**	**11hours**
Image Segmentation: Detection and Discontinuities – Edge Linking and Boundary deduction – Thresholding – Region-Based segmentation – Segmentation by Morphological watersheds – The use of motion in segmentation.		
Unit:6	**Contemporary Issues**	**2 hours**
Expert lectures, online seminars –webinars		
	Total Lecture hours	**60hours**

Text Books

1.	RafaelC.Gonzalez,RichardE.Woods,"DigitalImageProcessing",SecondEdition,PHI/Pearson Education.
2.	B.Chanda, D.Dutta Majumder,"Digital Image Processing and Analysis", PHI, 2003.

Reference Books

1.	NickEfford,"DigitalImageProcessingapracticalintroducingusingJava",Pearson Education, 2004.

Related Online Contents[MOOC, SWAYAM, NPTEL, Websites etc.]

1.	https://nptel.ac.in/courses/117/105/117105135/
2.	https://www.tutorialspoint.com/dip/index.htm
3.	https://www.javatpoint.com/digital-image-processing-tutorial

Mapping with Programming Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	S	S	S	M	S	M	M	S
CO2	S	S	S	S	S	M	S	M	S	S
CO3	S	S	S	S	S	S	S	M	S	S
CO4	S	S	S	S	S	S	S	M	S	S
CO5	S	S	S	S	S	S	S	M	S	S

*S-Strong ;   M-Medium ; L-Low

Mapping with Programme Specific Outcomes

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	2	2	3	3
CO2	3	3	2	3	3
CO3	3	3	3	3	3
CO4	3	3	2	3	3
CO5	3	3	2	3	3
Weightage of course contributed to each PSO	15	14	11	15	15
Weighted % of Course Contribution to POs	3.0	2.8	2.2	3.0	3.0

[*]**S-Strong-3; M-Medium-2; L-Low-1**

III SEMESTER

Course code		CLOUDCOMPUTING	L	T	P	C
Core/Elective/Supportive		**Core -VIII**		6		5
Pre-requisite	Basics of Cloud & its Applications					

Learning Objectives:

The main objectives of this course are to:

1. Gain knowledge on cloud computing, cloud services ,architectures and applications.
2. Enable the students to learn the basics of cloud computing with real time usage
3. How to store and share ,in and from cloud?

Expected Course Outcomes:	

On the successful completion of the course ,student will be able to:

1.	Understand the concepts of Cloud and its services	K1,K2
2.	Collaborate Cloud for Event & Project Management	K3,K4
3.	Analyze on cloud in–Word Processing, Spread Sheets, Mail ,Calendar, Database	K4,K5
4.	Analyze cloud in social networks	K5,K6
5.	Explore cloud storage and sharing	K6

K1-Remember;**K2**-Understand;**K3**-Apply;**K4**-Analyze;**K5**-Evaluate; **K6**-Create

Unit:1	INTRODUCTION	12hours

INTRODUCTION: Cloud Computing Introduction, From, Collaboration to cloud, Working of cloud computing, pros and cons, benefits, developing cloud computing services, Cloud service development, discovering cloud services.

Unit:2	CLOUD COMPUTING	12hours

CLOUD COMPUTING FOR EVERYONE: Centralizing email communications, cloud computing for community, collaborating on schedules, collaborating on group projects and events, cloud computing for corporation, mapping, schedules, managing projects, presenting on road.

Unit:3	CLOUD SERVICES	12hours

USING CLOUD SERVICES: Collaborating on calendars, Schedules and task management, exploring on line scheduling and planning, collaborating on event management, collaborating on contact management, collaborating on project management, collaborating on word processing, spreadsheets, and databases.

Unit:4	OUTSIDE THE CLOUD	12hours

OUTSIDE THE CLOUD: Evaluating web mail services, Evaluating instant messaging, Evaluating web conference tools, creating groups on social networks, Evaluating online groupware, collaborating via blogs and wikis

Unit:5	STORING AND SHARING	10hours
	STORING AND SHARING: Understanding cloud storage, evaluating on line file storage, exploring on line book marking services, exploring on line photo editing applications, exploring photo sharing communities, controlling it with web based desktops.	
Unit:6	Contemporary Issues	2 hours
	Expert lectures, online seminars –webinars	
	Total Lecture hours	60hours

Text Books

1.	Michael Miller," Cloud Computing" ,Pearson Education, New Delhi, 2009.

Reference Books

1.	Anthony T.Velte, "Cloud Computing: A Practical Approach", 1st Edition, Tata Mc Graw Hill Education Private Limited, 2009.

Related Online Contents[MOOC, SWAYAM, NPTEL, Websites etc.]

1.	https://nptel.ac.in/courses/106/105/106105167/
2.	https://www.tutorialspoint.com/cloud_computing/index.htm
3.	https://www.javatpoint.com/cloud-computing-tutorial

Mapping with Programming Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	L	S	M	S	M	S	M	M	M	S
CO2	M	S	M	S	S	S	M	M	M	S
CO3	S	S	S	S	S	S	S	S	S	S
CO4	S	S	S	S	S	S	S	S	S	S
CO5	M	S	S	S	S	S	S	S	S	S

*S-Strong; M-Medium; L-Low

Mapping with Programme Specific Outcomes					
CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	2	2	3	3
CO2	3	3	2	3	3
CO3	3	3	3	3	3
CO4	3	3	2	3	3
CO5	3	3	3	3	3
Weightage of course contributed to each PSO	15	14	12	15	15
Weighted % of Course Contribution to POs	3.0	2.8	2.4	3.0	3.0

*S-Strong-3; M-Medium-2; L-Low-1

III SEMESTER

Course code		NETWORK SECURITY AND CRYPTOGRAPHY	L	T	P	C
Core/Elective/Supportive		**Core - IX**		6		5
Pre-requisite		Basics of Networks & its Security				

Learning Objectives:

The main objectives of this course are to:

1. Enable students to learn the Introduction to Cryptography, Web Security and Case studies in Cryptography.
2. Togainknowledgeonclassicalencryptiontechniquesandconceptsofmodulararithmeticand number theory.
3. To explore the working principles and utilities of various cryptographic algorithms including secret key cryptography, hashes and message digests, and public key algorithms.
4. To explore the design issues and working principles of various authentication Applications and various secure communication standards including Kerberos, IPsec, and SSL/TLS and email.

