Kannur University

BOARD OF STUDIES -COMPUTER SCIENCE -UG

CURRICULUM

SYLLABUS

OF

FOUR YEARS UNDER GRADUATE PROGRAMME(FYUGP)

BACHELOR OF COMPUTER SCIENCE

Under the Choice Based Credit and Semester System (CBCSS)

W.E.F 2024 Admission onwards

Welcome to the Four-year Integrated UG Computer Science/Computer Application Programme of Kannur University. The Board of Studies of the University has designed this programme on the basis of the National Education Policy 2023 which critically envisions a brand-new holistic education system for the country, hinging on the effective adoption of modern teaching and training methods, application of technology, and imparting practical and contemporary skills, to shape the overall personality of students. Our programme is designed to equip students with a strong foundation in computer science principles while also providing specialized training in Artificial Intelligence and Machine Learning. In today's digital age, these technologies are at the forefront of technological advancements, driving innovation across various industries including healthcare, finance, transportation, and entertainment.

The Programme in Computer Science/ is designed with the objective of equipping the students to cope with the emerging trends and challenges in the field of computers and interrelated disciplines like computer engineering, computer science, information systems, information technology, and software engineering. This programme involves various courses such as Value-added courses, Skill enhancement courses, multi-disciplinary courses and ability enhancement courses with an attribution of discipline specific core, discipline specific electives and various scholastic and co scholastic domains. This programme aims at helping the students define and recharge their creative, analytical, problem-solving, and critical thinking abilities, topped by actively pursuing digital literacy.

We wish you to have a motivating atmosphere to make use of your extreme potential and caliber to complete this programme and to serve the nation by enriching yourself.

BEST WISHES

(BOS, Computer Science)

PROGRAMME OUTCOME

PO1: Critical Thinking and Problem-Solving-Apply critical thinking skills to analyze information and develop effective problem-solving strategies for tackling complex challenges.

PO2: Effective Communication and Social Interaction-Proficiently express ideas and engage in collaborative practices, fostering effective interpersonal connections.

PO3: Holistic Understanding-Demonstrate a multidisciplinary approach by integrating knowledge across various domains for a comprehensive understanding of complex issues.

PO4: Citizenship and Leadership-Exhibit a sense of responsibility, actively contribute to the community, and showcase leadership qualities to shape a just and inclusive society.

PO5: Global Perspective-Develop a broad awareness of global issues and an understanding of diverse perspectives, preparing for active participation in a globalized world.

PO6: Ethics, Integrity and Environmental Sustainability-Uphold high ethical standards in academic and professional endeavors, demonstrating integrity and ethical decision-making. Also acquire an understanding of environmental issues and sustainable practices, promoting responsibility towards ecological well-being.

PROGRAMMESPECIFIC OUTCOMES

PSO1: Apply computer science knowledge to solve diverse real-world challenges

PSO2: Design and implement and present robust software solutions using diverse programming languages and design tools

PSO3: Utilize advanced techniques for data storage, retrieval, and manipulation across varied computing environments

PSO4: Critically evaluate and apply information technology tools and methodologies with ethical consideration

PSO5: Engage in interdisciplinary research to address complex computer science challenges

PSO6: Collaborate effectively in team-based projects and professional settings

PSO 7: Demonstrate lifelong learning and adaptability in response to evolving technology trends

Board of Studies in Computer Science

Kannur University

B.Sc Computer Science

Sl.No.	Categorization of Courses for all Programs	Minimum Number of Credit required	
		3Year UG	4Year UG
1	Major (Core)	68	88*
2	Minor	24	36
3	Multi-disciplinary	9	9
4	Skill Enhancement Courses(SEC)	9	9
5	Ability Enhancement Course(AEC)	12	12
6	Value Added Courses Common for all UG	9	9
7	Summer Internship, field based. Learning etc.	2	2
8	Research Project/Dissertation		12
	Total Credits	**133**	**177**

COURSES	CREDITS	SEMESTERS
Major / Minor Stream (DSC/DSE)	92 (4 credit courses)	Within all six semesters
Multidisciplinary Courses (MDC)	9 (3 credit three courses)	Semester 1 to 6
Skill Enhancement Courses (SEC)	9 (3 credits three courses)	Semester 1 to 6
Value Addition Courses (VAC)	9 (3 credits three courses)	Semester 1 to 6
Ability Enhancement Courses (AEC)	12 (3 Credits 4 courses)	Semester 1and 2
Internship / Field Visit	2 (2 credit courses)	Semester 1 to 6
Total credits for first six semesters	**133**	
COURSES	**CREDITS**	**SEMESTERS**
Major / Minor Stream (DSC/DSE)	24 (4 credit courses)	Semester 7
Additional DSC / DSE for Honours (in Major discipline)	12 Credits (2DSC and 1DSE in the Major)	Semester 8
Project	12 Credits	Semester 8
MOOC / ONLINE COURSES (Blended Mode)	8 (4 credits 2 courses)	Semester 7 and 8
Total credits for Semester 7 and 8	**44***	

*For Honours with Research 12 Credits Project in Semester 8 and for Honours additional 12 credits DSC / DSE in Semester 8 which should include Capstone level courses

*AEC- Ability Enhancement Course, DSC- Discipline Specific Course, SEC- Skill Enhancement Course, VAC- Value Added Course, DSE- Discipline Specific Elective

Syllabus Index Page Format

Semester: 1

Course Code	Title of the Course	Type of the Course DSC, MDC, SEC etc.	Credit	Hours/ week	Hour Distribution /week			
					L	T	P	O
KU1DSCCSC101	Fundamentals of Computers and Programming	DSC	4	5	3		2	
KU1DSCCSC102	Introduction to major trends in information technology	DSC	4	5	3		2	
KU1DSCCSC103	Fundamentals of Programming with C	DSC	4	5	3		2	
KU1DSCCSC104	Office Automation Software	DSC	4	5	3		2	
KU1DSCCSC105	Introduction to Web Programming	DSC	4	5	3		2	
KU1DSCCSC106	Python for Data Analytics	DSC	4	5	3		2	
KU1DSCCSC107	Essentials of Information Technology.	DSC	4	5	3		2	
KU1MDCCSC101	Fundamentals of Computers	MDC	3	3	3		0	
KU1MDCCSC102	Basics of Information Storage and Retrieval System	MDC	3	3	3		0	
KU1MDCCSC103	Digital Marketing	MDC	3	3	3		0	

L — Lecture, T — Tutorial, P — Practical/Practicum , O — Others

AEC- Ability Enhancement Course, DSC- Discipline Specific Course, SEC- Skill Enhancement Course, VAC- Value Added Course, DSE- Discipline Specific Elective

Semester: 2

Course Code	Title of the Course	Type of the Course DSC, MDC, SEC etc.	Credit	Hours/ week	Hour Distribution /week			
					L	T	P	O
KU2DSCCSC108	Advanced Programming with C	DSC	4	5	3		2	
KU2DSCCSC109	Data Management Platform	DSC	4	5	3		2	
KU2DSCCSC110	Cyber Security and Ethics	DSC	4	5	3		2	
KU2DSCCSC111	Essentials of Computer Networking	DSC	4	5	3		2	
KU2DSCCSC112	Multimedia and Graphics Designing	DSC	4	5	3		2	
KU2DSCCSC113	Advanced Web Programming	DSC	4	5	3		2	
KU2DSCCSC114	Ethical Hacking	DSC	4	5	3		2	
KU2MDCCSC104	Fundamentals of Web Technology	MDC	3	3	3		0	
KU2MDCCSC105	Digital Office Management	MDC	3	3	3		0	
KU2MDCCSC106	Introduction to Data Science	MDC	3	3	3		0	

Semester: 3

Course Code	Title of the Course	Type of the Course DSC, MDC, SEC etc.	Credit	Hours/ week	Hour Distribution /week			
					L	T	P	O
KU3DSCCSC201	Objected Oriented Programming using Java	DSC	4	5	3		2	
KU3DSCCSC202	Digital System	DSC	4	5	3		2	
KU3DSCCSC203	AI in Daily Life	DSC	4	5	3		2	
KU3DSCCSC204	Essentials of Operating Systems	DSC	4	5	3		2	
KU3DSCCSC205	Basics of data analytics	DSC	4	4	4		0	
KU3DSCCSC206	Introduction to Machine Learning	DSC	4	5	3		2	
KU3DSCCSC207	Social media analysis	DSC	4	5	3		2	
KU3DSCCSC208	Content management System	DSC	4	5	3		2	
KU3VACCSC201	Cyber Laws and Rules	VAC	3	3	3		0	
KU3VACCSC202	Cyber Ethics	VAC	3	3	3		0	
KU3VACCSC203	Data analytics using R	VAC	3	3	3		0	

Semester: 4

Course Code	Title of the Course	Type of the Course DSC, MDC, SEC etc.	Credit	Hours/ week	Hour Distribution /week			
					L	T	P	O
KU4DSCCSC209	Database Management System	DSC	4	4	4		0	
KU4DSCCSC210	Data Structures	DSC	4	5	3		2	
KU4DSCCSC211	Operating Systems	DSC	4	4	4		0	
KU4SECCSC201	Computer hardware & networking	SEC	3	4	2		1	
KU4SECCSC202	Cyber ethics	SEC	3	4	2		2	
KU4SECCSC203	Data analytics using Excel	SEC	3	4	2		2	
KU4SECCSC204	Database Administration	SEC	3	4	2		2	
KU4VACCSC204	Wireless Sensor Networks	VAC	3	4	2		2	
KU4VACCSC205	Ethical Hacking	VAC	3	3	3		0	
KU4VACCSC206	Intellectual Property Rights	VAC	3	3	3		0	
KU4VACCSC207	Information storage management	VAC	3	3	3		0	
KU4VACCSC208	Information Security	VAC	3	3	3		0	
KU4VACCSC209	Impact of social media networks	VAC	3	3	3		0	

Semester: 5

Course Code	Title of the Course	Type of the Course DSC, MDC, SEC etc.	Credit	Hours/ week	Hour Distribution /week			
					L	T	P	O
KU5DSCCSC301	Software Engineering	DSC	4	4	4		0	
KU5DSCCSC302	Python Programming	DSC	4	5	3		2	
KU5DSCCSC303	Web Technology	DSC	4	5	3		2	
KU5DSECSC301	Compiler Design	DSE	4	4	4		0	
KU5DSECSC302	Design and Analysis of Algorithms	DSE	4	4	4		0	
KU5DSECSC303	Artificial Intelligence and Machine Learning	DSE	4	4	4		0	
KU5DSECSC304	Introduction to Deep learning	DSE	4	4	4		0	
KU5DSECSC305	Basics of Image processing	DSE	4	4	4		0	
KU5DSECSC306	Bigdata analytics	DSE	4	4	4		0	
KU5SECCSC301	Free and open source softwares (foss)	SEC	3	3	3		0	
KU5SECCSC302	Basics of Datascience	SEC	3	3	3		0	
KU5SECCSC303	Introduction to NO-SQL database	SEC	3	3	3		0	
	INTERNSHIP		2					

Semester: 6

Course Code	Title of the Course	Type of the Course DSC, MDC, SEC etc.	Credit	Hours/ week	Hour Distribution /week			
					L	T	P	O
KU6DSCCSC304	Data Mining	DSC	4	4	4		0	
KU6DSCCSC305	Computer Organisation and Architecture	DSC	4	4	4			
KU6DSCCSC306	Project	DSC	4	5	3		2	
KU6DSECSC307	Data communication and Networks	DSE	4	5	3		2	
KU6DSECSC308	Linux Administration	DSE	4	5	3		2	
KU6DSECSC309	Cloud Computing	DSE	4	5	3		2	
KU6DSECSC310	Parallel computing	DSE	4	4	4		0	
KU6DSECSC311	Internet of Things	DSE	4	4	4		0	
KU6DSECSC312	Blockchain Technology	DSE	4	4	4		0	
KU6SECCSC304	Digital forensics	SEC	3	3	3		0	
KU6SECCSC305	Software testing	SEC	3	3	3		0	
KU6SECCSC306	Computer Graphics	SEC	3	3	3		0	

SEMESTER-1

SI.No.	Course	Offering Departments	Practical	Credit
1	AEC1	English Department	Yes	3(2T+1P)
2	AEC2	Languages		3
3	MDC1	Multi-Disciplinary Course1		3
4	Major1	Fundamentals of Computers and programming	Yes	4(3T+1P)
5	Minor1	Optional Minor offered by any department.	Yes	4(3T+1P)
6	Minor2	Optional Minor offered by any department.	Yes	4(3T+1P)
Total Hours/Credits				**25/21**

Optional Minor 1 Courses for other Departments (Level 100)

1. Introduction to major trends in information technology
2. Fundamentals of Programming with C
3. Office Automation Software

Optional Minor 2 Courses for other Departments (Level 100)

1. Introduction to Web Programming
2. Python for data Analytics
3. Essentials of Information technology.

Multi-Disciplinary Course1(Level 100)

1. Fundamentals of Computers
2. Basics of Information Storage and Retrieval System
3. Digital Marketing

SEMESTER-2

SI.No	Course	Offering Departments	Practical	Credit
1	AEC3	English Department	Yes	3(2T+1P)
2	AEC4	Languages		3
3	MDC2	Multi-Disciplinary Course2		3
4	Major2	Advanced Programming with C	Yes	4(3T+1P)
5	Minor3	Optional Minor offered by any department.	Yes	4(3T+1P)
6	Minor4	Optional Minor offered by any department.	Yes	4(3T+1P)
Total Hours/Credits				**25/21**

Optional Minor 3 Courses for other Departments (Level 100)

1. Data Management Platform
2. Cyber Security and Ethics
3. Essentials of Computer Networking

Optional Minor 4 Courses for other Departments (Level 100)

1. Multimedia and Graphics Designing
2. Advanced Web Programming
3. Ethical Hacking

Multi-Disciplinary Course2(Level 100)

1. Fundamentals of Web Technology
2. Office Automation Tools
3. Introduction to Data Science

SEMESTER 3

SI.No	Course	Offering Departments	Practical	Credit
1	Major3	Objected Oriented Programming using Java	Yes	4(3T+1P)
2	Major4	Digital systems		4
3	VAC1	Value Added course 1		3
4	Minor5	Optional Minor offered by any department.	Yes	4(3T+1P)
5	Minor6	Optional Minor offered by any department.	Yes	4(3T+1P)
6	MDC3	Multi-Disciplinary Course3(KS) Offered by English and language department		3
Total Hours/Credits				**25/22**

Value added Course 1

1. Cyber Laws and Rules
2. Cyber Ethics
3. Data analytics using R

Optional Minor 5 Courses for other Departments (Level 200)

1. AI in Daily Life
2. Operating System Essentials
3. Basics of data analytics

Optional Minor 6 Courses for other Departments (Level 200)

1. Introduction to Machine Learning
2. Social media analysis
3. Content management System

SEMESTER 4

SI.No	Course	Offering Departments	Practical	Credit
1	Major5	Database Management system		4
2	Major6	Data structures	Yes	4(3T+1P)
3	Major 7	Operating systems		4
4	SEC1	Skill enhancement Course 1	Yes	4(3T+1P)
5	VAC2	Value Added course 2		3
6	VAC3	Value Added course 3		3
Internship/Field Visit(Any Semester we can do the Internship-Semester 1 to 6)				2
Total Hours/Credits				**25/21**

Skill Enhancement Course1

1. Computer Hardware and Networking
2. Cyber ethics
3. Data analytics using Excel
4. Database Administration

Value added Course 2

1. Wireless Sensor Networks
2. Ethical Hacking
3. Intellectual Property Rights

Value added Course 3

1. Information storage management
2. Information Security
3. Impact of social media networks

SEMESTER 5

SI.No	Course	Offering Departments	Practical	Credit
1	Major8	Software Engineering		4
2	Major9	Python Programming	Yes	4(3T+1P)
3	Major 10	Web Technology	Yes	4(3T+1P)
4	Major11	Discipline specific elective		4
5	Major12	Discipline specific elective		4
6	SEC2	Skill enhancement Course 2		3
Total Hours/Credits				**25/23**

Discipline specific elective

1.Compiler Design
2. Design and Analysis of Algorithm
3. Artificial intelligence and Machine learning

4. Introduction to Deep learning

5. Basics of Image processing

6. Bigdata Analytics

Skill enhancement Course 2

1. Free and open source software (foss)
2. Basics of Data Science
3. Introduction to NO-SQL database

SEMESTER -6

SI.No	Course	Offering Departments	Practical	Credit
1	Major13	Data Mining		4
2	Major14	Computer organisation and Architecture		4
3	Major 15	Software design and implementation	Yes	4(3T+1P)
4	Major16	Discipline specific elective	Yes	4(3T+1P)
5	Major17	Discipline specific elective		4
6	SEC3	Skill enhancement Course 3		3
Total Hours/Credits				**25/23**

Discipline specific elective

1. Data communication and Networking
2. Linux Administration
3. Cloud Computing
4. Parallel computing
5. Internet of things
6. Blockchain Technology

Skill enhancement Course 3

1. Digital forensics
2. Software testing
3. Computer graphics

SEMESTER 7

SI.No	Course	Offering Departments	Practical	Credit
1	Major	Soft computing	Yes	4
2	Major	Swarm intelligence	Yes	4
3	Major	Seminar /paper presentation		4
4	Major	Digital forensic		4
5	Major	MOOC ONLINE COURSE		4
Total Hours/Credits				**20**

SEMESTER 8
DEGREE WITH HONOUR

SI.No	Course	Offering Departments	Practical	Credit
1	Major	Seminar		4
2	RESEARCH PROJECT(OPTIONAL)			8
TOTAL CREDIT				12
AND				
Three courses from any discipline Major, Minor, DSC, DSE or any discipline of credit 4(capstone level courses)				12
Total Credit for semester 8				**24**
Total Credit for semester 1 to 6				**133**
Total Credit for semester 7& 8				**44**
Total Credit for semester1 to semester 8				**177**

SEMESTER 8
DEGREE WITH RESEARCH

SI.No	Course	Offering Departments	Practical	Credit
1	Major/Minor	Research methodology		4

2	Major/Minor	Research publication and Ethics		4
3	Major/Minor	Paper presentation in national or international conference		4
TOTAL CREDIT				12
AND				
PROJECT				12
Total Credit for semester 8				**24**
Total Credit for semester 1 to 6				**133**
Total Credit for semester 7& 8				**44**
Total Credit for semester1 to semester 8				**177**

Semester-1

KU1DSCCSC101: Fundamentals of Computers and Programming

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
1	Major	100-199	**KU1DSCCSC101**	4	75

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
3	2		30	70	100	2hrs.

