KAMARAJ COLLEGE

(AUTONOMOUS)

Accredited with A+ Grade by NAAC

Among Top 150 Colleges in India - NIRF Ranking 2025

இந்து நாடார் சங்கங்களால் 1966-ல் தொடங்கப்பட்ட கல்லூரி

(Affiliated to Manonmaniam Sundaranar University, Tirunelveli)

THOOTHUKUDI - 628 003.

B.Sc., Computer Science

Semester – I to VI

(for the students those who joined from the academic year 2025-2026)

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SYLLABUS

(for the students those who joined from the academic year 2025-2026)

Department profile

Name of the Programme: B.Sc., Computer Science

Programme Code : 03011

Year of Establishment : 1987

Vision

- To develop students' research skills and expose them to the wide world of computers in order to prepare them for lifetime learning.

Mission

- To impart knowledge of Computer science, develop a scientific attitude, and make students aware the importance of the technology in computers.

College Mail ID kamarajcoll@gmail.com

College Website www.kamarajcollege.ac.in

Undergraduate Degree Programme

1. Introduction

Programme Outcome, Programme Specific Outcomes and Course Outcomes

Students completing this programme will be able to present their core under-graduate discipline clearly and precisely, make abstract ideas precise by formulating them in the language of the specific discipline, describe related ideas from multiple perspectives and explain fundamental concepts. Completion of this programme will also enable the learners to join teaching profession, enhance their employability for government jobs, jobs in various other public and private enterprises.

Eligibility: Passed the 10 + 2 (Higher Secondary) examination conducted by Government of Tamil Nadu with Mathematics / Computer Science as one of the Subject or other equivalent examinations (Minimum Aggregate of 50%)

Learning Outcomes-Based Curriculum Framework Guidelines Based Regulations For Under Graduate Programme	
Programme:	B.Sc. (Computer Science)
Programme Code:	03011
Duration:	3 Years (UG)
Programme Outcomes:	
PO1	**Disciplinary knowledge**: Capable of demonstrating comprehensive knowledge and understanding of one or more disciplines that form a part of an undergraduate Programme of study.
PO2	**Communication Skills**: Ability to express thoughts and ideas effectively in writing and orally; Communicate with others using appropriate media; confidently share one's views and express herself/himself; demonstrate the ability to listen carefully, read and write analytically, and present complex information in a clear and concise manner to different groups.
PO3	**Critical thinking:** Capability to apply analytic thought to a body of knowledge; analyse and evaluate evidence, arguments, claims, beliefs on the basis of empirical evidence; identify relevant assumptions or implications; formulate coherent arguments; critically evaluate practices, policies and theories by following scientific approach to knowledge development.
PO4	**Problem solving:** Capacity to extrapolate from what one has learned and apply their competencies to solve different kinds of non-familiar problems, rather than replicate curriculum content knowledge; and apply one's learning to real life situations.

PO5	**Analytical reasoning**: Ability to evaluate the reliability and relevance of evidence; identify logical flaws and holes in the arguments of others; analyse and synthesize data from a variety of sources; draw valid conclusions and support them with evidence and examples, and addressing opposing viewpoints.
PO6	**Research-related skills:** A sense of inquiry and capability for asking relevant/appropriate questions, problem arising, synthesising and articulating; Ability to recognise cause-and-effect relationships, define problems, formulate hypotheses, test hypotheses, analyse, interpret and draw conclusions from data, establish hypotheses, predict cause-and-effect relationships; ability to plan, execute and report the results of an experiment or investigation
PO7	**Cooperation/Team work:** Ability to work effectively and respectfully with diverse teams; facilitate cooperative or coordinated effort on the part of a group, and act together as a group or a team in the interests of a common cause and work efficiently as a member of a team
PO8	**Scientific reasoning:** Ability to analyse, interpret and draw conclusions from quantitative/qualitative data; and critically evaluate ideas, evidence and experiences from an open-minded and reasoned perspective.

Programme Specific Outcomes (PSOs)

PSO1: Placement: To prepare the students who will demonstrate respectful engagement with others ideas, behaviour and beliefs. Also apply diverse frames of reference to decisions and actions.

PSO2: Entrepreneur: To create effective entrepreneurs by enhancing their critical thinking, problem solving, decision making and leadership skills that will facilities start-ups and high potential organisations.

PSO3: Research and Development: Design and implement HR system and practices grounded in research that complies with employment laws, leading the organisation towards growth and development.

PSO4: Contribution to Business Words: To produce employability, ethical and innovative professionals to sustain in the dynamic business world.

PSO5: Contribution to the Society: To contribute to the development of the society by collaborating with stakeholders for mutual benefits.

Methods of Assessment			
Recall (K1)	Simple definitions , MCQ, Recall steps, Concept definitions		
Understand/ Comprehend (K2)	MCQ, True/False, Short essays, Concept explanations, Short summary or overview		
Application (K3)	Suggest idea/concept with examples, Suggest formulae, Solve problems, Observe, Explain		
Analyze (K4)	Problem-solving questions, Finish a procedure in many steps, Differentiate Between various ideas, Map knowledge		
Evaluate (K5)	Longer essay/Evaluation essay, Critique or justify with pros and cons		
Create (K6)	Check knowledge in specific or offbeat situations, Discussion, Debating or Presentations		
Methods of Evaluation		**Marks**	
Internal Evaluation	Continuous Internal Assessment Test	15	25
	Assignment (PPT) and Seminar	5	
	Group Discussion and Viva	5	
External Evaluation	End Semester Examination		75
	Total		100

Extra Credits

Curricular Activities	Co-Curricular Activities	Extra-Curricular Activities
Paper Presentation	Cultural Competitions	NCC
Paper Publication	Domain Clubs	NSS
Placement Training		Sports
Quiz		YRC
Competitions		UBA
SWAYAM /NPTEL/MOOCs		

Level	Credit			
	Participation	III Prize	II Prize	I Prize
Intra college	1	2	3	4
Intercollegiate	2	3	4	5
District	3	4	5	6
University	4	5	6	7
State	5	6	7	8
National	6	7	8	9
International	7	8	9	10

****Paper Presentation for each paper: 1credit**

Total credits Under–Graduate Courses including Lab Hours – 2025 to 2026

Semester	Hours	Credits	Additional Credits
I	30	22	2
II	30	22	2
III	30	23	2
IV	30	24	2
V	30	25	3
VI	30	24	3
Total		**140**	**14**

**Extra Credit will be given on the basis of student's performances

Written Examination: Theory Paper (Bloom's Taxonomy based) Question paper Model Assessment Pattern

Continuous Internal Assessment (CIA) & End Semester Examination (ESE)

- CIA : 25
- ESE:75

Theory Course:

For theory courses there shall be two tests conducted by the faculty concerned and the average of the best two can be taken as the Continuous Internal Assessment (CIA).CIA is for 50 marks max and will be converted in to 15 marks. The duration of each test shall be 2 Hrs.

Continuous Internal Assessment (Writing)	15marks
Assignment (PPT) & Seminar	5marks
Viva & Group Discussion	5marks

For theory Papers:

- Part A (10×1=10) Marks-Answer all questions (Multiple choice)
- Part B (5×5=25) Marks-Choosing either(a) or (b)
- Part C (5×8=40) Marks-Choosing either (a) or (b)

Total =75marks

Laboratory Courses Assessment

- CIA-40marks
- ESE-60marks
- Mandatory Record submission, attendance and class participation.
- Two CIA for 40 marks max. The average of the best two can be taken as the Continuous Internal Assessment.
- The duration of each test shall be 3 hours. In order to avoid pull the score down of each PO, it is suggested that the usage L-Low (1) to the minimum. The S, M, L is based on the Course outcomes. The mapping is based on the revised Bloom's

Taxonomy Verbs used to describe your Course outcomes.

- Remember and Understanding–Lower level
- Apply and Analyze– Medium Level
- Evaluate and Create–Strong Level

Pedagogy:

- Technology Based Learning (PPT)
- Peer Teaching (Chalk & Talk)
- Virtual Lab
- Blended Learning (Online & Offline)
- Group Learning
- Self - Study
- Games Based Learning

Course Structure for Science Stream
First Year – Semester – I
B.Sc., Computer Science
(With effect from the academic year 2025 to 2026 onwards)

Semester I	Course Code	Title of the Course	Hours / Week / L/P	Credit	Duration of ESE (Hrs.)	Marks Allotted		
						CIA	ESE	Total
Part - I	25ULTL11	தமிழ் இலக்கிய வரலாறு -I	6	3	3	25	75	100
Part - II	25ULEN11	General English - I	6	3	3	25	75	100
Part - III Core - I	25UMCS11	Programming in C++	5	5	3	25	75	100
Core Lab - I	25UMCSL1	Programming in C++ Lab	5	4	3	40	60	100
EC - I Discipline /Generic	25UECS11	Digital Logic Fundamentals	4	3	3	25	75	100
Part - IV SEC - I	25USCSL1	Office Automation Lab	2	2	3	40	60	100
FC	25UFCS11	Problem Solving Techniques	2	2	3	25	75	100
Total			**30**	**22**				

**** SEC-Skill Enhancement Course** ****CIA- Continuous Internal Assessment**
****EC –Elective Course** **** ESE- End Semester Examination**
****FC - Foundation course**

Course Structure for Science Stream
First Year – Semester II
B.Sc., Computer Science
(With effect from the academic year 2025 – 2026 onwards)

Semester II	Course Code	Title of the Course	Hours / Week L/P	Credit	Duration of ESE (Hrs.)	Marks Allotted		
						CIA	ESE	Total
Part - I	25ULTL21	தமிழ் இலக்கிய வரலாறு - II	6	3	3	25	75	100
Part - II	25ULEN21	General English – II	6	3	3	25	75	100
Part - III Core - II	25UMCS21	Python Programming	5	5	3	25	75	100
Core Lab - 2	25UMCSL2	Python Programming (Lab)	5	4	3	40	60	100
EC - II Discipline /Generic	25UECS21	Discrete Mathematics	4	3	3	25	75	100
Part - IV SEC - II	25USCS21	Web Design	2	2	3	25	75	100
SEC – III Lab - 2	25USCSL2	Web Design Lab	2	2	3	40	60	100
		Total	**30**	**22**				

**** SEC-Skill Enhancement Course** **** CIA- Continuous Internal Assessment**

**** EC –Elective Course** **** ESE- End Semester Examination**

Course Structure for Science Stream
Second Year – Semester III
B.Sc., Computer Science
(With effect from the academic year 2025 to 2026 onwards)

Semester III	Course Code	Title of the Course	Hours /Week L/P	Credit	Duration of ESE (Hrs.)	Marks Allotted		
						CIA	ESE	Total
Part-I	25ULTL31	தமிழக வரலாறும் பண்பாடும்	6	3	3	25	75	100
Part- II	25ULEN31	General English - III	6	3	3	25	75	100
Part -III Core- III	25UMCS31	Data Structure and Algorithms	4	4	3	25	75	100
Core Lab - 3	25UMCSL3	Data Structure and Algorithms Lab	5	4	3	40	60	100
EC - III Discipline /Generic (Select any one)	25UECS31 25UECS32 25UECS33	1. Introduction to Data Science 2. IOT and its applications 3. Computer Architecture	3	3	3	25	75	100
Part-IV SEC - IV	25USCS31	PHP & MySQL	2	2	3	25	75	100
Part-IV SEC - V Lab - 3	25USCSL3	PHP & MySQL Lab	2	2	3	40	60	100
Part-IV	25UYOG31	Yoga, Culture & Heritage	2	2	1.5	25	75	100
		Total	**30**	**23**				

**** SEC-Skill Enhancement Course** ****CIA- Continuous Internal Assessment**

****EC –Elective Course** **** ESE- End Semester Examination**

Course Structure for Science Stream
Second Year – Semester – IV
B.Sc., Computer Science
(With effect from the academic year 2025 – 2026 on wards)

Semester IV	Course Code	Title of the Course	Hours / Week	Credit	Duration of ESE (Hrs.)	Marks Allotted		
						CIA	ESE	Total
Part - I	25ULTL41	தமிழும் அறிவியலும்	6	3	3	25	75	100
Part - II	25ULEN41	General English - IV	6	3	3	25	75	100
Part - III Core - IV	25UMCS41	Java Programming	4	4	3	25	75	100
Core Lab - 4	25UMCSL4	Java Programming Lab	5	4	3	40	60	100
EC -IV Discipline /Generic	25UECS41 25UECS42 25UECS43	1. Resource Management Techniques 2. Analytics for Service Industry 3. Biometrics	3	3	3	25	75	100
Part - IV SEC - VI	25USCS41	Web Frameworks	2	2	3	25	75	100
Part-IV - SEC – VII Lab - 4	25USCSL4	Advanced Excel Lab	2	2	3	40	60	100
Part - IV	25UEVS41	Environmental Studies	2	2	3	25	75	100
Part - V	25UEA41	NCC/ NSS/ YRC/ SPORTS	-	1	-	-	-	100
		Total	**30**	**24**				

**** SEC-Skill Enhancement Course** **** CIA- Continuous Internal Assessment**

**** EC –Elective Course** **** ESE- End Semester Examination**

Course Structure for Science Stream
Third Year – Semester – V
B.Sc., Computer Science
(With effect from the academic year 2025 – 2026 on wards)

Semester V	Course Code	Title of the Course	Hours / Week	Credit	Duration of ESE (Hrs.)	Marks Allotted		
						CIA	ESE	Total
Part - III - Core - V	25UMCS51	Software Engineering	5	4	3	25	75	100
Part - III - Core - VI	25UMCS52	Database Management System	5	4	3	25	75	100
Part - III - Core - VII	25UMCS53	Image Processing	4	4	3	25	75	100
Core - Lab - 5	25UMCSL5	Image Processing Lab	4	3	3	40	60	100
Mini Project	25UMCSP1	Mini Project with Viva-Voce	4	3	3	50	50	100
EC - V Discipline /Generic (Select any one)	25UECS51 25UECS52 25UECS53	1. Cloud Computing 2. Data Analytics using R 3. AI and its Applications	4	3	3	25	75	100
Part-IV – SEC - VIII	25USCS51	Enhancing the Programming Skills	2	2	3	25	75	100
Part - IV Training	25UINT51	*Internship	-	2	1.5	50	50	100
Part - V	25UPDT51	Personality Development	2	2	3	25	75	100
		Total	**30**	**27**				

**** SEC-Skill Enhancement Course** ****CIA- Continuous Internal Assessment**

****EC –Elective Course** **** ESE- End Semester Examination**

***Internship – course duration - 7 to 14 days (Report should be submitted & Viva Voce will be conducted for the report which is equivalent to the project Viva – voce).**

Course Structure for Science Stream
Third Year – Semester – VI
B.Sc., Computer Science
(With effect from the academic year 2025 – 2026 on wards)

Semester VI	Course Code	Title of the Course	Hours / Week	Credit	Duration of ESE (Hrs.)	Marks Allotted		
						CIA	ESE	Total
Part III - Core - VIII	25UMCS61	Computer Networks	5	4	3	25	75	100
Part III - Core - IX	25UMCS62	.NET Programming	5	4	3	25	75	100
Part III - Core - X	25UMCS63	Operating System	5	4	3	25	75	100
Core - Lab - 6	25UMCSL6	.NET Programming Lab	5	3	3	40	60	100
Major Project	25UMCSP2	Major Project with Viva voce	4	3	3	50	50	100
EC - VI Discipline /Generic	25UECS61 25UECS62 25UECS63	1. Natural Language Processing 2. Artificial Neural Network 3. Cyber Forensics	4	3	3	25	75	100
Part - IV – SEC - IX	25USCS61	MongoDB	2	2	3	25	75	100
		Total	**30**	**23**				

**** SEC-Skill Enhancement Course** ****CIA- Continuous Internal Assessment**

****EC –Elective Course** **** ESE- End Semester Examination**

Semester - I

Programming in C++

Title of the Course		Programming in C++					
Course Type		Core - II					
Year	I	Semester	II	Credits	5	Course Code	25UMCS11
Instructional Hours per week		Lecture	Tutorial		Lab Practice		Total
		3	2		--		5

Learning Objectives:

LO1 Describe the procedural and object oriented paradigm with concepts of streams, classes, functions, data and objects

LO2 Understand dynamic memory management techniques using pointers, constructors, destructors, etc.

LO3 Describe the concept of function overloading, operator overloading, virtual functions and polymorphism

LO4 Classify inheritance with the understanding of early and late binding, usage of exception handling, generic programming

LO5 Demonstrate the use of various OOPs concepts with the help of programs

Contents:

Unit I

Introduction to C++ - key concepts of Object-Oriented Programming –Advantages – Object Oriented Languages – I/O in C++ - C++ Declarations. Control Structures: - Decision Making and Statements: If..else, jump, goto, break, continue, Switch case statements - Loops in C++ : for, while, do - functions in C++ - inline functions – Function Overloading.

Unit II

Classes and Objects: Declaring Objects – Defining Member Functions – Static Member variables and functions – array of objects –friend functions – Overloading member functions – Bit fields and classes – Constructor and destructor with static members.

Unit III

Operator Overloading: Overloading unary, binary operators – Overloading Friend functions –type conversion – Inheritance: Types of Inheritance – Single, Multilevel, Multiple, Hierarchical, Hybrid, Multi path inheritance – Virtual base Classes – Abstract Classes.

Unit IV

Pointers – Declaration – Pointer to Class, Object – this pointer – Pointers to derived classes and Base classes – Arrays – Characteristics – array of classes – new and delete operators – dynamic object – Binding, Polymorphism and Virtual Functions.

Unit V

Files – File stream classes – file modes – Sequential Read / Write operations – Exception Handling - String – Declaring and Initializing string objects – String Attributes – Miscellaneous functions.

Recommended Textbook

E. Balagurusamy, "Object-Oriented Programming with C++", TMH 2013, 7th Edition.

References Books

1. Ashok N Kamthane, "Object-Oriented Programming with ANSI and Turbo C++", Pearson Education 2003.
2. Maria Litvin&GrayLitvin, "C++ for you", Vikas publication 2002.

Web Resources

https://alison.com/course/introduction-to-c-plus-plus-programming

Course outcomes:

CO1 Remember the program structure of C with its syntax and semantics
Cognitive Level K1

CO2 Understand the programming principles in C (data types, operators, branching and looping, arrays, functions, structures, pointers and files)
Cognitive Level K2

CO3 Apply the programming principles learnt in real-time problems
Cognitive Level K3

CO4 Analyse the various methods of solving a problem and choose the best method
Cognitive Level K4

CO5 Code, debug and test the programs with appropriate test cases
Cognitive Level K5

Mapping With Programme Outcomes and Programme Specific Outcomes

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	3	2	3	3	2	3	3
CO2	2	3	3	3	2	3	3	3
CO3	3	3	3	2	3	3	3	2
CO4	3	3	2	3	3	3	1	3
CO5	3	2	3	3	2	3	3	2

Strong (3) Medium (2) Low (1)

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	2	3	3
CO2	2	3	3	1	3
CO3	3	3	3	3	3
CO4	3	3	2	3	2
CO5	3	2	3	3	3

Strong (3) Medium (2) Low (1)

Programming in C++ Lab

Title of the Course	Programming in C++						
Course Type	Core Lab - 1						
Year	I	Semester	I	Credits	3	Course Code	25UMCSL1
Instructional Hours Per week	Lecture		Tutorial		Lab Practice		Total
	1		-		4		5

Learning Objectives:

LO1 Describe the procedural and object oriented paradigm with concepts of streams, classes, Functions, data and objects.

LO2 Understand dynamic memory management techniques using pointers, constructors, destructors, etc.

LO3 Describe the concept of function overloading, operator overloading, virtual functions and Polymorphism.

LO4 Classify inheritance with the understanding of early and late binding, usage of exception handling, generic programming.

LO5 Demonstrate the use of various OOPs concepts with the help of programs.