Expected Course Outcomes:	

On the successful completion of the course ,student will be able to:

1.	Understand the process of the cryptographic algorithms	K1,K2
2.	Compareandapplydifferentencryptionanddecryptiontechniquestosolveproblems related to confidentiality and authentication	K2,K3
3.	Applyandanalyzeappropriatesecuritytechniquestosolvenetworksecurity problem	K3,K4
4.	Explore suitable cryptographic algorithms	K4,K5
5.	Analyzedifferentdigitalsignaturealgorithmstoachieveauthenticationand design secure applications	K5,K6

K1-Remember;**K2**-Understand;**K3**-Apply;**K4**-Analyze;**K5**-Evaluate; **K6**-Create

Unit:1	**INTRODUCTION**	**12hours**

Introduction to Cryptography – Security Attacks – Security Services –Security Algorithm- Stream cipher and Block cipher - Symmetric and Asymmetric-key Cryptosystem Symmetric Key Algorithms: Introduction – DES – Triple DES – AES.

Unit:2	**CRYPTOSYSTEM**	**12hours**

Public-key Cryptosystem: Introduction to Number Theory-RSA Algorithm–Key Management -Diffie-HellmanKeyexchange–EllipticCurveCryptographyMessageAuthenticationand Hash functions – Hash and Mac Algorithm – Digital Signatures and Authentication Protocol.

Unit:3	**NETWORK SECURITY**	**12hours**

NetworkSecurityPractice:AuthenticationApplications–Kerberos–X.509Authentication services and Encryption Techniques. E-mail Security – PGP – S / MIME – IP Security.

Unit:4	WEB SECURITY	10hours
WebSecurity-SecureSocketLayer–SecureElectronicTransaction.SystemSecurity-Intruders and Viruses – Firewalls– Password Security.	

Unit:5	CASE STUDY	12hours
	Case Study: Implementation of Cryptographic Algorithms–RSA–DSA–ECC(C/JAVA Programming).Network Forensic – Security Audit - Other Security Mechanism: Introduction to: Stenography –Quantum Cryptography – Water Marking - DNA Cryptography	

Unit:6	Contemporary Issues	2 hours
	Expert lectures, online seminars–webinars	
	Total Lecture hours	**60hours**

Text Books

1.	William Stallings, "Cryptography and Network Security", PHI/Pearson Education.
2.	Bruce Schneir, "Applied Cryptography", CRC Press.

Reference Books

1.	A.Menezes, P Van Oorschot and S.Vanstone, "Hand Book of Applied Cryptography", CRC Press, 1997
2.	AnkitFadia, "Network Security", MacMillan.

Related Online Contents[MOOC, SWAYAM ,NPTEL, Websites etc.]

1.	https://nptel.ac.in/courses/106/105/106105031/
2.	http://www.nptelvideos.in/2012/11/cryptography-and-network-security.html
3.	https://www.tutorialspoint.com/cryptography/index.htm

Mapping with Programming Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	S	M	L	S	M	S	M	S
CO2	S	S	S	S	S	S	S	S	S	S
CO3	S	S	S	S	S	S	S	S	S	S
CO4	S	S	S	S	S	S	S	S	S	S
CO5	S	S	S	S	S	S	S	S	S	S

*S-Strong; M-Medium; L-Low

Mapping with Programme Specific Outcomes					
CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	2	2	3	3
CO2	3	3	2	3	3
CO3	3	3	3	3	3
CO4	3	3	2	3	3
CO5	3	3	2	3	3
Weightage of course contributed to each PSO	15	14	11	15	15
Weighted % of Course Contribution to Pos	3.0	2.8	2.2	3.0	3.0

*S-Strong-3; M-Medium-2; L-Low-1

III SEMESTER

Course code		DATA SCIENCE & ANALYTICS	L	T	P	C
Core/Elective/Supportive		Core-X		6		4
Pre-requisite		Basics of Data Science& its Applications				

Learning Objectives:		
The main objectives of this course are to:		

1. Introduce the students to data science ,big data & its ecosystem.
2. Learn data analytics &its life cycle.
3. To explore the programming language R, with respect to the data mining algorithms.
4. Relate the relationship between artificial intelligence, machine learning and data science.

Expected Course Outcomes:

On the successful completion of the course ,student will be able to:

1.	Understand the concept of data science and its techniques	K1,K2
2.	Review data analytics	K2,K3
3.	ApplyanddetermineappropriateDataMiningtechniquesusingRtorealtime applications	K3,K4
4.	Analyze on clustering algorithms	K4,K5
5.	Analyze on regression methods in AI	K6

K1-Remember;**K2**-Understand;**K3**-Apply;**K4**-Analyze;**K5** -Evaluate; **K6**-Create

Unit:1	INTRODUCTION	12hours

Introduction of Data Science: data science and big data–facets of data-data science process-Ecosystem- The Data Science process – six steps- Machine Learning.

Unit:2	BASICSOFDATA ANALYTICS	12hours

DataAnalyticslifecycle-reviewofdataanalytics-AdvanceddataAnalytics-technologyand tools.

Unit:3	DATAANALYTICSUSINGR	12hours

Basic Data Analytics using R : R Graphical User Interfaces – Data Import and Export – Attribute and Data Types –Descriptive Statistics – Exploratory Data Analysis –Visualization Before Analysis – Dirty Data – Visualizing a Single Variable – Examining Multiple Variables – Data Exploration Versus Presentation.