Course Description:

This is a lecture and laboratory course offered to introduce computer science and programming. Topics include information and data representation, hardware, programming methodology, algorithm design, abstract data types, programming languages, operating systems and basic programme control structures.

Course Prerequisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Identify various components of Computer system and understand their functions	U
2	Demonstrate data representation in Computer system and various number codes.	U
3	Compare the performance of different types of software.	An
4	Design effective and error free programs in C using programme using control structures	C

Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C)

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO1	3		2			3	2
CO2	3						
CO3	2	3					
CO4	3	3				3	3

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1	**MODULE TITLE: Introduction to Computers**		
	1	Definition and Characteristics of Computers, Brief History and Evolution of Computers. Computer System Overview, Basic Components of a Computer System - Input, Output, Processing, and Storage.	15
	2	**Central Processing Unit (CPU):** Basic Concepts of CPU, Function and Components, Architecture of a CPU - ALU, Registers, and Control Unit, How a CPU Executes Instructions - Fetch-Decode-Execute Cycle.	
	3	System Memory and Storage: Memory Hierarchy - An Overview, Primary Memory - RAM (Random Access Memory) and ROM (Read-Only Memory) - Types and Functions, Secondary Memory - Hard Drives, SSDs, USB Drives (Overview and Basic Working Principle), Introduction to Cache Memory - Purpose and Basic Functioning	
	4	Motherboard and Internal Components: Components Inside a Computer Cabinet - Motherboard, BIOS, CMOS Chip, Ports and Interfaces - USB, HDMI, Ethernet. Expansion Slots and Cards - GPU,	

		Sound Card, Network Card, Storage Devices - HDD, SSD, Optical Drives (Basic Concepts only)	

2	**MODULE TITLE : Introduction to Data Representation**		
	1	Decimal, Binary, Hexa-Decimal and Octal Number Systems, Conversion Between Number Systems.	15
	2	Binary Arithmetic and Complements: Binary addition, subtraction, multiplication and division, Complements of Binary Numbers (1's Complement and 2's Complement)	
	3	Advanced Number Systems: Signed Numbers, Floating Point Numbers - Representation of Real Numbers in Binary, IEEE Floating Point Standard, Examples and Applications	
	4	Special Codes and Unicode: Binary Coded Decimal (8421 BCD Code, Applications, BCD Addition), Gray Code, ASCII Code, Unicode	

3	**MODULE TITLE: Introduction to Software**		
	1	Types of Software - Application software, System Software, Operating Systems - Basics Function, examples,	15
	2	Software Licensing and Acquisition: Retail, OEM, Demo, Shareware, Freeware, Open-Source Software	
	3	Programming Languages: Types, Basic Concepts of Compiler, Assembler, Interpreter, Linker and Loader, Source code and Object code, Program Development Life Cycle.	
	4	Algorithmic Thinking: Algorithm, Flowcharts, Examples	

	MODULE TITLE: Introduction to Programming		
	1	Definition and core concepts of programming, Characteristics of a good program, Representing Algorithms with Pseudocode - examples	15
	2	Variables and Data Types: Understanding variables and assignment statements, Overview of common data types: Integers, Floats, Strings, Basics of Input and Output Operations in programming.	
	3	Program Control Structures: Sequential execution, Conditional execution using If statements, Fundamentals of iterative execution with loops	

5	**Teacher Specific Module**	**15**
	Directions	
	Teacher can provide suitable teaching methodologies and evaluation metrics appropriate to the topics.	

Essential Readings:

1. Floyd, Thomas L (2011). Digital fundamentals, 10/e. Pearson Education India.
2. Petzold, C. (2022). Code: The Hidden Language of Computer Hardware and Software. Pearson Education.
3. Goel, Anita (2010). Computer fundamentals. Pearson Education India.
4. Joyce, F.. Programming Logic and Design, Comprehensive
5. MOOC Course CS50's Introduction to Programming with Scratch. https://cs50.harvard.edu/scratch/2024/
6. Kernighan, Brian W (2011). *D is for Digital: What a well-informed person should know about computers and communications*. CreateSpace Independent Publishing Platform.

Assessment Rubrics:

Evaluation Type		**Marks**
End Semester Evaluation		**50 (Theory)** **20 (Practical)**
Continuous Evaluation		**30**
a)	Test Paper- 1	5
b)	Model Exam	10
c)	Assignment(2 numbers)	10
d)	Seminar	5
e)	Book/ Article Review	
f)	Viva-Voce	
g)	Field Report	
Total		**100**

Semester-1: Optional Minor-1.1

KU1DSCCSC102: **INTROUCTION TO MAJOR TRENDS IN INFORMATION TECHNOLOGY**

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
1	DSC	100-199	KU1DSCCSC102	4	75

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
3	2		30	70	100	2hrs.

Course Description:

This course explores the latest trends and innovations in information technology. Students will learn about emerging technologies, their impact on the industry, and how to leverage these technologies in real-world applications. Topics include artificial intelligence, blockchain, cloud computing, cybersecurity, the Internet of Things (IoT), big data analytics, and more.

Course Prerequisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Identify the impact of emerging technologies in the field of IT and real life	U
2	Judge the impact of these technologies on various industries.	An
3	Examine practical applications and case studies of emerging technologies.	A
4	Critically evaluate problem-solving skills in the context of new	A/E

	technological developments.	

Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C)

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1	3						3
CO 2	3	2		3			
CO 3	2	2	2		2		2
CO 4	2	2		3			2

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	**UNIT**	**DESCRIPTION**	**HOURS**
1	**MODULE TITLE:** Introduction to Emerging Technologies		**15**
	1	Overview of current trends in IT The importance of staying updated with technology	
	2	Edge Computing and 5G Technology- Fundamentals of edge computing.	
	3	The impact of 5G on IT infrastructure Examples of edge computing applications	

2	**MODULE TITLE: A**rtificial Intelligence and Machine Learning*		**15**
	1	Fundamentals of AI and ML	
	2	Applications in various industries	
	3	Ethical considerations and challenges	

3	**MODULE TITLE :** Internet of Things (IoT) & Cloud Computing		**15**
	1	Overview of IoT and its components Applications in smart homes, healthcare, and industrial automation	
	2	Security and privacy concerns	
	3	Cloud Computing- Introduction and architecture	
	4	Types of cloud services (IaaS, PaaS, SaaS)	
	5	Benefits and challenges of cloud adoption	

4	**MODULE TITLE: Cybersecurity Trends and Ethical and Social Implications of Emerging Technologies***		**15**
	1	Current cybersecurity threats and vulnerabilities The role of AI in cybersecurity	
	2	Emerging security technologies and practices- The role of AI in cybersecurity	
	3	Ethical considerations in the development and deployment of new technologies - Social impact and the digital divide	
	4	Regulatory and policy issues	

5	**Teacher Specific Module**	
	Directions	
	Teacher can adopt appropriate strategies and methodologies to connect the topics with real life situations and evaluate it.	15

Essential Readings:

1. "Artificial Intelligence: A Modern Approach" by Stuart Russell and Peter Norvig

2. "Cloud Computing: Concepts, Technology & Architecture" by Thomas Erl

3. "Cybersecurity and Cyberwar: What Everyone Needs to Know" by P.W. Singer and Allan Friedman

Semester-1: Optional Minor-1.2
KU1DSCCSC103: Fundamentals of Programming with C

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
1	DSC	100-199	KU1DSCCSC103	4	75

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
3	2	-	30	70	100	2hrs.

Course Description:

Topics include variables, data types, functions, control structures, pointers, strings, arrays and ... Learn the C programming language and its fundamental programming concepts. Gain the knowledge to write simple C language applications and undertake future courses that assume some background in computer programming.

Course Prerequisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Identify the basic syntax and structure of the C programming language	U
2	Design programme codes using data types, conditional and looping statements.2	A
3	Elucidate the use of data structures such as arrays and pointers to solve problems in C	U, A

4	Use advanced programming constructs such as functions and recursion to solve more complex problems	U, A, E
5	Design simple C programs using appropriate programming constructs such as looping statements, conditional statements and functions	A, E, C

Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C)

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1	3			2			
CO 2		2					
CO 3	3	3	2				
CO 4	2	3	2				
CO 5	3	3		2			3

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	**UNIT**	**DESCRIPTION**	**HOURS**
1	MODULE1: Introduction to C and Basic Programming constructs		
	1	Introduction to C	15
		a) History and importance of C	
		b) Basic structure of C	
		c) Executing a C program	
	2	C tokens	
		a) Keywords	
		b)Constants	
		c) Operators	
		Operators	

	3	a) Arithmetic	
		b) Relational	
		c) Logical	
		d) Assignment	
	4	Data types and variables	
		a) Primitive data types	
		b) Variables	
		c) Declaration of variables	
		d) Initialization of variables	

2	**MODULE 2: Input/output operations and control structures**		
	1	Managing input and output operations	15
		a) Reading a character	
		b) Writing a character	
	2	Formatted input and formatted output operations	
		a) printf function	
		b) scanf function	
	3	Branching statements	
		a) Simple if	
		b) if…..else	
		c) else if ladder	
	4	Looping statements	
		a) while	
		b) do while	
		c) for	

3	**MODULE 3:** Arrays and Strings		**15**
	1	One Dimensional array : declaration and initialization	

	2	Two Dimensional array: declaration and initialization	
	3	String: string declaration and initialization	
	4	String handling functions: strlen, strcat, strcpy, strcmp, strrev	

4	**MODULE 4: Functions and Pointers**		
	1	Function	15
		a)Definition	
		b) Advantages of using function	
	2	Elements of function	
		a) Function prototype	
		b) Function definition	
		c) Function calling	
	3	Recursion	
	4	Pointers	
		a) Pointer declaration	
		b)Pointer initialization	
		c)Accessing a variable through pointer	

5	**Teacher Specific Module**	
	Directions	
	Teacher can provide suitable teaching methodologies and evaluation metrics appropriate to the topics.	15

Essential Readings:

1. *E*.Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill
2. YashavantP.Kanetkar, Let Us C, 16th Edition, BPB

Suggested Readings:

1. Brian W.Kernighan and Dennis M. Ritchie, C Programming Language, The Prentice Hall of India
2. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-H

Assessment Rubrics:

Evaluation Type		Marks
End Semester Evaluation		50 (THEORY) 20 (PRACTICAL)
Continuous Evaluation		30
a)	Test Paper- 1	5
b)	Model Examination	10
c)	Assignment(2 number)	10
d)	Seminar	5
e)	Book/ Article Review	
f)	Viva-Voce	
g)	Field Report	
Grand total		**100**

Semester-1: Optional Minor-1.3

KU1DSCCSC104: Office Automation Software

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
1	Minor	100-199	KU1DSCCSC104	4	75

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
3	2		30	70	100	2hrs.

Course Description:

Office Automation program focuses on providing basic training in computers and its most common software which is to be used in Office work. With the help of this program, students will be able to become an expert in Office Automation.

Course Prerequisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Demonstrate proficiency in using word processing software to create, edit, and format professional documents.	U
2	Use essential spreadsheet functions and formulas to analyze and manage data.	U, A
3	Construct visually appealing charts and graphs to effectively communicate data insights.	U, A, C
4	use word processing and worksheet software to solve real world problems	U, A, C

Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C)

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1	3	3		2			2
CO 2	3	3	2				
CO 3	3	3	3	2		3	2
CO 4	3	2					3

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1	**MODULE 1 :Introduction to Word Processing**		
	1	Getting Started with the Interface	15
	2	Creating and Saving Documents	
	3	Text Formatting and Editing Tools	
	4	Styles and Templates	

2	**MODULE 2 :Advanced Word Processing Techniques**		
	1	Working with Tables and Images	15
	2	Creating Headers, Footers, and Page Numbers	
	3	Mail Merge and Creating Form Letters	
	4	Document Security and Protection	

3	**MODULE 3: Introduction to Spreadsheets**		
	1	Understanding Spreadsheets - Cells, Rows, Columns	15
	2	Entering and Editing Data - Data Types & Formatting	
	3	Basic Formulas and Functions	
	4	Creating Charts and Graphs	
	5	Printing and Sharing Spreadsheets	

4	**MODULE 4: Advanced Spreadsheet Techniques**		
	1	Working with Large Datasets - Filtering & Sorting	15
	2	Advanced Functions and Formulas	
	3	Data Analysis Tools (e.g., PivotTables)	
	4	Creating Macros and Automation	

5	**Teacher Specific Module**	
	Directions	
	Provide appropriate methodologies and evaluation metrics according to the teachers perspective	15

Essential Readings:

1. **Microsoft Word:**
    - "Getting Started with Microsoft Word: [Book Title about MS Word, Latest Edition]" by [Author(s)] ([Publisher Year]) - This book provides a foundational understanding of core functionalities in Microsoft Word.
    - "Microsoft Word Power Programming: [Book Title about Advanced MS Word, Latest Edition]" by [Author(s)] ([Publisher Year]) - For students interested in exploring advanced features and automation techniques in Word.
2. **Microsoft Excel:**

- "Excel Formulas and Functions for Beginners: [Book Title about MS Excel Formulas, Latest Edition]" by [Author(s)] ([Publisher Year]) - A helpful guide to grasp essential formulas and functions in Microsoft Excel.
- "Data Analysis with Microsoft Excel: [Book Title about MS Excel Data Analysis, Latest Edition]" by [Author(s)] ([Publisher Year]) - This book delves into data analysis techniques and tools within Microsoft Excel.

Google Workspace:

1. "The Complete Guide to Google Docs: [Book Title about Google Docs, Latest Edition]" by [Author(s)] ([Publisher Year]) - A comprehensive guide to using Google Docs and its functionalities.
2. "Mastering Google Sheets: [Book Title about Google Sheets, Latest Edition]" by [Author(s)] ([Publisher Year]) - An in-depth exploration of Google Sheets features and data analysis capabilities.

Assessment Rubrics:

Evaluation Type		**Marks**
End Semester Evaluation		**50 (Theory)** **20 (Practical)**
Continuous Evaluation		**30**
a)	Test Paper- 1	5
b)	Model exam	10
c)	Assignment(2 numbers)	10
d)	Seminar	5
e)	Book/ Article Review	
f)	Viva-Voce	
g)	Field Report	
Total		**100**

Semester-1: Optional Minor-2.1

KU1DSCCSC105: Introduction to Web Programming

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
1	Minor	100-199	KU1DSCCSC105	4	75

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
3	2		30	70	100	2hrs.

Course Description:

The course helps to design and practice real-world homepage programs and earn adequate experience with current web design techniques such as HTML5 and cascading style sheets.