Experiments

1. Write a C++ program to demonstrate Class and Objects.
2. Write a C++ program to demonstrate function overloading.
3. Write a C++ program to demonstrate the concept of Passing Objects to Functions.
4. Write a C++ program to demonstrate the Friend Functions.
5. Write a C++ program to demonstrate Constructor and Destructor.
6. Write a C++ program to demonstrate Unary Operator Overloading.
7. Write a C++ program to demonstrate Binary Operator Overloading.
8. Write a C++ program to demonstrate: Single Inheritance.
9. Write a C++ program to demonstrate: Multiple Inheritance.
10. Write a C++ program to demonstrate Virtual Functions.
11. Write a C++ program to demonstrate Exception Handling.
12. Write a C++ program to traverse an array using pointers.
13. Write a C++ program to create a text file and write some content into it.

Recommended Texts E. Balagurusamy, "Object-Oriented Programming with C++", TMH 2013, 7th Edition

Reference Books Ashok N Kamthane, "Object-Oriented Programming with ANSI and Turbo C++", Pearson Education 2003.

Web resources: https://alison.com/course/introduction-to-c-plus-plus-programming

Course outcomes:

CO1 Remember the program structure of C with its syntax and semantics.
Cognitive Level K1

CO2 Understand the programming principles in C (data types, operators, branching and looping, arrays, functions, structures, pointers and files).
Cognitive Level K2

CO3 Apply the programming principles learnt in real-time problems.

Cognitive Level K3

CO4 Analyse the various methods of solving a problem and choose the best method.
Cognitive Level K4

CO5 Code, debug and test the programs with appropriate test cases
Cognitive Level K5

Mapping With Programme Outcomes and Programme Specific Outcome

CO /PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	3	2	3	3	2	3	3
CO2	2	3	3	3	2	3	3	3
CO3	3	3	3	2	3	3	3	2
CO4	3	3	2	3	3	3	1	3
CO5	3	2	3	3	2	3	3	2

Strong (3) Medium (2) Low (1)

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	2	3	3
CO2	2	3	3	1	3
CO3	3	3	3	3	3
CO4	3	3	2	3	2
CO5	3	2	3	3	3

Strong (3) Medium (2) Low (1)

Digital Logic Fundamentals

Title Of The Course	**Digital logic fundamentals**						
Course Type	**Elective Course - I**						
Year	**I**	**Semester**	**I**	**Credits**	**3**	**Course Code**	**25UECS11**
Instructional Hours per week	**Lecture**		**Tutorial**	**Lab Practice**	**Total**		
	3		**1**	**-**	**4**		

Learning Objectives

LO1 To understand the concepts of number systems
LO2 To learn conversions
LO3 To construct truth tables
LO4 To learn SOP and POS
LO5 To understand various simplifications

Contents

Unit I

Number Systems: Codes and Digital Logic Binary Number System –Binary to Decimal Conversion– Decimal to Binary Conversion–Octal Numbers –Hexadecimal Numbers –The ASCII Code–The Excess-3Code–The Gray Code. Digital Logic: The Basic gates NOT, OR, AND– Universal Logic Gates NOR, NAND– AND-OR Invert Gates.

Unit II

Combinational Logic: Circuits Boolean Laws and Theorems–Sum of Products Method– Truth Table to Karnaugh Map –Pairs, Quads and Octets –Karnaugh Simplifications –Don't Care Conditions –Product of Sums Method –Product of Sums Simplification.

Unit III

Data Processing and Arithmetic circuits: Multiplexers –De- multiplexers –1-of- 16-Decoders–BCD-to-DecimalDecoders–Seven-Segmentdecoders–Encoders– Exclusive-OR gates. Arithmetic Circuits: Binary Addition –Binary Subtraction – Unsigned Binary Numbers– Sign-Magnitude Numbers–2's Complement Representation 2's Complement Arithmetic.

Unit IV

Flip-Flops: RS Flip Flops–Edge Triggered RS Flip Flops-Edge Triggered D Flip Flops-Edge Triggered JK Flip Flops–JK Master Slave Flip Flops

Unit V

Registers: Types of Registers–Serial in serial out–serial in parallel out–parallel in serial out –parallel in parallel out–Universal Shift Register.

Recommended Texts

Digital Principles and Applications, by Albert Paul Malvino &Donald P. Leach, Seventh Edition, McGraw Hill Education Private Limited

Reference books:

Fundamentals of Digital Circuits, A.Anand Kumar, Second Edition, PHI Learning Private Limited Digital design, M.Morris Mano, Third Edition, Pearson Education

Web Resources:

1. https://www.geeksforgeeks.org/number-system-and-base-conversions/#1-decimal-to-binary-number-system
2. https://www.tutorialspoint.com/digital-electronics/digital-electronics-number-systems.htm
3. https://www.geeksforgeeks.org/flip-flop-types-their-conversion-and-applications/
4. https://www.electronicsforu.com/technology-trends/learn-electronics/flip-flop-rs-jk-t-d
5. https://www.tutorialspoint.com/digital-electronics/digital-electronics-flip-flops.htm

Course outcomes:

- **CO1** Understand the concept of various number systems
  Cognitive Level K1

- **CO2** Understand basic concepts of digital systems
  Cognitive Level K2

- **CO3** Describe the storage structures
  Cognitive Level K3

- **CO4** Solve problems using SOP and POS
  Cognitive Level K4

- **CO5** Apply concepts for simplifications

  Cognitive Level K5

Mapping with Programme Outcomes and Programme Specific Outcomes

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	2	3	2	3	3	3	3	2
CO2	2	3	3	2	3	2	3	3
CO3	3	2	1	3	2	3	1	2
CO4	3	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	3	3

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

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	1	3	2
CO2	3	3	2	3	3
CO3	3	2	1	3	2
CO4	3	3	3	3	3
CO5	3	3	3	3	3

Office Automation Lab

Title of the Course	Office Automation Lab						
Course Type	Skill Enhancement Course - I						
Year	I	Semester	I	Credits	2	Course Code	25USCSL1

Instructional Hours Per week	Lecture	Tutorial	Lab Practice	Total
	-	-	2	2

Learning Objectives:

LO1 To understand the concepts of MS word
LO2 To learn the features of Word
LO3 To do calculations in excel
LO4 To Design invitation set using Word
LO5 To understand and design presentations

Experiments

1. Usage of Numbering, Bullets, Indents and Headers in a Word Document
2. Prepare a Calendar in a Word Document
3. Usage of Spell Check, Find and Replace
4. Picture Insertion and Alignment
5. Prepare a semester wise mark statement for a computer class of 20 students using any spreadsheet worksheet. Total, average and rank the student marks. Give proper headings. Make the column headings bold and italics
6. Use any spreadsheet to use mathematical, statistical and logical functions
7. Use any spreadsheet to plot a chart for marks obtained by the students (out of 5) vs. frequency (total number of students in class is 50).
8. Create a student database and create validation rules for fields like age, date of birth, pin code etc.
9. Enter data to the student database using a form.
10. Create a query and add criteria to the query.

Recommended Book

1. "Excel 2016 Bible" by John Walken bach.
2. **"**Microsoft Word 2016 Step by Step" **by** Joan Lambert

Reference Books

1. MicrosoftOffice2016StepByStep, Lambert, Joan, Frye, Curtis D., Phi Learning
2. MicrosoftExcel2016StepByStep,Curtis Frye, Phi Learning
3. Browse the Internet for Open Source Office Software

Web Resources

1. https://opentextbc.ca/computerstudies/chapter/headers-footers/
2. https://barn2.com/blog/student-database/
3. https://www.gcflearnfree.org/access-2016/queries/1/

Course Outcomes:

- **CO1** Understanding Office Productivity Tools

  Cognitive Level K1

- **CO2** Data Management Skills
  Cognitive Level K2

- **CO3** Data Visualization
  Cognitive Level K3

- **CO4** Logical and Statistical Functions
  Cognitive Level K4

- **CO5** Query Creation and Filtering
  Cognitive Level K5

Mapping With Programme Outcomes and Programme Specific Outcomes

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	2	3	2	3	3	3	3	2
CO2	2	3	3	2	3	2	3	3
CO3	3	2	1	3	2	3	1	2
CO4	3	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	3	3

S-Strong (3) M-Medium (2) L-Low (1)

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	1	3	2
CO2	3	3	2	3	3
CO3	3	2	1	3	2
CO4	3	3	3	3	3
CO5	3	3	3	3	3

S-Strong (3) M-Medium (2) L-Low (1)

Problem Solving Techniques

Title of the Course	Problem Solving Techniques						
Course Type	Foundation Course						
Year	I	Semester	I	Credits	2	Course Code	25UFCS11
Instructional Hours per week		Lecture	Tutorial		Lab Practice	Total	
		2	-		-	2	

Learning Objectives:

LO1 Familiarize with writing of algorithms, fundamentals of C and philosophy of problem solving
LO2 Implement different programming constructs and decomposition of problems in to functions
LO3 Use data flow diagram, Pseudo code to implement solutions.
LO4 Define and use of arrays with simple applications
LO5 Understand about operating system and their uses

Contents

Unit I

Introduction: History, characteristics and limitations of Computer. Hardware/Anatomy of Computer: CPU, Memory, Secondary storage devices, Input Devices and Output devices. Types of Computers: PC, Workstation, Minicomputer, Mainframe and Supercomputer. Software: System software and Application software.

Unit II

Programming Languages: Machine language, Assembly language, High-level language, and 4GL and 5GL-Features of good programming language. Translators: Interpreters and Compilers. Data: Data types, Input, Processing of data, Arithmetic Operators, Hierarchy of operations and Output. Different phases in Program Development Cycle (PDC).

Unit III

Structured Programming: Algorithm: Features of good algorithm, Benefits and drawbacks of algorithm. Flowcharts: Advantages and limitations of flowcharts, when to use flowcharts, flowchart symbols and types of flowcharts.

Unit IV

Pseudo code: Writing a pseudo code. Coding, documenting and testing a program: Comment lines and types of errors. Selection Structures: Relational and Logical Operators -Selecting from Several Alternatives–Applications of Selection Structures.

Unit V

Repetition Structures: Counter Controlled Loops –Nested Loops– Applications of Repetition Structures. Data: Numeric Data and Character Based Data. Arrays: One Dimensional Array- Two Dimensional Arrays–Strings as Arrays of Characters.

Recommended Texts

Stewart Venit, "Introduction to Programming: Concepts and Design", Fourth Edition, 2010, Dream Tech Publishers.

Reference Text Book

1. "Fundamentals of Computer Programming with C#" by Svetlin Nakov
2. "Programming in C" by Stephen G. Kochan
3. "Computer Fundamentals" by P.K. Sinha

Web Resources

1. https://www.codesansar.com/computer-basics/problem-solving-using-computer.htm
2. http://www.nptel.iitm.ac.in/video.php?subjectId=106102067http://utubersity.com/?page_id=876

Course Outcomes:

- **CO1** Study the basic knowledge of Computers. Analyse the programming languages.
  Cognitive Level K1
- **CO2** Study the data types and arithmetic operations. Know about the algorithms. Develop program using flowchart and pseudo code.
  Cognitive Level K2
- **CO3** Determine the various operators. Explain about the structures. Illustrate the concept of Loops
  Cognitive Level K3
- **CO4** Study about Numeric data and character-based data. Analyze about Arrays.
  Cognitive Level K4
- **CO5** Explain about DFD Illustrate program modules. Creating and Reading Files
  Cognitive Level K5

Mapping With Programme Outcomes and Programme Specific Outcomes

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	3	2	3	3	2	3	3
CO2	3	3	3	3	2	3	3	3
CO3	3	2	3	2	3	3	3	2
CO4	3	3	2	3	3	2	1	3
CO5	1	2	3	3	2	3	3	2

Strong (3) Medium (2) Low (1)

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	2	3	3
CO2	2	2	3	1	2
CO3	3	3	3	3	3
CO4	2	3	2	3	2
CO5	3	2	3	3	3

Semester - II

Python Programming

Title of the Course	**Python Programming**						
Course Type	**Core - II**						
Year	**I**	**Semester**	**II**	**Credits**	**5**	**Course Code**	**25UMCS21**
Instructional Hours per week		**Lecture**	**Tutorial**		**Lab Practice**	**Total**	
		2	**-**		**-**	**5**	

Learning Objectives	
LO1	To understand the features and history of python. To develop algorithms and design logical flow charts for solving problems and to solve simple formula based problems on computer using Python.
LO2	To understand the conditional and unconditional Statements, Decision Control Statements and to implement programs using python control Structure
LO3	To understand need for functions, variables and to use various operators in concatenating, appending, and multiplying strings. To develop programs using built-in string methods and functions.
LO4	To demonstrate creating, accessing elements in a tuples and lists and to develop programs using lists and tuples.
LO5	To understand various file types and file paths. To understand various operations on files and to implement programs on Files.

Unit	Contents
I	**Basics of Python Programming**: History of Python - Features of Python-Literal- Constants-Variables - Identifiers–Keywords-Built-in Data Types-Output Statements – Input Statements-Comments – Indentation. Operators-Expressions-Type Conversions. Python Arrays: Defining and Processing Arrays – Array methods.
II	**Control Statements:** Selection/Conditional Branching statements: if, if-else, nested if and if-elif-else statements. **Iterative Statements:** while loop, for loop, else suite in loop and nested loops. **Jump Statements:** break, continue and pass statements**.**
III	**Functions:** Function Definition – Function Call – Variable Scope and its Lifetime-Return Statement. **Function Arguments**: Required Arguments, Keyword Arguments, Default Arguments and Variable Length Arguments Recursion. **Python Strings**: String operations- Immutable Strings - Built-in String Methods and Functions - String Comparison. **Modules:** import statement-The Python module–dir()function– Modules and Namespace – Defining our own modules.
IV	**Lists:** Creating a list -Access values in List-Updating values in Lists- Nested lists -Basic list operations-List Methods. **Tuples**: Creating, Accessing, Updating and Deleting Elements in a tuple– Nested tuples– Difference between lists and tuples. **Dictionaries:** Creating, Accessing, Updating and Deleting Elements in a Dictionary–Dictionary Function and Methods-Difference between Lists and Dictionaries..
V	**Python File Handling:** Types of files in Python - Opening and Closing files- Reading and Writing files: write( ) and writelines() methods-append() method–read() and readlines() methods – with keyword – Splitting words – File methods - File Positions- Renaming and deleting files.

Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC/TRB/NET/UGCCSIR/GATE/TNPSC /others to be solved (To be discussed during the Tutorial hour)
Skills acquired from this course	Knowledge, Professional Competency, Professional Communication and Transferrable Skill.
Recommended Texts	1. Reema Thareja, "Python Programming using problem solving approach", First Edition, 2017, Oxford University Press 2. Dr.R.NageswaraRao,"CorePythonProgramming",FirstEdition,2017,Dreamtech Publishers
Reference books	1. Mark Lutz," Learning Python",Orielly. 2. Vamsi Kurama, "Python Programming: A Modern Approach", Pearson Education.
Web Resources	https://www.programiz.com/python-programming https://www.guru99.com/python-tutorials.html https://youtu.be/eWRfhZUzrAc https://www.learnpython.org/ https://www.tutorialspoint.com/python/index.htm

Course outcomes: CO	On completion of this course, the students will be able to:
CO1	Demonstrate the basic elements of Python
CO2	Implement programs using Python Control Structures.
CO3	Design functions in Python to solve the problems.
CO4	Apply strings, lists and tuples in developing Python programs.
CO5	Develop python programs by using files.

Mapping With Programme Outcomes and Programme Specific Outcomes

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	2	3	3	3	2	3	3	3
CO2	3	2	3	3	3	3	3	3
CO3	3	2	2	3	3	3	3	3
CO4	3	3	3	3	3	3	3	3
CO5	2	2	2	3	3	3	3	3

Strong (3) **Medium (2)** **Low (1)**

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	2	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	2	2	3	3	3

Python Programming Lab

Title of the Course	**Python Programming Lab**					
Course Type	**Core Lab - 2**					
Course Code	**25UMCSL2**					
Year	**I**	**Semester**	**II**	**Credits**		**4**
Instructional Hours per week		**Lecture**		**Tutorial**	**Lab Practice**	**Total**
		-		**-**	**4**	**5**

Learning Objectives

1. Understand and implement string manipulation techniques
2. Work with different data structures
3. Apply object-oriented programming concepts
4. Understand and apply regular expressions
5. Work with databases and data visualization

Experiments

1. Write a Python program to read and print values of variables of different datatypes.
2. Write a Python program to perform addition, subtraction, multiplication, division,
   integer

   division and modulo division on two integer numbers.
3. Write a Python program to determine whether the character entered is a vowel or not using conditional statement.
4. Write a Python program to calculate the factorial of a number using loop.
5. Write a Python program to calculate the square root of a number.
   Use break, continue and pass statements.
6. Write a Python program using function and return statement to check whether a number is even or odd.
7. Write a Python program to print the Fibonacci series using recursion.
8. Write a Python program to reverse the order of the items in the array.
9. Write a Python program that accepts a string from the user and display the same string after removing vowels from it.
10. Write a Python program to remove all duplicates from a list.
11. Write a Python program that has a list of numbers.
    (Both positive and negative). Make new tuple that has
    only positive values from this list.
12. Write a Python program that creates a dictionary of radius of a circle and its circumference

Recommended Texts

"Python Programming: An Introduction to Computer Science" by John Zelle

Reference books

1. "Learning Python" by Mark Lutz

Web Resources

https://docs.python.org/3/
https://www.w3schools.com/python/
https://www.geeksforgeeks.org/python-programming-language/

Course outcomes CO	On completion of this course, students will be able to:
CO1	Appreciate programming concepts in Python
CO2	Work with Widgets.
CO3	Insert, Delete and Update in Database.
CO4	Create and perform operations using Data Frames.
CO5	Implement Data Visualization

Discrete Mathematics

Title of the Course	Discrete Mathematics						
Course Type	Elective - II						
Year	I	Semester	II	Credits	3	Course Code	25UECS21
Instructional Hours per week		Lecture		Tutorial	Lab Practice	Total	
		3		1	-	4	

Learning Objectives	
LO1	Understanding the Fundamentals of Set Theory
LO2	Analysing Relations and Their Properties
LO3	Exploring Functions and Their Operations
LO4	Mastering Mathematical Logic and Propositional Logic
LO5	Understanding Matrix Algebra and Its Applications

Unit	Contents
I	Set theory-Sets and elements-Specifications of sets-Identity and Cardinality-Set inclusion-Equality of sets-proper sets- Power sets-Universal set-Operations on sets-ordered pairs- Cartesian product of sets
II	Introduction to relation-Binary relation-Classifications of relations-Composition of relation-Inverse of relation-Closure Operation on relations-Matrix representation of relation
III	Introduction to Function-Addition and Multiplication of functions-Classifications of functions-Composition of functions-Inverse function
IV	Mathematical Logic Introduction – Statement (Propositions) – Laws of Formal Logic –Basic Set of Logical operators/operations - Propositions and Truth Tables – Algebra Propositions - Tautologies and Contradictions –Logical Equivalence –Logical Implication – Normal Forms
V	Matrix Algebra Introduction–Definition of a Matrix- Types of Matrices–Operations on Matrices–Related Matrices– Transpose of a Matrix –Symmetric and Skew-symmetric Matrices –Complex Matrix–Conjugate of a Matrix–Determinant of a Matrix– Typical Square Matrices

Extended Professional Component (is a part of internal component only, not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC /others to be solved (To be discussed during the Tutorial hour)
Skills acquired from this course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill
Recommended Texts	Discrete Mathematics, Swapan Kumar, Chakraborty and BikashKanti Sarkar, OXFORD University Press.
Reference books	1. Discrete Mathematics, Third Edition, Seymour Lipschutz And Marc Lars Lipson, Tata Mcgraw Hill Education Private Limited. 2. Discrete Mathematical Structures With Applications To Computer Science By J.P.Tremblay, R.Manohar TMH Edition
Web Resource	https://byjus.com/maths/basics-set-theory/? https://en.wikipedia.org/wiki/Algebra_of_sets?