Unit:4	CLUSTERING	12hours

Overview of Clustering : K-means – Use Cases – Overview of the Method – Perform a K-means Analysis using R –Classification – Decision Trees – Overview of a Decision Tree – Decision Tree Algorithms – Evaluating a Decision Tree – Decision Tree in R – Bayes' Theorem – Naïve Bayes Classifier – Smoothing – Naïve Bayes in R.

Unit:5	ARTIFICIALINTELLIGENCE	10hours
Artificial intelligence: Machine Learning and deep learning in data science-Clustering, association rules. Linear regression-logistic regression-Additional regression methods.		
Unit:6	Contemporary Issues	2 hours
Expert lectures ,online seminars –webinars		
	Total Lecture hours	60hours

Text Books

1.	Introducing-Data-Science-Big-Data-Machine-Learning-and-more-using-Python-tools-2016. Pdf
2.	Data science in big data analytics-Wiley2015JohnWiley&Sons

Reference Books

1.	AsimpleintroductiontoDataScience-LarsNielson2015
2.	Introducing Data Science Davy Cielen, Arno D.B.Meysman, Mohamed Ali 2016 Manning Publication
3.	R Programming fo r Data Science-Roger D.Peng 2015LeanPublication
4.	DataScience&BigDataAnalytics:Discovering,Analyzing,VisualizingandPresenting Data

Related Online Contents[MOOC, SWAYAM, NPTEL ,Websites etc.]

1.	https://www.tutorialspoint.com/python_data_science/index.htm
2.	https://www.javatpoint.com/data-science
3.	https://nptel.ac.in/courses/106/106/106106179/

Mapping with Programming Outcomes										
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	S	S	S	M	M	S
CO2	S	S	S	S	S	S	S	M	S	S
CO3	S	S	S	S	S	S	S	M	S	S
CO4	S	S	S	S	S	S	S	M	S	S
CO5	S	S	S	S	S	S	S	M	S	S

*S-Strong; M-Medium; L-Low

Mapping with Programme Specific Outcomes					
CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	2	2	3	3
CO2	3	3	2	3	3
CO3	3	3	3	3	3
CO4	3	3	2	3	3
CO5	3	3	3	3	3
Weightage of course contributed to each PSO	15	14	12	15	15
Weighted % of Course Contribution to POs	3.0	2.8	2.4	3	3

*S-Strong-3; M-Medium-2; L-Low-1

III SEMESTER

Course code		DIGITAL IMAGE PROCESSING USING MATLAB	L	T	P	C
Core/Elective/Supportive		**Elective-V**			3	3
Pre-requisite		Basic Programming of Image Processing& an intro to MATLAB				

Learning Objectives:

The main objectives of this course are to:

1. To understand the basics of Digital Image Processing fundamentals, image enhancement and image restoration techniques

2. To enable the students to learn the fundamentals of image compression and segmentation

3. To understand Image Restoration & Filtering Techniques

4. Implementation of the above using MATLAB

Expected Course Outcomes:

On the successful completion of the course ,student will be able to:

1.	To write programs in MATLAB for image processing using the techniques	K1,K2
2.	To able to implement Image Enhancements & Restoration techniques	K2,K3
3.	Capable of using Compression techniques in an Image	K3,K4
4.	Must be able to manipulate the image and Segment it	K5,K6
5.	Describe graphic features of MATLAB	K5,K6

K1-Remember;**K2**-Understand;**K3**-Apply;**K4**-Analyze;**K5**-Evaluate; **K6**-Create

LIST OF PROGRAMS	60 hours

1. Implement Image enhancement Technique.

2. Histogram Equalization

3. Image Restoration.

4. Implement Image Filtering.

5. Edge detection using Operators (Roberts, Prewitts and Sobels operators)

6. Implement image compression.

7. Image Subtraction

8. Boundary Extraction using morphology.

9. Image Segmentation

Total Lecture hours	**60 hours**

	Text Books
1	Rafael C.Gonzalez, Richard E.Woods, "Digital Image Processing" ,Second Edition,

	PHI/Pearson Education.
2	B.Chanda,D.DuttaMajumder,"DigitalImageProcessingandAnalysis",PHI, 2003.
	Reference Books
1	NickEfford,"DigitalImageProcessingapracticalintroducingusingJava",Pearson Education, 2004.
	Related Online Contents[MOOC, SWAYAM, NPTEL, Websites etc.]
1	https://nptel.ac.in/courses/117/105/117105135/
2	https://www.tutorialspoint.com/dip/index.htm
3	https://www.javatpoint.com/digital-image-processing-tutorial

Mapping with Programming Outcomes										
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	S	M	S	S	S	M	M	S	S
CO2	S	S	S	S	S	S	S	M	S	S
CO3	S	S	S	S	S	S	S	M	S	S
CO4	S	S	S	S	S	S	S	M	S	S
CO5	S	M	S	S	S	M	S	M	S	S

*S-Strong; M-Medium; L-Low

Mapping with Programme Specific Outcomes					
CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	2	2	3	3
CO2	3	3	2	3	3
CO3	3	3	3	3	3
CO4	3	3	2	3	3
CO5	3	3	2	3	3
Weightage of course contributed to each PSO	15	14	11	15	15
Weighted % of Course Contribution to POs	3.0	2.8	2.2	3.0	3.0

[*]**S-Strong-3; M-Medium-2; L-Low-1**

III SEMESTER

Course code		DOT NET PROGRAMMING LAB	L	T	P	C
Core/Elective/Supportive		Elective-V			3	3
Pre-requisite		Knowledge of C and C++.				