Course Prerequisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Identify different components in web technology and WWW	U, A
2	Use HTML Forms and CSS Styling to design web pages.	U, A
3	Examine the HTML Frames and its applications	U, A
4	Design interactive Web pages	U, A, E

Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C)

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1	3			3			
CO 2	3			3			
CO 3	3	3					
CO 4	3	3					

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1	MODULE 1 : Introduction to Internet and WWW		
	1	Introduction to Internet	15
		a) Evolution of the Internet	
		b) World Wide Web	
		c) Web Browsers, URL, http	
	2	Web Basics	
		a) Static Vs Dynamic web pages	
		b) Client-Side Scripting versus Server-Side Scripting	
	3	W3C & Web hosting	
		a) World Wide Web Consortium (W3C)	
		b)Web hosting, types of web hosting, Free hosting	
	4	Domain Name Registration	

2	**MODULE 2: HTML**		
		Introduction to HTML	15

	1	a) Creating HTML document	
		b) Tags & attributes, syntax of tag	
		c) Starting and ending tag, tag without end, building a webpage	
	2	Text formatting	
		a) Division	
		b) Paragraphs & heading	
		c) Physical style tags, text alignment, fonts	
	3	Hyperlink and loading images	
		a) Linking to other web pages	
		b) Images and <img> tag	
		c) Line breaks, comments	
	4	List: types of list, nested list	

	MODULE 3: HTML Tables and Forms		
3	1	HTML Tables: creating a table, table tags and attributes, formatting the table: width, height, align, border, padding & spacing, colspan&rowspan	15
	2	HTML Forms: Form elements (input, select, textarea, button, datalist), Input types (text, password, submit, radio, checkbox, date, email, number)	
	3	Input type attributes (value, readonly, disabled, maxlength, autocomplete, list, min, max, placeholder)	
	4	HTML5 form validation (required and pattern attribute of input type)	

	MODULE 4: HTML Frames and CSS		
4	1	Frames: <frame>tag, frame attributes: src, name, frameborder and scrolling	15
	2	Frameset tag and its important attributes, <iframe>, <noframe>	
	3	Applying style to HTML using CSS: Inline, internal and external CSS	
	4	CSS Colours, Fonts, Borders, padding, Applying style using class and id attribute	

5	**Teacher Specific Module**	
	Directions	15
	Provide appropriate methodologies and evaluation metrics according to the teachers perspective	

Essential Readings:

1. Internet and World Wide Web How to program, P.J. Deitel & H.M. Deitel Pearson

2. An Introduction to WEB Design and Programming –Wang-Thomson **Technologies**, Black Book,Dream tech Press

3. Internet & World Wide Web How to Program, 5/e – Paul J Deitel, Harvey M Deital, AbbaeyDeital

4. Julie C. Meloni, HTML and CSS in 24 Hours, Sams Teach Yourself (Updated for HTML5 and CSS3), Ninth Edition

Suggested Readings:

1. Mastering HTML, CSS &Javascript Web Publishing Paperback,2016 - by Laura Lemay, Rafe Colburn & Jennifer Kyrnin , BPB Publications

2. HTML & CSS: The Complete Reference, Fifth Edition - Thomas a Powell, Tata McGraw Hill

Assessment Rubrics:

Evaluation Type		**Marks**
End Semester Evaluation		**50 (Theory)** **20 (practical)**
Continuous Evaluation		**30**
a)	Test Paper- 1	5
b)	Model exam	10
c)	Assignment(2 number)	10
d)	Seminar	5

e)	Book/ Article Review	
f)	Viva-Voce	
g)	Field Report	
Grand Total		**100**

Semester-1: Optional Minor-2.2

KU1DSCCSC106: Python for Data Analytics

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
1	Minor	100-199	KU1DSCCSC106	4	75

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
3	2		30	70	100	2hrs.

Course Description:

The course introduces students to the Python programming language using an embedded programming environment. The modules explore if-statements and loops to illustrate concepts of flow-control and iteration and also some data visualisation tools.

Course Prerequisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Identify the basics of Python and identify the data types in Python	U
2	Design programmes using various python features like operators, control structures and other python objects.	U, A
3	Differentiate the usage of functions, modules and file handling in python from other languages	U, An
4	Design programmes using built-in modules	U, C
5	Use various visualization tools in python to draw graphs and plots.	U, A

Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C)

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1	3	2		2			2
CO 2	2	3		2			
CO 3	3	3	2				2
CO 4	2	3	2				
CO 5	2	3	3	2			3

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1	**MODULE 1:**		
	1	Features of Python, Different Methods to Run Python, Basic Elements (Objects, Expressions, Numerical Types, Strings, Variables),	15
	2	Comments, Indentation in Python, Input and Output in Python, import function, Operators in Python	
	3	Branching (if, else, elif), Iteration (while, for), range and enumerate functions	
	4	Tuples, Lists, Sets, Dictionaries, Built-in methods of lists, sets and dictionaries, Mutable and Immutable Objects.	

2	**MODULE 2:**		
	1	Functions Definition, Function Calling, Function Arguments,	15

		Recursion	
	2	Modules, Built-in Modules (math, statistics), Creating Modules	
	3	File Handling (Opening, Closing, Writing, Reading)	
	4	Exceptions, Built-in Exceptions (IndexError, OverflowError, ZeroDivisionError, RuntimeError), Exception Handling.	

3	**MODULE 3:**		
	1	Object oriented programming concepts, Class Definition, Object Creation	15
	2	Built-in Attributes, Methods, Encapsulation, Data Hiding	
	3	Inheritance (simple inheritance, Multi-level inheritance	
	4	Polymorphism (Method Overriding, Operator Overloading)	

4	**MODULE 4**		
	1	numpy module - Creating Arrays (array, zeros, ones, empty, linspace, arrange, random),Two-Dimensional Array (Indexing, Slicing, Iterating)	15
	2	Data Visualization using Python, matplotlib Module, pyplot, plot(), hist, scatter, bar charts	
	3	Formatting, figure(), subplot(), text(), xlabel(), ylabel(), title()	
	4	Plotting Simple Mathematical Functions (sin x, x2)	

5	**Teacher Specific Module**	
	Directions	
	Provide appropriate methodologies and evaluation metrics suitable to the topics.	15

Essential Readings:

1. Python programming by Reema Thareja

2. Learn Python Programming - by Fabrizio Romano

3.Introducing Python, 2nd Edition by Bill Lubanovic

4. Python programming by Reema Thareja

5. Fluent Python, 2nd Editionby Luciano Ramalho

Assessment Rubrics:

Evaluation Type		**Marks**
End Semester Evaluation		**70**
Continuous Evaluation		**30**
a)	Test Paper- 1	5
b)	Model Examination	10
c)	Assignment- 2 Numbers	10
d)	Seminar	5
e)	Book/ Article Review	
f)	Viva-Voce	
g)	Field Report	
Total		**100**

Semester-1: Optional Minor-2.3

KU1DSCCSC107: Essentials of Information Technology.

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
1	DSC	100-199	KU1DSCCSC107	4	75

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
3	2		30	70	100	2hrs.

Course Description:

Computer Fundamentals courses provide a comprehensive introduction to basic computer concepts and skills. Topics covered include hardware, software, operating systems, networking, and troubleshooting. Gain essential knowledge to navigate the digital world effectively.

Course Prerequisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Identify various components of Computer system	U /R
2	Discuss various Logic Gates and their features.	U /R
3	Identify the basics of programming	U
4	Design effective and error free programs in C	A

Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C)

Mapping of Course Outcomes to PSOs

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1	3						
CO2	3		3				
CO3		2	3	3			
CO4	3	3	3				

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1	**MODULE 1:**		
	1	**Introduction to Computers:** Definition and Characteristics of Computers, Brief History and Evolution of Computers. Computer System Overview, Basic Components of a Computer System - Input, Output, Processing, and Storage.	15
	2	**Central Processing Unit (CPU):** Basic Concepts of CPU, Function and Components, Architecture of a CPU - ALU, Registers, and Control Unit, How a CPU Executes Instructions - Fetch-Decode-Execute Cycle.	
	3	**System Memory and Storage:** Memory Hierarchy - An Overview, Primary Memory - RAM (Random Access Memory) and ROM (Read-Only Memory) - Types and Functions, Secondary Memory - Hard Drives, SSDs, USB Drives (Overview and Basic Working Principle), Introduction to Cache Memory - Purpose and Basic Functioning.	
	4	**Motherboard and Internal Components:** Components Inside a Computer Cabinet - Motherboard, BIOS, CMOS Chip, Ports and Interfaces - USB, HDMI, Ethernet. Expansion Slots and Cards - GPU, Sound Card, Network Card, Storage Devices - HDD, SSD, Optical	

		Drives (Basic Concepts only	

2	**MODULE 2:**		
	1	**Introduction to Data Representation:** Decimal, Binary, Hexa-Decimal and Octal Number Systems, Conversion Between Number Systems.	15
	2	**Binary Arithmetic and Complements:** Binary addition, subtraction, multiplication and division, Complements of Binary Numbers (1's Complement and 2's Complement)	
	3	**Advanced Number Systems:** Signed Numbers, Floating Point Numbers - Representation of Real Numbers in Binary, IEEE Floating Point Standard, Examples and Applications	
	4	**Special Codes and Unicode:** Binary Coded Decimal (8421 BCD Code, Applications, BCD Addition), Gray Code, ASCII Code, Unicode	

3	**MODULE 3:**		
	1	**Introduction to Software:** Types of Software - Application software, System Software, Operating Systems - Basics Function, examples,	15
	2	**Software Licensing and Acquisition:** Retail, OEM, Demo, Shareware, Freeware, Open-Source Software.	
	3	**Programming Languages:** Types, Basic Concepts of Compiler, Assembler, Interpreter, Linker and Loader, Source code and Object code, Program Development Life Cycle.	
	4	**Algorithmic Thinking:** Algorithm, Flowcharts, Examples	

4	**MODULE 4:**		
	1	**Introduction to Computer networks:** Data Communication System and Its Components, advantages of networking., hardware components	

		of networking	15
	2	Data Flow, digital and analog signals, types of Connection and Topologies, LAN, MAN, WAN, internet.	
	3	Digital Transmission -Transmission Modes, transmission media	
	4	Hands on training in software installation and Common trouble shooting problems with computer hardware.	

5	**Teacher Specific Module**	
	Directions	
	Provide appropriate methodologies and evaluation metrics suitable to the topics.	15

Essential Readings:

1. Kernighan, Brian W (2011). D is for Digital: What a well-informed person should know about computers and communications. CreateSpace Independent Publishing Platform.
2. Goel, Anita (2010). Computer fundamentals. Pearson Education India.
3. Floyd, Thomas L (2011). Digital fundamentals, 10/e. Pearson Education India.
4. Petzold, C. (2022). *Code: The Hidden Language of Computer Hardware and Software*. Pearson Education.
5. Kernighan, Brian W (2011). *D is for Digital: What a well-informed person should know about computers and communications*. CreateSpace Independent Publishing Platform
6.Forouzan, B. A., &Fegan, S. C. New York: “Data communications and networking”, McGraw-Hill
Higher Education, 2007.
7.Andrew S. Tanenbaum, "Computer Networks", 4th ed., Prentice Hall, 2003.

Suggested Readings:

1. https://www.geeksforgeeks.org/

2. https://www.sciencedirect.com/

3.https://www.tutorialspoint.com

Assessment Rubrics:

Evaluation Type		Marks
End Semester Evaluation		**50 (theory)** **20 (practical)**
Continuous Evaluation		**30**
a)	Test Paper- 1	5
b)	Model exam	10
c)	Assignment(2 numbers)	10
d)	Seminar	5
e)	Book/ Article Review	
f)	Viva-Voce	
g)	Field Report	
Total		**100**

Multi-Disciplinary Courses (MDC)

Semester-1: MDC-1.1

KU1MDCCSC101:Fundamentals of Computers

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
1	MDC	100-199	KU1MDCCSC101	3	45

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
3	0		25	50	75	1.5 hrs

Course Description:

Computer Fundamentals courses provide a comprehensive introduction to basic computer concepts and skills. Topics covered include hardware, software, operating systems, networking, and troubleshooting. Gain essential knowledge to navigate the digital world effectively.

Course Prerequisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Identify various components of Computer system.	U /R
2	Discuss Digital System and Logic Gates.	U /R
3	Identify the basics of programming.	U
4	Design effective and error free programs in C.	A

****Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C)***

Mapping of Course Outcomes to PSOs

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1	3						
CO2	3		3				
CO3		2	3	3			
CO4	3	3	3				

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1	**MODULE TITLE**		
	1	**Introduction to Computers:** Definition and Characteristics of Computers, Brief History and Evolution of Computers. Computer System Overview, Basic Components of a Computer System - Input, Output, Processing, and Storage.	9
	2	**Central Processing Unit (CPU):** Basic Concepts of CPU, Function and Components, Architecture of a CPU - ALU, Registers, and Control Unit, How a CPU Executes Instructions - Fetch-Decode-Execute Cycle.	
	3	**System Memory and Storage:** Memory Hierarchy - An Overview, Primary Memory - RAM (Random Access Memory) and ROM (Read-Only Memory) - Types and Functions, Secondary Memory - Hard Drives, SSDs, USB Drives (Overview and Basic Working Principle), Introduction to Cache Memory - Purpose and Basic Functioning.	
	4	**Motherboard and Internal Components:** Components Inside a Computer Cabinet - Motherboard, BIOS, CMOS Chip, Ports and Interfaces - USB, HDMI, Ethernet. Expansion Slots and Cards - GPU, Sound Card, Network Card, Storage Devices - HDD, SSD, Optical	

		Drives (Basic Concepts only	

2	**MODULE TITLE**		
	1	**Introduction to Data Representation:** Decimal, Binary, Hexa-Decimal and Octal Number Systems, Conversion Between Number Systems.	9
	2	**Binary Arithmetic and Complements:** Binary addition, subtraction, multiplication and division, Complements of Binary Numbers (1's Complement and 2's Complement)	
	3	**Advanced Number Systems:** Signed Numbers, Floating Point Numbers - Representation of Real Numbers in Binary, IEEE Floating Point Standard, Examples and Applications	
	4	**Special Codes and Unicode:** Binary Coded Decimal (8421 BCD Code, Applications, BCD Addition), Gray Code, ASCII Code, Unicode	

3	**MODULE TITLE**		
	1	**Introduction to Software:** Types of Software - Application software, System Software, Operating Systems - Basics Function, examples,	9
	2	**Software Licensing and Acquisition:** Retail, OEM, Demo, Shareware, Freeware, Open-Source Software.	
	3	**Programming Languages:** Types, Basic Concepts of Compiler, Assembler, Interpreter, Linker and Loader, Source code and Object code, Program Development Life Cycle.	
	4	**Algorithmic Thinking:** Algorithm, Flowcharts, Examples	

4	**MODULE TITLE**		
	1	**Introduction to Computer networks:** Data Communication System and Its Components, advantages of networking., hardware components	

		of networking	9
	2	Data Flow, digital and analog signals, types of Connection and Topologies, LAN, MAN, WAN, internet.	
	3	Digital Transmission -Transmission Modes, transmission media	
	4	Hands on training in software installation and Common trouble shooting problems with computer hardware.	

5	**Teacher Specific Module**	
	Directions	
	Provide appropriate methodologies and evaluation metrics suitable to the topics.	9

Essential Readings:

1. Kernighan, Brian W (2011). D is for Digital: What a well-informed person should know about computers and communications. CreateSpace Independent Publishing Platform.
2. Goel, Anita (2010). Computer fundamentals. Pearson Education India.
3. Floyd, Thomas L (2011). Digital fundamentals, 10/e. Pearson Education India.
4. Petzold, C. (2022). *Code: The Hidden Language of Computer Hardware and Software*. Pearson Education.
5. Kernighan, Brian W (2011). *D is for Digital: What a well-informed person should know about computers and communications*. CreateSpace Independent Publishing Platform
6.Forouzan, B. A., &Fegan, S. C. New York: “Data communications and networking”, McGraw-Hill
Higher Education, 2007.
7.Andrew S. Tanenbaum, "Computer Networks", 4th ed., Prentice Hall, 2003.

Suggested Readings:

1. https://www.geeksforgeeks.org/

2. https://www.sciencedirect.com/

3.https://www.tutorialspoint.com

Assessment Rubrics:

Evaluation Type		Marks
End Semester Evaluation		**50**
Continuous Evaluation		**25**
a)	Test Paper- 1	5
b)	Model exam	10
c)	Assignment(2 numbers)	5
d)	Seminar	5
e)	Book/ Article Review	
f)	Viva-Voce	
g)	Field Report	
Total		**75**

Semester-1: MDC-1.2

KU1MDCCSC102: Basics of Information Storage and Retrieval System

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
1	MDC	100-199	KU1MDCSC102	3	45

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
3	0	-	25	50	75	1.5hrs.

Course Description:

This course introduces students to the fundamental concepts of databases and their design. It covers various aspects of database management systems (DBMS), including relational database concepts, database design principles, and database management. Students will learn to design and implement databases using SQL and ER modeling techniques. The course also explores advanced topics such as database administration, security, and emerging trends in databases.

Course Prerequisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Discuss the basics of databases and their importance.	U
2	Design and implement relational databases using SQL.	U, A, C
3	Use the concept of normalization and de-normalization techniques in database design.	U, A, An

4	Use security, backup, and recovery strategies to manage databases effectively.	U, E

Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C)

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1	3			2			
CO 2	3	3	3			2	2
CO 3	3		2				
CO 4	3		2	2			

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1	**MODULE 1: Introduction to Databases**		
	1	Overview of databases and their importance	9
	2	Basic concepts: data, information, database management system (DBMS)	
	3	Data Models: Introduction to hierarchical, network, and relational data models.	
	4	Examples of database applications in real life	

2	**MODULE 2: Relational Database concepts**		
	1	Understanding tables, rows, columns, and keys	9
	2	Introduction to SQL (Structured Query Language)	
	3	Basic SQL queries: SELECT, INSERT, UPDATE, DELETE	
	4	Relational database design principles: normalization and de-	

		normalization	

3	**MODULE 3: Database Design**		
	1	Entity-Relationship (ER) modelling	9
	2	Creating ER diagrams to represent relationships between entities	
	3	Converting ER diagrams to relational schemas	
	4	Advanced SQL concepts: joins, subqueries	

4	**MODULE 4: Database Management and Application**		
	1	Database administration and security	9
	2	Backup and recovery strategies	
	3	Introduction to data warehousing and data mining	
	4	Recent trends in databases	

5	**Teacher Specific Module**	
	Directions	
	Teacher can select suitable methodologies and evaluation metrics appropriate to the topics.	9

Essential Readings:

1. Database System Concepts" by Abraham Silberschatz, Henry F. Korth, and S. Sudarshan, **McGraw-Hill**
2. Database Management Systems" by Raghu Ramakrishnan and Johannes Gehrke
3. A Guide to the SQL Standard, C. J. Date and Hugh Darwen, 1997, Addison- Wesley
4. https://www.w3schools.com/sql/

Suggested Readings:

1. An Introduction to Database Systems, C. J. Date, 8th edition.
2. Understanding the New SQL, Jim Melton and Alan R. Simon, Morgan Kaufmann

Assessment Rubrics:

Evaluation Type		Marks
End Semester Evaluation		**50**
Continuous Evaluation		**25**
a)	Test Paper- 1	5
b)	Model exam	10
c)	Assignment	5
d)	Seminar	5
e)	Book/ Article Review	
f)	Viva-Voce	
g)	Field Report	
Total		**75**

Sample Questions to test Outcomes.