Course Outcomes:

Course outcomes: CO	On completion of this course, the students will be able to:
CO1	Know how to solve various problems on discrete mathematics
CO2	Use approximation to solve problems
CO3	Differentiation and integration concepts are applied
CO4	Apply, direct methods for solving linear systems
CO5	Discrete solution of ordinary problems

Mapping With Programme Outcomes and Programme Specific Outcomes

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	3	2	3	3	2	3	3
CO2	3	3	3	3	2	3	3	3
CO3	3	2	3	1	3	3	3	2
CO4	3	3	2	3	3	2	1	3
CO5	1	2	3	3	2	3	3	2

Strong (3) **Medium (2)** **Low (1)**

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	2	3	3
CO2	3	2	3	1	2
CO3	3	3	3	3	3
CO4	2	3	2	3	2
CO5	3	2	3	3	3

Web Design

Title of the Course	**Web Design**						
Paper Number	**Skill Enhancement Course - II**						
Year	**I**	**Semester**	**II**	**Credits**	**2**	**Course Code**	**25USCS21**
Instructional Hours Per week		**Lecture**	**Tutorial**		**Lab Practice**	**Total**	
		2	**-**		**-**	**2**	

Learning Objectives	
LO1	To introduce the fundamentals of Internet, and the principles of web design
LO2	To construct basic websites using HTML
LO3	To construct basic websites using Cascading Style Sheets
LO4	To introduce the fundamentals of JAVA SCRIPT
LO5	To build dynamic web pages with validation using Java Script objects and by applying different event handling mechanisms.

Unit	**Contents**
I	**Introduction to HTML –** What is HTML - HTML Documents - Basic structure of an HTML document- Creating an HTML document- Mark up Tags-Heading- Paragraphs -Line Breaks - HTML Tags- Working with Text.
II	Working with Lists, Tables and Frames- Working with Hyperlinks, Images and Multimedia- Working with Forms and controls - Marquee Elements
III	**Introduction to Cascading Style Sheets-** Concept of CSS- Creating Style Sheet-CSS Properties- CSS Styling(Background, Text Format, Controlling Fonts) - Working with block elements and objects - Working with Lists and Tables-Working with Lists and Tables- CS Sid and Class - Box Model- Creating page Layout and Site Designs.

IV	**Introduction to JavaScript -** Introduction to JavaScript - Variable - Operator- Conditional Statement - Function - Methods.
V	**Embedding HTML with Java Script -** Creating the Web Pages - validating elements using JavaScript with HTML- Binding of CSS and JavaScript with HTML.

Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questionsrelatedtotheabovetopics,fromvariouscompetitiveexaminationsUPSC /TRB/NET/UGC –CSIR/GATE /TNPSC/others to be solved (To be discussed during the Tutorial hour)
Skills acquired from this course	Knowledge ,Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill
Recommended Texts	1. HTML in simple steps, Dream tech press, Cogent Learning, 2010. 2. Jennifer Neediest Robbins, Learning Web Design: A Beginners' Guide to HTML, CSS, Java Script, and Web Graphics, O' Reilly.
Reference Books	1. Sams Teach Yourself HTML, CSS, and JavaScript All in One 2012 edition Pearson Education, Inc. 2. Beginning HTML, XHTML, CSS & Java script, Duckett, Jon, and Wiley India. 3. HTML 5 Black Book (Covers CSS3, JavaScript, XML, XHTML, AJAX, PHP, jQuery) , DT Editorial Services,2e
Web Resources	1. https://www.w3schools.com/html/ 2. https://www.w3schools.com/js/ 3. https://hackernoon.com/a-beginners-guide-to-html-css-and-javascript 4. https://www.geeksforgeeks.org/web-design/ 5. https://www.javatpoint.com/html-and-css-design-and-website 6. https://www.tutorialspoint.com/internet_technologies/website_designing.htm

Course Outcomes:

Course outcomes: CO	On completion of this course, the students will be able to:
CO1	Describe the concepts of World Wide Web, and the requirements of effective web design.
CO2	Develop the website using HTML
CO3	Develop web pages using the HTML and CSS features with different layouts as per need of applications.
CO4	Develop the simple webpage using java script
CO5	Use the JavaScript to develop the dynamic web pages.

Mapping With Programme Outcomes and Programme Specific Outcomes

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	3	2	3	3	2	3	3
CO2	3	3	3	3	2	3	3	3
CO3	3	2	3	2	3	3	3	2
CO4	3	3	2	3	3	2	1	3
CO5	1	2	3	3	2	3	3	2

Strong (3) **Medium (2)** **Low (1)**

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	2	3	3
CO2	2	2	3	1	2
CO3	3	3	3	3	3

Web Design - Lab

Title of the Course	Web Design - Lab						
Paper Number	Skill Enhancement Course – III – Lab - 2						
Year	I	Semester	II	Credits	2	Course Code	25USCSL2
Instructional Hours per week		Lecture	Tutorial		Lab Practice	Total	
		-	-		2	2	

Learning Objectives	
LO1	To understand the concepts of links
LO2	To learn tags, lists
LO3	To learn CSS
LO4	To apply forms and to create pages with java script
LO5	To validating the pages using javascript

Experiments

1. Create a Home Page for a company using paragraph, text, hyperlink, images using HTML Page.
2. Create a Web Page having two Frames, Frame 1 Containing link and another with content of the link. When link is clicked appropriate content should be displayed on Frame.
3. Design a Sign-up Form using text, password, drop- downlist, checkbox, radio button, submit and reset button etc.
4. Create a HTML form using CSS style sheet.
5. Create a sample code to illustrate the inline style sheet for your web page.
6. Create a sample code to illustrate the External style sheet for your web page.
7. Write a Java Script program to change the case string (i.e upper case to lower case and vice versa).
8. Write a JavaScript Program to Merge Two Arrays and Remove Duplicate Items
9. Create a Web Page for a College and check Validation for the Application Form.
10. Create a Web Page for Hotel using HTML with implementation of css and validation using Java Script.

Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questionsrelatedtotheabovetopics,fromvariouscompetitiveexaminations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC /others to be solved (To be discussed during the Tutorial hour)
Skills acquired from this course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill
Recommended Texts	1. HTML in simple steps, Dream tech press, Cogent Learning, 2010. 2. Jennifer Niederst Robbins, Learning Web Design: A Beginners' Guide to HTML, CSS, Java Script, And Web Graphics, Reilly.

Reference books	• Sams Teach Yourself HTML, CSS, and JavaScript All in One 2012 edition Pearson Education, Inc. • Beginning HTML, XHTML, CSS & Java script, Duckett, Jon, and Wiley India. • HTML 5 Black Book (Covers CSS3, JavaScript, XML, XHTML, AJAX, PHP, j Query) , DT Editorial Services,2e
Web Resources	https://www.w3schools.com/html/ https://www.w3schools.com/js/ https://hackernoon.com/a-beginners-guide-to-html-css-and-javascript https://www.geeksforgeeks.org/web-design/ https://www.javatpoint.com/html-and-css-design-and-website https://www.tutorialspoint.com/internet_technologies/website_designing.htm

Course outcomes CO	On completion of this course, the students will be able to
CO1	To introduce the fundamentals of Internet, and the principles of web design.
CO2	To construct basic websites using HTML and Cascading Style Sheets.
CO3	To construct basic websites using Cascading Style Sheets.
CO4	To build dynamic web pages with validation using Java Script objects and by applying different event handling mechanisms.
CO5	To develop modern interactive web applications using PHP, XML and MySQL

Mapping With Programme Outcomes and Programme Specific Outcomes

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	3	2	3	3	2	3	3
CO2	3	3	3	3	2	3	3	3
CO3	3	2	3	2	3	3	3	2

Semester - III

Data Structure and Algorithms

Title of the Course	Data Structure And Algorithms						
Course Type	Core - III						
Year	II	Semester	III	Credits	4	Course Code	25UMCS31

Instructional Hours per week	Lecture	Tutorial	Lab Practice	Total
	4	-	-	4

Learning Objectives	
LO1	To understand the concepts of ADTs
LO2	To learn linear data structures-lists, stacks, queues
LO3	To learn Tree structures and application of trees
LO4	To learn graph structures and application of graphs
LO5	To understand various sorting and searching

Unit	Contents
I	Abstract Data Types (ADTs)- List ADT-array-based implementation linked list implementation singly linked lists- circular linked lists doubly-linked lists applications of lists- Polynomial Manipulation-All operations-Insertion-Deletion- Merge-Traversal
II	Stack ADT-Operations-Applications-Evaluating arithmetic expressions–Conversion of infix to postfix Expression - Queue ADT-Operations Circular Queue-Priority Queue- deQueue applications of queues.
III	Tree ADT-tree traversals-Binary Tree ADT-expression trees applications of trees-binary search tree ADT-Threaded Binary Trees Heap-Applications of heap.
IV	Definition-Representation of Graph-Types of graph-Breadth first traversal–Depth first traversal- Topological sort-Bi- connectivity–Cut vertex-Euler circuits-Applications of graphs
V	Searching-Linear search-Binary search-Sorting-Bubble sort- Selection sort-Insertion sort-Shell sort-- Hashing-Hash functions Separate chaining- Open Addressing

Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questionsrelatedtotheabovetopics,fromvariouscompetitiveexaminations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC /others to be solved (To be discussed during the Tutorial hour)
Skills acquired from this course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill

Recommended Texts	1. Mark Allen Weiss, ―Data Structures and Algorithm Analysis in C++‖, Pears on Education 2014, 4th Edition. 2. Reema Thareja,―Data Structures Using C‖,OxfordUniversitiesPress2014,2nd Edition
Reference books	1. Thomas H.Cormen, Chales E. Leiserson, Ronald L. Rivest, Clifford Stein, ―Intro deduction To Algorithms‖, McGraw Hill 2009, 3rd Edition. 2. Aho, Hop croft and Ullman,―Data Structures and Algorithms‖, Pearson Education 2003 3. Ellis Horowitz, Satraj Sahni― Fundamentals of Computer Algorithms‖, Universities Press; Second edition (1 January 2008) 4. DebasisSamanta,―Classic Data Structures‖, Prentice Hall India Learning Private Limited; 2nd edition (1 January 2009) 5. Richard F. Gilberg ,‖Data Structures: A Pseudo code Approach using C++‖, CENGAGE LEARNING (1 January 2006)
Web Resources	1. https://www.programiz.com/dsa 2. https://www.geeksforgeeks.org/learn-data-structures-and-algorithms-dsa- tutorial/

Course outcomes CO	On completion of this course, the students will be able to
CO1	Understand the concept of Dynamic memory management, data types, algorithms, Big O notation
CO2	Understand basic data structures such as arrays, linked lists, stacks and queues
CO3	Describe the hash function and concepts of collision and Its resolution methods
CO4	Solve problem involving graphs, trees and heaps
CO5	Apply Algorithm for solving problems like sorting, searching, insertion and deletion of data

Mapping With Programme Outcomes and Programme Specific Outcomes

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	2	3	2	3	3	2	3	3
CO2	2	3	3	3	2	3	3	3
CO3	3	2	3	2	3	3	3	2
CO4	3	3	2	3	3	2	1	3
CO5	3	2	3	3	2	3	3	2

Strong (3) Medium (2) Low (1)

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	2	3	3
CO2	2	2	3	1	2
CO3	3	3	3	3	3
CO4	3	3	2	3	2

CO5	**3**	**2**	**3**	**3**	**3**

Data Structure and Algorithms Lab

Title of the Course	**Data Structure and Algorithms**						
Course Type	**Core Lab - 3**						
Year	**II**	**Semester**	**III**	**Credits**	**4**	**Course Code**	**25UMCSL3**
Instructional Hours per week	**Lecture**		**Tutorial**	**Lab Practice**	**Total**		
	-		**-**	**5**	**5**		
Learning Objectives							
LO1	To understand the concepts of ADTs						
LO2	To learn linear data structures -lists, stacks, queues						
LO3	To learn Tree structures and application of trees						
LO4	To learn graph structures and application of graphs						
LO5	To understand various or ting and searching						
Experiments							

1. Search an element in a list using Binary Search.
2. Implementation of Stack- Push and Pop.
3. Implementation of Queue– Enqueue and Dequeue
4. Implementation of Binary Tree Traversals using recursion. a)Pre-order b)In-order c)Post-Order
5. Implementation of Breadth First Search algorithm.
6. Implementation of Depth First Search algorithm.
7. Implementation of Merge Sort
8. Implementation of Quick Sort

Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questionsrelatedtotheabovetopics,fromvariouscompetitiveexaminations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC /others to be solved (To be discussed during the Tutorial hour)
Skills acquired from this course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill

Recommended Texts	1. Mark Allen Weiss, — Data Structures and Algorithm Analysis in C++‖, Pearson Education2014, 4th Edition. 2. ReemaThareja,—DataStructuresUsingC‖,OxfordUniversitiesPress2014,2nd Edition
Reference books	1. ThomasH.Cormen,ChalesE.Leiserson,RonaldL.Rivest,CliffordStein,—Introduction to Algorithms‖, McGraw Hill 2009, 3rd Edition 2. Aho, Hopcr of t and Ullman,—Data Structures and Algorithms‖, Pearson Education 2003
Web Resources	https://www.programiz.com/dsa www.geeksforgeeks.org

Course outcomes CO	On completion of this course, the students will be able to
CO1	Implement and analyze searching techniques (Binary Search) for efficient data retrieval.
CO2	Understand basic data structures such as arrays, linked lists, stacks and queues
CO3	Describe the hash function and concepts of collision and Its resolution methods
CO4	Solve problem involving graphs, trees and heaps
CO5	Apply Algorithm for solving problems likes or ting, searching, insertion and deletion of data

Mapping With Programme Outcomes and Programme Specific Outcomes

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	2	3	2	3	3	2	3	3
CO2	2	3	3	3	2	3	3	3
CO3	3	2	3	2	3	3	3	2
CO4	3	3	2	3	3	2	1	3
CO5	3	2	3	3	2	3	3	2

Strong (3) Medium (2) Low (1)

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	2	3	3
CO2	2	2	3	1	2
CO3	3	3	3	3	3
CO4	3	3	2	3	2
CO5	3	2	3	3	3

Introduction to Data science

Title of the Course	**Introduction to Data science**						
Course Type	**Elective - III**						
Year	**II**	**Semester**	**III**	**Credits**	**3**	**Course Code**	**25UECS31**
Instructional Hours per week		**Lecture**	**Tutorial**		**Lab Practice**	**Total**	
		3	**-**		**-**	**3**	
Learning Objectives							
LO1	To learn about basics of Data Science and Big data.						
LO2	To learn about overview and building process of Data Science.						
LO3	To learn about various Algorithms in Data Science.						
LO4	To learn about Ha doop Framework.						
LO5	To understand Data Science with case study.						

Unit	Contents
I	**Introduction:** Benefits and uses–Facets of data–Data science process –Big data eco system and data science
II	**The Data science process**: Overview–research goals – retrieving data- transformation –Exploratory Data Analysis– Model building.
III	**Algorithms**: Machine learning algorithms–Modeling process– Types – Supervised – Unsupervised - Semi-supervised
IV	**Introduction to Hadoop**: Hadoop framework–Spark–replacing Map Reduce–No SQL–ACID–CAP– BASE–types
V	**Case Study**: Prediction of Disease –Setting research goals –Data retrieval–preparation-exploration-Disease profiling-presentation and automation

Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questionsrelatedtotheabovetopics,fromvariouscompetitiveexaminations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC /others to be solved (To be discussed during theTutorial hour)
Skills acquired from this course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill

Recommended Texts	Davy Cielen, Arno D.B. Meysman,M ohamed Ali,—Introducing Data Science‖, manning publications 2016
Reference books	1. Roger Peng, —The Art of Data Science‖, lulu.com 2016. 2. Murtaza Haider, —Getting Started with Data Science– Making Sense of Data with Analytics‖,IB Mpress ,E-book. 3. Davy Cielen, Arno D.B. Meysman, Mohamed Ali,—Introducing Data Science: Big Data,MachineLearning,andMore,UsingPythonTools‖,DreamtechPress2016 . 4. Annalyn Ng, Kenneth Soo, —Numsense! Data Science for the Layman: No Math Added‖, 2017, 1st Edition. 5. CathyO'Neil,Rachel Schutt,—Doing Data Science Straight Talk from the Front line‖, O'Reilly Media 2013. 6. LillianPierson,—DataScienceforDummies‖,2017IIEdition
Web Resources	https://www.w3schools.com/datascience/ https://en.wikipedia.org/wiki/Data_science http://www.cmap.polytechnique.fr/~lepennec/en/post/references/refs/

Course outcomes CO	**On completion of this course, the students will be able to**
CO1	Understand the basics in Data Science and Big data.
CO2	Understand overview and building process in Data Science.
CO3	Understand various Algorithms in Data Science.
CO4	Understand Hadoop Framework in Data Science.
CO5	Case study in Data Science.

Mapping with Programme Outcomes and Programme Specific Outcomes

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	3	3	3	3	2	3	3
CO2	3	3	3	3	2	3	3	3
CO3	3	2	3	1	3	3	3	2
CO4	3	3	2	3	3	2	1	3
CO5	1	2	3	3	2	3	3	2

CO/P3O	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	2	3	1	2
CO3	3	3	3	3	3
CO4	3	3	2	3	2
CO5	1	2	3	3	3

Strong (3) Medium (2) Low (1)

IOT and its applications

Title of the Course	**IOT and its applications**						
Course Type	**Elective - III**						
Year	**II**	**Semester**	**III**	**Credits**	**3**	**Course Code**	**25UECS32**
Instructional Hours per week		**Lecture**	**Tutorial**		**Lab Practice**	**Total**	
		3	**-**		**-**	**3**	
Learning Objectives							
LO1	To understand the concept of IOT and layers						
LO2	Design IOT applications in different domain and be able to analyze their performance						
LO3	TolearnM2M						
LO4	To gain knowledge on IOT implementation using Python						
LO5	To Learn about IOT physical devices						

Unit	Contents
I	Introduction: Definition & Characteristics of IOT - Physical Design of IOT: Things in IOT - IOT protocols: Link layer - Network/Internet layer - Transport layer - Application layer - Logical design of IOT: IOT functional blocks- IOT communication Models - IOT enabling technologies: Wireless Sensor Networks - Cloud computing - Big data analytics- Communication Protocols - Embedded systems.
II	IOT Applications: Introduction - Home automation: Smart lighting- Smart appliances-Intrusion Detection- Smoke/Gas Detectors- Cities: Smart parking- Smart lighting- Smart roads- Structural health monitoring - Surveillance- Emergency response - Environment: Weather monitoring- Air Pollution Monitoring- Noise pollution monitoring- Forest Fire Detection - River Floods Detection - Retail: Inventory Management - Smart payments- Smart vending machines - Agricultural: Smart irrigation - Green House Control- Health& Lifestyle: Health & Fitness Monitoring - Wearable Electronics.
III	IOT and M2M: Introduction- M2M - Difference between IOT and M2M - Need for IOT systems management - Simple Network Management Protocol(SNMP) - Limitations of SNMP - IOT Design Methodology: Purpose and requirement specification - Process specification - Domain Model specification- Information Model specification- Service specification-IOT level specification- Functional view specification- Operational view specification - Device and component integration-Application Development -Case study on IOT system for Weather Monitoring
IV	IOT Systems Logical Design Using Python: Python data types and structures: Lists-Tuples-Dictionaries- Type conversions - Packages -Date/Time operations - Classes - Python packages of interest for IOT: JSON- XML – HTTP Lib & URL Lib – SMTP Lib.
V	IOT physical devices & Endpoints: What is an IOT device- Basic building blocks of an IOT device- Exemplary device: Raspberry PI - About the board- Linux on Raspberry PI- Other IOT devices - IOT Physical servers & Cloud offerings: Amazon Web services for IOT: Amazon EC2- Amazon Auto scaling- Amazon S3 - Amazon RDS - Amazon Dynamo DB- Amazon Kinesis.

Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questionsrelatedtotheabovetopics,fromvariouscompetitiveexaminations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC /others to be solved (To be discussed during the Tutorial hour)
Skills acquired from this course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill

Recommended Texts	Vijay Madisetti and Arshdeep Bahga, —Internet of Things :(A Hands- on Approach) ‖, Universities Press (INDIA) Private Limited 2014, 1st Edition.
Reference books	1. Michael Miller, —The Internet of Things: How Smart TVs, Smart Cars, Smart Homes, and Smart Cities Are Changing the World‖, kind eversion. 2. Francisda Costa,—Rethinking the Internet of Things: A Scalable Approach to Connecting Everything‖, Apress Publications 2013, 1st Edition, 3. WaltenegusDargie,ChristianPoellabauer,"Fundamentals ofWirelessSensor Networks: TheoryandPractice‖4..CunoPfister,—GettingStartedwitht heInternetofThin gs‖,O‟ReillyMedia2011
Web Resources	https://www.simplilearn.com https://www.javatpoint.com https://www.w3schools.com

Course outcomes CO	On completion of this course, the students will be able to
CO1	Understanding the Fundamentals of IoT
CO2	Mastering IoT Enabling Technologies
CO3	Designing and Implementing IoT Systems
CO4	Applying IoT in Real-World Scenarios
CO5	Understanding IoT and M2M Communication Models

Mapping with Programme Outcomes and Programme Specific Outcomes

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	**3**	**3**	**2**	**3**	**3**	**2**	**3**	**3**
CO2	**3**	**3**	**3**	**3**	**2**	**3**	**3**	**3**
CO3	**3**	**2**	**3**	**2**	**3**	**3**	**3**	**2**
CO4	**3**	**3**	**2**	**3**	**3**	**2**	**1**	**3**
CO5	**1**	**2**	**3**	**3**	**2**	**3**	**3**	**2**

Strong (3) Medium (2) Low (1)

CO/P3O	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	**3**	**3**	**2**	**3**	**3**
CO2	**2**	**2**	**3**	**1**	**2**
CO3	**3**	**3**	**3**	**3**	**3**
CO4	**2**	**3**	**2**	**3**	**2**
CO5	**3**	**2**	**3**	**3**	**3**

Computer Architecture

Title of the Course	Computer Architecture						
Course Type	Elective - III						
Year	II	Semester	III	Credits	3	Course Code	25UECS33
Instructional Hours per week		Lecture		Tutorial	Lab Practice	Total	
		3		-	-	3	
Learning Objectives							
LO1	To understand Basic computer organization						
LO2	To learn about CPU						
LO3	To learn Computer arithmetic						
LO4	To understand interface						
LO5	To learn various types of memory						

Unit	Contents
I	Basic Computer Organization and Design: Instruction Codes- Computer Registers- Computer Instructions-Instruction cycle-Control memory.
II	Central Processing Unit: General register organization- Stack organization- Instruction formats- Addressing modes- Data transfer and manipulation.
III	Computer Arithmetic: Hardware implementation and algorithm for addition, subtraction, Multiplication, Division.
IV	Arithmetic and Interface: Booth multiplication algorithm- Floating point arithmetic- Input-output interface- Direct Memory Access.
V	Memory Organization: Memory Hierarchy- Main memory- Auxiliary Memory- Associative Memory- Cache Memory.

Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questionsrelatedtotheabovetopics,fromvariouscompetitiveexaminations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC /others to be solved (To be discussed during the Tutorial hour)
Skills acquired from this course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill

Recommended Texts	Computer System Architecture- Morris Mano, Third Edition, PHI Private Ltd.
Reference books	1. Computer System Architecture-John P.Hayes 2. Computer Organization-C. Hamacher, Z.Vranesic, S.Zaky 3. Computer Architecture and Parallel Processing-H wang K
Web Resources	https://www.geeksforgeeks.org/

Course outcomes CO	**On completion of this course, the students will be able to**
CO1	Understanding the Fundamentals of Computer Organization
CO2	Mastering the Central Processing Unit (CPU) Architecture
CO3	Implementing Computer Arithmetic Operations
CO4	Exploring Advanced Arithmetic and Interface Concepts
CO5	Understanding Memory Organization and Hierarchy

Mapping With Programme Outcomes and Programme Specific Outcomes

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	3	3	3	3	2	3	3
CO2	3	3	3	3	2	3	3	3
CO3	3	2	3	1	3	3	3	2
CO4	3	3	2	3	3	2	1	3
CO5	1	2	3	3	2	3	3	2

Strong (3) Medium (2) Low (1)

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	2	3	1	2
CO3	3	3	3	3	3
CO4	3	3	2	3	2
CO5	1	2	3	3	3

PHP & MYSQL

Title of the Course	**PHP & MYSQL**						
Course Type	**Skill Enhancement Course - IV**						
Year	**II**	**Semester**	**III**	**Credits**	**2**	**Course Code**	**25USCS31**
Instructional Hours per week		**Lecture**	**Tutorial**		**Lab Practice**	**Total**	
		2	**-**		**-**	**2**	
Learning Objectives							
LO1	To provide the necessary knowledge on basics of PHP.						
LO2	To design and develop dynamic, database-driven web applications using PHP version.						
LO3	To get an experience on various web application development techniques.						
LO4	Tolerate necessary concepts for working with the files using PHP.						
LO5	To get a knowledge on OOPS with PHP.						

Unit	Contents
I	**Overview of PHP** -What is PHP? - PHP vs. other languages (e.g., HTML, JavaScript, Python) - History and evolution of PHP - Basic Syntax - PHP tags – Variables and data types - Operators (arithmetic, comparison, logical)- Comments in PHP
II	**Conditional Statements** - if, else, elseif - switch case - **Loops**- for, while, do-while - foreach loop – **Functions** – Defining functions - Parameters and return values - Variable scope - Built-in PHP functions
III	**HTML Forms and PHP** - Form methods (GET, POST) - Handling form data with PHP - **Handling File Uploads** - File upload functionality in PHP.
IV	**Database Basics** - Introduction to MySQL - Creating and managing databases and tables - **PHP and MySQL Integration -** Connecting to a MySQL database with PHP - Performing CRUD operations (Create, Read, Up date, Delete) - Using SQL queries in PHP
V	**Session Management and Cookies** -Using sessions and cookies for user authentication - Managing user login and logout

Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questionsrelatedtotheabovetopics,fromvariousco mpetitiveexaminations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC /others to be solved (To be discussed during the Tutorial hour)
Skills acquired from this course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill

Recommended Texts	• Head First PHP & MySQL: A Brain-Friendly Guide- Oreilly2009-LynnBeighleyandMichaelMorrison. • The Joy of PHP: A Beginner 's Guide to Programming Interactive Web Applications with PHP and MySQL-Alan Forbes
Reference books	• PHP: The Complete Reference-Steven Holzner, McGraw Hill, 2008. • HTML 5 Black Book –Dream tech Press2016, 2nd Edition..
Web Resources	• Refer MOOC Courses like NPTEL and SWAYAM • 2. https://www.w3schools.com/php/default.asp

Course outcomes CO	**On completion of this course, the students will be able to**
CO1	Write PHP scripts to handle HTML forms
CO2	Write regular expressions including modifiers, operators, and meta characters..
CO3	Create PHP Program using the concept of array.
CO4	Create PHP programs that use various PHP library functions
CO5	Manipulate files and directories..

Mapping With Programme Outcomes and Programme Specific Outcomes

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	2	3	2	3	3	2	3	3
CO2	2	3	3	3	2	3	3	3
CO3	3	2	3	2	3	3	3	2
CO4	3	3	2	3	3	2	1	3
CO5	3	2	3	3	2	3	3	2

Strong (3) Medium (2) Low (1)

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	2	3	3
CO2	2	2	3	1	2
CO3	3	3	3	3	3
CO4	3	3	2	3	2
CO5	3	2	3	3	3

PHP & MySQL Lab

Title of the Course	**PHP & MySQL Lab**						
Course Type	**Skill Enhancement Course – V – Lab - 3**						
Year	**II**	**Semester**	**III**	**Credits**	**2**	**Course Code**	**25USCSL3**
Instructional Hours per week		**Lecture**	**Tutorial**		**Lab Practice**	**Total**	
		-	**-**		**2**	**2**	

Learning Objectives	
LO1	To provide the necessary knowledge on basics of PHP.
LO2	To design and develop dynamic, database-driven web application s using PHP version.
LO3	To get an experience on various web application development techniques.
LO4	To learn the necessary concepts for working with the files using PHP.
LO5	To get a knowledge on OOPS with PHP.

Experiments

1. Create a simple HTML form and accept employee details, and display the detail through PHP echo statement.
2. Write a PHP program to prepare the student marks list and redirect details to a different page.
3. Write a PHP function to test whether a number is greater than 30, 20 or 10 using ternary operator.
4. Create a PHP script which display the capital and country name from the given array. Sort the list by the name of the country
5. Write a PHP script to calculate and display average temperature, five lowest and highest temperatures.
6. Create a script using for loop to add all the integers between 0 and 30 and display the total.
7. Write a PHP script using nested for loop that creates a chess board.
8. Create a Login Page with SQL connection.
9. Create student registration form with text box, check box, radio button, select, submit button. And display user inserted value in new PHP page.
10. Create Website Registration Form (text box, check box, radio button, select, submit button) with SQL connection(INSERT, UPDATE, and DELETE)

Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questionsrelatedtotheabovetopics,fromvariouscompetitiveexaminations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC /others to be solved (To be discussed during the Tutorial hour)
Skills acquired from this course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill

Recommended Texts	1. VIKRAMVASHWANI-PHpandMYSQLMcHill-2005 2. Head First PHP & My SQL:A Brain-FriendlyGuide-2009- Lynn mighley and Michael Morrison. 3. The Joy of PHP: A Beginner's Guide to Programming Interactive Web Applications with PHP and MySQL-Alan Forbes
Reference books	1. PHP: The Complete Reference-Steven Holzner. 2. DT Editorial Services (Author), *—HTML5 Black Book (Covers CSS3,J avaScri pt, XML, XHTML, AJAX, PHP, jQuery)*‖, Paperback 2016, 2nd Edition.
Web Resources	Open source digital libraries: PHP Programming https://www.w3schools.com/php/default.asp

Course outcomes CO	On completion of this course, the students will be able to
CO1	Write PHP scripts to handle HTML forms
CO2	Write regular expressions including modifiers, operators, and meta characters.
CO3	Create PHP Program using the concept of array.
CO4	Create PHP programs that use various PHP library functions
CO5	Manipulate files and directories.

Mapping with Programme Outcomes and Programme Specific Outcomes

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	2	3	2	3	3	2	3	3
CO2	2	3	3	3	2	3	3	3
CO3	3	2	3	2	3	3	3	2
CO4	3	3	2	3	3	2	1	3
CO5	3	2	3	3	2	3	3	2

Strong (3) Medium (2) Low (1)

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	2	3	3
CO2	2	2	3	1	2
CO3	3	3	3	3	3
CO4	3	3	2	3	2
CO5	3	2	3	3	3

Semester - IV

Java Programming

Title of the Course	Java Programming						
Course Type	Core - IV						
Year	II	Semester	IV	Credits	4	Course Code	25UMCS41
Instructional Hours per week		Lecture	Tutorial		Lab Practice	Total	
		4	-		-	4	
Learning Objectives							
LO1	To provide fundamental knowledge of object-oriented programming						
LO2	Toequipthestudentwithprogrammingknowledgein CoreJavafromthebasics up.						
LO3	To enable the students to use AWT controls, Event Handling and Swing for GUI.						
LO4	To provide fundamental knowledge of object-oriented programming.						
LO5	Toequipthestudentwithprogrammingknowledgein CoreJavafromthebasics up.						

Unit	Contents
I	**Introduction:** Review of Object-Oriented Concepts.-History of Java - Java Buzzwords - JVM Architecture - Data Types: Variables - Scope and Lifetime of Variables - Arrays - Operators: Control Statements - Type Conversion and Casting- Simple Java Program - Constructors and Methods - Static Members - String and String Buffer Classes
II	**Inheritance**: Types of inheritance (single, multi-level, hierarchical), member access rules. - The this and super - Keywords: Usage for accessing current and parent class members.- Method Overloading and Method Overriding: Difference and implementation. - Abstract Classes: Usage of abstract classes and methods. - Dynamic Method Dispatch: Runtime polymorphism. - Final Keyword: Final variables, methods, and classes. **Packages**: Definition and creation of packages. - Access Protection (public, private, protected). - Importing packages. **Interfaces**: Interface definition, implementation, and extending interfaces.
III	**Exception Handling**: try, catch, throw, throws, finally. - Built-in exceptions (e.g., IO Exception, Null Pointer Exception) - Creating custom exception classes. **Multithreading**: The Thread class and Runnable interface. - Synchronization: Using synchronized methods and blocks. - Inter- thread Communication: wait(), notify(), notify All().- Deadlock: Prevention and detection.
IV	**I/O Streams**: Concept of streams: Byte streams and character streams. - Stream classes: File Reader, File Writer, Buffered Reader, and Buffered Writer. - Reading console input and writing console output. - File Handling: File operations using streams. **Event Handling**: Events, event sources, and event listeners.- Event Delegation Model (EDM). - Mouse and keyboard events. - Adapter classes and inner classes for event handling.
V	**AWT Controls**: AWT class hierarchy. - Components: Labels, Buttons, Text fields, Checkboxes, Radio buttons, Menus, Lists, Panels, Scroll panes, and Scrollbars. **Working with Frames**: Setting up a frame and adding components.- Layout managers: Flow Layout, Border Layout, Grid Layout, etc. - Colors and Fonts in AWT.

Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questionsrelatedtotheabovetopics,fromvariouscompetitiveexaminations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC /others to be solved (To be discussed during the Tutorial hour)
Skills acquired from this course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill

Recommended Texts	1. Programming with JAVA a primer – E.Balagurusamy, McGraw Hill, 4TH Edition 2. Java: A Beginner's Guide" by Herbert Schildt, Edition: 8th Edition (2018), Publisher: McGraw-Hill Education.
Reference books	Head First Java, O' Rielly Publications, Y.DanielLiang,IntroductiontoJavaProgramming,7thEdition,Pearson EducationIndia,2010
Web Resources	https://javabeginnerstutorial.com/core-java-tutorial http://docs.oracle.com/javase/tutorial/ https://www.coursera.org/

Course outcomes CO	On completion of this course, the students will be able to
CO1	Understand the basic Object-oriented concepts. Implement the basic constructs of Core Java.
CO2	Implement inheritance, packages, interfaces and exception handling of Core Java.
CO3	Implement multi-threading and I/OS teams of Core Java
CO4	Implement AWT and Even than doing.
CO5	Use Swing to create GUI.

Mapping With Programme Outcomes and Programme Specific Outcomes

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	2	3	2	3	3	2	3	3
CO2	2	3	3	3	2	3	3	3
CO3	3	2	3	2	3	3	3	2
CO4	3	3	2	3	3	2	1	3
CO5	3	2	3	3	2	3	3	2

Strong (3) Medium (2) Low (1)

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	2	3	3
CO2	2	2	3	1	2
CO3	3	3	3	3	3
CO4	3	3	2	3	2
CO5	3	2	3	3	3

Java Programming Lab

Title of the Course	**Java Programming Lab**						
Paper Number	**Core Lab - 4**						
Year	**II**	**Semester**	**IV**	**Credits**	**4**	**Course Code**	**25UMCSL4**
Instructional Hours per week		**Lecture**	**Tutorial**		**Lab Practice**	**Total**	
		-	**-**		**5**	**5**	
Learning Objectives							
LO1	To provide fundamental knowledge of object-oriented programming.						
LO2	To equip the student with programming knowledge in Core Java from the basics up.						
LO3	To enable the students to know about Event Handling.						
LO4	To enable the students to use String Concepts.						
LO5	To equip the student with programming knowledge into create GUI using AWT controls.						

Experiments

1. Write a JAVA program using Multiple Constructors
2. Write a JAVA program using overloading method
3. Write a JAVA program using Overriding Method
4. Write a JAVA program using one-dimensional arrays
5. Write a JAVA program using Two-dimensional array
6. Write a program to do String Manipulation using Character Array and perform the following string operations: String length, Finding a character at a particular position, Concatenating two strings
7. Write a JAVA program implementing interface(s)
8. Write a JAVA program to create and import package
9. Write a JAVA program to create and deal multiple threads
10. Write a JAVA program with throwing your own exception
11. Write a JAVA program using Applet to Design a Web Page
12. Write a JAVA program for handling mouse events Write a JAVA program for handling keyboard events

Extended Professional Component (Is a part of internal component only, Not to be included in the External Examination question paper)	Questionsrelatedtotheabovetopics,fromvariouscompetitiveexaminations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC /others to be solved (To be discussed during the Tutorial hour)
Skills acquired from this course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill

Recommended Texts	Herbert Schildt, the Complete Reference, Tata Mc Graw Hill, New Delhi, 7th Edition, 2010. Gary Cornell, Core Java 2 Volume I– Fundamentals, Addison Wesley, 1999.
Reference books	Head First Java, O'Rielly Publications, Y.Daniel Liang, Introduction to Java Programming, 7th Edition, Pearson Education India, 2010.
Web Resources	https://www.w3schools.com/java/ http://java.sun.com http://www.afu.com/javafaq.html

Course outcomes CO	**On completion of this course, the students will be able to**
CO1	Apply object-oriented programming concepts such as constructors, method overloading, and overriding to develop reusable and efficient Java programs.
CO2	Implement arrays and string manipulation techniques to efficiently store, process, and retrieve data in Java applications.
CO3	Design and develop Java programs using interfaces and packages to achieve modular programming and better software organization.
CO4	Develop multithreaded Java applications and implement custom exceptions to handle real-world concurrent processing and error handling scenarios.
CO5	Create interactive GUI applications using Applets and event handling (mouse & keyboard events) to enhance user interaction in Java-based applications.

Mapping With Programme Outcomes and Programme Specific Outcomes

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	3	2	3	3	2	3	3
CO2	3	3	3	3	2	3	3	3
CO3	3	2	3	1	3	3	3	2
CO4	3	3	2	3	3	2	1	3
CO5	1	2	3	3	2	3	3	2

Strong (3) Medium (2) Low (1)

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	2	3	3
CO2	3	2	3	1	2
CO3	3	3	3	3	3
CO4	2	3	2	3	2
CO5	3	2	3	3	3

Resource Management Techniques

Title of the Course	Resource Management Techniques						
Paper Number	Elective - IV						
Year	II	Semester	IV	Credits	3	Course Code	25UECS41
Instructional Hours per week		Lecture	Tutorial		Lab Practice	Total	
		3	-		-	3	
Learning Objectives							
LO1	Understand the definition and classification of optimization problems.						
LO2	Learn the fundamentals of Linear Programming (LP) and its applications.						
LO3	Explore various gradient-based optimization methods.						
LO4	Understand the principles of Integer Linear Programming (ILP).						
LO5	Understand the working principles and coding of Genetic Algorithms (GA).						

Unit	Contents
I	Definition, Classification of optimization problems, Classical Optimization Techniques, Single and Multiple Optimization with and without inequality constraints.
II	Simplex method of solving LPP, revised simplex method, duality, Constrained, optimization, Theorems and procedure, Linear programming, mathematical model, solution technique, duality.
III	Steepest descent method, conjugates gradient method, Newton's Method, Sequential quadratic programming, Penalty function method, augmented Lagrange multiplier method.,
IV	Multistage decision processes, concept of sub-optimization and principle of optimality, Recursive relations, Integer Linear programming, Branch and bound algorithm
V	Introduction to genetic Algorithm, working principle, coding of variables, fitness function, GA operators; Similarities and differences between Gas and traditional methods; Unconstrained and constrained optimization using genetic Algorithm, real coded gas, Advanced Gas, global optimization using GA, Applications to power system.