Learning Objectives:

The main objectives of this course are to:

1. Introduce to .Net IDE Component Framework.

2. Programming concepts in .Net Framework.

3. Creating website using ASP.Net Controls.

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1.	Create user interactive web pages using ASP.Net.	K1,K2
2.	Create simple data binding applications using ADO.Net connectivity.	K2,K3
3.	Performing Database operations for Windows Form and web applications.	K3,K4
4.	Create user interactive web pages using C#.Net.	K5,K6
5.	Evaluate database using server.	K5,K6

K1-Remember;**K2**-Understand;**K3**-Apply;**K4**-Analyze;**K5**-Evaluate; **K6**-Create

LISTOF PROGRAMS	60 hours

1. Create a windows form with the following controls Textbox, Radio button, Check box, Command Button
2. Write a program for Menu option.
3. Create a program to connect with database and manipulate the records in the database using ADO .NET
4. Create a program to implement the concepts of OOPS for creating class, inheritance
5. Create a program to perform input validation using procedure.
6. Write a program to open a file and using I/O operations write contents into a file and read the contents from the file.
7. Create a window form using HTML controls.
8. Create a program to perform validation using validation controls.
9. Create a program in ASP .NET to connect with the database using ADODB connectivity and manipulate the records.
10. Write a program to store the employee details using class and methods in C# .NET
11. Write a program to Handle Exceptions
12. Write a program to create a form with Basic controls. In c#. NET.

	Total Lecture hours	60hours

Text Books

| 1. | Pankaj Agarwal, "Principles of .NET Framework", Vayu Education of India, 2009 |
| 2. | Steven Holzner, "Visual Basic.NET Black Book",Paraglyph Press, 2002. |

Reference Books	
1.	Cornell, "Visual Basic 6 From the Ground up" Tata Mcgraw Hill Company Limited
2.	Charul Shukla, "ASP.NET 2.0 black book", Paraglyph Press, 2006.
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1.	https://nptel.ac.in/courses/117/105/117105135/
2.	https://www.tutorialspoint.com/dip/index.htm

Mapping with Programming Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	M	S	M	S	M	M	S	S
CO2	M	S	S	S	S	M	S	M	S	S
CO3	S	S	S	M	S	S	S	M	S	S
CO4	S	S	S	S	S	S	S	M	S	S
CO5	S	M	S	S	S	M	S	M	S	S

*S-Strong; M-Medium; L-Low

Mapping with Programme Specific Outcomes

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	2	2	3	3
CO2	3	3	2	3	3
CO3	3	3	3	3	3
CO4	3	3	2	3	3
CO5	3	3	2	3	3
Weightage of course contributed to each PSO	15	14	11	15	15
Weighted % of Course Contribution to POs	3.0	2.8	2.2	3.0	3.0

*S-Strong-3; M-Medium-2; L-Low-1

III SEMESTER

Course code		CLOUD COMPUTING LAB	L	T	P	C
Core/Elective/Supportive		**Skill Enhancement-II/NME**			3	2
Pre-requisite		Basic Programming using Cloud				

Learning Objectives:	
The main objectives of this course are to:	
1. This course covers the basic data structures like Stack, Queue, Tree, List.	
2. This course enables the students to learn the applications of the data structures using various techniques	
3. It also enable the students to understand C++ language with respect to OOAD concepts	
4. Application of OOPS concepts	

Expected Course Outcomes:		
On the successful completion of the course ,student will be able to:		
1.	Understand the concepts of object oriented with respect to C++	K1,K2
2.	Able to understand and implement OOPS concepts	K3,K4
3.	Implementation of data structures like Stack, Queue, Tree ,List using C++	K4,K5
4.	Application of the data structures for Sorting , Searching using different techniques.	K5,K6
5.	Design and implement cloud applications.	K5,K6
K1-Remember;**K2**-Understand;**K3**-Apply;**K4**-Analyze;**K5**-Evaluate; **K6**-Create		

LIST OF PROGRAMS	60hours
1. Working with Google Drive to make spread sheet and notes.	
2. Launch a Linux Virtual Machine.	
3. To host a static website	
4. Exploring Google cloud for the following a) Storage b) Sharing of data c) manage your calendar, to-do lists, d) a document editing tool	
5. Working and installation of Google AppEngine	
6. Working and installation of Microsoft Azure	
7. To Connect Amazon Redshift with S3 bucket	
8. To Create and Query a NoSQL Table	
Expert lectures ,online seminars–webinars	

	Total Lecture hours	60hours

Text Books	
1.	Michael Miller," Cloud Computing" ,Pearson Education, New Delhi, 2009.

	Reference Books
1.	Anthony T. Velte, "Cloud Computing: A Practical Approach", 1st Edition, Tata Mc Graw Hill Education Private Limited, 2009.
	Related Online Contents[MOOC, SWAYAM, NPTEL, Websites etc.]
1.	https://nptel.ac.in/courses/106/105/106105167/
2.	https://www.tutorialspoint.com/cloud_computing/index.htm
3.	https://www.javatpoint.com/cloud-computing-tutorial

Mapping with Programming Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	M	S	S	S	M	M	S	S
CO2	S	S	S	S	S	S	S	M	S	S
CO3	S	S	S	S	S	S	S	M	S	S
CO4	S	S	S	S	S	S	S	M	S	S
CO4	S	S	S	S	S	S	S	M	S	S
CO5	S	M	S	S	M	S	S	M	S	S

*S-Strong;   M-Medium;   L-Low

Mapping with Programme Specific Outcomes

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	2	2	3	3
CO2	3	3	2	3	3
CO3	3	3	3	3	3
CO4	3	3	2	3	3
CO5	3	3	2	3	3
Weightage of course contributed to each PSO	15	14	11	15	15
Weighted % of Course Contribution to POs	3.0	2.8	2.2	3.0	3.0

*S-Strong-3; M-Medium-2; L-Low-1

III SEMESTER

Course code		INTERNSHIP / INDUSTRIAL ACTIVITY	L	T	P	C
Core/Elective/Supportive		**Supportive**				2
Pre-requisite		Basics of Hardware and Software				

Learning Objectives:
The main objectives of this course are to: 1. To offer a hands-on-learning experience, that allows the learners to maximize the outcome and benefits of their theoretical knowledge through practical implementation.   2. By adding technical skills, soft skills and professional experience to the learners' resume, they can enhance their chances of securing the job.   3. To provide the learners an experience of the real corporate world and thus help them to understand the expectations and requirements of the industry.   4. To enable the learners build their network and professional relationships, which turns them into confident future professionals.   5. To learn about Industrial Infrastructure.