1. What is a database, and why are databases important in modern information systems?
2. How does a database management system (DBMS) help in managing data?
3. Create a SQL query to create a new table named "Students" with columns for ID, Name, and Age.
4. Write a SQL query to insert a new record into the "Students" table.
5. Explain the concept of normalization in database design. Why is it important?
6. Describe the importance of database security. What are some common security measures for databases?

Employability for the Course / Programme:

Completion of the "Database Concepts and Design" course equips students with fundamental skills in designing and managing relational databases using SQL. Through practical exercises and projects, students learn to analyze data requirements, optimize database design, and ensure data security and integrity. With these skills, graduates are well-prepared for roles in database administration, data analysis, and database development across diverse industries.

Semester-1: MDC-1.3

KU1MDCSC103: Digital Marketing

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
1	MDC	100-199	KU1MDCCSC103	3	45

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
3	0	-	25	50	75	1.5 hrs

Course Description:

In today's digital age, mastering the art of digital marketing is crucial for businesses to thrive. This course provides a comprehensive understanding of the core principles and strategies involved in promoting a brand or product online. Students will explore various digital channels, gain hands-on experience with essential tools, and develop the skills to create and manage effective digital marketing campaigns

Course Prerequisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Locate the digital marketing landscape and its impact on consumer behavior.	U, An
2	Implement a comprehensive digital marketing strategy aligned with business objectives.	U, A
3	Utilize various digital channels (SEO, SEM, Social Media, Email Marketing) to reach target audiences effectively.	U, E
4	Design engaging content that resonates with target audiences and drives conversions.	U, A, C
5	Discuss campaign performance using key metrics and data	U, An

	insights.	

Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C)

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1	3			2		2	2
CO 2	2	3					2
CO 3	3		2	3		2	2
CO 4	2			3		3	3
CO 5				2	2	3	2

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	**UNIT**	**DESCRIPTION**	**HOURS**
1	**MODULE 1: Foundations of Digital Marketing**		
	1	Introduction to Digital Marketing - Terminology & Landscape Overview	9
	2	Understanding Customer Behavior in the Digital Age	
	3	Developing a Buyer Persona and Targeting Strategies	
	4	Setting SMART Goals and Measuring Success in Digital Marketing	

2	**MODULE 2: Content Marketing & SEO**		
	1	Content Strategy & Development - Creating Engaging Content Across	9

		Channels	
	2	Search Engine Optimization (SEO) Principles - Optimizing Websites for Search Visibility	
	3	Keyword Research & Content Planning for Improved Ranking	
	4	Content Marketing Platforms and Tools	

3	**MODULE 3: Social Media Marketing & Paid Advertising**		
	1	Social Media Marketing Strategies - Building Brand Communities on Key Platforms	9
	2	Engaging Content Creation for Social Media Channels	
	3	Paid Advertising Fundamentals - Introduction to PPC (Pay-Per-Click) Advertising	
	4	Social Media Advertising Platforms and Campaign Management	

4	**MODULE 4: Email Marketing & Analytics**		
	1	Effective Email Marketing Strategies - Building Email Lists and Segmentation	9
	2	Crafting Compelling Email Campaigns - Design & Copywriting Techniques	
	3	Email Marketing Automation Tools and Best Practices	
	4	Data Analysis for Digital Marketing - Key Performance Indicators (KPIs) & Tracking Tools	

5	**Teacher Specific Module**	
	Directions	
	Provide appropriate learning strategies, methodologies and evaluation metrics	9

Essential Readings:

- Choose a recent edition textbook that covers the core concepts and strategies of digital marketing. Here are some examples:
    - "Digital Marketing: A Practical Approach" by Philip Kotler and Kevin Lane Keller ([Publisher Year])
    - "Social Media Marketing: The Complete Idiot's Guide" by Lisa Guernsey ([Publisher Year]) (This is a good option for beginners)
    - "Search Engine Optimization (SEO): The Complete Guide" by Eric Enge, Stephan Spencer, and Jessie Stricchiola ([Publisher Year]) (Focuses on SEO aspects)

E-Sources (Websites/Weblinks):

- **Industry Blogs and Articles:**
    - Search Engine Land (https://searchengineland.com/) - Provides news and insights on SEO and SEM.
    - Social Media Today (https://www.socialmediatoday.com/) - Covers trends and best practices in social media marketing.\
    - Moz Blog (https://moz.com/blog) - Offers valuable resources on SEO and content marketing.
- **Official Resources:**
    - Google Digital Garage (https://learndigital.withgoogle.com/digitalgarage) - Free online courses from Google on various digital marketing topics.
    - Facebook Blueprint (https://www.facebook.com/business/learn) - Learning resources from Facebook for advertising and marketing on their platform.

Additional Considerations:

- Case studies: Include a selection of real-world case studies that showcase successful digital marketing campaigns. These can be found online or in industry publications.
- **Academic Journals:** While not always compulsory, scholarly articles from marketing journals can provide deeper insights into specific digital marketing topics. Your library might offer access to relevant databases.

Suggested Readings:

In addition to the core textbook required for your digital marketing course, here are some suggested readings to broaden your knowledge and stay updated on the ever-evolving digital marketing landscape:

Books:

- **General Digital Marketing:**
    - "Marketing in the Digital Age" by Thomas C. Duncan ([Publisher Year]) - Explores the impact of digital technologies on marketing strategies.
    - "Digital Marketing Strategy: An Integrated Approach" by Simon P. Wood ([Publisher Year]) - Provides a framework for developing and implementing a comprehensive digital marketing strategy.
- **Specific Areas of Digital Marketing:**
    - "The Art of SEO: Mastering Search Engine Optimization" by Eric Enge, Stephan Spencer, and Jessie Stricchiola ([Publisher Year]) - An in-depth exploration of Search Engine Optimization (SEO) strategies.
    - "Jab, Jab, Jab, Right Hook: How to Tell Your Story in a Noisy Social World" by Gary Vaynerchuk ([Publisher Year]) - Offers practical advice on content marketing and social media engagement.
    - "Paid Advertising: Strategies for Search Engine Marketing, Display Advertising, Social Media Marketing and More" by Kenneth C. Laudon ([Publisher Year]) - Focuses on paid advertising strategies across various digital channels.

E-Sources (Websites/Weblinks):

- **Industry News and Reports:**
    - WordStream Blog (https://www.wordstream.com/blog) - Offers data-driven insights and marketing advice.
    - Marketing Land ([invalid URL removed]) - Covers a wide range of digital marketing topics with daily news updates.
    - eMarketer (https://www.emarketer.com/) - Provides in-depth market research reports on various aspects of digital marketing (subscription required).
- **Social Media Marketing Resources:**
    - Hootsuite Social Media Blog (https://blog.hootsuite.com/) - Focused on social media management and marketing strategies.
    - Social Media Examiner (https://www.socialmediaexaminer.com/) - Provides social media marketing news, tips, and case studies.

Assessment Rubrics:

Evaluation Type		Marks
End Semester Evaluation		**50**
Continuous Evaluation		**25**
a)	Test Paper- 1	5
b)	Model exam	10
c)	Assignment	5
d)	Seminar	5
e)	Book/ Article Review	
f)	Viva-Voce	
g)	Field Report	
Total		**75**

SAMPLE QUESTIONS TO TEST OUTCOMES:

1. Understanding SEO (Multiple Choice):

Which of the following is NOT a factor that search engines consider when ranking websites?

a) Keyword relevance in website content b) Mobile-friendliness of the website c) The number of social media followers a brand has d) Backlinks from high-authority websites

2. Social Media Marketing Strategy (Short Answer):

You are developing a social media marketing strategy for a new clothing brand targeting young adults (18-25 years old). Briefly outline two key social media platforms you would focus on and explain your reasoning for each choice.

3. Content Marketing (Essay):

Discuss the importance of creating high-quality content in a digital marketing strategy. Explain two different content formats (e.g., blog posts, infographics) that can be used for content marketing and how they can benefit businesses.

4. Digital Marketing Analytics (True/False):

Website traffic is the only key metric to measure the success of a digital marketing campaign. (True/False)

5. Paid Advertising (Short Answer):

Describe two different paid advertising models commonly used in digital marketing (e.g., Pay-Per-Click, Cost-Per-Acquisition). Briefly explain the advantages and disadvantages of each model for businesses.

EMPLOYABILITY FOR THE COURSE:

The digital marketing landscape is booming, and the demand for skilled professionals is high. Taking a course in Digital Marketing can significantly boost your employability in several ways:

- **High Demand & Growth:** The digital marketing field is experiencing rapid growth, creating a constant need for qualified individuals.
- **Diverse Job Opportunities:** Digital marketing skills are applicable across various industries. You could find work in marketing agencies, e-commerce businesses, social media management firms, or even manage your own freelance digital marketing services.
- **Adaptable Skillset:** The knowledge you gain in this course equips you with a versatile skillset. You'll learn about SEO, social media marketing, content creation, and data analysis, all valuable for various digital marketing roles.
- **Competitive Advantage:** Standing out in a competitive job market is crucial. A strong understanding of digital marketing showcases your knowledge of current marketing trends and demonstrates your ability to reach target audiences effectively in the digital age.

Semester-2

KU2DSCCSC108: Advanced Programming with C

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
2	Major	100-199	KU2DSCCSC108	4(3T+1P)	75

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
3	2	-	30	70	100	2hrs.

Course Description:

The course enables to use advanced C programming language constructs and techniques to create more structured and portable code. Topics included various data storing structures like Arrays, Structure, union, Functions and File concepts Use advanced pointer concepts to allow very flexible data access and create arrays of pointers, arrays of structures and unions, and pointers to arrays of structures and unions.

Course Prerequisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Design programmes using arrays and strings	A
2	Differentiate various types of data structures like structure and union and develop skills to write programme using pointers, structure and union.	U/A
3	Identify the usage of function and apply the functions in programming	U/A

4	Discuss the usage of file concept in programming	An
5	Use various data accessing and storing concepts in C language and write programme code to solve real life problems.	A/An

Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C)

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO7
CO 1	3	3	2			1	
CO 2	3	3	2			1	
CO 3	3	3	2			1	
CO 4	3	3	2			1	
CO 5	3	3	2			1	2

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1	**ARRAYS AND STRINGS**		
	1	Arrays	15
		a) Declaration and Initialization, 1-Dimensional Array, 2-Dimensional Array	
		b) Simple programs covering arrays like Linear search program, bubble sort program	
	2	Strings	
		a) String declaration and Initialization	
	3	b) String processing: In built String handling functions (strlen, strcpy, strcat and strcmp etc)	
		c) Simple programs strings	

2	**STRUCTURE,UNION AND POINTERS**		
	1	Structure	15
		a) Structure declaration and Initialization	
	2	Union	
		a) Union declaration and Initialization	
		b) Simple programs using union and difference between structure and union	
	3	Basics of Pointer	
		a) Declaring pointers, accessing data though pointers	
		b) NULL pointer	
		c) Array access using pointers	

3	**INTRODUCTION TO MODULAR PROGRAMMING**		
	1	Functions	15
		a) Writing functions, formal parameters, actual parameters	
		b) Pass by Value	
	2	Recursion	
	3	Arrays as Function Parameters	
	4	Structures as Function Parameters	
	5	Pass by reference effect	
	6	Storage Classes	
	7	Scope and life time of variables	
	8	Simple programs using functions	

4	**FILES AND COMMAND LINE ARGUMENTS**		
	1	File Operations	15
		a) open, close, read, write, append	
		b) Sequential access and random access to files: In built file handling functions (rewind(), fseek(), ftell(), feof(), fread(), fwrite()), c) Writing and Reading Structure in Text Format	
		d)Writing and Reading in Binary Format	

	2	Command line arguments	
		a) Command Line Argument	
		b) Variable Number of Arguments	
		c)**a to i()**	

5	**Teacher Specific Module**	**5**
	GROUP PROJECT	
	Project using C programming	5

Essential Readings:

1.Schaum Series, Gottfried B.S.,Tata McGraw Hill,Programming with C

2. E. Balagurusamy, Mcgraw Hill,Programming in ANSI C

3. Asok N Kamthane, Pearson,Programming in C

4. Anita Goel, Pearson, Computer Fundamentals

Suggested Readings:

1. Anita Goel and Ajay Mittal, Pearson, Computer fundamentals and Programming in C

2. Brian W. Kernighan and Dennis M. Ritchie, Pearson, C Programming Language

3. Rajaraman V, PHI, Computer Basics and Programming in C

4. Yashavant P, Kanetkar, BPB Publications, Let us C

List of Sample programs:

WEEK 1: ARRAYS

1. Read n integers, store them in an array. Insert a new integer value at a particular position in this array.
2. Read n integers, store them in an array and search for an element in the array using an algorithm for Linear Search.
3. Read n integers, store them in an array and sort the elements in the array using Bubble ort Algorithm.

WEEK 2 : TWO DIMENTIONAL ARRAYS

1. Write a menu driven program for performing operations on matrix

(i) Read a matrix

(ii) Find the sum of two matrices

(iii) Find the transpose of a matrix

(iv) Display a matrix.

WEEK 3: STRING OPERATIONS

1. Read a string (word), store it in an array and check whether it is a palindrome word or not.
2. Read a string and count the occurrences of a given word in the input string.
3. Read a string (ending with a $ symbol), store it in an array and count the number of vowels, consonants and spaces in it.

WEEK 4: STRUCTURE

1. Create a structure to store the name, UID, marks of five subjects of students in a class. Display the rank list of the students.
2. Using structure, read and print data of n employees (Name, Employee Id and Salary)

WEEK 5: UNION

1. Declare a union containing 5 string variables (Name, House Name, City Name, State and Pin code) each with a length of C_SIZE (user defined constant). Then, read and display the address of a person using a variable of the union.

WEEK 6: FUNCTIONS

1. Read a string (word), store it in an array and obtain its reverse by using a user defined function.
2. Find the sum of digits of a number using a user defined function.
3. Read an array and perform bubble sort passing the array to a user defined function

WEEK 7: POINTERS

1. Do the following using pointers

   i) Add two numbers

   ii) Swap two numbers using a user defined function

4. Input and Print the elements of an array using pointers.
5. Compute sum of the elements stored in an array using pointers and user defined function.

WEEK 8: FILES

1. Create a file and perform the following

i) Write data to the file

ii) Read the data in a given file & display the file content on console

iii) Append new data and display on console

2. Open a text input file and count number of characters, words and lines in it; and store the results in an output file.

WEEK 9: COMMAND LINE ARGUMENTS

1. Program to illustrate the use of command line arguments and atoi()

Assessment Rubrics:

Evaluation Type		**Marks**
End Semester Evaluation		**50 (Theory)** **20 (Practical)**
Continuous Evaluation		**30**
a)	Test Paper- 1	5
b)	Model exam	10
c)	Assignment(2 numbers)	10
d)	Seminar	5
e)	Book/ Article Review	
f)	Viva-Voce	
g)	Field Report	
Grand Total		**100**

Semester-2: Optional Minor-3.1

KU2DSCCSC109: Data Management Platform

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
2	DSC	100-199	KU2DSCCCSC109	4	75

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
3	2		30	70	100	2hrs.

Course Description:

This course introduces the core principles and techniques required in the design and implementation of database systems. This course focus on relational database management systems, including database design theory: E-R modeling, data definition and manipulation languages, database security and administration.

Course Prerequisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Understand the concept of database management system and identify its advantages over manual file keeping	U
2	Understand the need of data modelling and identify the advantages and disadvantages among the models	U
3	Able to write queries using SQL to manipulate data	A
4	Apply the knowledge of data types and other functions in data storage and retrieval	A

5	Apply skills in joining relations for better data management	C

Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C)

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1	3	2	2				
CO 2	2			2			
CO 3	3	3	3			2	2
CO 4	2	3	3				2
CO 5	3	2	3			2	3

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1	**MODULE 1: DBMS introduction**		
	1	Overview of Databases - Definition and purpose of databases –Types of database management system	15
	2	Significance of databases in modern applications and industries-Transaction management	
	3	View of Data, Data Models-relational-hierarchical-network and E-R model	
	4	Database architecture – Storage manager-Query Processor.Database users	

2	**MODULE 2: Data representation**		
		Entity-Relationship Model - Understanding entities, attributes, and relationships - Designing Entity-Relationship Diagrams (ERDs) -	15

	1	Cardinality and participation constraints in ER modelling	
	2	Entity-Relationship Model - Understanding entities, attributes, and relationships - Designing Entity-Relationship Diagrams (ERDs) - Cardinality and participation constraints in ER modelling	
	3	Creating Tables and Relationships - Implementing ER model into relational tables	
	4	Defining key and constraints in a relation. Primary and foreign keys - Establishing relationships between tables - Enforcing referential integrity	

3	**MODULE 3: Relational algebra and SQL**		
	1	Relational Algebra -Fundamental operations	15
	2	SQL: database languages; DDL- create, alter, drop, truncate; DML- Insert , Select, update, Delete; DCL ,TCL	
	3	Functions, Data types in SQL; Creation and deletion of database and user	
	4	Pattern matching, views and sequence.	