Recommended Book	"Introduction to Operations Research" by Frederick S. Hillier and Gerald J. Lieberman "Optimization by Vector Space Methods" by David G. Luenberger
Reference books:	S.S. Rao ,"Optimization – Theory and Applications",Wiley-Eastern Limited, 1984. G.Luenberger," Introduction of Linear and Non-Linear Programming" , Wesley Publishing Company, 2011 Computational methods in Optimization, Polak , Academic Press,1971 Optimization Theory with applications, Pierre D.A.,Wiley Publications,1969. Taha, H. A., Operations Research: An Introduction, Seventh Edition, Pearson Education Edition, Asia, New Delhi ,2002.
web Resources	https://www.geeksforgeeks.org/optimization-algorithms-in-machine-learning

Course outcomes: CO	**On completion of this course, the students will be able to:**
CO1	Know how to solve various problems on discrete mathematics
CO2	Use approximation to solve problems
CO3	Differentiation and integration concepts are applied
CO4	Apply, direct methods for solving linear systems
CO5	Discrete solution of ordinary problems

Mapping with Programme Outcomes and Programme Specific Outcomes

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	3	2	3	3	2	3	3
CO2	3	3	3	3	2	3	3	3
CO3	3	2	3	1	3	3	3	2
CO4	3	3	2	3	3	2	1	3
CO5	1	2	3	3	2	3	3	2

Strong (3) Medium (2) Low (1)

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	2	3	3
CO2	3	2	3	1	2
CO3	3	3	3	3	3
CO4	2	3	2	3	2
CO5	3	2	3	3	3

Analytics for Service Industry

Title of the Course	**Analytics for Service Industry**						
Course Type	**Elective - IV**						
Year	**II**	**Semester**	**IV**	**Credits**	**3**	**Course Code**	**25UECS42**
Instructional Hours		**Lecture**		**Tutorial**	**Lab Practice**	**Total**	
Per week		**3**		**-**	**-**	**3**	
Learning Objectives							
LO1	Understand the fundamental concepts and applications of analytics in the service industry.						
LO2	Manage, analyze, and preprocess data to ensure quality insights for decision-making.						
LO3	Develop predictive models and apply statistical techniques to real-world scenarios in the service sector.						
LO4	Design and implement optimization techniques for resource management and pricing strategies.						
LO5	Explore big data technologies and emerging trends in service analytics, including ethical considerations and future advancements.						

Unit	Contents
I	Introduction to Analytics and Service Industry **Overview of Analytics:** Definition and scope of analytics-Types of analytics (Descriptive, Predictive, and Prescriptive)-The role of analytics in the service industry (banking, healthcare, hospitality, etc.) **Data and Its Role in Analytics:** Types of data (structured and unstructured)- Data collection and data quality-Importance of data preprocessing (data cleaning, normalization, etc.) **Service Industry Basics:** Overview Of the service industry and its sectors (e.g., healthcare, finance, travel)-Key performance indicators (KPIs) in service industries
II	Data Management and Analysis Techniques **Data Management:** Data storage: Relational databases and data warehousing-SQL and basic querying-Data integrity and normalization **Descriptive Statistics and Data Analys is:** Measures of central tendency (mean, median, mode)-Measures of dispersion (variance, standard deviation)-Probability and distributions (normal distribution, binomial distribution) **Tools for Data Analysis:** Introduction to tools: Excel, R, and Python-Data visualization techniques (e.g., bar charts, histograms, box plots)
III	**Predictive Analytics in Service Industry Introduction to Predictive Analytics:** Importance and application in the service industry- Predictive modeling process **Techniques in Predictive Analytics:** Linear and logistic regression models- Decision trees and random forests-Neural networks and machine learning algorithms **Applications:** Customer behavior prediction (e.g., churn prediction in telecom)-Demand forecasting (e.g., predicting customer traffic in hospitality or retail)
IV	Prescriptive Analytics for Service Optimization **Prescriptive Analytics Overview:** Optimization and decision-making models-Role in resource allocation, pricing strategies, and service improvements **Techniques in Prescriptive Analytics:** Linear programming and optimization-Simulation models and Monte Carlo simulations **Applications in the Service Industry:** Pricing models (e.g., revenue management in airlines)- Resource management and staffing optimization (e.g., in healthcare, customer service)-Logistics and supply chain management (e.g., for retail and hospitality)
V	**Big Data and Emerging Trends in Service Industry Analytics Big Data Concepts:** Definition and characteristics of big data (Volume, Variety, Velocity, Veracity)**-** Big data technologies (e.g., Hadoop, Spark, No SQL databases) **Emerging Trends in Analytics:** The role of AI and Machine Learning in service industries**-**Real-time analytics and the Internet of Things (IoT) inservices**-**Ethical concerns in data analytics (privacy issues, bias in data) **Future of Analytics in Service Industry:** The impact of automation, chat bots, and predictive maintenance in service-based industries

Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questionsrelatedtotheabovetopics,fromvariouscompetitiveexaminationsUPSC /TRB/NET/UGC –CSIR/GATE /TNPSC/others to be solved (To be discussed during the Tutorial hour)
Skills acquired from this course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill
Recommended Texts	1. "Business Analytics: Data Analysis & Decision Making" by S. Christian Albright
Reference Books	2. Data Science for Business" by Foster Provost and Tom Fawcett 3. "PredictiveAnalytics:ThePowertoPredictWhoWillClick,Buy,Lie,orDie"by Eric Siegel 4. "Big Data: A Revolution That Will Transform How We Live, Work, and Think "by Viktor Mayer-Schönberger and Kenneth Cukier
Web Resources	1. **Industrial Data Analytics**: Digital Measures - UTEP 2. **Introduction to Business Analytics**: DePaul University - Introduction to Business Analytics Syllabus 3. **Business Intelligence & Analytics Curriculum**: Stevens Institute of Technology - Business Intelligence & Analytics Curriculum

Course out comes CO	On completion of this course, the students will be able to
CO1	Define analytics and explain its scope and significance in service industries.
CO2	Demonstrate SQL querying and data integrity concepts.
CO3	Build and interpret predictive models using linear regression, logistic regression, and machine learning algorithms.
CO4	Solve linear programming problems and simulate real-world scenarios.
CO5	Explore the future of automation, predictive maintenance, and chatbots in services.

Mapping With Programme Outcomes and Programme Specific Outcomes

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	3	3	3	3	2	3	3
CO2	3	3	3	3	2	3	3	3
CO3	3	2	3	1	3	3	3	2
CO4	3	3	2	3	3	2	1	3
CO5	1	2	3	3	2	3	3	2

Strong (3) Medium (2) Low (1)

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	2	3	1	2
CO3	3	3	3	3	3
CO4	3	3	2	3	2
CO5	1	2	3	3	3

Biometrics

Title of the Course	**Biometrics**						
Course Type	**Elective - IV**						
Year	**II**	**Semester**	**IV**	**Credits**	**3**	**Course Code**	**25UECS43**
Instructional Hours per week		**Lecture**		**Tutorial**	**Lab Practice**	**Total**	
		3		**-**	**-**	**3**	

Learning Objectives	
LO1	Identify the various bio metric technologies.
LO2	Design of bio metric recognition.
LO3	Develop simple applications for privacy
LO4	Understand the need of bio metric in the society
LO5	Understand the scope of bio metric techniques

Unit	Contents
I	**Introduction**: What is Biometrics, History, Types of biometric Traits, General architecture of biometric systems, Basic working of biometric matching, Biometric system error and performance measures, Design of bio metric system, Applications of bio metrics, Biometrics Versus traditional authentication methods.
II	**Face Biometrics:** Introduction, Background of Face Recognition, Design of Face Recognition System, Challenges in Face Biometrics, Face Recognition Methods, Advantages and Disadvantages **Retina and Iris Biometrics:** Introduction, Performance of Biometrics, Design of Retina Biometrics, Design of Iris Recognition System, Applications of Iris Biometrics, Advantages and Disadvantages
III	**Vein and Fingerprint Biometrics:** Introduction, Biometrics Using Vein Pattern of Palm, Fingerprint Biometrics, Fingerprint Recognition System, Advantages and Disadvantages **Privacy Enhancement Using Biometrics:** Introduction, Privacy Concerns Associated with Biometric Deployments, Comparison of Various Biometrics in Terms of Privacy, Soft Biometrics.

IV	**Multimodal Biometrics:** Introduction to Multimodal Biometrics , Basic Architecture of Multimodal Biometrics, Multimodal Biometrics Using Face and Ear, Characteristics and Advantages of Multimodal Biometrics, **Watermarking Techniques:** Introduction, Data Hiding Methods, Basic Framework of Watermarking, Classification of Watermarking, Applications of Watermarking,
V	**Scope and Future:** Scope and Future Market of Biometrics, Biometric Technologies, Applications of Biometrics, Biometrics and Information Technology Infrastructure, Role of Biometrics in Enterprise Security, Role of Biometrics in Border Security, Smart Card Technology and Biometrics, Radio Frequency Identification (RFID) Biometrics, DNA Biometrics, Comparative Study of Various Biometric Techniques.

Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questionsrelatedtotheabovetopics,fromvariouscompetitiveexaminations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC /others to be solved (To be discussed during the Tutorial hour)
Skills acquired from this course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill
Recommended Texts	Biometrics:ConceptsandApplicationsbyG.RSinhaandSandeepB.Patil,Wiley, 2013
Reference books	1. GuidetoBiometricsbyRuudM.Bolle,SharathPankanti,Nalinik.Ratha,Andrew W.Senior,JonathanH.Connell,Springer2009 2. IntroductiontoBiometricsbyAnilk.Jain,ArunA.Ross,KarthikNandakumar 3. Nd book of Biometrics by AnilK. Jain, Patrick Flynn, Arun A. Ross.
Web Resources	https://www.tutorialspoint.com/biometrics/index.htm https://www.javatpoint.com/biometrics-tutorial https://www.thalesgroup.com/en/markets/digital-identity-and-security/government/inspired/biometrics

Course outcomes CO	On completion of this course, the students will be able to
CO1	To understand the basic concepts and the functionality of The Biometrics, Face Biometrics, Types, Architecture and Applications.
CO2	To know the concepts Retina and Iris Biometrics and Vein And Finger print Biometrics.
CO3	To analyse the Privacy Enhancement and Multimodal Biometrics.
CO4	To get a analytical idea on Watermarking Techniques
CO5	To Gain knowledge on Future scope of Biometrics, and Study of various Biometric Techniques.

Mapping With Programme Outcomes and Programme Specific Outcomes

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	3	2	3	3	2	3	3
CO2	3	3	3	3	2	3	3	3
CO3	3	2	3	1	3	3	3	2
CO4	3	3	2	3	3	2	1	3
CO5	1	2	3	3	2	3	3	2

Strong (3) Medium (2) Low (1)

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	2	3	3
CO2	3	2	3	1	2
CO3	3	3	3	3	3
CO4	2	3	2	3	2
CO5	3	2	3	3	3

Web Frameworks

Title of the Course	Web Frameworks						
Course Type	Skill Enhancement Course - I V						
Year	II	Semester	IV	Credits	2	Course Code	25USCS41
Instructional Hours per week		Lecture	Tutorial		Lab Practice	Total	
		2	-		-	2	
Learning Objectives							
LO1	Understand the Fundamentals of Bootstrap						
LO2	Work with Bootstrap CSS						
LO3	Work with Bootstrap Components						
LO4	Explore the Bootstrap Javascript plugins						
LO5	To build an app using React						

Unit	Contents
I	**Overview of Web Development-**Front-End vs Back-End Development-Web Frameworks: Purpose and Importance -**Introduction to Web Development Tools** -Version Control (Git, GitHub)-Package Managers (npm, Yarn)-**Frameworks vs Libraries: Key Differences-** Introduction: What Is Bootstrap? Introduction: What Is Bootstrap? - Bootstrap File Structure – BasicHTML Template-Global Styles - Default Grid System - Basic GridHTML-Offsetting Columns - Nesting Columns - Fluid GridSystem - container Layouts .
II	Bootstrap CSS: Typography - Headings – Emphasis – Bold – Italics - Emphasis Classes - Lists – Code – Tables - Forms - Optional Form Layouts - Supported Form Controls - Form Control Sizing - Form Control States – Buttons – Images.
III	Bootstrap Layout Components: Dropdown Menus – Options - Button Groups - Button Groups as Radio Buttons and Checkboxes - Buttons with Dropdowns – Drop up Menus - Navigation Elements - Tabular Navigation – Dropdowns - Navigation Lists – Forms - – Labels – Alerts.

IV	Bootstrap Java Script Plugins: Overview - Programmatic API – Transitions – Modal – Usage – Options – Methods – Events. Using Bootstrap: GitHub Project - Customizing Bootstrap - Using LESS - Text Snippets - Photoshop Templates – Themes - Built with Bootstrap.
V	Introduction of React: React without a Build Tool chain - Interactive "Hello, World" with Create React App and JSX. Introduction to Angular.js-Angular Architecture-Modules, Components, Services- Express.js Framework.
Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questionsrelatedtotheabovetopics,fromvariouscompetitiveexaminations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC /others to be solved (To be discussed during the Tutorial hour)
Skills acquired from this course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill
Recommended Texts	1. Bootstrap, Jake Spurlock, O'REILLY 2. BEGINNING React JS Foundations, Building User Interfaces with React JS, AN APPROACHABLE GUIDE, Chris Minnick
Web Resources	• www.allitebooks.com • https://www.learnvern.com/bootstrap-tutorial • https://www.w3schools.com/REACT/ DEFAULT. ASP

Course outcomes CO	On completion of this course, the students will be able to
CO1	Understand the Fundamentals of Bootstrap
CO2	Able to work with Bootstrap CSS
CO3	Able to work with Bootstrap Components
CO4	Implementing Bootstrap Java script plugins
CO5	Building an app using React

Mapping with Programme Outcomes and Programme Specific Outcomes

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	3	3	3	3	2	3	3
CO2	3	3	3	3	2	3	3	3
CO3	3	2	3	1	3	3	3	2
CO4	3	3	2	3	3	2	1	3
CO5	1	2	3	3	2	3	3	2

Strong (3) Medium (2) Low (1)

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	2	3	1	2
CO3	3	3	3	3	3
CO4	3	3	2	3	2
CO5	1	2	3	3	3

Advanced Excel Lab

Title of the Course		Advanced Excel Lab					
Paper Number		Skill Enhancement Course – VII – Lab - 4					
Year	II	Semester	IV	Credits	2	Course Code	25USCSL4
Instructional Hours per week		Lecture		Tutorial	Lab Practice	Total	
				-	2	2	
Learning Objectives							
LO1	Handle large amounts of data						
LO2	Aggregate numeric data and summarize in to categories and subcategories						
LO3	Filtering, sorting, and grouping data or subsets of data						
LO4	Create pivot tables to consolidate data from multiple files						
LO5	Presenting data in the form of charts and graphs						

Experiments

1. Logical operations - Consider the design of a light switch system that can turn the same light on or off in three different places.
    a. One switch (A) is installed in the hall on the first floor.
    b. Another switch (B) is located on the upstairs landing and the third switch (C) is located on the ground floor. Each of the switches has 2 states (on and off). When an odd number of switches are on, the bulb remains off and in all other cases, the bulb glows. Design a truth table and find the various states of the bulb for various combinations of the 3 switches.

2. You are given the name, gender, attendance, assignment, midterm and final grades of five students. Find the total of the assessment marks. Students who pass need to have a total score greater than or equal to 50. Display the word "Pass" or "Fail" under a column called Description.
3. Create worksheet with columns Full name, Last Name, First Name and E-Mail. Give Full Name for ten students. Using text function find and fill Last Name, First Name and E-mail(Last Name_First Name @gmail.com)

4. Use the functions related to date and time such as Date, Date value, Day, Days, Minute, Month

5. Data Validation
    a. Create excel table with columns Emp.Name, Emp.No, Salary, Bonus, Date of entry, Department. Each column in the Excel table have some rule for writing values. We have to modify Data Validation to be able to enter only correct values into the cells.

    b. Rules: **Employee number** is exactly 5 characters long. **Salary** can be set in the range 600-2000.**Bonus** cannot be greater than 10 % of the salary. **Date of entry** can be set only as today. **Department** must be one of the values from the list of Departments.
6. Sorting and filtering: Create excel table with columns Course, Level(Certificate, diploma, advanced diploma, all levels), Instructor name, Day(Monday to Friday), Starting time, Duration, Course fee
    a. Sort the table by: Course level; then Start time; then course fee
    b. Use filtering to show rows for a particular instructor, The day is Monday; and The time is after 17:00.
7. Create Column chart, Line chart, Bar Chart, Pie chart, Scatter chart for the marks obtained by a student in six semesters.
8. Create Line chart and Histogram chart for student wise scores.
9. Create Pivot chart for Region wise Sales data.
10. Share chart with word and ppt.

Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC /others to be solved (To be discussed during the Tutorial hour)
Skills acquired from this course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill
Recommended Texts	Excel 2019 All Microsoft Excel 2019 Pivot Table Data Crunching
Reference books	Excel 2019 All-in-One for Dummies, Greg Harvey,1st edition
Web Resources	https://www.simplilearn.com https://www.javapoint.com https://www.w3schools.com

Course out comes CO	On completion of this course, the students will be able to
CO1	To perform various logical operators
CO2	To perform various functions
CO3	To perform data validation
CO4	To Performs or ting and filtering
CO5	To perform various charts and sharing

Mapping with Programme Outcomes and Programme Specific Outcomes

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	2	3	2	3	3	2	3	3
CO2	2	3	3	3	2	3	3	3
CO3	3	2	3	2	3	3	3	2
CO4	3	3	2	3	3	2	1	3
CO5	3	2	3	3	2	3	3	2

Strong (3) **Medium (2)** **Low (1)**

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	2	3	3
CO2	2	2	3	1	2
CO3	3	3	3	3	3
CO4	3	3	2	3	2
CO5	3	2	3	3	3

Semester – V

Software Engineering

Title of the Course	Software Engineering						
Course Type	Core - V						
Year	III	Semester	V	Credits	4	Course Code	25UMCS51
Instructional Hours Per week		Lecture		Tutorial	Lab Practice	Total	
		5		-	-	5	

Learning Objectives	
LO1	Gain basic knowledge of analysis and design of systems
LO2	Ability to apply software engineering principles and techniques
LO3	Model a reliable and cost-effective software system
LO4	Ability to design an effective model of the system
LO5	Perform Testing at various levels and produce an efficient system.

Units	Contents
I	**Introduction**: The software engineering discipline, programs vs. software products, why study software engineering, emergence of software engineering, Notable changes in software development practices, computer systems engineering. **Software Life Cycle Models**: Why use a life cycle model, Classical waterfall model, iterative waterfall model, prototyping model, evolutionary model, spiral model, comparison of different life cycle models.
II	**Requirements Analysis and Specification:** Requirements gathering and analysis, Software requirements specification (SRS) **Software Design**: Good software design, cohesion and coupling, neat arrangement, software design approaches, object- oriented vs function-oriented design.
III	**Function-Oriented Software Design:** Overview of SA/SD methodology, structured analysis, data flow diagrams (DFD's), structured design, detailed design. **User-Interface design:** Characteristics of a good interface; basic concepts; types of user interfaces.
IV	**Coding and Testing:** Coding; code review; testing; testing in the large vs testing in the small; unit testing; black-box testing; white-box testing; debugging; program analysis tools; integration testing; system testing. **Software Reliability and Quality Management:** Software reliability; statistical testing; software quality; software quality management system.
V	**Computer Aided Software Engineering:** CASE and its scope; CASE environment; CASE support in software life cycle; other characteristics of CASE tools; towards second generation CASE tool; architecture of a CASE environment. **Software Maintenance:** Characteristic of software maintenance; software reverse engineering.

Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper) Skills acquired from this course	Questions related to the above topics, from various competitive examinations UPSC/TRB/NET/UGC –CSIR/GATE /TNPSC/others to be solved (To be discussed during the Tutorial hour)
Recommended Texts	Rajib Mall, Fundamentals of Software Engineering, Fifth Edition, Prentice-Hall of India, 2018
Reference Books	1. Richard Fairley, Software Engineering Concepts, Tata McGraw-Hill publishing company Ltd, Edition 1997. *2.* Roger S. Pressman, Software Engineering, Seventh Edition, McGraw-Hill. 3. James A. Senn, Analysis & Design of Information Systems, Second Edition, McGraw-Hill International Editions.

Course outcomes	On completion of this course, students will be able to:
CO1	Gain basic knowledge of analysis and design of systems.
CO2	Ability to apply software engineering principles and techniques.
CO3	Model a reliable and cost-effective software system.
CO4	Ability to design an effective model of the system.
CO5	Perform Testing at various levels and produce an efficient system.

Mapping With Programme Outcomes and Programme Specific Outcomes

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	3	2	3	3	2	3	3
CO2	3	3	3	3	2	3	3	3
CO3	3	2	3	2	3	3	3	2
CO4	3	3	2	3	3	2	1	3
CO5	1	2	3	3	2	3	3	2

Strong (3) **Medium (2)** **Low (1)**

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	2	3	3
CO2	2	2	3	1	2
CO3	3	3	3	3	3
CO4	2	3	2	3	2
CO5	3	2	3	3	3

Database Management System

Title of the Course		Database Management System					
Course Type		Core - VI					
Year	III	Semester	V	Credits	4	Course Code	25UMCS52

Instructional Hours Per week	Lecture	Tutorial	Lab Practice	Total
	5	-	--	5

Learning Objectives	
LO1	To enable the students to learn the designing of database systems, foundation on the relational model of data and normal forms.
LO2	To understood the concepts of database management system, design simple Database models.
LO3	To learn and understand to write queries using SQL, PL/SQL.
LO4	To enable the students to learn the designing of database systems, foundation on the relational model of data and normal forms.
LO5	To understood the concepts of database management system, design simple Database models.

Unit	Contents
I	**Database Concepts:** Database Systems - Data vs Information - Introducing the database -File system - Problems with file system – Database systems. Data models - Importance - Basic Building Blocks - Business rules - Evolution of Data models - Degrees of Data Abstraction
II	**Design Concepts:** Relational database model - logical view of data-keys - Integrity rules – relational set operators-Data dictionary and the system catalog - relationships -data redundancy revisited –indexes - cod's rules. Entity relationship model - ER diagram
III	**Normalization of Database Tables**: Database tables and Normalization – The Need for Normalization – The Normalization Process – Higher level Normal Form. **Introduction to SQL**: Data Definition Commands – Data Manipulation Commands – SELECT Queries – Additional Data Definition Commands – Additional SELECT Query Keywords – Joining Database Tables.
IV	**Advanced SQL**: Relational SET Operators: UNION –UNIONALL– INTERSECT- MINUS.SQL Join **Operators:** Cross Join – Natural Join – Join USING Clause–JOINON Clause – Outer Join. **Sub Queries and Correlated Queries**: WHERE – IN – HAVING–ANY and ALL– FROM. SQL Functions: Date and Time Function – Numeric Function – String Function – Conversion Function
V	**PL/SQL**: A Programming Language: History – Fundamentals – Block Structure – Comments – Data Types – Other Data Types – Variable Declaration – Assignment operation –Arithmetic operators. **Control Structures and Embedded SQL**: Control Structures – Nested Blocks – SQL in PL/SQL – Data Manipulation – Transaction Control statements. **PL/SQL Cursors and Exceptions**: Cursors – Implicit Cursors, Explicit Cursors and Attributes – Cursor FOR loops – SELECT…FOR UPDATE– WHERECURRENT OF clause–Cursor with Parameters – Cursor Variables– Exceptions–Types of Exceptions.

Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE/ TNPSC /others to be solved (To be discussed during the Tutorial hour)
Skills acquired from this course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill

Recommended Text Book	1. Abraham Silbers chatz, Henry F.Korth and S.Sudarshan, —Database System Concepts‖, McGraw Hill International Publication ,VI Edition 2. Nilesh Shah, "Database Systems Using Oracle", 2nd edition, Pearson Education India, 2016
Reference Books	1. Shio Kumar Singh,—Database Systems—,Pearson publications, II Edition 2. Coronel, Morris, Rob, "Database Systems, Design, Implementation and Management", Ninth Edition
Web Resources	Web resources from NDL Library, E-content from open-source libraries

Course outcomes	**On completion of this course, students will be able to:**
CO1	Understand the various basic concepts of Data Base System. Difference between file system and DBMS and compare various data models.
CO2	Define the integrity constraints. Understand the basic concepts of Relational Data Model, Entity- Relationship Model.
CO3	Design database schema considering normalization and relationships within database. Understand and construct database using Structured Query Language. Attain a good practical skill of managing and retrieving of data using Data Manipulation Language (DML)
CO4	Classify the different functions and various join Operations and enhance the knowledge of handling multiple tables.
CO5	Learn to design Data base operations and implement using PL/SQL programs. Learn basics of PL/SQL and develop programs using Cursors, Exceptions

Mapping With Programme Outcomes and Programme Specific Outcomes

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	3	3	3	3	2	3	3
CO2	3	3	3	3	2	3	3	3
CO3	3	2	3	1	3	3	3	2
CO4	3	3	2	3	3	2	1	3
CO5	1	2	3	3	2	3	3	2

Strong (3) **Medium (2)** **Low (1)**

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	2	3	1	2
CO3	3	3	3	3	3
CO4	3	3	2	3	2
CO5	1	2	3	3	3

Image Processing

Title of the Course		Image Processing					
Course Type		Core - VII					
Year	III	Semester	V	Credits	4	Course Code	25UMCS53
Instructional Hours Per week		Lecture	Tutorial	Lab Practice	Total		
		3	1	--	4		

Learning Objectives	
LO1	To learn fundamentals of digital image processing.
LO2	To learn about various 2D Image transformations
LO3	To learn about various image enhancement processing methods and filters
LO4	To learn about various classification of Image segmentation techniques
LO5	To learn about various image compression techniques

Unit	Contents
I	Introduction & Fundamentals: Definition of image and Digital image processing - Examples of Digital image processing- Fundamental steps in Digital image processing- Components of image processing system- Image acquisition- A simple image model- Zooming and shrinking of digital image.
II	Image enhancement in spatial domain: Introduction- Mathematical analysis of enhancement in spatial domain- Basic gray level transformation- Histogram processing- Histogram equalization - Histogram matching- Image enhancement using arithmetic and logical operation- Basic transformation- Basics of spatial filtering- Image enhancement infrequency domain: One dimensional fourier transform and its inverse- Two dimensional fourier transform and its inverse- Basics of filtering in frequency domain- Homomorphic filtering.
III	Color image processing: Introduction- Advantages of Color image processing- Categories of Color image processing- Color fundamentals- Primary colors - Secondary colors- Primary and secondary colors for pigments- Characteristics that are used for differentiating different colors- Color models- conversion between color models- Pseudo color image processing- Color transformation- Color image smoothing and sharpening- Color segmentation.
IV	Image Compression: Introduction-Mathematical analysis- Types of data redundancies- Image compression model - Compression strategies- Morphological Image processing: Introduction- Basic concept of set theory- Logic operations involving binary images- Dilation and erosion- opening and closing
V	Feature extraction and image segmentation: Introduction- Classification of features- Features of an image - Attributes of features- Complete process of feature extraction -Image segmentation - Thresholding- Region based segmentation.

Professional Component(is a part of internal component only, Not to be included In the External Examination question paper	Questions related to the above topics, from various competitive examinations UPSC/TRB/NET/UGC –CSIR/GATE /TNPSC/others to be solved (To be discussed during the Tutorial hour)
Skills acquired from this course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill
Recommended Texts:	Digital image processing – Abhishek and Poonam Yadav- university science press
References Books:	"The Handbook of Digital Imaging" by H. H. Arnold and J. W. Willson- **Edition**: 1st Edition "Fundamentals of Digital Image Processing" by Anil K. Jain **Edition**: 1st Edition
Web Resources:	1. https://www.geeksforgeeks.org/digital-image-processing-basics 2. https://www.javatpoint.com/digital-image processing-tutorial

Course outcomes	On completion of this course, students will be able to:
CO1	Understand the fundamental concepts of digital image processing.
CO2	Understand various 2D Image transformations.
CO3	Understand image enhancement processing techniques and filters.
CO4	Understand the classification of Image segmentation techniques.
CO5	Understand various image compression techniques.

Mapping with Programme Outcomes and Programme Specific Outcomes

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	3	2	3	3	2	3	3
CO2	3	3	3	3		3	3	3
CO3	3	2	3	1	3	3	3	2
CO4	3	3	2	3	3	2	1	3
CO5	1	2	3	3	2	3	3	2

Strong (3) **Medium (2)** **Low (1)**

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	2	3	3
CO2	3	2	3	1	2
CO3	3	3	3	3	3
CO4	2	3	2	3	2
CO5	3	2	3	3	3

Image Processing Lab

Title of the Course	Image Processing Lab						
Course Type	CORE – V – Lab - 5						
Year	III	Semester	V	Credit	3	Course Code	25UMCSL5
Instructional Hours Per week		Lecture		Tutorial		Lab Practice	Total
		-		-		4	4
Learning Objectives							
LO1	Understand the fundamentals of image processing techniques						
LO2	Learn to manipulate images using basic mathematical operations						
LO3	Understand how to apply convolution for filtering and enhancement						
LO4	Gain proficiency in advanced image transformations like Fourier and Cosine Transforms						
LO5	Explore image morphology and edge detection techniques						

EXPERIMENTS
1. Perform 2D Linear Convolution, Circular Convolution between two 2D matrices. 2. Perform Discrete Fourier Transform (DFT), Discrete Cosine Transform (DCT) of 4x4 gray scale image. 3. Perform Brightness enhancement, Contrast Manipulation, Image negative of an image. 4. Perform threshold operation on an image. 5. Perform Edge detection using different edge detectors. 6. Perform Dilation and Erosion operation. 7. Perform Opening and closing operations 8. Read a color image and separate the image into red, blue and green planes.

Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC/TRB/NET/ CSIR/GATE/TNPSC/others to be solved (To be discussed during the Tutorial hour)
Skills acquired from this course	Knowledge, Problem Solving, Analytical ability Professional Competency, Professional Communication and Transferrable Skill
Recommended Textbook	Digital image processing – Abhishek and Poonam Yadav-university science press
Reference Books	"The Handbook of Digital Imaging" by H. H. Arnold and J. W. Wills on -**Edition**: 1st Edition "Fundamentals of Digital Image Processing" by Anil K. Jain **Edition**: 1st Edition
Web Resources	https://www.geeksforgeeks.org/digital-image-processing-basics/ https://www.javatpoint.com/digital-image-processing-tutorial

Course outcomes: CO	On completion of this course, students will be able to:
CO1	Ability to apply convolution operations for image filtering
CO2	Mastery of transformation techniques in image analysis
CO3	Skill in performing image enhancement and manipulation
CO4	Competence in implementing edge detection algorithms
CO5	Proficiency in morphological operations

Mapping with Programme Outcomes and Programme Specific Outcomes

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	3	2	3	3	2	3	3
CO2	3	3	3	3	2	3	3	3
CO3	3	2	3	1	3	3	3	2
CO4	3	3	2	3	3	2	1	3
CO5	1	2	3	3	2	3	3	2

Strong (3) **Medium (2)** **Low (1)**

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	2	3	3
CO2	3	2	3	1	2
CO3	3	3	3	3	3

Mini Project with Viva Voce

Title of the Course	Mini Project with Viva Voce						
Course Type	Project						
Year	III	Semester	V	Credit	3	Course Code	25UMCSP1
Instructional Hours Per week		Lecture	Tutorial		Lab Practice		Total
		-	-		4		4

Mini Project (Case studies with DBMS) - Students will take a specific problem with a front-end and back-end (involving Database Connectivity) for the mini project and solve it and submit a report. Further each student will participate in regular project review with project guide/faculty.

Mini Project: Individual or group of maximum three members- Project report should be submitted for external evaluation. Internal 50 marks, External 50 marks

Cloud Computing

Title of the Course		Cloud Computing					
Course Type		Elective - V					
Year	III	Semester	V	Credits	3	Course Code	25UECS51
Instructional Hours Per week		Lecture	Tutorial		Lab Practice	Total	
		3	1		--	4	

Learning Objectives	
LO1	Learning fundamental concepts and Technologies of Cloud Computing.
LO2	Learning various cloud service types and their uses and pitfalls.
LO3	To learn about Cloud Architecture and Application design.
LO4	To know the various aspects of application design, bench marking and security on the Cloud.
LO5	To learn the various Case Studies in Cloud Computing.

Unit	Contents
I	**Introduction to Cloud Computing:** Definition of Cloud Computing – Characteristics of Cloud Computing – Cloud Models – Cloud Service Examples – Cloud-based Services and Applications: Cloud computing for health care, Energy systems, Government, Education. **Cloud Concepts and Technologies:** Virtualization – Load balancing –Scalability and Elasticity – Deployment – Replication – Monitoring –Software Defined Networking – Network Function Virtualization – Map Reduce – Identity and Access Management – Service Level Agreements– Billing.

II	**Compute Services:** Amazon Elastic Computer Cloud - Google Computer Engine - Windows Azure Virtual Machines Storage Services: Amazon Simple Storage Service - Google Cloud Storage - Windows Azure Storage. **Database Services:** Amazon Relational Data Store - Amazon Dynamo DB - Google Cloud SQL - Google Cloud Data Store - Windows Azure SQL Database - Windows Azure Table Service Application Services: Application Runtimes and Frameworks – Queuing Services - Email Services - Notification Services - Media Services Content Delivery Services: Amazon Cloud Front - Windows Azure Content Delivery Network
III	**Analytics Services:** Amazon Elastic Map Reduce - Google Map Reduce Service - Google Big Query - Windows Azure HD Insight Deployment and Management Services: Amazon Elastic Bean stack - Amazon Cloud Formation Identity and Access Management Services: Amazon Identity and Access Management - Windows Azure Active Directory Open Source Private Cloud Software: Cloud Stack – Eucalyptus –Open Stack.
IV	**Cloud Application Design Methodologies:** Service Oriented Architecture (SOA), Cloud Component Model, IaaS, PaaS and SaaS Services for Cloud Applications, Model View Controller (MVC), REST ful Web Services – Data Storage Approaches: Relational Approach(SQL), Non-Relational Approach (No SQL).
V	**Cloud Security:** Introduction – CSA Cloud Security Architecture – Authentication (SSO) – Authorization – Identity and Access Management – Data Security: Securing data at rest, securing data in motion – Key Management – Auditing. Case Studies: Cloud Computing for Healthcare – Cloud Computing for Education.

Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC/TRB/NET/UGC – CSIR/GATE /TNPSC/others to be solved (To be discussed during the Tutorial hour) Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill
Skills acquired from this course	Knowledge, Problem Solving, Analytical ability, Professional Competency Professional Communication and Transferrable Skill

Text Book	Arshdeep Bahga, Vijay Madisetti, *Cloud Computing – A Hands On Approach*, Universities Press (India)Pvt. Ltd.,2018
Reference Books	Anthony T Velte, Toby J Velte, Robert Elsenpeter, *Cloud Computing: A Practical Approach*, Tata McGraw-Hill, 2013. Barrie So in sky, *Cloud Computing Bible*, Wiley India Pvt. Ltd., 2013. David Crookes, *Cloud Computing in Easy Steps*, Tata McGraw Hill, 2015. Dr. Kumar Saurabh, *Cloud Computing*, Wiley India, Second Edition 2012.
Web Resources	https://en.wikipedia.org/wiki/Cloud_computing https://link.springer.com/chapter/10.1007/978-3-030-34957-8_7 https://webobjects.cdw.com/webobjects/media/pdf/solutions/cloud-computing/121838- CDW-Cloud-Computing-Reference-Guide.pdf

Course outcomes CO	**On completion of this course, students will be able to :**
CO1	Understand the fundamental concepts and Technologies in Cloud Computing.
CO2	Able to understand various cloud service types and their uses and pitfalls.
CO3	Able to understand Cloud Architecture and Application design.
CO4	Understand the various aspects of application design, benchmarking and security in the Cloud.
CO5	Understand various Case Studies in Cloud Computing.

Mapping with Programme Outcomes and Programme Specific Outcomes

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	3	2	3	3	2	3	3
CO2	3	3	3	3	2	3	3	3
CO3	3	2	3	1	3	3	3	2
CO4	3	3	2	3	3	2	1	3
CO5	1	2	3	3	2	3	3	2

Strong (3) **Medium (2)** **Low (1)**

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	2	3	3
CO2	3	2	3	1	2
CO3	3	3	3	3	3
CO4	2	3	2	3	2
CO5	3	2	3	3	3

Data Analytics Using R

Title of the Course		Data Analytics Using R					
Course Type		Elective - V					
Year	III	Semester	V	Credits	3	Course Code	25UECS52
Instructional Hours per week		Lecture	Tutorial	Lab Practice	Total		
		3	1	--	4		

Learning Objectives	
LO1	To understand the problem-solving approaches
LO2	To learn the basic of Big Data
LO3	To learn the basic programming constructs in R Programming
LO4	To use R Programming data structures.
LO5	To do input/output with files in R Programming.

Unit	Contents
I	Big Data: Evolution of Big data, Best Practices for Big data Analytics, Big data characteristics, Validating, The Promotion of the Value of Big Data, Big Data Use Cases, Characteristics of Big Data Applications, A General Overview of High-Performance Architecture, HDFS, Map Reduce And YARN, Map Reduce Programming Model
II	Control Structures: Control structures, functions, scoping rules, dates and times, Introduction to Functions, preview of Some Important R Data Structures, Vectors, Character Strings, Matrices, Lists, Data Frames, Classes
III	Vectors: Generating sequences, Vectors and subscripts, Extracting elements of a vector using subscripts, Working with logical subscripts, Scalars, Vectors, Arrays, and Matrices, Adding and Deleting Vector Elements, Obtaining the Length of a Vector, Matrices and Arrays as Vectors Vector Arithmetic and Logical Operations, Vector Indexing, Common Vector Operations

IV	Lists: Creating Lists, General List Operations, List Indexing Adding and Deleting List Elements, Getting the Size of a List, Text Concordance Accessing List Components and Values Applying Functions to Lists, Data Frames, Creating Data Frames, Accessing Data Frames.
V	Factors and Tables: Factors and Levels, Common Functions Used with Factors, Working with Tables, Matrix/Array-Like Operations on Tables , Extracting a Sub table, Finding the Largest Cells in a Table, Math Functions, Calculating a Probability, Cumulative Sums and Products, Minima and Maxima, Functions for Statistical Distributions R PROGRAMMING .

Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC/TRB/NET/UGC – CSIR/GATE /TNPSC/others to be solved (To be discussed during the Tutorial hour) Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill
Skills acquired from this course	Knowledge, Problem Solving, Analytical ability, Professional Competency Professional Communication and Transferrable Skill
Text Book	1. Seema Acharya and Subhashini Chellappan, "Big Data and Analytics", Wiley India Pvt. Ltd., 2016. 2. Norman Matl off, The Art of R Programming-A Tour of Statistical Software Design, 2011
Reference Books	1. Garrett Grolemund, Hadley Wickham, Hands-On Programming with R: Write Your Own Functions and Simulations , 1st Edition, 2014 2. Roger D.Peng, R Programming for data science, 2012
Web Resources	https://www.simplilearn.com

Mapping with Programme Outcomes and Programme Specific Outcomes

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	3	2	3	3	2	3	3
CO2	3	3	3	3	2	3	3	3
CO3	3	2	3	1	3	3	3	2
CO4	3	3	2	3	3	2	1	3
CO5	1	2	3	3	2	3	3	2

Strong (3) **Medium (2)** **Low (1)**

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	2	3	3
CO2	3	2	3	1	2
CO3	3	3	3	3	3
CO4	2	3	2	3	2
CO5	3	2	3	3	3

AI and its Applications

Title of the Course	**AI and its Applications**						
Course Type	**Elective - V**						
Year	**III**	**Semester**	**V**	**Credit**	**3**	**Course Code**	**25UECS53**
Instructional Hours Per week		**Lecture**	**Tutorial**		**Lab Practice**		**Total**
		4	**-**		**-**		**4**

Learning Objectives:

LO1	Understand AI Concepts and Industry-Specific Applications
LO2	Explore Data Processing and AI Model Deployment
LO3	Analyze AI-Powered Decision-Making and Automation
LO4	Examine AI Ethics, Regulations, and Challenges
LO5	Design and implement AI-driven applications tailored to real-world industry needs.