Expected Course Outcomes:		
On the successful completion of the course ,student will be able to:		
1.	Understand about Software technics.	K1,K2
2.	Understand about Software project management skills, design and quality management	K2,K3
3.	Analyze on Software Requirements and Specification	K3,K4
4.	Analyze on Software Testing, Maintenance	K4,K5
5.	Design and conduct various types and levels of software quality for a software project	K5,K6
K1-Remember;**K2**-Understand;**K3**-Apply;**K4**-Analyze;**K5**-Evaluate; **K6**-Create		

Duration of the Training:

* The learners of all the Under-Graduation Programmes are to undergo the Internship / Industrial Training during the summer vacation, after completion of the IV Semester examinations. The training period is 30 working days.

* Evaluation:

* After completion of the training, the evaluation of the performance of the learners will be done in the V semester.

* Two credits will be awarded for the best performers.

* Viva-voce examination will be conducted and the learners have to appear for the Viva-voce individually.
* At the time of Viva-voce, the learners have to submit the given records to the examiner.
  * Work Diary, endorsed by the trainer
  * A complete report on the objectives, modules and outcomes.
  * A certificate, duly signed and issued by the trainer

Mapping with Programming Outcomes										
Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	M	S	S	S	M	M	M	M
CO2	S	S	S	S	S	S	S	M	S	S
CO3	S	S	S	S	S	S	S	M	S	S
CO4	S	S	S	S	S	S	S	M	S	S
CO5	S	S	M	S	S	S	S	M	S	M

*S-Strong; M-Medium ;L-Low

Mapping with Programme Specific Outcomes					
CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	2	3	2	3
CO2	3	2	2	2	2
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage of course contributed to each PSO	15	13	14	13	14
Weighted % of Course Contribution to Pos	3.0	2.6	2.8	2.6	2.8

*S-Strong-3; M-Medium-2; L-Low-1

IV SEMESTER

Course code		ADVANCED SOFTWARE ENGINEERING	L	T	P	C
Core/Elective/Supportive		Core-XI		6		5
Pre-requisite		Basics of Software Engineering & SPM				

Learning Objectives:

The main objectives of this course are to:

1. Introduce to Software Engineering, Design, Testing and Maintenance.
2. Enable the students to learn the concepts of Software Engineering.
3. Learn about Software Project Management, Software Design &Testing.

Expected Course Outcomes:

On the successful completion of the course ,student will be able to:

1.	Understand about Software Engineering process	K1,K2
2.	Understand about Software project management skills ,design and quality management	K2,K3
3.	Analyze on Software Requirements and Specification	K3,K4
4.	Analyze on Software Testing, Maintenance and Software Re-Engineering	K4,K5
5.	Design and conduct various types and levels of software quality for a software project	K5,K6

K1-Remember;**K2**-Understand;**K3**-Apply;**K4**-Analyze;**K5**-Evaluate; **K6**-Create

Unit:1	INTRODUCTION	15hours

Introduction: The Problem Domain – Software Engineering Challenges - Software Engineering Approach – Software Processes: Software Process – Characteristics of a Software Process – Software Development Process Models – Other software processes.

Unit:2	SOFTWAREREQUIREMENTS	15hours

Software Requirements Analysis and Specification : Requirement engineering – Type of Requirements – Feasibility Studies – Requirements Elicitation – Requirement Analysis – Requirement Documentation – Requirement Validation – Requirement Management – SRS - Formal System Specification – Axiomatic Specification – Algebraic Specification - Case study: Student Result management system. Software Quality Management –Software Quality, Software Quality Management System.

Unit:3	PROJECT MANAGEMENT	15hours

Software Project Management: Responsibilities of a software project manager – Project planning – Metrics for Project size estimation – Project Estimation Techniques – Empirical Estimation Techniques – COCOMO – Staffing level estimation – Scheduling– Organization and Team Structures –Risk management – Software Configuration Management – Miscellaneous Plan.

Unit:4	SOFTWARE DESIGN	15hours

Software Design: Outcome of a Design process – Characteristics of a good software design – Cohesion and coupling - Strategy of Design – Function Oriented Design – Object Oriented Design - Detailed Design - IEEE Recommended Practice for Software Design Descriptions.

Unit:5	SOFTWARE TESTING	13hours

Software Testing: A Strategic approach to software testing – Terminologies – Functional testing– Structural testing – Levels of testing – Validation testing - Regression testing – Art of Debugging–Testing tools - Metrics - Reliability Estimation. Software Maintenance - Maintenance Process.

Unit:6	Contemporary Issues	2 hours

Expert lectures, online seminars –webinars

	Total Lecture hours	75hours

Text Books

1.	AnIntegratedApproachtoSoftwareEngineering–PankajJalote,NarosaPublishingHouse, Delhi, 3rd Edition.
2.	Fundamentals of Software Engineering –RajibMall,PHIPublication,3rdEdition.

Reference Books

1.	SoftwareEngineering–K.K.AggarwalandYogeshSingh,NewAgeInternational Publishers, 3 rd edition.
2.	A Practitioners Approach-Software Engineering, - R.S. Pressman, McGraw Hill.
3.	Fundamentals of Software Engineering - Carlo Ghezzi, M.Jarayeri, D. Manodrioli, PHI Publication.

Related Online Contents[MOOC, SWAYAM, NPTEL, Websites etc.]