4	**MODULE 4:** SQL Join Operations and emerging trends IN DBMS		
	1	INNER,OUTER AND CROSS JOIN	15
	2	Case Studies and Projects - Applying database and SQL skills to real-world scenarios - Designing and implementing a database project - Presenting and documenting the project results	
	3	Professional Development and Emerging Trends- Career Opportunities in Database Management	
	4	Emerging Technologies (e.g., NoSQL, NewSQL)	

5	**Teacher Specific Module**	
	Directions	
	Provide appropriate methodologies and evaluation metrics suitable to the topics.	15

Essential Readings:

1. Database System Concepts by Abraham Silberschatz, Henry F. Korth, and S. Sudarshan
2. Fundamentals of Database Systems by RamezElmasri and Shamkant B. Navathe
3. SQL Performance Explained by Markus Winand
4. Learning SQLby Alan Beaulieu

Assessment Rubrics:

Evaluation Type		**Marks**
End Semester Evaluation		**50 (theory)** **20 (practical**
Continuous Evaluation		**30**
a)	Test Paper- 1	5
b)	Model exam	10
c)	Assignment(2 numbers)	10
d)	Seminar	5
e)	Book/ Article Review	
f)	Viva-Voce	
g)	Field Report	
Total		**100**

Semester-2: Optional Minor-3.2

KU2DSCCSC110: Cyber Security and Ethics

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
2	DSC	100-199	KU2DSCCSC110	4	75

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
3	2		30	70	100	2hrs.

Course Description:

This course covers standards and best practices for ethical computing. This course offers a wide array of situations that are applicable to the real world.

Course Prerequisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Demonstrate various aspects of digital security, including cybercrimes, social media privacy, end-point device security, and cyber security fundamentals	U, A
2	Examine concept of cyber security, including its associated issues and challenges	U, A
3	Appraise cybercrimes, including their characteristics, legal recourse, and procedures for reporting via available platforms	U, A
4	Judge on the privacy and security implications of social media, the reporting protocols for inappropriate content, the legal framework surrounding online platforms.	U, A, E

**Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C)*

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1	3			3			3
CO 2	3			3			2
CO 3	3			3			2
CO 4	3		2	3			3

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1	MODULE1: Introduction to Cyberspace and Web Technology		
	1	Introduction to Cyberspace	15
		a) Definition of Cyberspace	
		b) Basic concepts of computer and web technology	
		c) Architecture of Cyberspace	
		d) Communication in Cyberspace	
	2	Communication and Web Technology	
		a) Internet and World Wide Web	
		b) Advent of the Internet	
		c) Internet Infrastructure for Data Transfer and Governance	
		d) Internet Society	
	3	Regulation of Cyberspace	
		a) Laws Governing Cyberspace	
		b) International Regulations	

		c) Data Protection and Privacy Laws	
		d) Intellectual Property Rights	
	4	Cyber security	
		a) Understanding Cyber security	
		b) Principles of Cyber security	
		c) Cyber security Challenges	

2	**MODULE 2: Cybercrime and Cyber law**		
	1	Introduction to Cyber Crimes	15
		a) Definition of cyber crimes	
		b) Types of cyber crimes	
		c) Common Cyber Crimes	
	2	Cyber Attacks	
		a) Zero-day and zero-click attacks	
		b) Social engineering attacks	
		c) Malware and ransomware attacks	
	3	Cybercriminal Modus Operandi	
		a) Methods used by cybercriminals	
		b) Reporting and Mitigation	
		c) Reporting procedures for cyber crimes	
		d) Remedial and mitigation measures	
	4	Organizations and Cyber Security	
	5	Cybercrime and offences according to Indian law	

3	**MODULE 3:** Social Media Overview and Security		
	1	Introduction to Social Networks	15
		Social Media	
		*a)*Types of Social Media	

	2	*b)*Social Media Features	
		*c)*Social Media Marketing	
		*d)*Social Media Privacy	
	3	Challenges, Opportunities, and Pitfalls	
	4	Flagging and Reporting of Inappropriate Content	

4	**MODULE 4:** Digital Devices Security , Tools and Technologies for Cyber Security		
	1	Introduction to End-Point Device Security	15
		a)Mobile Phone Security	
		b)Password Policy	
	2	Security Patch Management	
	3	Data Backup	
	4	Third-Party Software Management	
	5	Cyber Security Best Practices	
	6	Host Firewall and Anti-virus	
		a)Management of Host Firewall and Anti-virus	
		b)Wi-Fi Security	

5	**Teacher Specific Module**	
	Directions	
	Provide appropriate methodologies and evaluation metrics suitable to the topics.	15

Essential Readings:

1.Praveen Kumar Shukla, Surya PrakashTripathi, RitendraGoel"Introduction to Information Security and Cyber Laws" Dreamtech Press.

2. Cyber Crime Impact in the New Millennium, by R. C Mishra ,Auther Press. Edition 2010.

3. Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives by SumitBelapure and Nina Godbole, Wiley India Pvt. Ltd. (First Edition, 2011)

4. Security in the Digital Age: Social Media Security Threats and Vulnerabilities by Henry A. Oliver, Create Space Independent Publishing Platform. (Pearson , 13th November, 2001)

5. Cyber Laws: Intellectual Property & E-Commerce Security by Kumar K, Dominant Publishers.

6. Network Security Bible, Eric Cole, Ronald Krutz, James W. Conley, 2nd Edition, Wiley India Pvt. Ltd.

7.Fundamentals of Network Security by E. Maiwald, McGraw Hill.

Suggested Readings:

3. M. Stamp, "Information Security: Principles and Practice", Wiley.
4. David J. Loundy, "Computer Crime, Information Warfare, And Economic Espionage", Carolina Academic Press

Assessment Rubrics:

Evaluation Type		**Marks**
End Semester Evaluation		**50 (theory)** **20 (practical)**
Continuous Evaluation		**30**
a)	Test Paper- 1	5
b)	Model exam	10
c)	Assignment(2 numbers)	10
d)	Seminar	5
e)	Book/ Article Review	
f)	Viva-Voce	
g)	Field Report	
Total		**100**

Semester-2: Optional Minor-3.3

KU2DSCCSC111: Essentials of Computer Networking

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
2	DSC	100-199	KU2DSCCSC111	4	75

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
3	2		30	70	100	2hrs.

Course Description:

Computer networking classes combine lectures and hands-on practice to provide skills in computer network system configuration. Courses may include discussions, lectures and projects that deal with basic networking principles and current developments in the field.

Course Prerequisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Identify the functions of each layer in OSI and TCP/IP model.	U
2	Appraise the routing and subnetting mechanisms.	U
3	Describe the features and functions of application layer	U/R
4	Identify the network services like DNS, DHCP and ways to connect to the internet	U, An
5	Select appropriate network devices and connections.	U

**Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C)*

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1	3			3			
CO 2		3					2
CO 3	3						
CO 4							3
CO 5	3			2			2

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1	INTRODUCTION TO NETWORKING		
	1	Introduction computer network	15
		a) OSI Model, TCP/IP Model	
		b) Differences between TCP/IP and OSI, Advantages of TCP/IP	
	2	Networking Devices	
		a) Cables and Types, Hub, Repeater, Bridge, Switch, Router, Gateways, Servers & Clients	
	3	Physical layer: line coding	
	4	Data link layer: Ethernet and MAC address, Unicast, multicast and broadcast, frames.	

2	NETWORK LAYER		
	1	IP address, IP address classes.	15
	2	IP Datagram , various components of IP datagram	
	3	Subnet, subnet mask, Encapsulation in networking.	

	4	Basics of routing, routing protocols: IGP,BGP, Routable address space	
	5	How internet works	

3	TRANSPORT AND APPLICATION LAYERS		
	1	Transport layer, TCP segment, Dissecting a TCP segment, TCP control flags.	15
	2	Connection Establishment	
		a) 3 way handshake	
		b) Connection oriented and connectionless protocols and	
		c) Firewalls.	
	3	Application layer: HTTP	

4	INTRODUCTION TO NETWORK DEVICES		
	1	DNS, DHCP	15
		a) Importance of DNS, steps of name resolution, overview of DHCP, Basics of NAT, VPN and proxy services	
	2	Introduction to connecting to the internet	
		a) POTS and dial up, broadband and T-carrier tech,DSL , cable broadband and fibre connections.	
		b) Wireless technology,wireless network configurations, WLAN,Mesh network, wireless channel and wireless security.	
	3	Troubleshooting	
		a) ICMP and ping, trace route name resolution tools, the cloud	

5	Teacher Specific Module	
	Directions	
	Provide appropriate methodologies and evaluation metrics suitable to the topics.	15

Essential Readings:

1. Computer Networks | By Pearson (5th Edition)
1. Networking fundamentals by Gordon Davies

Assessment Rubrics:

Evaluation Type		Marks
End Semester Evaluation		**50 (theory)** **20 (practical)**
Continuous Evaluation		**30**
a)	Test Paper- 1	5
b)	Model exam	10
c)	Assignment(2 numbers)	10
d)	Seminar	5
e)	Book/ Article Review	
f)	Viva-Voce	
g)	Field Report	
Total		**100**

Semester-2: Optional Minor-4.1

KU2DSCCSC112: Multimedia and Graphics Designing

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
2	DSC	100-199	KU2DSCCSC112	4	75

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
3	2		30	70	100	2hrs.

Course Description:

The course helps to create interactive content for movies, advertisements, commercials, video games, and television shows. This course gives an excellent opportunity to build a strong portfolio.

Course Prerequisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Recognise with the media software	U
2	Design digital publications using Photoshop	U, A, C
3	Explain editing software	U, A
4	Identify the basic idea of audio and video editing	U, A, E

Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C)

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1	3			2			
CO 2	3	2					3
CO 3	3	3	3				
CO 4	3	3	3				

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1	MODULE 1: Multimedia & Media software		
	1	Introduction to Multimedia a) Definition b) Building blocks of multimedia (Text, Graphics, Audio, Video, Animation)	15
	2	Multimedia System, desirable Features of multimedia System	
	3	Data Compression, Multimedia Applications, Virtual reality	
	4	Introduction to Media Software Application, System Software, Application Software	
2	**MODULE 2:** Photo Editing Software Applications		
	1	Photoshop, light room, highlights, midtones and shadows, levels, balance, cure	15

	2	Histogram, basic tools, crop, lasso tool, pen tool, text	
	3	Keyboard short cuts, layers, masking,	
	4	Effects, photo manipulation and editing, raw, jpeg, tiff, Exploring Formats	

3	**MODULE 3:** Video Editing		
	1	Software for Video Editing, Premier Pro or FCP, ratio, resolution	15
	2	Introduction to software interface, creating project and sequence,	
	3	Timeline, basic cuts, transitions and effects, LUTs, effect window, title graphics	
	4	Nesting, stabilizer, video formats and extensions.	

4	**MODULE 4: Audio and Animation**		
	1	Software for Audio: Adobe Audition, software interface, wave and multi-track view, basic tools	15
	2	Applying audio effects, effect adjustments, audio recording, mixing, gain, pitch, volume, pan, file formats.	
	3	Software for Basic Animation: An Introduction to Adobe after Effects, The basics of creating projects. compositions, and layers	
	4	Importing footage, including video, audio, and still images, creating special effects using the Effects menu	

5	**Teacher Specific Module**	
	Directions	
	Provide appropriate methodologies and evaluation metrics suitable to the topics.	15

Essential Readings:

1. Introduction to Information Technology (Second Edition) by ITL Education Solutions Limited, Pearson

2. Adobe Photoshop CC Classroom in a Book (2018 Release) Book by Andrew Faulkner and Conrad Chavez
3. https:lihelpx.adobe.com/in/photoshop/tutorials.html
4. Adobe After Effects CS6 Digital Classroom Book by Jerron Smith
5. Adobe Premiere Pro Classroom in a Book (2020 release) by Maxim Jago
6. https:/lhelpx.adobe.com/prerniere-pro/vierv-all-tutorials.html
7. https://helpx.adobe.com/in/audition/tutorials.html

Suggested Readings:

1. Adobe After Effects CC Classroom Book 2018 | First Edition I By Pearson
2. Adobe Audition CC Classroom 2013 by Adobe Creative
3. https://helpx.adobe.com/in/indesign/tutorials.html

Assessment Rubrics:

Evaluation Type		**Marks**
End Semester Evaluation		**50 (theory)** **20 (practical)**
Continuous Evaluation		**30**
a)	Test Paper- 1	5
b)	Model exam	10
c)	Assignment(2 numbers)	10
d)	Seminar	5
e)	Book/ Article Review	
f)	Viva-Voce	
g)	Field Report	
Total		**100**

Semester-2: Optional Minor-4.2

KU2DSCCSC113: Advanced Web Programming

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
2	DSC	100-199	KU2DSCCSC113	4	5

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
3	2		30	70	100	2hrs.

Course Description:

This course will help to learn the basic coding in XHTML, javascript and php. The course will help to write programs using such constructs as loops, statements, variables, and functions.

Course Prerequisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Demonstrate the basics of XML and XHTML.	U
2	Discuss various web protocols.	U
3	Design p interactive web pages using Java script.	U, A , C
4	Design web document with server-side scripting language php.	U, A, C
5	Identify the basics of AJAX.	U, A

Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C)

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1	3			3			
CO 2	3			3			
CO 3	3	3					3
CO 4	3	3					3
CO 5	3						

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	**UNIT**	**DESCRIPTION**	**HOURS**
1	MODULE 1 : XML, XHTML and web protocols		
	1	Introduction to XML a) Uses of XML, simple XML b) XML key components c) DTD and Schemas, well formed, using XML with application	15
	2	Introduction to XSL, XSL elements a)XSL and XSLT b)XML transformed simple example c)Transforming with XSLT	
	3	Introduction to XHTML	

		a)XHTML, Move to XHTML	
		b)Meta tags, Character entities	
		Web Protocols	
	4	a)Internet protocol- types, need for protocol	
		b)IP addressing,	
		c)TCP, SMTP, FTP, HTTP, POP3, TELNET	

	MODULE 2: Dynamic web pages and java script		
	1	Dynamic web pages , Scripting languages: Java script and PHP script	
	2	a) Introduction to JavaScript	
		b) Operators	
		c) Data types, variables	
2		d) Dialog boxes: Alert, confirm and prompt dialog boxes.	15
	3	Arrays in Java script	
		a) Declaring and allocating arrays	
		b) Examples using arrays	
	4	Functions in Java script	
		a)Function definition	
		b)Function call	

	MODULE 3: DOC and PHP		
	1	Document Object Model, objects: math, string and date objects	
3	2	Introduction to PHP: Basic Syntax, data types, operators, variables and constants, simple script using PHP	15
	3	Flow control: decision making and looping statements,	
	4	Arrays and functions in PHP: Creating index based and Associative array, Function, defining a function	

4	**MODULE 4: Form Processing and Ajax**		
	1	From processing using PHP, Handling Html Form with Php, Capturing Form	15
	2	Databases, advantages of databases, relational databases and SQL	
	3	Using PHP to access databases	
	4	Introduction to AJAX	
		a) History of Ajax	
		b)Traditional web applications	
		c)Ajax applications	
		d)Rich Internet Applications (RIAs) with Ajax	

5	**Teacher Specific Module**	
	Directions	
	Provide appropriate methodologies and evaluation metrics suitable to the topics.	15

Essential Readings:

1. Internet and World Wide Web How to program, P.J. Deitel & H.M. Deitel Pearson

2. JavaScript – Definitive Guide O'Reilly 6th Edition

3.Programming in PHP, O'Reilly

4. Internet & World Wide Web How to Program, 5/e – Paul J Deitel, Harvey M Deital, AbbaeyDeital

Suggested Readings:

1. Mastering HTML, CSS &Javascript Web Publishing Paperback,2016 - by Laura Lemay, Rafe Colburn & Jennifer Kyrnin , BPB Publications

2. HTML & CSS: The Complete Reference, Fifth Edition - Thomas a Powell, Tata McGraw Hill

Assessment Rubrics:

Evaluation Type		Marks
End Semester Evaluation		**50 (theory)** **20 (practical)**
Continuous Evaluation		**30**
a)	Test Paper- 1	5
b)	Model exam	10
c)	Assignment(2 numbers)	10
d)	Seminar	5
e)	Book/ Article Review	
f)	Viva-Voce	
g)	Field Report	
Total		**100**

Semester-2: Optional Minor-4.3

KU2DSCCSC114: Ethical Hacking

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
2	DSC	100-199	KU2DSCCSC114	4	75

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
3	2		30	70	100	2hrs.

Course Description:

Ethical hacking is a process of detecting vulnerabilities in an application, system, or organization's infrastructure that an attacker can use to exploit an individual or organization. They use this process to prevent cyberattacks and security breaches by lawfully hacking into the systems and looking for weak points.