Unit	Content
I	Introduction to Artificial Intelligence: Artificial Intelligence, How Does AI Work?, Advantages and Disadvantages of Artificial Intelligence, History of Artificial Intelligence, Types of Artificial Intelligence, Weak AI, Strong AI.
II	Machine Intelligence: Defining Intelligence, Components of Intelligence, Differences Between Human and Machine Intelligence, Agent and Environment, Search, Uninformed Search Algorithms, Informed Search Algorithms: Pure Heuristic Search, Best-First Search Algorithm (Greedy Search).
III	Introduction to Prompt Engineering, Introduction to Prompt Engineering, The Evolution of Prompt Engineering, Types of Prompts, How Does Prompt Engineering Work?, Comprehending Prompt engineering's Function in Communication, The Advantages of Prompt Engineering, The Future of LLM Communication. Prompts for Creative Thinking: Introduction, Unlocking Imagination and Innovation. Prompts for Effective Writing: Introduction, Igniting the Writing Process with Prompts.
IV	Trends in AI: AI and Ethical Concerns, AI as a Service (AIaaS), Recent trends in AI, Expert System, Internet of Things, Artificial Intelligence of Things (AIoT).
V	Industrial Applications of AI: Application of AI in Healthcare, Application of AI in Retail, Application of AI in Agriculture, Application of AI in Education, Application of AI in Transportation, AI in Experimentation and Multi-disciplinary research.

Books for Study:
1. Reema Thareja, Artificial Intelligence: Beyond Classical AI, Pearson Education, 2023. 2. Ajantha Devi Vairamani and Anand Nayyar, Prompt Engineering: Empowering Communication, 1st Edition, CRC Press, Taylor & Francis Group, 2024. (DOI: https://doi.org/10.1201/9781032692319). 3. Saptarsi Goswami, Amit Kumar Das and Amlan Chakrabarti, "AI for Everyone – A Beginner's Handbook for Artificial Intelligence", Pearson, 2024.
Books for Reference:
1. B. V. Ravindran – Introduction to Machine Learning and AI Applications, McGraw Hill India (2020) 2. Parag Kulkarni – Artificial Intelligence: Building Intelligent Systems, PHI Learning (2020) 3. Dr. N. Gupta – AI and Industry 4.0: Applications and Challenges, Wiley India (2020).
Web References:
1. https://ocw.mit.edu/ 2. https://www.coursera.org/learn/ai-for-everyone 3. https://cloud.google.com/solutions/ai 4. https://www.microsoft.com/en-us/ai/ai-business-school 5. https://aimi.stanford.edu/

Course Outcomes:

Course outcomes: CO	On completion of this course, the students will be able to:
CO1	Explain AI techniques and their role in different industries.
CO2	Apply AI models to industry-specific problems in healthcare, finance, and manufacturing.
CO3	Analyze AI-powered decision-making systems and automation techniques in various sectors.
CO4	Evaluate ethical, security, and regulatory challenges in AI applications across industries.
CO5	Design and develop AI-driven solutions tailored for real-world industry needs.

Mapping With Programme Outcomes and Programme Specific Outcomes

CO/PO-PSO	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
CO1	3	2	3	2	2	1	3	2	2
CO2	3	3	2	2	3	1	3	3	2
CO3	3	3	3	3	2	2	3	3	3
CO4	3	2	3	3	3	2	3	3	2
CO5	2	3	2	3	2	1	3	3	3
Average	2.80	2.60	2.60	2.60	2.40	1.40	3.00	2.80	2.40

Strong - 3 Moderate -2 Weak-1 No Correlation-0

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3

Enhancing the Programming Skills

Title of the Course		**Enhancing the Programming Skills**					
Course Type		**Skill Enhancement Course - VIII**					
Year	**III**	**Semester**	**V**	**Credits**	**2**	**Course Code**	**25USCS51**
Instructional Hours Per week		**Lecture**	**Tutorial**		**Lab Practice**	**Total**	
		2	**-**		**--**	**2**	

Learning Objectives	
LO1	To understand the different types, steps and algorithms involved in Machine Learning Process.
LO2	To familiarize the students with the Programming basics and the fundamentals of C, Data types in C, Mathematical and logical operations.
LO3	To understand the concept using if statements and loops.
LO4	This unit covers the concept of Arrays and Functions.
LO5	This unit covers the concept of Structures and unions and Preprocessors.

Unit	Contents
I	**OVERVIEW OF C** Overview of C - Structure of a C program – Data types – Declarations – operators – Expressions – Type conversions – Built-in functions.
II	**CONTROL AND BRANCHING** Data Input and Output – Control statements: IF, ELSE-IF, GOTO, SWITCH, WHILE-DO, DO- WHILE, FOR, BREAK and CONTINUE.
III	**ARRAYS AND FUNCTIONS** Arrays: Defining and processing Arrays – Multidimensional arrays – passing arrays to functions – Arrays and strings – String functions – String Manipulation. Functions: Defining and Accessing Arguments – recursive functions – functions with arrays – call by value, call by reference, storage classes –character arrays and string functions.
IV	**POINTERS** Pointers –Defining and Declaration of Pointers – Operations on pointers – pointers to functions – Pointer and strings –array of pointers – pointer expression,
V	**STRUCTURES AND UNIONS** Structure and Unions : Defining, giving values to members, initialization and comparison of structure variables, arrays of structures – within structures, structur within structures, structure and functions, structures and pointers – union.

Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC/TRB/NET/UGC – CSIR/GATE /TNPSC/others to be solved (To be discussed during the Tutorial hour) Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill
Skills acquired from this course	Knowledge, Problem Solving, Analytical ability, Professional Competency Professional Communication and Transferrable Skill
Recommended Texts:	
1	Programming in C" – E.Balagurusamy – Fifth Edition, Tata McGraw Hill Publications
References Books:	
1	"A first course in Programming with C" – T.Jeyapoovan, Vikas Publishing House Pvt. Ltd., New Delhi.
2	"Let Us C "– Kanetkar. Y, Eighteenth Edition, BPB Publications, 2021.
Web Resources:	
1	https://codeforwin.org/
2	https://www.geeksforgeeks.org/c-programming-language/
3	http://en.cppreference.com/w/c
4	http://learn-c.org/

Course outcomes	On completion of this course, students will be able to :
CO1	To understand the character set and different data types in C
CO2	To learn the different programming concepts in C
CO3	To analyze Pointers and Structures and unions
CO4	To explore pointers and user defined functions
CO5	To Code, debug and test the programs with appropriate test cases

Mapping with Programme Outcomes and Programme Specific Outcomes

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	3	2	3	3	2	3	3
CO2	3	3	3	3	2	3	3	3
CO3	3	2	3	1	3	3	3	2
CO4	3	3	2	3	3	2	1	2
CO5	1	2	3	3	2	3	3	2

Strong (3) Medium (2) Low (1)

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	2	3	3
CO2	3	2	3	1	2
CO3	3	3	3	3	3
CO4	2	3	2	3	2
CO5	3	2	3	3	3

Personality Development

Title of the Course		Personality Development					
Course Type		Indian Knowledge System (IKS)					
Course Code		25UPDT51					
Year	III	Semester		V		Credits	2
Instructional Hours Per week		Lecture		Tutorial		Lab Practices	Total
		1		1		--	2

UNIT – I

Personality - Definition – Determinants – Personality Traits –Theories of Personality – Importance of Personality Development. Self-Awareness – Meaning – Benefits of Self – Awareness – Developing Self – Awareness. Swot – Meaning – Importance- Application – Components. Goal Setting Meaning- Importance – Effective goal setting – Principles of goal setting – Goal setting at the Right level.

UNIT – II

Self-Monitoring – Meaning – High self – monitor versus low self-monitor – Advantages and Disadvantages self-monitor- Self –monitoring and job performance. Perception- Definition- Factor influencing perception- Perception process –Errors in perception – Avoiding perceptual errors. Attitude – Meaning- Formation of attitude – Types of attitude - Measurement of Attitudes – Barriers to attitude change – Methods to attitude change. Assertiveness - Meaning – Assertiveness in Communication – Assertiveness Techniques – Benefits of being Assertive – Improving Assertiveness.

UNIT – III

Team Building – Meaning – Types of teams – Importance of Team building- Creating Effective Team. Leadership – Definition – Leadership style- Theories of leadership – Qualities of an Effect leader. Negotiation Skills – Meaning – Principles of Negotiation – Types of Negotiation – The Negotiation Process – Common mistakes in Negotiation process. Conflict Management – Definition- Types of Conflict- Levels of Conflict – Conflict Resolution – Conflict management.

UNIT –IV

Communication – Definition – Importance of communication – Process of communication - Communication Symbols – Communication network – Barriers in communication – Overcoming Communication Barriers. Transactional Analysis – Meaning – Ego States – Types of Transactions – Johari Window- Life Positions. Emotional Intelligence- Meaning – Components of Emotional Intelligence- Significance of managing Emotional intelligence – How to develop Emotional Quotient. Stress Management – Meaning – Sources of Stress – Symptoms of Stress – Consequences of Stress – Managing Stress

UNIT – V

Social Graces – Meaning – Social Grace at Work – Acquiring Social Graces. Table Manners – Meaning – Table Etiquettes in Multicultural Environment- Do's and Don'ts of Table Etiquettes. Dress Code – Meaning- Dress Code for selected Occasions – Dress Code for an Interview. Group Discussion – Meaning – Personality traits required for Group Discussion- Process of Group Discussion- Group Discussion Topics. Interview – Definition- Types of skills – Employer Expectations –Planning for the Interview – Interview Questions- Critical Interview Questions.

References:

1. Dr.S. Narayana Rajan, Dr. B. Rajasekaran, G. Venkadasalapthi, V. Vijuresh Nayaham and Herald M.Dhas, **Personality Development**, Publication Division, Manonmaniam Sundaranar University, Tirunelveli
2. Stephan P.Robbins, **Organisational Behaviour**, Tenth Edition, Prentice Hall of India Private Limited, New Delhi,2008
3. Jit S. Chandan, **Oragnisational Behaviour**, Third Edition, Vikas Publishing House Private Limited, 2008
4. Dr.K.K. Ramachandran and Dr.K.K. Karthick, **From Campus to Corporate**, Macmillan Publishers India Limited, New Delhi, 2010.

Semester - VI Computer Networks

Title of the Course		Computer Networks					
Course Type		Core - VIII					
Year	III	Semester	VI	Credits	4	Course Code	25UMCS61
Instructional Hours Per week		Lecture	Tutorial		Lab Practice	Total	
		4	1		--	5	

Learning Objectives	
LO1	To learn the basic concepts of Data communication and Computer network
LO2	To learn about wireless Transmission
LO3	To learn about networking and data link layer.
LO4	To study about Network communication.
LO5	To learn the concept of Transport layer

Unit	Contents
I	**Introduction:** Data communications – networks - layers in OSI model – TCP/IP protocol suite – addressing – guided media – Unguided media.
II	**Data Link Layer:** Switching – Circuit switched networks – datagram networks – virtual circuit networks – Framing – Flow and Error control.
III	**Network Layer:** Network layer – IP V4 addressing – IPV6 addressing – ICMP – IGMP – unicast and multicast routing protocols.
IV	**Transport layer:** Process to process delivery – UDP -TCP - Congestion – congestion control – QoS.
V	**Application Layer:** Domain name system – name space – domain name space – distribution of name space – DN Sin the internet – remote logging email – file transfer - SNMP Protocol.

Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC/TRB/NET/UGC – CSIR/GATE /TNPSC/others to be solved (To be discussed during the Tutorial hour) Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill
Skills acquired from this course	Knowledge, Problem Solving, Analytical ability, Professional Competency Professional Communication and Transferrable Skill

Reference Text Books	
1	Data communications and networking – Behrouz A Forouzan McGraw Hill 4thRep
Reference Books	
1.	Computer Networks – Tenenbaum -Pearson -2022
2.	Computer networking –Kurose James F, Ross Keith W -Pearson – 2017
3.	Data and computer communications – William Stallings – Pearson 2017
4.	Computer networks and Internet – Douglas E Comer – Pearson – 2018
Web Resources	
1.	https://nptel.ac.in/courses/106105080
2.	https://www.tutorialspoint.com/computer-networks/ind.ex.asp
3.	https://www.javatpoint.com/computer-network-tutorial

Course outcomes	On completion of this course, students will able to
CO1	Understand fundamental underlying principles of computer networking.
CO2	Understand details and functionality of layered network architecture.
CO3	Apply mathematical foundations to solve computational problems
CO4	Analyze and evaluate performance of various communication protocols.
CO5	Compare and create new

Mapping With Programme Outcomes and Programme Specific Outcomes

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	3	2	3	3	2	3	3
CO2	3	3	3	3	2	3	3	3
CO3	3	2	3	1	3	3	3	2
CO4	3	3	2	3	3	2	1	3
CO5	1	2	3	3	2	3	3	2

Strong (3) **Medium (2)** **Low (1)**

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	2	3	3
CO2	3	2	3	1	2
CO3	3	3	3	3	3
CO4	2	3	2	3	2
CO5	3	2	3	3	3

.NET Programming

Title of the Course		.NET Programming					
Course Type		Core - IX					
Year	III	Semester	VI	Credits	4	Course Code	25UMCS62
Instructional Hours per week		Lecture	Tutorial		Lab Practice		Total
		3	2		--		5

Learning Objectives	
LO1	To identify and understand the goals and objectives of the.NET framework and ASP.NET
LO2	To develop ASP.NET Web application using standard controls.
LO3	To implement file handling operations.
LO4	To handles SQL Server Database using ADO.NET.
LO5	Understand the Grid view control and XML classes.

Unit	Contents
I	Overview of .NET framework: Common Language Runtime (CLR), Framework Class Library- C# Fundamentals: Primitive types and Variables – Operators - Conditional statements -Looping statements – Creating and using Objects – Arrays – String operations.
II	Introduction to ASP.NET - IDE-Languages supported Components - Working with Web Forms – Web form standard controls: Properties and its events – HTML controls -List Controls: Properties and its events.
III	Rich Controls: Properties and its events – validation controls: Properties and its events– File Stream classes - File Modes – File Share – Reading and Writing to files – Creating, Moving, Copying and Deleting files – File uploading.
IV	ADO.NET Overview – Database Connections – Commands – Data Reader - Data Adapter - Data Sets - Data Controls and its Properties – Data Binding
V	Grid View control: Deleting, editing, Sorting and Paging. XML classes – Web form to manipulate XML files - Website Security – Authentication – Authorization – Creating a Web application.

Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC/TRB/NET/UGC – CSIR/GATE /TNPSC/others to be solved (To be discussed during the Tutorial hour) Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill
Skills acquired from this course	Knowledge, Problem Solving, Analytical ability, Professional Competency Professional Communication and Transferrable Skill

Reference Text Books	
1	Mathew, Mac Donald, The Complete Reference ASP. NET, Tata McGraw- Hill, 2015
2	Svetlin Nakov, Veselin Kolev & Co, Fundamentals of Computer Programming with C#, Faber publication, 2019.
Reference Books	
1.	Herbert Schildt, The Complete Reference C#.NET, Tata McGraw-Hill, 2017.
2.	Kogent Learning Solutions, C#2012 Programming Covers. NET 4.5 Black Book, Dream techpres, 2013.
3.	Anne Boehm, Joel Murach, Murach'sC#2015, Mike Murach & Associates Inc. 2016.
4.	Denielle Otey, Michael Otey, ADO. NET: The Complete reference, McGraw Hill, 2008.
5.	Matthew Mac Donald, Beginning ASP. NET 4 in C# 2010, APRESS, 2010.
Web Resources	
1.	https://www.geeksforgeeks.org/introduction-to-net-framework/
2.	https://www.javatpoint.com/net-framework

Course outcomes	On completion of this course, students will able to
CO1	Develop working knowledge of C# programming constructs and the .NET Framework
CO2	To develop a software to solve real-world problems using ASP.NET
CO3	To Work On Various Controls Files
CO4	To create a web application using NET.
CO5	To develop web applications using rich controls

Mapping With Programme Outcomes and Programme Specific Outcomes

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	3	2	3	3	2	3	3
CO2	2	3	3	3	2	3	3	3
CO3	3	3	3	2	3	3	3	2
CO4	3	3	2	3	3	3	1	3
CO5	3	2	3	3	2	3	3	2

Strong (3) Medium (2) Low (1)

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	2	3	3
CO2	2	3	3	1	3
CO3	3	3	3	3	3
CO4	3	3	2	3	2
CO5	3	2	3	3	3

Operating System

Title of the Course		Operating System					
Course Type		Core - X					
Year	III	Semester	VI	Credits	4	Course Code	25UMCS63
Instructional Hours Per week		Lecture	Tutorial		Lab Practice	Total	
		4	1		--	5	

Learning Objectives	
LO1	To acquire the fundamental knowledge of the operating system architecture and components and to know the various operations performed by the operating system.
LO2	Understand the basic working process of an operating system.
LO3	Understand the importance of process and scheduling.
LO4	Understand the issues in synchronization and memory management.
LO5	To acquire the fundamental knowledge of the operating system architecture and components and to know the various operations performed by the operating system.

Unit	Contents
I	**Introduction:** What Operating system do? – Computer System Operation – Storage Structure - Operating System Structure - Operating System Operation. **System Structures:** Operating System Services – System Calls – System Programs – Operation System Generation- System Boot.
II	**Process Concept:** Process Concept- Process Scheduling – Operation on Processes- Inter Process Communication. **Process Scheduling:** Basic concept-Scheduling criteria- Scheduling algorithm- Multiple Processor Scheduling - Real Time CPU Scheduling.
III	**Synchronization:** Background - The Critical section problem-Peterson's solution - Semaphores – Classic problems of Synchronization. **Dead Locks:** System model-Deadlock Characterization Methods for handling deadlocks- Deadlock Prevention-Deadlock Avoidance-Deadlock detection - Recovery from deadlock.
IV	**Memory Management:** Background–Swapping-Contiguous Memory allocation – Segmentation – paging. Virtual Memory Management: Background - Demand paging -Copy and Write-page replacement.
V	**File System:** File Concept - Access Method - Directory and Disk Structure - File sharing-Protection. **Mass Storage Structure**: Overview of Mass Storage Structure- Disk Structure- Disk Scheduling - Disk Management

Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC/TRB/NET/UGC – CSIR/GATE /TNPSC/others to be solved (To be discussed during the Tutorial hour) Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill
Skills acquired from this course	Knowledge, Problem Solving, Analytical ability, Professional Competency Professional Communication and Transferrable Skill

Recommended Texts:
Operating System Concepts–Abraham Silberscartz, Peter Baer Galvin, and Greg Gange. Addision Wesley Publishing Company – Ninth Edition.
References Books:
1. Operating System: Internal and Design Principles – Fifth Edition, William Stalling, PHI Learning Private Limited. 2. Understanding Operating Systems: Ida M. Flynn, Ann Mclver McHoes.
Web Resources:
1. https://en.wikipedia.org/wiki/Operating_system 2. https://www.geeksforgeeks.org/what-is-an-operating-system/

Course outcomes	**On completion of this course, students will be able to:**
CO1	Describe the fundamental concepts and techniques of natural language processing.
CO2	Explain the advantages and disadvantages of different NLP technologies and their applicability in different business situations.
CO3	Distinguish among the various techniques, taking into account the assumptions, strengths, and weaknesses of each
CO4	Use NLP technologie s to explore and gain a broad understanding of text data.
CO5	Analyze large volume text data generated from arrange of real-World applications. Use NLP methods to perform topic modelling.