1.	https://www.javatpoint.com/software-engineering-tutorial
2.	https://onlinecourses.swayam2.ac.in/cec20_cs07/preview
3.	https://onlinecourses.nptel.ac.in/noc19_cs69/preview

Mapping with Programming Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	M	S	S	S	M	M	M	M
CO2	S	S	S	S	S	S	S	M	S	S
CO3	S	S	S	S	S	S	S	M	S	S
CO4	S	S	S	S	S	S	S	M	S	S
CO5	S	S	S	S	S	S	S	M	S	S

*S-Strong; M-Medium ;L-Low

Mapping with Programme Specific Outcomes					
CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	2	3	2	2
CO2	3	2	2	2	3
CO3	3	3	3	2	3
CO4	3	3	3	3	2
CO5	3	3	3	3	2
Weightage of course contributed to each PSO	15	13	14	12	12
Weighted % of Course Contribution to Pos	3.0	2.6	2.8	2.4	2.4

*S-Strong-3; M-Medium-2; L-Low-1

IV SEMESTER

Course code		INTERNET OF THINGS	L	T	P	C
Core/Elective/Supportive		**Core-XII**		6		5
Pre-requisite		Basics of Sensors & its Applications				

Learning Objectives:
The main objectives of this course are to:

1. AboutInternetofThingswherevariouscommunicatingentitiesarecontrolledandmanaged for decision making in the application domain.
2. Enable students to learn the Architecture of IoT and IoT Technologies
3. Developing IoT applications and Security in IoT, Basic Electronics for IoT, Arduino IDE, Sensors and Actuators Programming NODEMCU using Arduino IDE.

Expected Course Outcomes:
On the successful completion of the course, student will be able to:

1.	Understand about IoT, its Architecture and its Applications	K1,K2
2.	Understand basic electronics used in IoT & its role	K2,K3
3.	Develop applications with C using Arduino IDE	K4
4.	Analyze about sensors and actuators	K5,K6
5.	Design IoT in real time applications using today's internet &wireless technologies	K6

K1-Remember;**K2**-Understand;**K3**-Apply;**K4**-Analyze;**K5**-Evaluate; **K6**-Create

Unit:1	**INTRODUCTION**	**12hours**

Introduction to IoT: Evolution of IoT – Definition & Characteristics of IoT - Architecture of IoT– Technologies for IoT – Developing IoT Applications – Applications of IoT – Industrial IoT – Security in IoT

Unit:2	**BASIC ELECTRONICS FOR IoT**	**12hours**

Basic Electronics for IoT: Electric Charge, Resistance, Current and Voltage – Binary Calculations – Logic Chips – Microcontrollers – Multipurpose Computers – Electronic Signals – A/D and D/A Conversion – Pulse Width Modulation.

Unit:3	**PROGRAMMING USING ARDUINO**	**12hours**

Programming Fundamentals with C using Arduino IDE: Installing and Setting up the Arduino IDE – Basic Syntax – Data Types/ Variables/ Constant – Operators – Conditional Statements and Loops – Using Arduino C Library Functions for Serial, delay and other invoking Functions – Strings and Mathematics Library Functions.

Unit:4	**SENSORS AND ACTUATORS**	**10hours**

SensorsandActuators:AnalogandDigitalSensors–Interfacingtemperaturesensor,ultrasound Sensor and infrared(IR)sensor with Arduino– Interfacing LED and Buzzer with Arduino.

Unit:5	**SENSOR DATA IN INTERNET**	**12hours**

Sending Sensor Data Over Internet: Introduction to ESP8266 NODEMCU WiFi Module – Programming NODEMCU using Arduino IDE – Using WiFi and NODEMCU to transmit data from temperature sensor to Open Source IoT cloud platform (ThingSpeak).

Unit:6	**Contemporary Issues**	**2 hours**

	Expert lectures, online seminars –webinars		
		Total Lecture hours	**hours**

Text Books		
1.	ArshdeepBahga,VijayMadisetti,"InternetofThings:AHands-OnApproach",2014. ISBN: 978-0996025515
2.	Boris Adryan, Dominik Obermaier, Paul Fremantle, "The Technical Foundations of IoT", Artech Houser Publishers, 2017.

Reference Books		
1.	MichaelMargolis,"ArduinoCookbook",O"Reilly,2011
2.	Marco Schwartz, "InternetofThingswithESP8266",PacktPublishing, 2016.
3.	DhivyaBala,"ESP8266:StepbyStepTutorialforESP8266IoT,ArduinoNODEMCU Dev. Kit", 2018.

Related Online Contents[MOOC, SWAYAM ,NPTEL, Websites etc.]		
1.	https://onlinecourses.nptel.ac.in/noc20_cs66/preview
2.	https://www.javatpoint.com/iot-internet-of-things
3.	https://www.tutorialspoint.com/internet_of_things/index.htm

Mapping with Programming Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M	M	M	S	M	S	M	M	S	M
CO2	M	S	M	S	M	S	M	S	S	S
CO3	S	SS	S	S	M	S	M	S	S	S
CO4	S	S	S	S	S	S	S	S	S	S
CO5	S	S	S	S	S	S	S	S	S	S

*S-Strong; M-Medium; L-Low

Mapping with Programme Specific Outcomes					
CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	2	2	3	3
CO2	3	2	2	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage of course contributed to each PSO	15	13	13	15	15
Weighted % of Course Contribution to POs	3.0	2.6	2.6	3.0	3.0

*S-Strong-3   M-Medium-2 L-Low

IV SEMESTER

Course code		PROJECT WORK	L	T	P	C
Core/Elective/Supportive		**Core-XIII**		10		7
Pre-requisite		Basic Database Connectivity				

Learning Objectives:

The main objectives of this course are to:

     To motivate the Students to work in emerging/latest technologies, apply theoretical and practical tools/techniques, solve real life problems related to industry, academic institutions and research laboratories.