Course Prerequisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Discuss the fundamental concepts of ethical hacking, including its principles and methodologies.	U
2	Demonstrate proficiency in using various ethical hacking tools and techniques for information gathering, scanning, and enumeration.	U
3	Appraise ethical hacking principles to identify and exploit vulnerabilities in systems and networks.	U, A

4	Judge legal and ethical considerations in ethical hacking practices.	U, A, An

Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C)

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1	3			2			2
CO 2	3	2					2
CO 3	3	2		2			22
CO 4	2	2		2			

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1	MODULE 1 : Introduction to Ethical Hacking		
	1	Ethical hacking definition, Hacker types, threats and attacks, vulnerabilities	15
	2	Terminologies in hacking	
	3	Ethics and laws in hacking	
	4	Need of Ethical hacking, Roles and responsibilities	
2	**MODULE 2:**		
	1	Information Gathering :Information gathering techniques	15
	2	Foot printing and reconnaissance: definitions and techniques	

	3	Tools and methodologies for information gathering	
	4	Legal and ethical considerations	

3	**MODULE 3:**		
	1	Scanning and Enumeration: Port Scanning Techniques, Service Enumeration	15
	2	Vulnerability Scanning	
	3	Network Mapping	
	4	Enumerating Systems and Services	

4	**MODULE 4:**		
	1	Password Cracking Techniques	15
	2	Privilege Escalation	
	3	Executing applications	
	4	Hacking operating systems, Trojans and backdoors	

5	**Teacher Specific Module**	
	Directions	
	Space to fill the selected area/ activity	15

Essential Readings:

1. The Basics of Hacking and Penetration Testing: Ethical Hacking and Penetration Testing Made Easy, Patrick Engebretson

2. Gray Hat Hacking: The Ethical Hacker's Handbook, Allen Harper, Daniel Regalado, Ryan Linn, Stephen Sims, Branko Spasojevic, and Linda Martinez.

3. Penetration Testing: A Hands-On Introduction to Hacking" by Georgia Weidman

Suggested Readings:

1. The Web Application Hacker's Handbook: Finding and Exploiting Security Flaws", DafyddStuttard and Marcus Pinto.
2. The Hacker Playbook 3: Practical Guide To Penetration Testing, Peter Kim

Assessment Rubrics:

Evaluation Type		**Marks**
End Semester Evaluation		**50 (theory)** **20 (practical)**
Continuous Evaluation		**30**
a)	Test Paper- 1	5
b)	Model exam	10
c)	Assignment(2 numbers)	10
d)	Seminar	5
e)	Book/ Article Review	
f)	Viva-Voce	
g)	Field Report	
Total		**100**

Semester-2: MDC-2.1

KU2MDCCSC104: Fundamentals of Web Technology

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
2	MDC	100-199	KU2MDCCSC104	3	45

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
3	0	-	25	50	75	1.5hrs.

Course Description:

This course provides a comprehensive introduction to web technologies. Students will learn the basics of the World Wide Web, HTML, CSS, and JavaScript, focusing on practical skills and real-world applications. By the end of the course, students will be able to create and design basic web pages, apply styling and layout techniques, and add interactivity using client-side scripting.

Course Prerequisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Examine the architecture and evolution of the internet and the World Wide Web.	U
2	Design well-structured HTML documents with appropriate elements and attributes.	U, C
3	Use CSS to style text, colors, backgrounds, and layout elements effectively.	U, A
4	Utilize JavaScript to implement dynamic behaviour and interactivity on web pages.	U, E

**Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C)*

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1	3	3		3			
CO 2	3	3			2		2
CO 3	2	3					
CO 4	3	3		3			

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1	**MODULE 1: Introduction to the World Wide Web**		
	1	Overview of the internet and its evolution	9
	2	Introduction to the World Wide Web (WWW) and its components	
	3	Client-side scripting versus server-side scripting	
	4	Role of web technologies in various disciplines	
2	**MODULE 2: Introduction to HTML**		
	1	Origins and Evolution of HTML	9
	2	HTML elements and attributes	
	3	Basic structure of an HTML document	
	4	Creating hyperlinks , images, lists ,tables and forms	
3	**MODULE 3: CSS Fundamentals**		
	1	Introduction to CSS	9
	2	CSS syntax and selectors	

	3	Styling text, colors, and backgrounds	
	4	Box model and layout techniques	

4	**MODULE 4: Client-Side Scripting with JavaScript**		
	1	Introduction to JavaScript	9
	2	JavaScript variables, data types, and operators	
	3	Dialog boxes: Alert, confirm and prompt dialog boxes	
	4	Functions and events	

5	**Teacher Specific Module**	
	Directions	
	Space to fill the selected area/ activity	9

Essential Readings:

1. Paul Deitel, Harvey Deitel& Abbey Deitel, Internet and World Wide Web: How to Program, Pearson, Fifth Edition, 2016.
2. Powell, Thomas A. HTML & CSS: The Complete Reference. McGraw Hill Education;
3. Javascript-Definitive Guide O'reilley 7th edn
4. https://www.w3schools.com
5. https://javascript.info

Suggested Readings:

1. Julie C. Meloni, HTML and CSS in 24 Hours, Sams Teach Yourself (Updated for HTML5 and CSS3), Ninth Edition
2. CSS Secrets: Better Solutions to Everyday Web Design Problems" by Lea Verou
3. JavaScript and JQuery: Interactive Front-End Web Development" by Jon Duckett
4. https://www.internetsociety.org/internet/history-internet/

5. https://developer.mozilla.org/en-US/docs/Web/HTML

Assessment Rubrics:

Evaluation Type		Marks
End Semester Evaluation		**50**
Continuous Evaluation		**25**
a)	Test Paper- 1	5
b)	Test Paper-2	10
c)	Assignment	5
d)	Seminar	5
e)	Book/ Article Review	
f)	Viva-Voce	
g)	Field Report	
Total		**75**

SAMPLE QUESTIONS TO TEST OUTCOMES:

7. Describe the evolution of the internet and its impact on society.
8. Provide examples of how web technologies are used in different disciplines.
9. List and explain the basic elements and attributes of HTML.
10. Create a simple HTML document with hyperlinks, images, lists, tables, and forms.
11. Define CSS and its role in web development.
12. Demonstrate how to style text, colors, and backgrounds using CSS.
13. What is JavaScript and how does it differ from HTML and CSS?
14. Describe JavaScript variables, data types, and operators.

EMPLOYABILITY FOR THE COURSE:

Completing the "Web Technologies Fundamentals" course will equip students with a strong foundation in web development, preparing them for entry-level positions in the field. They will gain proficiency in frontend technologies such as HTML, CSS, and JavaScript, enabling them to create interactive and visually appealing web pages. The course will also focus on developing problem-solving and collaboration skills through hands-on projects and group activities. By staying updated with industry trends and tools, students will be adaptable to changes in the web development landscape, enhancing their employability in this dynamic industry.

Semester-1: MDC-2.2

KU2MDCCSC105: Digital Office Management

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
2	MDC	100-199	KU2MDCCSC105	3	45

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
3	0	-	25	50	75	1.5 hrs.

Course Description:

Office Automation program focuses on providing basic training in computers and its most common software which is to be used in Office work. With the help of this program, students will be able to become an expert in Office Automation.

Course Prerequisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Demonstrate proficiency in using word processing software to create, edit, and format professional documents.	U
2	Use spreadsheet functions and formulas to analyze and manage data.	U, A
3	Design visually appealing charts and graphs to effectively communicate data insights.	U, A, C

****Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C)***

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1	3	3		2			2
CO 2	3	3	2				
CO 3	3	3	3	2		3	2

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1	**MODULE 1 : Introduction to Word Processing**		
	1	Getting Started with the Interface	9
	2	Creating and Saving Documents	
	3	Text Formatting and Editing Tools	
	4	Styles and Templates	
	5	Collaboration Features	
2	**MODULE 2: Advanced Word Processing Techniques**		
	1	Working with Tables and Images	9
	2	Creating Headers, Footers, and Page Numbers	
	3	Mail Merge and Creating Form Letters	
	4	Referencing and Citations	
	5	Document Security and Protection	
3	**MODULE 3: Introduction to Spreadsheets**		

	1	Understanding Spreadsheets - Cells, Rows, Columns	9
	2	Entering and Editing Data - Data Types & Formatting	
	3	Basic Formulas and Functions	
	4	Creating Charts and Graphs	
	5	Printing and Sharing Spreadsheets	

4	**MODULE 4: Advanced Spreadsheet Techniques**		
	1	Working with Large Datasets - Filtering & Sorting	9
	2	Advanced Functions and Formulas	
	3	Data Analysis Tools (e.g., PivotTables)	
	4	Creating Macros and Automation	
	5	Collaboration Features in Spreadsheets	

5	**Teacher Specific Module**	
	Directions	
	Space to fill the selected area/ activity	9

Essential Readings:

1. Microsoft Word:

- "Getting Started with Microsoft Word: [Book Title about MS Word, Latest Edition]" by [Author(s)] ([Publisher Year]) - This book provides a foundational understanding of core functionalities in Microsoft Word.
- "Microsoft Word Power Programming: [Book Title about Advanced MS Word, Latest Edition]" by [Author(s)] ([Publisher Year]) - For students interested in exploring advanced features and automation techniques in Word.

2. Microsoft Excel:

- "Excel Formulas and Functions for Beginners: [Book Title about MS Excel Formulas, Latest Edition]" by [Author(s)] ([Publisher Year]) - A helpful guide to grasp essential formulas and functions in Microsoft Excel.
- "Data Analysis with Microsoft Excel: [Book Title about MS Excel Data Analysis, Latest Edition]" by [Author(s)] ([Publisher Year]) - This book delves into data analysis techniques and tools within Microsoft Excel.

Additional Tips:

- Look for online resources that are compatible with your software version (e.g., Word 2021, Excel 2023, etc.).
- Consider your learning style - some resources offer video tutorials, while others focus on text-based explanations. Choose what works best for you.

Software:

- Access to a computer with word processing and spreadsheet software (e.g., Microsoft Word and Excel, Google Docs and Sheets) is required. .

Suggested Readings:

Google Workspace:

- "The Complete Guide to Google Docs: [Book Title about Google Docs, Latest Edition]" by [Author(s)] ([Publisher Year]) - A comprehensive guide to using Google Docs and its functionalities.
- "Mastering Google Sheets: [Book Title about Google Sheets, Latest Edition]" by [Author(s)] ([Publisher Year]) - An in-depth exploration of Google Sheets features and data analysis capabilities.

Assessment Rubrics:

Evaluation Type		**Marks**
End Semester Evaluation		**50**
Continuous Evaluation		**25**
a)	Test Paper- 1	5
b)	Model exam	10
c)	Assignment	5
d)	Seminar	5

e)	Book/ Article Review	
f)	Viva-Voce	
g)	Field Report	
Total		**75**

SAMPLE QUESTIONS TO TEST OUTCOMES:

1. Formatting and Styles (Multiple Choice):

What formatting feature in Word allows you to easily apply a consistent look and feel throughout your document, including fonts, headings, and margins?

a) Styles
b) Themes
c) Clip Art
d) Headers & Footers

2. Creating Professional Documents (Short Answer):

You are tasked with creating a business letter to a potential client. List three essential elements you would include to ensure a professional presentation in Word.

3. Working with Tables and Charts (Fill in the Blank):

In spreadsheets, you can use formulas to perform calculations on data. The formula =SUM(A1:A10) would calculate the _____ of all values in cells A1 to A10.

4. Collaboration and Sharing (True/False):

Both Word and Spreadsheets offer features that allow multiple users to work on the same document simultaneously. (True/False)

5. Advanced Features (Short Answer):

Describe two advanced features available in either Word or Spreadsheets (e.g., Mail Merge in Word, Pivot Tables in Excel) and explain how they can be used to improve efficiency and productivity.

EMPLOYABILITY FOR THE COURSE:

Mastering Word and Spreadsheet Processing software is like having a powerful Swiss Army Knife in your professional toolkit. These skills are highly valuable across many job sectors, making you more employable:

- **Essential for Many Jobs:** From administrative assistants to financial analysts, these tools are fundamental for creating documents, managing data, and boosting productivity.
- **Increased Efficiency & Productivity:** Employers value those who can work efficiently - strong Word and Spreadsheet skills showcase your ability to:
    - Craft professional documents and reports.
    - Organize and analyze data, generating insightful reports.
    - Automate tasks, saving time and minimizing errors.
- **Competitive Advantage:** Proficiency sets you apart. Highlighting these skills on your resume demonstrates you're adaptable and a quick learner, valuable qualities for employers.

In short, this course equips you with fundamental skills that are in high demand, making you a more attractive candidate in the job market.

Semester-2: MDC-2.3

KU2MDCCSC106: Introduction to Data Science

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
2	MDC	100-199	KU2MDCCSC106	3	45

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
3	0	-	25	50	75	1.5 hrs

Course Description:

This course introduces the fundamental concepts, techniques, and tools used in data science. Students will learn how to collect, clean, analyze, and visualize data using various programming languages and libraries. The course will cover topics such as data manipulation, exploratory data analysis, statistical modeling, machine learning, and data visualization.

Course Prerequisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Organize data using statistical methods to draw meaningful conclusions.	U, An
2	Use machine learning algorithms to real-world datasets for problem-solving	U, A
3	Identify data characteristics and patterns through exploratory data	U

	analysis (EDA).	
4	Demonstrate proficiency to collect, clean, and preprocess data using Python and relevant libraries.	U, A

Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C)

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1	3		3	3		3	
CO 2	3	2		2		3	2
CO 3	3		2			3	
CO 4	3	2	3	2		3	2

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1	**MODULE 1 :Introduction to Data Science**		
	1	Overview of data science and its applications	9
	2	Introduction to Python programming for data science	
	3	Introduction to data types, data structures, and libraries (NumPy, Pandas)	
	4	Data collection methods and sources	

2	**MODULE 2 :Exploratory Data Analysis and Statistical Analysis**		
	1	Descriptive statistics and data summarization	
	2	Data cleaning and preprocessing techniques	

	3	Handling missing data and outliers	9
	4	Data visualization techniques (Matplotlib, Seaborn)	
	5	Hypothesis testing, confidence intervals, and correlation analysis	

3	**MODULE 3: Machine Learning Fundamentals**		
	1	Introduction to machine learning	9
	2	Supervised vs. unsupervised learning	
	3	Model evaluation and validation	
	4	Regression analysis (linear regression, multiple regression)	
	5	Classification algorithms (logistic regression, decision trees)	

4	**MODULE 4: Advanced Topics in Data Science**		
	1	Clustering algorithms (K-means, hierarchical clustering)	9
	2	Dimensionality reduction techniques (PCA, t-SNE)	
	3	Introduction to deep learning and neural networks	
	4	Natural Language Processing (NLP) basics	
	5	Data visualization principles and techniques	

5	**Teacher Specific Module**	
	Directions	
	Provide appropriate learning methodologies and evaluation metrics	9

Essential Readings:

1. "Introduction to Data Science", Jeffrey Stanton, Chapman and Hall/CRC in 2013.

2. **"Data Science from Scratch: First Principles with Python", Joel Grus, O'Reilly Media.**
3. **"Python for Data Analysis", Wes McKinney, O'Reilly Media**

Suggested Readings:

1. "Data Science for Business: What You Need to Know about Data Mining and Data-Analytic Thinking", Foster Provost and Tom Fawcett**,** O'Reilly Media, 1st Edition (2013)

Assessment Rubrics:

Evaluation Type		**Marks**
End Semester Evaluation		**50**
Continuous Evaluation		**25**
a)	Test Paper- 1	5
b)	Model exam	10
c)	Assignment	5
d)	Seminar	5
e)	Book/ Article Review	
f)	Viva-Voce	
g)	Field Report	
Total		**75**

Sample Questions to test Outcomes.

1. What Python library is commonly used for data manipulation and analysis?
2. Explain the purpose of exploratory data analysis (EDA) in the data science process.
3. How would you determine the correlation between two variables in a dataset?
4. When would you use a classification algorithm versus a regression algorithm?
5. Explain the steps involved in creating a data analysis pipeline for a classification task.
6. How would you interpret a high RMSE value in a regression model?

Employability for the Course / Programme:

The course enhances employability by equipping students with sought-after data science skills, opening doors to roles like data analyst, data scientist, and machine learning engineer across various industries.

SEMESTER 3

DISCIPLINE SPECIFIC COURSES

Semester-3

KU3DSCCSC201: OBJECT ORIENTED P ROGRAMMING WITH JAVA

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
3	DSC	200-299	KU3DSCCSC201	4	75

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
3	2	-	30	70	100	2 Hrs

Course Description:

Java is a multi-platform, object-oriented, and network-centric language that can be used as a platform in itself. It is a fast, secure, reliable programming language for coding everything from mobile apps and enterprise software to big data applications and server-side technologies.

Course Prerequisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Demonstrate proficiency in fundamental Object-Oriented Programming (OOP) concepts.	U
2	Implement multithreading, synchronization, and advanced exception handling techniques in Java, showcasing the ability to handle concurrent programming challenges.	U,A
3	Develop Swing applications with interactive user interfaces, applying event handling mechanisms and utilizing appropriate layout managers for effective GUI design	U, A, C
4	Use Java Database Connectivity (JDBC) to interact with databases and implement networking concepts, showcasing proficiency in connecting Java applications to external systems.	U, A, C

5	Identify the basic idea of socket programming and web development	U,A,C

******Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C)*

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1	3			2			
CO 2		2					
CO 3	3	3					
CO 4	2	3					3
CO 5	3	3		2			3

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	**UNIT**	**DESCRIPTION**	**HOURS**
1	MODULE1: Introduction to OOP and Java Basics		
	1	Understanding Object-Oriented Programming (OOP) Concepts - Introduction to Classes and Objects - Encapsulation, Inheritance, Polymorphism, and Abstraction.	15
	2	Introduction to Java - Overview of Java Programming Language - Setting up the Java Development Environment (IDE) - Basic Syntax and Data Types in Java	
	3	Control Flow and Looping Constructs: if statements, switch statement, looping statements, jumping statements	
	4	Introducing Classes: Class fundamentals; Introducing methods; Declaring Objects; Constructors; This keyword; Garbage collection; the finalize method; A closer look at methods and classes; Inheritance basics; Using Super; When Constructors are called; Method Overriding; Dynamic method dispatch; Abstract classes.	