Mapping with Programme Outcomes and Programme Specific Outcomes

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	3	2	3	3	2	3	3
CO2	3	3	3	3	2	3	3	3
CO3	3	2	3	2	3	3	3	2
CO4	3	3	2	3	3	2	1	3
CO5	1	2	3	3	2	3	3	2

Strong (3) **Medium (2)** **Low (1)**

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	2	3	3
CO2	2	2	3	1	2
CO3	3	3	3	3	3
CO4	2	3	2	3	2
CO5	3	2	3	3	3

.NET Programming Lab

Title of the Course	.NET Programming Lab						
Course Type	Core – Lab - 6						
Year	III	Semester	VI	Credit	3	Course Code	25UMCSL6
Instructional Hours Per week		Lecture	Tutorial		Lab Practice		Total
		1	-		4		5

Learning Objectives	
LO1	To develop ASP. NET Web application using standard controls.
LO2	To create rich database applications
LO3	To implement file handling operations.
LO4	To implement XML classes.
LO5	To utilize ASP. NET security features for authenticating the website

Experiments

1. Implement the HTML Controls.
2. Implement the Server Controls.
3. Web application using Web Controls.
4. Web application using List Controls.
5. Design a web page using Rich control and validate user input using Validation controls.
6. Web application using Data Controls.
7. Database application to perform insert, update and delete operations.
8. Database application using Data controls to perform insert, delete, edit, paging and sorting operation.
9. Ticket reservation using ASP.NET controls.
10. Online examination using ASP.NET controls.

Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC/TRB/NET/UGC – CSIR/GATE /TNPSC/others to be solved (To be discussed during the Tutorial hour) Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill
Skills acquired from this course	Knowledge, Problem Solving, Analytical ability, Professional Competency Professional Communication and Transferrable Skill
Recommended Texts	1. Svetlin Nakov, Veselin Kolev & Co, Fundamentals of Computer Programming with C#, Faber publication,2019 2. Mathew, Mac Donald, the Complete Reference ASP. NET, Tata McGraw-Hill,2015
Reference Books:	1. Herbert S childt, The Complete Reference C#.NET,Tata McGraw- Hill, 2017. 2. Kogent Learning Solutions, C#2012 Programming Covers. NET 4.5 Black Book, Dream tech pres, 2013. 3. Anne Boehm, Joel Murach Murach'sC#2015, Mike Murach & Associates Inc.2016.
Web resources:	https://www.javatpoint.com/net-framework https://www.geeksforgeeks.org/introduction-to-net-framework/

Course outcomes	On completion of this course, students will be able to:
CO1	To develop ASP.NET Web application using standard controls.
CO2	To create web applications and implement various controls
CO3	Create web pages in Rich control.
CO4	Develop knowledge about filed and ling operations
CO5	An ability to design XML classes

Mapping with Programme Outcomes and Programme Specific Outcomes

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	3	2	3	3	2	3	3
CO2	3	3	3	3	2	3	3	3
CO3	3	2	3	1	3	3	3	2
CO4	3	3	2	3	3	2	1	3
CO5	1	2	3	3	2	3	3	3

Strong (3) **Medium (2)** **Low (1)**

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	2	3	3
CO2	3	2	3	1	2
CO3	3	3	3	3	3
CO4	2	3	2	3	2
CO5	3	2	3	3	3

Major project with Viva voce

Title of the Course	Major project with Viva voce						
Course Type	Major Project						
Year	III	Semester	VI	Credit	3	Course Code	25UMCSP2
Instructional Hours Per week		Lecture	Tutorial		Lab Practice		Total
		-	-		4		4

Major Project with Viva voce- Individual or group of maximum three members-Project report should be submitted for external evaluation.

Internal 50 marks, External 50 marks.

Natural Language Processing

Title of the Course		Natural Language Processing					
Course Type		Elective - VI					
Year	III	Semester	V	Credits	3	Course Code	25UECS61
Instructional Hours per week		Lecture	Tutorial		Lab Practice	Total	
		4	--		--	4	

Learning Objectives	
LO1	To understand approaches to syntax and semantics in NLP.
LO2	To learn natural language processing and to learn how to apply basic algorithms in this field.
LO3	To understand approaches to discourse, generation, dialogue and summarization with in NLP.
LO4	To get acquainted with the algorithmic description of the main language levels: morphology, syntax, semantics, pragmatics etc.
LO5	To understand current methods for statistical approaches to machine translation.

Unit	Contents
I	**Introduction :** Natural Language Processing tasks in syntax, semantics, and pragmatics – Issue-Applications– The role of machine learning – Probability Basics– Information theory –Collocations-N-gram Language Models– Estimating parameters and smoothing– Evaluating language models.
II	**Word level and Syntactic Analysis:** Word Level Analysis: Regular Expressions-Finite- State Automata-Morphological Parsing-Spelling Error Detection and correction-Words and Word classes-Part-Of Speech Tagging. Syntactic Analysis: Context-free Grammar- Constituency-Parsing – Probabilistic Parsing.
III	**Semantic analysis and Discourse Processing:** Semantic Analysis: Meaning Representation Lexical Semantics-Ambiguity-Word Sense Disambiguation. **Discourse Processing:** cohesion- Resolution Discourse Coherence and Structure.
IV	**Natural Language Generation:** Architecture of NLG Systems -Generation Tasks and Representations- Application of NLG. Machine Translation: Problems in Machine Translation. Characteristics of Indian Languages-Machine Translation Approaches- Translation involving Indian Languages.
V	**Information retrieval and lexical resources:** Information Retrieval: Design features of Information Retrieval Systems- Classical, Non-classical, Alternative Models of Information Retrieval– valuation Lexical Resources: World Net- Frame Net Stemmers-POS Tagger- Research Corpora SSAS.

Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC/TRB/NET/UGC – CSIR/GATE /TNPSC/others to be solved (To be discussed during the Tutorial hour) Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill
Skills acquired from this course	Knowledge, Problem Solving, Analytical ability, Professional Competency Professional Communication and Transferrable Skill
Textbooks	Daniel Jurafsky, James H.Martin, —Speech & language processing‖, Pearson publications. Allen, James. Natural language understanding. Pearson, 1995.
Reference Books	Pierre M. Nugues,—An Introductionto Language Processing with Perland Prolog‖, Springer
Web Resources	https://en.wikipedia.org/wiki/Natural_language_processing https://www.techtarget.com/searchenterpriseai/definition/natural-language-processing- NLP

Course Outcomes	On completion of this course, students will be able to:
CO1	Describe the fundamental concepts and technique so natural language processing. Explain the advantages and disadvantages of different NLP technologies and their applicability in different business situations.
CO2	Distinguish among the various techniques, taking into account the assumptions, strengths, and weaknesses of each Use NLP technologies to explore and gain abroad understanding of text data.
CO3	Use appropriate descriptions, visualizations, and statistics to communicate the problems and their solutions. Use NLP methods to analyse sentiment of a text document.
CO4	Analyze large volume text data generated from arrange of real- world applications. Use NLP methods to perform topic modeling.
CO5	Develop robotic process automation to manage business processes and to increase and monitor their efficiency and effectiveness. Determine the frame work in which artificial intelligence and the Internet of things may function, including interactions with people, enterprise functions, and environments.

Mapping with Programme Outcomes and Programme Specific Outcomes

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	3	2	3	3	2	3	3
CO2	3	3	3	3	2	3	3	3
CO3	3	2	3	2	3	3	3	2
CO4	3	3	2	3	3	2	1	3
CO5	1	2	3	3	2	3	3	2

Strong (3) **Medium (2)** **Low (1)**

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	2	3	3
CO2	2	2	3	1	2
CO3	3	3	3	3	3
CO4	2	3	2	3	2
CO5	3	2	3	3	3

Artificial Neural Network

Title of the Course		Artificial Neural Network					
Course Type		Elective - VI					
Year	III	Semester	VI	Credits	3	Course Code	25UECS62

Instructional Hours Per week	Lecture	Tutorial	Lab Practice	Total
	2	2	--	4

Learning Objectives	
LO1	To recall the Historical Development of Neural Networks.
LO2	To compare Basic neuron models: McCulloch-Pitts model and the generalized one, distance or similarity based neuron model, radial basis function model, etc
LO3	To discuss Basic neural network models: multilayer perception, distance or similarity based neural networks, associative memory and self- organizing feature map, radial basis function based multilayer perception, neural network decision trees, etc.
LO4	To evaluate Basic learning algorithms: the delta learning rule, the back propagation algorithm, self-organization learning
LO5	To discuss the Applications: pattern recognition, function approximation, information visualization, etc.

Unit	Contents
I	Introduction to Neural networks: Neural processing- Neural networks- an overview – the raise of neuro computing – introduction to artificial neural networks introduction- artificial neural networks – historical development of neural networks – biological neural networks – comparison between the brain and the computer – artificial and biological neural networks – basic building blocks of artificial neural networks – artificial neural network terminologies.
II	Fundamental models of artificial neural networks: McCulloch-Pits neuron Model- Learning rules. Perceptron networks: Introduction –single layer perceptron –brief introduction to multilayer perceptron networks.
III	Feedback networks: Introduction- discrete Hopfield net-continuous Hopfield net- relation between BAM and Hopfield nets. Feed forward networks: introduction- back propagation networks.

IV	Deep Learning – Introduction – Neuro architectures building blocks for the DL techniques, Deep Learning and Necocognitron, Deep Convolutional Neural Networks, Recurrent Neural Networks (RNN) Feature extraction.
V	Applications of Neural Networks: Applications of neural networks in Arts-Bioinformatics - Knowledge Extraction – Forecasting - Bankruptcy forecasting- Healthcare-Intrusion - Detection.

Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC/TRB/NET/UGC –CSIR/GATE /TNPSC/others to be solved (To be discussed during the Tutorial hour) Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill
Skills acquired from this course	Knowledge, Problem Solving, Analytical ability, Professional Competency Professional Communication and Transferrable Skill
Recommended Texts:	
1	1. Introduction to Neural Networks using MATLAB 6.0., S N Sivanandam S Sumathi S N Deepa, McGraw Hill, 2006. 2. Neural Network – A Comprehensive Foundation – Simon Haykins, Pearson Prentice Hall, 2nd edition , 1999
References Books:	
1	1. Artificial neural Networks B.Yegnanarayana, Prentice Hall India, 2005. 2. Neural Networks Alogorithms, Applications and programming Techniques, James A Freeman David M Skapura, Pearson Education. 3. Neural Networks for Pattern Recognition, Christopher M. Bishop, Indian Edition, OXFORD University Press.
Web Resources:	
1	https://www.w3schools.com/ai/ai_neural_networks.asp
2	https://link.springer.com/chapter/10.1007/978-3-642-21004-4_12

Course outcomes	On completion of this course, students will be able to:
CO1	Students will learn the basics of artificial neural networks with single layer and multi-layer perception networks.
CO2	Learn about the Error Correction and various Learning algorithms and tasks.
CO3	Learn the various Perception Learning Algorithm.
CO4	Learn about the various Multi-Layer Perception Network.
CO5	Understand the Deep Learning of various Neural Network and its Applications.

Mapping with Programme Outcomes and Programme Specific Outcomes

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	3	2	3	3	2	3	3
CO2	3	3	3	3	2	3	3	3
CO3	3	2	3	1	3	3	3	2
CO4	3	3	2	3	3	2	1	3
CO5	1	2	3	3	2	3	3	2

Strong (3) **Medium (2)** **Low (1)**

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	2	3	3
CO2	3	2	3	1	2
CO3	3	3	3	3	3
CO4	2	3	2	3	2
CO5	3	2	3	3	3

Cyber Forensics

Title of the Course		Cyber Forensics					
Course Type		Elective -VI					
Year	III	Semester	VI	Credits	3	Course Code	25UECS63
Instructional Hours Per week		Lecture	Tutorial		Lab Practice		Total
		2	2		--		4

Learning Objectives	
LO1	To learn cybercrime and forensics
LO2	To become familiar with forensics tools
LO3	To learn to analyse and validate forensics data
LO4	To understand cyber laws and the admissibility of evidence with case studies
LO5	Tolearnthevulnerabilitiesinnetworkinfrastructurewithethicalhacking

Unit	Contents
I	Introduction to Cyber Crime and Forensics - Introduction to Traditional Computer Crime, Traditional problems associated with Computer Crime. Role of ECD and ICT in Cybercrime-Classification of Cyber Crime. The Present and future of Cybercrime Cyber Forensics -Steps in Forensic Investigation - Forensic Examination Process - Types of CF techniques - Forensic duplication and investigation - Forensics Technology and Systems - Understanding Computer Investigation – Data Acquisition.
II	Evidence collection and forensics tools Processing Crime and Incident Scenes –Digital Evidence- Sources of Evidence-Working with File Systems. - Registry - Artifacts - Current Computer Forensics Tools: Software/ Hardware Tools- Forensic Suite- Acquisition and Seizure of Evidence from Computers and Mobile Devices - Chain of Custody- Forensic Tools.
III	Analysis and Validation - Validating Forensics Data–Data Hiding Techniques– Performing Remote Acquisition– Network Forensics – Email Investigations – Cell Phone and Mobile Devices Forensics - Analysis of Digital Evidence – Admissibility of Evidence - Cyber Laws in India – Case Studies.

IV	Ethical hacking Introduction to Ethical Hacking –Foot printing and Reconnaissance – Scanning Networks- Enumeration - System Hacking - Malware Threats – Sniffing – Email Tracking.
V	Ethical hacking In Web Social Engineering – Denial of Service- Session Hijacking - Hacking Webservers- Hacking Web Applications – SQL Injection - Hacking Wireless Networks - Hacking Mobile Platforms.

Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC/TRB/NET/UGC – CSIR/GATE /TNPSC/others to be solved (To be discussed during the Tutorial hour) Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill
Skills acquired from this course	Knowledge, Problem Solving, Analytical ability, Professional Competency Professional Communication and Transferrable Skill

Recommended Texts:

1. 1Bill Nelson, Amelia Phillips, Christopher Steuart,—Guide to Computer Forensics and Investigations‖, Cengage Learning, India Sixth Edition, 2019.
2. CEH official Certified Ethical Hacking Review Guide, Wiley India Edition, Version 11, 2021.
3. Dejey,S.Murugan-CyberForensics,OxfordUniversityPress,India,2018

References Books:

1. JohnR.Vacca,"Computer Forensics", Cengage Learning,2005
2. Marjie T. Britz, "Computer Forensics and Cyber Crime: An Introduction 3rd Edition, Prentice Hall, 2013.
3. Ankit Fadia "Ethical Hacking, Second Edition, Macmillan India Ltd, 2006
4. Kenneth C. Brancik "Insider Computer Fraud‖ Auerbach Publications Taylor & Francis Group– 2008.

Web Resources	www.geeksforgeeks.com

Course outcomes	On completion of this course, students will be able to:
CO1	Understand the basics of cybercrime and computer forensics
CO2	Apply a number of different computer forensic tools to a given scenario. Analyze and validate forensics data
CO3	Understand Admissibility of evidence in India with Cyber laws and Case Studies. Identify the vulnerabilities in a given network infrastructure
CO4	Implement real – world hacking techniques to test system security
CO5	Apply a number of different computer forensic tools to a given scenario. Analyze and validate forensics data

Mapping with Programme Outcomes and Programme Specific Outcomes

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	3	2	3	3	2	3	3
CO2	3	3	3	3	2	3	3	3
CO3	3	2	3	2	3	3	3	2
CO4	3	3	2	3	3	2	1	3
CO5	1	2	3	3	2	3	3	2

Strong (3) **Medium (2)** **Low (1)**

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	2	3	3
CO2	2	2	3	1	2
CO3	3	3	3	3	3
CO4	2	3	2	3	2
CO5	3	2	3	3	3

MongoDB

Title of the Course		MongoDB					
Course Type		Skill Enhancement Course - IX					
Year	III	Semester	VI	Credits	2	Course Code	25USCS61
Instructional Hours Per week		Lecture	Tutorial		Lab Practice	Total	
		2	-		--	2	

Learning Objectives	
LO1	Understand the fundamental concepts of Mongo DB and its advantages over traditional relational databases.
LO2	Understand the structure and purpose of collections in Mongo DB.
LO3	Comprehend the concept and importance of indexing in Mongo DB.
LO4	Understanding the Query Optimizer and Identifying and Implementing Various Index Types.
LO5	Understand the concept of replication and its significance in ensuring data availability and redundancy.

Unit	Contents
I	Mongo DB Overview-Advantages- Mongo DB Environment-Common Terms in Mongo DB- Create and Drop Database
II	Collections-Create and Drop Collections- Mong DB Data Types-Insert Command- Mongo DB Query Document-Update Command-Delete Command-Projection- Limit Record-Sort Record-Aggregation
III	Indexing- Compound Indexes -Indexing Objects and Arrays -Index Cardinality - Using explain () and hint ().
IV	The Query Optimizer-Types of Indexes- Unique Indexes -Sparse Indexes - Index Administration -Identifying Indexes- Changing Indexes
V	Replication: Overview –Components of Replica sets Sharding: Overview – Understanding the Components of Cluster.

Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC/TRB/NET/UGC – CSIR/GATE /TNPSC/others to be solved (To be discussed during the Tutorial hour) Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill
Skills acquired from this course	Knowledge, Problem Solving, Analytical ability, Professional Competency Professional Communication and Transferrable Skill

Recommended Texts:	
1	Kristina Chodorow "Mongo DB the definitive guide", Second Edition,, O'Reilly Media Inc
References Books:	
1	Rick Copeland, 2013, "Mongo DB Applied Design Patterns", First Edition, O'Reilly Media Inc.
Web Resources:	
1	https://www.tutorialspoint.com/mongodb

Course outcomes	On completion of this course, students will be able to:
CO1	Articulate the benefits of using MongoDB in various applications.
CO2	Manage collections and documents efficiently and Implement CRUD operations to manipulate data.
CO3	Optimize query performance using appropriate indexing strategies.
CO4	Performance Optimization, Index Management Proficiency, and Analytical Skills in Mongo DB
CO5	Implement replication to enhance data reliability and fault tolerance.

Mapping with Programme Outcomes and Programme Specific Outcomes

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	3	2	3	3	2	3	3
CO2	3	3	3	3	2	3	3	3
CO3	3	2	3	1	3	3	3	2
CO4	3	3	2	3	3	2	1	3
CO5	1	2	3	3	2	3	3	2

Strong (3) **Medium (2)** **Low (1)**

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	2	3	3
CO2	3	2	3	1	2
CO3	3	3	3	3	3
CO4	2	3	2	3	2
CO5	3	2	3	3	3

Blue Print – End Semester Examinations Semester – I to VI

Class: U.G. **Time: 3 Hours** **Max. Marks: 75**

Section A **(10 x 1 = 10)**

Answer all questions.
Choose the correct answer. (With four options)

	Unit I	Unit II	Unit III	Unit IV	Unit V
Question Nos.	1 & 2	3 & 4	5 & 6	7 & 8	9 & 10

Section B **(5 x 5 = 25)**

Answer all questions choosing either (a) or (b).
Answer should not exceed 250 words

	Unit I	Unit II	Unit III	Unit IV	Unit V
Question Nos.	11 (a) & 11 (b)	12 (a) & 12 (b)	13 (a) & 13 (b)	14 (a) & 14 (b)	15 (a) & 15 (b)

Section C **(5 x 8 = 40)**

Answer all questions choosing either (a) or (b).
Answer should not exceed 500 words

	Unit I	Unit II	Unit III	Unit IV	Unit V
Question Nos.	16 (a) & 16 (b)	17 (a) & 17 (b)	18 (a) & 18 (b)	19 (a) & 19 (b)	20 (a) & 20 (b)