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1.	Understand the problem.	**K1,K2**
2.	Implement & execute the real time application.	**K3,K4**
3.	Analyze various testing methods.	**K4,K5**
4.	Verify the expected results in real time applications.	**K4,K5**
5.	Verify the expected results in real time applications	**K5,K6**

The project is of 10 hours/week for one (semester IV) semester duration and a student is expected to do planning, analyzing, designing, coding, and implementing the project. The initiation of project should be with the project proposal. The synopsis approval will be given by the project guides.

The project proposal should include the following:

- ➢ **Title**
- ➢ **Objectives**
- ➢ **Input and output**
- ➢ **Details of modules and process logic**
- ➢ **Data Flow Diagram**
- ➢ **Limitations of the project**
- ➢ **Tools/platforms, Languages to be used**
- ➢ **Scope of future applications**

Related Online Contents[MOOC, SWAYAM ,NPTEL, Websites etc.]

https://www.edx.org/learn/project-based-learning

http://docs.microsoft.com/en-us/previous-versions/aspnet/f3stod45(v=vs.100)

http://www.bachelorprint.eu/academic-writing/referencing-citation-styles/how-to-cite-a-website/

http://academic guides.waldenu.edu/writingcenter/apa /references/example

http://www.bibiliography.com/how-to/how-to-write-a-bibiliography-for-a-school-project/

Mapping with Programming Outcomes

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	M	M	M	M
CO2	S	S	M	S	S
CO3	S	M	S	M	S
CO4	S	M	S	M	S
CO5	S	S	M	S	S

*S-Strong; M-Medium; L-Low

Mapping with Programme Specific Outcomes

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	3	2	3	3	2
CO 2	3	3	3	3	3
CO 3	3	3	3	3	2
CO 4	3	3	2	3	3
CO 5	3	3	3	3	3
Weightage of course contributed to each PSO	15	14	14	15	13
Weighted % of Course Contribution to POs	3.0	2.8	2.8	3.0	2.6

*S-Strong-3; M-Medium-2; L-Low

IV SEMESTER

Course code		PRACTICAL: WEB APPLICATION DEVELOPMENT AND HOSTING	L	T	P	C
Core/Elective/Supportive		**Elective-VI**			4	2
Pre-requisite		Basic Programming using HTML tags				

Learning Objectives:
The main objectives of this course are to:
1. Able to design a web page using HTML tags
2. To enable the students to use Frame sets, hyper links and different formatting features of HTML tags
3. Enable the students to use Forms &other controls in a webpage
4. To create interactive applications using PHP

Expected Course Outcomes:		
On the successful completion of the course, student will be able to:		
1.	Understand & implement the basic HTML tags to create static web pages	K1,K2
2.	Capable of using hyperlinks, frames, images, tables, in a webpage	K2,K3
3.	Able to write dynamic web applications using HTML forms	K4,K5
4.	Must be able to write dynamic web applications in PHP & HTML tags using XAMPP.	K5,K6
5.	Develop skill in client side web applications development technologies.	K5,K6
K1-Remember;**K2**-Understand;**K3**-Apply;**K4**-Analyze;**K5**-Evaluate; **K6**-Create		

LIST OF PROGRAMS	**30hours**
1. Develop a website for your college using advanced tags of HTML. 2. Write names of several countries in a paragraph and store it as an HTML document, world.html. Each country name must be a hot text. When you click India (for example), it must open india.html and it should provide a brief introduction about India. 3. Develop a HTML document to i)display Text with Bullets / Numbers - Using Lists ii) to display the Table Format Data 4. Develop a Complete Web Page using Frames and Framesets which gives the Information about a Hospital using HTML. 5. WriteaHTMLdocumenttoprintyourBio-Datainaneatformatusingseveralcomponents. 6. DevelopaHTMLdocumenttodisplayaRegistrationFormforaninter-collegiatefunction. 7. Using HTML form accept Customer details like Name, City, Pin code, Phone number and Email address and validate the data and display appropriate messages for violations using PHP (Eg. Name is Mandatory field; Pin code must be6digits, etc.). 8. Writeaprogramtoaccepttwonumbersn1andn2usingHTMLformanddisplaythePrime numbersbetweenn1 andn2using PHP.	

		Total Lecture hours	30hours

	Text Books	
1.	IvanBayross,"WebEnabledCommercialApplicationsDevelopmentUsingHTML, JavaScript, DHTML and PHP", BPB Publications, 4th Revised Edition, 2010.
	Reference Books
2.	A.K. Saini and SumintTuli, "Mastering XML" ,First Edition, New Delhi, 2002.
	Related Online Contents[MOOC ,SWAYAM ,NPTEL, Websites etc.]
1.	https://www.tutorialspoint.com/xml/index.htm
2.	https://www.tutorialspoint.com/internet_technologies/websites_development.htm
3.	https://www.youtube.com/watch?v=PlxWf493en4

Mapping with Programming Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	M	S	S	S	M	M	S	S
CO2	S	S	S	S	S	S	S	M	S	S
CO3	S	S	S	S	S	S	S	M	S	S
CO4	S	S	S	S	S	S	S	M	S	S
CO4	S	S	M	S	M	S	S	M	S	S

*S-Strong; M-Medium; L-Low

Mapping with Programme Specific Outcomes

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO1	3	2	2	3	3
CO2	3	3	2	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage of course contributed to each PSO	15	14	13	15	15
Weighted % of Course Contribution to POs	3.0	2.8	2.6	3.0	3.0

*S-Strong-3; M-Medium-2; L-Low-1

IV SEMESTER

Course code		INTERNET OF THINGS LAB	L	T	P	C
Core/Elective/Supportive		Elective-VI			4	3
Pre-requisite		Basic Programming using HTML tags				

Course Objectives:

The main objectives of this course are to:

1.Familiars Arduino programming

2.Understand IOT programming and Raspberry PI Device

3.Use of SQL queries in Raspberry PI

4.Implement IOT application using Raspberry PI

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1.	Use IOT device for exchange of data.	K1,K2
2.	Use the programming skills of Raspberry PI	K3,K5
3.	Use IoT concept in simple real life applications	K4,K5
4.	Design the applications using Arduino and Raspberry PI	K4,K5
5.	Develop the cloud platform to analyze and upload sensor data	K5,K6