2	MODULE 2: Advanced Java Programming Concepts		
	1	Exception Handling: try and catch, multiple exceptions	15
	2	Packages and interfaces	
	3	Multithreading in Java - Understanding Threads and Concurrency - Synchronization and Thread Safety - Java Executor Framework	
	4	Java Collections Framework - Overview of Collections - Lists, Sets, and Maps, Iterators and Stream API	

3	MODULE 3: **GUI Programming with Java Swing**		**15**
	1	Introduction to Java Swing - Overview of Swing - Swing Components and Containers	
	2	Event Handling in Swing - Event Listeners and Event Handling Mechanisms - User Interface Design Patterns	
	3	Building Swing Applications - Creating Swing GUIs using JFrame, JPanel, and Layout Managers - Customizing Swing Components	
	4	Implementing Menus, Toolbars, and Dialogs	

4	MODULE 4: Intermediate to Advanced Java Features		
	1	Java Database Connectivity (JDBC) - Connecting to Databases with JDBC - Executing SQL Queries and Handling Result Sets	*15*
	2	Networking in Java - Socket Programming in Java - Developing Client-Server Applications	
	3	Introduction to JavaFX - Overview of JavaFX - Building Rich User Interfaces with JavaFX - Event Handling and Animation in JavaFX	
	4	Web Development with Java Servlets and JSP - Basics of Servlets and Java Server Pages (JSP) - Developing Dynamic Web Applications with Java	

5	**Teacher Specific Module**	
	Directions	

	Space to fill the selected area/ activity	15

Sample Lab List

Lab 1: Introduction to Object-Oriented Programming and Java Basics

1. **Create a simple Java program to print "Hello, World!" to the console.**
2. **Implement a basic calculator using Java classes and methods.**

Lab 2: Advanced Java Programming Concepts

1. **Write a Java program that demonstrates the use of exception handling.**
2. **Implement a Java program that uses multithreading to perform parallel tasks.**

Lab 3: GUI Programming with Java Swing

1. **Create a simple Swing application with a JFrame, JPanel, and buttons.**
2. **Implement event handlers for buttons and other components in a Swing GUI.**

Lab 4: Intermediate to Advanced Java Features

1. **Create programs to demonstrate the use of Lists, Sets, and Maps in Java Collections.**
2. **Write a Java program to implement package**

Lab 5: Advanced Java Features

1. **Connect to a database using JDBC and perform basic CRUD operations**
2. **Implement a simple client-server application using Java sockets.**

Lab 6: GUI Programming with JavaFX (Optional)

1. **Create a basic JavaFX application with buttons, text fields, and labels.**
2. **Implement animation effects in a JavaFX application.**

Lab 7: Web Development with Servlets and JSP (Optional)

1. **Create a simple servlet to handle HTTP requests.**
2. **Develop a JSP page to display dynamic content.**

Essential Readings:

1. "Head First Java" by Kathy Sierra and Bert Bates.O'Reilly 3rd edition
2. Java The Complete Reference-Eleventh Edition- Oracle Press- Herbert Schildt
3. “Java Network Programming" by Elliotte Rusty Harold. O'Reilly Media; 4th edition

4. https://www.tutorialspoint.com/java/

Suggested Readings:

1. "Clean Code: A Handbook of Agile Software Craftsmanship" by Robert C. Martin
2. "Java Threads" by Scott Oaks and Henry Wong

Assessment Rubrics:

Evaluation Type		**Marks**
End Semester Evaluation		**50 (Theory)** **20 (Practical)**
Continuous Evaluation		**30**
a)	Test Paper- 1	5
b)	Model Exam	10
c)	Assignment(2 numbers)	10
d)	Seminar	5
e)	Book/ Article Review	
f)	Viva-Voce	
g)	Field Report	
Total		**100**

Semester-3

KU3DSCCSC202: DIGITAL SYSTEM

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
4	DSC	200-299	**KU6DSCCSC306**	4	60

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
4	0	-	30	70	100	2hrs.

Course Description:

This course introduces the principles of digital systems, covering fundamental concepts of digital and analog systems and their advantages. It includes basic logic operations, number systems, Boolean algebra, and the simplification of Boolean expressions. The course also explores combinational and sequential logic circuits, such as adders, subtractors, encoders, decoders, multiplexers, flip-flops, counters, and shift registers. Emphasis is placed on practical applications and design considerations.

Course Prerequisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Differentiate between digital and analog systems and articulate the advantages of digital systems.	U
2	Demonstrate basic logic operations and convert between various number systems used in digital electronics	A
3	Use Boolean algebra and logic gates to design and simplify digital circuits.	A
4	Design and analyze combinational circuits, including adders,	C, An

	subtractors, encoders, decoders, multiplexers, and demultiplexers.	
5	Comprehend the functioning of sequential circuits, including flip-flops, counters, and shift registers, and apply this knowledge to real-world digital system designs.	U,A,C

Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C)

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1	3						2
CO 2	3	2					
CO 3	3	3	2				
CO 4	3	2					22
CO 5	3	2					

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1	**INTRODUCTION TO DIGITAL SYSTEMS**		12
	1	Digital and Analog Systems	
		a) Definition and comparison	
		b) Advantages of digital systems over analog systems	
	2	Introduction to basic logic operations	
		a) NOT , AND, OR Operations	
	3	Number Systems	
		a) Number systems	
		b) Number base conversion	
	4	Binary codes	

		a) BCD, Gray code	
		b) Alphanumeric codes	
		c) Error detecting codes	

2	**BOOLEAN ALGEBRA AND LOGIC GATES**		
	1	Basic Definitions	12
	2	Basic theorems and Properties of Boolean algebra	
	3	Simplification of Boolean expressions	
	4	Karnaugh maps for simplification	
	5	Digital Logic gates	

3	**COMBINATIONAL CIRCUITS**		
	1	Basic combinational logic circuits	12
	2	Combinational Circuits	
		a) Adders and Subtractors	
		b) Encoders & Decoders	
		c) multiplexers and demultiplexers	
	3	Parity generators / checkers	

4	**SEQUENTIAL LOGIC CIRCUITS**		
	1	**Flip-Flops and Latches**	
		a) SR, JK, D, T flip-flops, Master slave flip flop	12
	2	**Counters**	
		a) Synchronous and asynchronous counters	
		b) Ripple counters, up-down counters	
	3	**Shift Registers**	
		a) Different shift registers and Applications	

5	**Teacher Specific Module**	
	Directions	
	Teacher can adopt suitable methodologies and evaluation metrics according to the topics.	12

Essential Readings:

1. Digital Fundamentals, Floyd and Jain, 8thEdn, Pearson Education.
2. Fundamentals of Digital Circuits" by A. Anand Kumar
3. Digital Design" by M. Morris Mano and Michael D. Ciletti

Suggested Readings:

1. Digital Logic and Computer Design, M Morris mano

Assessment Rubrics:

Evaluation Type		**Marks**
End Semester Evaluation		**70**
Continuous Evaluation		**30**
a)	Test Paper- 1	5
b)	Model Examination	10
c)	Assignment- 2 Numbers	10
d)	Seminar/viva	5
e)	Book/ Article Review	
f)	Field report	
Total		**100**

- **Employability for the Course:**

  The "Digital Systems" course provides a solid foundation for careers in electronics, computer engineering, IT, and related fields, making graduates highly valuable to employers seeking expertise in digital technology.

Optional minor 5.1

KU3DSCCSC203**:** **AI IN DAILY LIFE**

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
3	DSC	200-299	KU3DSCCSC203	4	75

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
3	2		30	70	100	2hrs.

Course Description:

This course aims to introduce the fundamental concepts of artificial intelligence (AI) to individuals from all academic backgrounds. Participants will develop a broad understanding of AI technologies, their implications, and their potential applications in various fields. The course will emphasize practical examples and real-world case studies to facilitate comprehension and inspire innovative thinking.

Prerequisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Define and explain the fundamental concepts and subfields of AI.	U
2	Identify real-world applications of AI across various industries	U/A
3	Judge the ethical, social, and economic implications of AI.	E
4	Recognize the potential of AI to drive innovation and transformation	A/An

Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C)

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1	3						2
CO 2	3			2			2
CO 3	3			3			2
CO 4	3			3			3

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1	**MODULE TITLE**: **Introduction to Artificial Intelligence**		15
	1	Definition and scope of AI	
	2	Historical overview and key milestones	
	3	Differentiating AI from human intelligence	
2	**MODULE TITLE: AI Subfields and Technologies**		15
	1	Machine learning: Supervised, unsupervised	
	2	Reinforcement learning	
	3	Deep learning and neural networks	
	4	Natural language processing (NLP) and computer vision	
3	**MODULE TITLE : Applications of AI**		15
	1	AI in healthcare: Diagnosis, treatment, and medical imaging	
	2	AI in finance: Fraud detection, algorithmic trading, and risk assessment	
	3	AI in transportation: Autonomous vehicles and traffic optimization	

	4	AI in customer service and chatbots	
	5	AI in education: Personalized learning and intelligent tutoring system	

4	**MODULE TITLE : Ethical and Social Implications of AI**		15
	1	Bias and fairness in AI systems	
	2	Impact of AI on employment and the workforce	
	3	AI and social inequality	
	4	AI and social inequality	

5	**Teacher Specific Module**	
	Use appropriate methodologies and evaluation tools according to the topics.	5

Essential Readings:

1.Artificial Intelligence: A Modern Approach – Stuart J. Russell & Peter Norvig.

2**.** Artificial Intelligence in Daily Life eBook : Lee, Raymond S. T.

3.AI in Daily Life: A Practical Guide to Enhancing Your World **Kindle Edition** by Michael A. Campanelli

Assessment Rubrics:

Evaluation Type		**Marks**
End Semester Evaluation		**70**
Continuous Evaluation		**30**
a)	Test Paper- 1	5
b)	Model Examination	10
c)	Assignment- 2 Numbers	5
d)	Group project: data collection, analytics	10
e)	Report	
f)	presentation	

Total	**100**

Optional minor 5.2

KU3DSCCSC204: ESSENTIALS OF OPERATING SYSTEMS

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
3	DSC	200-299	KU3DSCCSC207	4	75

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
3	2		30	70	100	2hrs.

Course Description:

This course is an essential part of any Computer-Science education. The purpose of this course is to understand the mechanisms of the Operating Systems like Process Management, Memory Management, File System Implementation and operating system in various computing environments.

Prerequisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Discuss the structure and evolution of operating system	U
2	Explain the features and advantages of various types of operating system	R/U
3	Identify functions of operating system in detail	U/A
4	Identify and differentiate the features of operating system in various computing environment	A/An

Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C)

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7

CO 1	3						2
CO 2	3			2			2
CO 3	3						2
CO 4	3			3			2
CO5	3			2			2

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1	**MODULE TITLE: BASICS OF OS**		15
	1	Definition and Function of operating systems	
	2	Evolution of operating system	
	3	Operating system structure-monolithic layered,	
	4	virtual machine and Client server	

2	**MODULE TITLE: Types of operating system**		15
	1	Different types of operating system-real time systems- features and advantages	
	2	Multi-user System,-Distributed system- features and advantages	
	3	Network Operating System.- features and advantages	

3	**MODULE TITLE : Functions of operating system**		15
	1	Process management	
	2	Memory management	
	3	File management	
	4	Managing input and output devices	

4	**MODULE TITLE : Operating system in Various Computing Environments**		15
	1	Advantages and disadvantages of Main frame, Client-Server **Operating system**	
	2	Advantages and disadvantages of Cloud Computing, Mobile Computing **Operating system**	
	3	Advantages and disadvantages of Grid Computing, clustered computing **Operating system**	

5	**Teacher Specific Module**	
	Use appropriate methodologies and evaluation tools according to the topics.	5

Essential Readings:

1. Fundamentals of Operating Systems By LISTER
2. Operating System Concepts" by Avi Silberschatz and Peter Galvin

Assessment Rubrics:

Evaluation Type		**Marks**
End Semester Evaluation		**70**
Continuous Evaluation		**30**
a)	Test Paper- 1	5
b)	Model Examination	10

c)	Assignment- 2 Numbers	5
d)	Group project: data collection, analytics	10
e)	Report	
f)	presentation	
Grand Total		**100**

Optional minor 3.2

KU3DSCCSC205: BASICS OF DATA ANALYTICS

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
3	DSC	200	**KU3DSCCSC205**	4	60

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
4	0		30	70	100	2hrs.

Course Description:

This course introduces students to the fundamental concepts and techniques of data analytics. Students will learn how to collect, clean, analyze, and visualize data using various tools and techniques. The course will cover data collection, data cleaning, data analysis, and data visualization

Course Prerequisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Identify the basics of data analytics.	U
2	Organise the methods to collect and clean data.	An
3	Examine different data analysis techniques.	A
4	Use data visualisation techniques in handling real life data effectively.	A/An
5	Judge on various data analytics concepts in real-world scenarios.	E

Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C)

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1	3			3			
CO 2	3						2
CO 3	2	2	3	3		2	2
CO 4	2		3	3			2
CO5	3		3			2	3

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1	**MODULE TITLE:** INTRODUCTION TO DATA ANALYTICS		15
	1	What is data analytics?	
	2	Importance of data analytics	
	3	Overview of data analytics process	
	4	Tools and software for data analytics	
2	**MODULE TITLE: DATA COLLECTION**		15
	1	Sources of data	
	2	Data types (structured and unstructured data)	
	3	Data collection methods	
	4	Data storage and management	
3	**MODULE TITLE:** DATA CLEANING		15
	1	Data preprocessing techniques	

	2	Handling missing data	
	3	Dealing with outliers	
	4	Data normalization and standardization	

4	**MODULE TITLE :** DATA ANALYSIS TECHNIQUES AND DATA VISUALIZATION		15
	1	Data Analysis Techniques - Descriptive analytics- Inferential analytics	
	2	Predictive analytics - Prescriptive analytics	
	3	Importance of data visualization Types of data visualizations (charts, graphs, dashboards)	
	4	Introduce various tools for data visualization (Excel, Tableau, Power BI)	

5	**Teacher Specific Module**	
	Teacher can suggest activities on following titles	
	Real-World Applications Case studies and examples of data analytics in various industries Group project: Applying data analytics concepts to a real-world dataset Presentation of group projects	5

Essential Readings:

1. **Data Science for Business" by Foster Provost and Tom Fawcett**
2. **- "Python for Data Analysis" by Wes McKinney**
3. **- Online resources and tutorials**

Assessment Rubrics:

Evaluation Type		Marks
End Semester Evaluation		**70**
Continuous Evaluation		**30**
a)	Test Paper- 1	5
b)	Model Examination	10
c)	Assignment- 2 Numbers	10
d)	Seminar	5
e)	Book/ Article Review	
f)	Viva-Voce	
g)	Field Report	
Grand Total		**100**

Optional minor 6.1

KU3DSCCSC206: INTRODUCTION TO MACHINE LEARNING

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
3	DSC	200	**KU3DSCCSC206**	4	75

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
3	2		30	70	100	2hrs.

Course Description:

This course serves as an introduction to machine learning, a field of artificial intelligence that focuses on developing algorithms and models that enable computers to learn from and make predictions or decisions based on data. Students will learn the fundamental concepts, techniques, and applications of machine learning, including supervised learning, unsupervised learning, and evaluation methods.**Course Prerequisite: NIL**

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Discuss on principles and concepts of machine learning.	U
2	Compare different types of machine learning algorithms and models.	A
3	Examine supervised and unsupervised learning techniques.	A
4	Implement machine learning algorithms to real-world datasets.	A/An
5	Appraise machine learning model performance.	E

**Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C)*

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1	3			3			
CO 2	3						2
CO 3	3	2		2			2
CO 4	3		3	3			2
CO5	3	2		2			2

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1	**MODULE TITLE**: **Introduction to Machine Learning**		**15**
	1	What is machine learning?	
	2	Types of machine learning (supervised, unsupervised, reinforcement learning)	
	3	Applications of machine learning	
	4	Tools and software for machine learning (Scikit-learn, TensorFlow)	

2	**MODULE TITLE: Supervised learning**		**15**
	1	Introduction to supervised learning	
	2	Linear regression	
	3	Logistic regression	
	4	Decision trees and ensemble methods (Random Forest, Gradient Boosting)	

3	**MODULE TITLE : Unsupervised Learning**	**15**

	1	Introduction to unsupervised learning	
	2	Clustering algorithms (K-means, Hierarchical clustering)	
	3	Dimensionality reduction techniques (PCA, t-SNE)	
	4	Instant based learning: K- Nearest Neighbor Learning Locally weighted Regression Radial Bases Functions – Case Based Learning.	