K1-Remember;**K2**-Understand;**K3**-Apply;**K4**-Analyze;**K5**-Evaluate; **K6**-Create

LIST OF PROGRAMS	30 hours

1.Sense the Available Networks Using Arduino

2. Measure the Distance Using Ultrasonic Sensor and Make Led Blink Using Arduino

3 Detect the Vibration of an Object Using Arduino

4. Connect with the Available Wi-Fi Using Arduino

5.Sense a Finger When it is Placed on Board Using Arduino

6.Temperature Notification Using Arduino

7.LDR to vary the Light Intensity of LED Using Arduino

8.MySQL Database Installation in Raspberry Pi

9.SQL Queries by Fetching Data from Database in Raspberry Pi

10.Switch Light on and off Based on the User using Raspberry Pi

	Total Lecture hours	30hours

	Text Books
1.	ArshdeepBahga,VijayMadisetti,"InternetofThings:AHands-OnApproach",2014. ISBN: 978-0996025515
2.	Boris Adryan, Dominik Obermaier, Paul Fremantle, "The Technical Foundations of IoT", Artech Houser Publishers, 2017.
	Reference Books
1.	MichaelMargolis,"ArduinoCookbook",O"Reilly,2011
2.	Marco Schwartz, "InternetofThingswithESP8266",PacktPublishing, 2016.
3.	DhivyaBala,"ESP8266:StepbyStepTutorialforESP8266IoT,ArduinoNODEMCU Dev. Kit", 2018.
	Related Online Contents[MOOC, SWAYAM ,NPTEL, Websites etc.]
1.	https://onlinecourses.nptel.ac.in/noc20_cs66/preview
2.	https://www.javatpoint.com/iot-internet-of-things
3.	https://www.tutorialspoint.com/internet_of_things/index.htm

Mapping with Programming Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M	M	M	S	M	S	M	M	S	M
CO2	M	S	M	S	M	S	M	S	S	S
CO3	S	S	S	S	M	S	M	S	S	S
CO4	S	S	S	S	S	S	S	S	S	S
CO5	S	M	S	M	S	M	S	S	S	S

*S-Strong; M-Medium; L-Low

Mapping with Programme Specific Outcomes

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	3	2	2	3	3
CO 2	3	3	2	3	3
CO 3	3	2	3	3	3
CO 4	3	3	3	3	3
CO 5	3	3	2	3	3
Weightage of course contributed to each PSO	15	13	12	15	15
Weighted % of Course Contribution to Pos	3.0	2.6	2.4	3.0	3.0

*S-Strong-3; M-Medium-2; L-Low-1

IV SEMESTER

Course code		TRAINING FOR COMPETITIVE EXAMINATIONS	L	T	P	C
Core/Elective/Supportive		Skill Enhancement Course / Professional Competency Skill		4		2
Pre-requisite		Basic knowledge in numerical ability				

Learning Objectives:

The main objectives of this course are to:
1. To improve the quantitative skills of the students
2. To prepare the students for various competitive exams

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1.	To gain knowledge on LCM and HCF and its related problems	K1,K2
2.	To get an idea of age, profit and loss related problem solving.	K2,K3
3.	Able to understand time series simple and compound interests	K5,K4
4.	Understanding the problem related to probability, and series	K5,K6
5.	Able to understand graphs, charts.	K5,K6

K1-Remember;**K2**-Understand;**K3**-Apply;**K4**-Analyze;**K5**-Evaluate; **K6**-Create

Unit – 1:		12hours

Numbers-HCFandLCMofnumbers-Decimalfractions-Simplification-Square roots and cuberots- Average-problems on Number.

Unit – 2:		12hours

Problems on Ages - Surds and Indices - percentage - profits and loss - ratio and proportion-partnership-Chain rule

Unit – 3:		12hours

Time and work - pipes and cisterns - Time and Distance - problems on trains -Boats and streams - simple interest - compound interest - Logarithms - Area –Volume and surface area-races and Games of skill

Unit - 4 :		10hours

Permutation and combination-probability-True Discount-Bankers Discount
Height and Distances-Odd man out &Series

Unit – 5:		12hours
Calendar - Clocks - stocks and shares - Data representation - Tabulation – Bar Graphs-Pie charts-Line graphs.		
Unit – 6:	**Contemporary Issues**	2 hours
Expert lectures, online seminars –webinars		
	Total Lecture hours	hours
Text Books		
1.	R.S.Aggarwal, "Quantitative Aptitude", S.Chand & Company Ltd., 2012	
2.	R.S.Aggarwal, "Verbal and Non-Verbal Reasoning", Revised Edition, S.Chand & Company Ltd., 2013	
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]		
	Web resources related to Competitive examinations	
1.	https://www.indiabix.com	
2.	https://www.sawaal.com	
3.	https://www.placementpreparation.io/quantitative-aptitude/#topics	

Mapping with Programming Outcomes										
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	M	M	M	S	M	S	M	M	S	M
CO2	M	S	M	S	M	S	M	S	S	S
CO3	S	S	S	S	M	S	M	S	S	S
CO4	S	S	S	S	S	S	S	S	S	S
CO5	S	S	S	S	S	S	S	S	S	S

*S-Strong; M-Medium; L-Low

Mapping with Programme Specific Outcomes					
CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	3	2	2	3	3
CO 2	3	2	2	3	3
CO 3	3	2	3	3	3
CO 4	3	3	3	3	3
CO 5	3	3	3	3	3
Weightage of course contributed to each PSO	15	12	13	15	15
Weighted % of Course Contribution to Pos	3.0	2.4	2.6	3.0	3.0

*S-Strong-3; M-Medium-2; L-Low-1