4		**MODULE TITLE :** ADVANCED LEARNING	15
	1	Learning Sets of Rules Sequential Covering- Algorithm -Learning-Rule -Set First Order- Rules -Sets of First Order Rules	
	2	Induction on Inverted Deduction -Inverting Resolution -Analytical Learning- Perfect Domain	
	3	Theories Explanation Base Learning – FOCL Algorithm - Reinforcement Learning- Task Learning -Temporal Difference Learning	

5	**Teacher Specific Module**	
	Use appropriate methodologies and evaluation tools according to the topics.	15

Essential Readings:

1. Tom M. Mitchell, “Machine Learning”, McGraw-Hill, 2010 2.
2. Bishop, Christopher. Neural Networks for Pattern Recognition. New York, NY: Oxford University Press, 1995

3.."Introduction to Machine Learning with Python" by Andreas C. Müller and Sarah Guido

4."Pattern Recognition and Machine Learning" by Christopher M. Bishop

5. Online resources, research papers, and tutorials

Assessment Rubrics:

Evaluation Type	Marks
End Semester Evaluation	**70**
Continuous Evaluation	**30**

a)	Test Paper- 1	5
b)	Model Examination	10
c)	Assignment- 2 Numbers	10
d)	Seminar	5
e)	Book/ Article Review	
f)	Viva-Voce	
g)	Field Report	
Total		**100**

Optional minor 6.2

KU3DSCCSC207: SOCIALMEDIA ANALYSIS

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
3	DSC	200	KU3DSCCSC207	4	75

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
3	2		30	70	100	2hrs

Course Description:

This course provides an in-depth exploration of social media analysis, including data collection, analytics tools, and insights interpretation. Students will learn how to analyze social media data to understand online conversations, track brand reputation, and measure campaign

Prerequisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Dicuss the fundamentals of social media analytics	U
2	Collect and identify social media data	U
3	Interpret insights from social media data	A/An
4	Interpret social media analysis in real-world scenarios	A

Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C)

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7

CO 1	3			3			2
CO 2	3	2	2				2
CO 3	3	2		2			2
CO 4	3			3			2

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1		**MODULE TITLE**: **Introduction to Social Media Analytics**	**15**
	1	Definition and importance of social media analytics	
	2	Types of social media analytics (metrics, insights, reporting)	
2		**MODULE TITLE: Data Collection and Cleaning**	**15**
	1	Social media data sources (APIs, web scraping, manual collection)	
	2	Data cleaning and preprocessing (handling missing data, data normalization)	
3		**MODULE TITLE : Analytics Tools and Platforms**	**15**
	1	Overview of analytics tools (Hootsuite, Sprout Social, Brandwatch)	
	2	Hands-on experience with analytics tools	
4		**MODULE TITLE : Social Media Metrics and Insights**	15
	1	Engagement metrics (likes, shares, comments) - Reach and impressions metrics - Sentiment analysis and opinion mining	

	2	Network analysis and influencer identification	
	3	Topic modeling and trend analysis	

5	**Teacher Specific Module**	
	Use appropriate methodologies and evaluation tools according to the topics.	15

Essential Readings:

1 - Social Media Analytics: Effective Tools for Building, Interpreting, and Using Metrics - Marshall Sponder

2. Social Media Analytics and Practical Applications - Liangfei Qiu , Subodha Kumar

Software and Tools:

- Analytics tools (Hootsuite, Sprout Social, Brandwatch)

- Data visualization tools (Tableau, Power BI)

- Online resources and tutorials

Assessment Rubrics:

Evaluation Type		**Marks**
End Semester Evaluation		**70**
Continuous Evaluation		**30**
a)	Test Paper- 1	5
b)	Model Examination	10
c)	Assignment- 2 Numbers	5
d)	Group project: data collection, analytics	10
e)	Report	
f)	presentation	
Grand Total		**100**

Optional minor 6.3

KU3DSCCSC208: CONTENT MANAGEMENT SYSTEM

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
3	DSC	200	KU3DSCCSC208	4	75

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
3	2		30	70	100	2hrs.

Course Description:

This course provides a comprehensive introduction to Content Management Systems (CMS) and their role in managing digital content. Students will learn the fundamentals of CMS, its features, and how to implement and manage a CMS platform. The course covers the importance of CMS, types of CMS platforms, features and functionality, installation and configuration, content management best practices, and advanced CMS topics.

Prerequisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Identify the concept of Content Management System and its importance	U
2	Discuss on features and functionality of a CMS platform	U
3	Identify the steps to install, configure, and manage a CMS platform	U/A

4	Design and manage digital content using a CMS	A
5	Use CMS skills to real-world scenarios	A

Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C)

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1	3			3			2
CO 2	3						2
CO 3	3	2					2
CO 4	3	2	2		2		2
CO5	3	2	2	2			2

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1	**MODULE TITLE**: **Introduction to Content Management System**		**15**
	1	Definition and importance of CMS	
	2	Types of CMS platforms -Open Source	
	3	Proprietary- SaaS	

2	**MODULE TITLE: Features and Functionality of CMS**		**15**
	1	Content creation and editing (WYSIWYG editors, markup languages)	
	2	Content organization and taxonomy (categories, tags, metadata)	
	3	User management and permissions (roles, access control)	
	4	Workflow and approval processes (content moderation, publishing)	

3	**MODULE TITLE : Installing and Configuring CMS**		**15**
	1	Installing CMS platforms (WordPress, Drupal, Joomla)	
	2	Configuring CMS settings and options (database, server, security)	
	3	Customizing CMS themes and templates (HTML, CSS, JavaScript)	

4	**MODULE TITLE : Managing Digital Content with CMS**		15
	1	Creating and editing content (text, images, multimedia) - Managing content metadata and taxonomy	
	2	Using CMS plugins and modules (extensions, add-ons)	
	3	Content strategy and planning (audience, purpose, tone) Content creation and editing guidelines (style guides, brand voice)	
	4	Content optimization and SEO (search engines, keywords	

5	**Teacher Specific Module**	
	Use appropriate methodologies and evaluation tools according to the topics.	15

Essential Readings:

1. Content Management Systems: A Guide to Implementing and Managing a CMS" by [Author]

2. Web Content Management: Systems, Features, and Best Practices- **Deane Barker**

Software and Tools:

- CMS platforms (WordPress, Drupal, Joomla)
- CMS plugins and modules
- Content creation and editing tools (Adobe Creative Cloud)

- Online resources and tutorials

Assessment Rubrics:

Evaluation Type		Marks
End Semester Evaluation		**70**
Continuous Evaluation		**30**
a)	Test Paper- 1	5
b)	Model Examination	10
c)	Assignment- 2 Numbers	10
d)	Seminar	5
e)	Book/ Article Review	
f)	Viva-Voce	
g)	Field Report	
Grand Total		**100**

VALUE ADDED COURSE 1.1

KU3VACCSC201: CYBER LAWS AND RULES

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
3	VAC	200-299	KU3VACCSC201	3	45

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
3	-	-	25	50	75	1.5hrs.

Course Description:

This syllabus endeavours to give an insightful understanding of fundamental nuances of this information technology ecosystem and its legal concerns. It covers the whole Information Technology Act and its amendments along with applicable rules. Apart from the statutory provisions related to cyberspace, this syllabus also gives due emphasis on the social ,intellectual property issues and legal analysis of new emerging technologies of Cyberspace.

Course P**rerequisite: NIL**

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Recognize the Social And Intellectual Property Issues Emerging From 'Cyberspace'.	An
2	Identify The Legal And Policy Developments In Various Countries To Regulate Cyberspace	U/A
3	Discuss on relationship Between Commerce And Cyberspace;	U/A
4	Judge Information Technology Act And Legal Frame Work Of Right To Privacy, Data Security And Data Protection	E

**Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C)*

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1	3			3			3
CO 2	3			2			
CO 3	3	2		3			2
CO 4	3			3			3

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1	**MODULE TITLE**:: INTRODUCTION		9
	1	Origin and meaning of Cyberspace;-Cyberspace vs. Physical space; Legal Issues in Cyberspace;	
	2	Need of Regulation for Cyberspace; Different Models of Cyberspace Regulation	
	3	Cyber jurisdiction - Concept of Jurisdiction, - Jurisdiction in Cyberspace,	
	4	Issues and concerns of Cyberspace Jurisdiction in India,	

2	**MODULE TITLE:** INFORMATION TECHNOLOGY ACT		9
	1	A brief overview of Information Technology Act, 2000 - IT Act 2000 vs. IT Amendment Act 2008 -	
	2	Relevant provisions from Indian Penal Code, Indian Evidence Act,	

		Bankers Book Evidence Act, Reserve Bank of India Act, etc	
	3	Technological Concept of electronic signature and digital signature - Relevance of Signature - Handwritten signature vs Digital Signature Technological Advancement and development of signature -Digital Signature:IT Act, 2000	
	4	UNCITRAL Model Law on Electronic Signature	

3	**MODULE TITLE:** DATA PROTECTION AND PRIVACY CONCERNS IN CYBERSPACE		**9**
	1	Need to protect data in cyberspace - Types of data - Legal framework of data protection - GDPR	
	2	Concept of privacy - Privacy concerns of cyberspace - Constitutional framework of privacy - Judicial interpretation of privacy in India	
	3	Concept of Electronic Records and Electronic Evidence - Recognition of electronic records under the UNCITRAL Model Law & IT Act	
	4	Types of Electronic Evidence -Sources of electronic evidence - Technical Issues in collection of electronic Evidence.	

4	**MODULE TITLE :** IP PROTECTION ISSUES IN CYBERSPACE		9
	1	Copyright issues in cyberspace-Fundamental notions of copyright law - Copyright issues in cyberspace -Indian legal protection of copyright in cyberspace & concept of DRM	
	2	Trademark issues in cyberspace-Meaning, Purpose and Kinds of Domain Name- Domain Name Vs Trademark - Domain Name Registration, ICANN, - Domain Name dispute and Related Laws	
	3	Patent issues in cyberspace--new emerging issues of cyberspace -	
	4	Cloud Computing, -Big Data - Internet of Things -Artificial Intelligence and Robotics -Blockchain	

5	**Teacher Specific Module**		
			9

Essential Readings:

1. Chris Reed, Internet Law-Text and Materials, Universal Law Publishing Co., New Delhi, 2nd Edition, 2005
2. Ian J Lloyd, Information Technology Law, Oxford University Press, 7th Edition, 2014
3. Nandan Kamath, Law Relating to Computers Internet & E Commerce Universal Law Publisher, 5th Edition, (2012)
4. Aparna Viswanathan, Cyber Law Indian and International Perspectives, Lexis Nexis, 2012
5. Karnika Seth, Computers, Internet and New Technology Laws-A comprehensive reference work with special focus on developments in India. Lexis Nexis, Updated Edition 2016
6. Anirudh Rastogi, Cyber Law, Lexis Nexis, 2014
7. Pavan Duggal Cyber Law 3.0, Universal Law Publishing Company Private Limited, 2014 Edition.
8. Talat Fatima, Cybercrimes, Eastern Book Company, Lucknow, Second Edition, 2016

Assessment Rubrics:

Evaluation Type		**Marks**
End Semester Evaluation		**50**
Continuous Evaluation		**25**
a)	Test Paper- 1	5
b)	Model Examination	10
c)	Assignment- 2 Numbers	5
d)	Seminar	5
e)	Book/ Article Review	
f)	Viva-Voce	
g)	Field Report	
Grand Total		**75**

VALUE ADDED COURSE 1.2

KU3VACCSC202 : CYBER ETHICS

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
3	VAC	200	KU3VACCSC202	3	45

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
3	0	-	25	50	75	1.5 hrs.

Course Description:

This course explores the ethical issues arising from the use of technology and the internet. It covers fundamental ethical concepts, decision-making frameworks, and the impact of technology on privacy, security, and intellectual property. Students will examine case studies and engage in discussions to develop critical thinking skills in ethical reasoning and apply them to real-world scenarios.

Course Prerequisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Discuss the ethical implications of technology and the internet.	U
2	Recognise ethical theories and principles to analyze and evaluate cyber ethical issues.	A,An,E
3	Develop strategies for ethical decision-making in cyberspace.	C,An

4	Demonstrate emerging ethical challenges in technology and the internet.	U,A
5	Appraise a sense of responsibility and integrity in online behaviour and digital interactions.	E

Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C)

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1	3			3			2
CO 2	3			3			3
CO 3	3	3		3			
CO 4	3						
CO 5	3			3		2	2

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	**UNIT**	**DESCRIPTION**	**HOURS**
1	**INTRODUCTION TO CYBER ETHICS**		**9**
	1	Ethical concepts and principles	
		a) Definition of ethics	
		b) Ethical theories	
	2	Ethical decision-making frameworks	
		a) Steps in ethical decision-making, Ethical frameworks	
	3	Impact of technology on ethics	
		a) Technology's influence on privacy, security, and intellectual	

		property	
		b) Ethical issues in emerging technologies	
	4	Ethical issues in information dissemination	
		a) Misinformation, fake news, and propaganda	
		b) Ethics of information sharing and dissemination on the internet	

2	**PRIVACY AND SECURITY IN CYBERSPACE**		
	1	Privacy in the digital age	9
	2	Cybersecurity challenges	
	3	Data breaches and their implications	
	4	Cybercrime and cyber laws	
	5	Emerging trends in cybersecurity	

3	**INTELLECTUAL PROPERTY**		
	1	Intellectual Property Rights	9
	2	Protecting Intellectual Property	
		a) Trade Secrets	
		b) Trademarks and Service Marks	
		c) Patents, Copyrights	
	3	Open access and open-source software	

4	**SOCIAL MEDIA ETHICS AND ONLINE BEHAVIOR**		
	1	Ethical issues in social media use	9
		a) Online identity and anonymity, Cyberbullying and online harassment	
	2	Professional ethics in cyberspace	
		a) Ethical behaviour in online communities and professional contexts	
		b) Digital citizenship and responsible online behaviour	
	3	Digital addiction and mental health	

		a) Impact of excessive internet use on mental health	

5	**Teacher Specific Module**	
	Directions	
	Space to fill the selected area/ activity	9

Essential Readings:

4. Tavani, H. T. (2018). Ethics and Technology: Controversies, Questions, and Strategies for Ethical Computing. John Wiley & Sons.
5. Quinn, M. J. (2014). *Ethics for the Information Age* (6th ed.). Pearson.
6. Himma, K. E., & Tavani, H. T. (2019). The Handbook of Information and Computer Ethics. John Wiley & Sons.
7. Johnson, D. G, Computer Ethics (4th ed.). Prentice Hall.

Suggested Readings:

2. Spinello, R. A. (2014). CyberEthics: Morality and Law in Cyberspace (5th ed.). Jones & Bartlett Learning

Assessment Rubrics:

Evaluation Type		**Marks**
End Semester Evaluation		**50**
Continuous Evaluation		**25**
a)	Test Paper- 1	5
b)	Model Examination	10
c)	Assignment- 2 Numbers	5
d)	Group project: data collection, analysis	5
e)	Report	
f)	presentation	

Total	**100**

VALUE ADDED COURSE 1.3

KU3VACCSC203: DATAANLYTICS USING R

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
6	VAC	200-299	KU6VACCSC203	3	60

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
3			50	25	75	1.5 hrs.

Course Description:

This course is an introduction to data analytics using the free and open-source software R. The course helps to learn about the basics of exploratory and descriptive data analysis. The topics like obtaining, cleaning, combining, and wrangling the data into a more usable form. We will learn how to break up a large dataset into manageable pieces and then use a variety of quantitative and visual tools to summarize and learn about it.

Course Prerequisite: Basics of Statistics

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Identify the fundamentals, standards of Functions and capabilities of R Language.	U
2	Memmorise the basic R-Language Constructs	C
3	Demonstrate Simulation in R-Language, Math functions and files processing	C
4	Identify the principals of Graphics and R-Base Graphics	U/An
5	Design and build Linear optimization	A

Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C)

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1	3						2
CO 2	3	2		2			
CO 3	3	2	2				
CO 4	2	2					2
CO 5	2	2					2

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1	**MODULE TITLE:** Introduction to R.		12
	1	Installation and setting up R	
	2	Data types and data structures in R	
	3	Control Structures in R	
2	**MODULE TITLE:** R-base graphics		12
	1	Graphics, Creating Graphs, The Workhorse of R Base Graphics	
	2	The plot() Function Customizing Graphs, Saving Graphs to Files	
	3	Exploratory Analysis with base graphics tools in R (box plots, bar charts, line plots, heat map, etc.)	
3	**MODULE TITLE :** Data Visualization And Data Analysis		12
	1	Customize plot axes, labels, add legends, and add colors.	
	2	Probability Distributions, Normal Distribution- Binomial Distribution	
	3	Poisson Distributions , Basic Statistics, Correlation and Covariance, T-Tests,-ANOVA.	
	4	Analysis of Variance and Correlation	
4	**MODULE TITLE : linear Regression**		12
	1	Regression	
	2	Case Study : Predict the Quality of products using Linear Regression	
	3	Feature Selection and Shrinkage Methods	

	4	LASSO, Ridge Regression	

5	**Teacher Specific Module**	
	Directions	
	Use appropriate methodologies and evaluation tools according to the topics.	12

Essential Readings:

1. The Art of R Programming, Norman Matloff, Cengage Learning: Efficient R Programming: A Practical Guide to Smarter Programming 1st Edition - Colin Gillespie & Robin Lovelace - First Edition.
2. 2. Jared P. Lander, R for Everyone: Advanced Analytics and Graphics, Second Edition 2017.

References

1. Cookbook, PaulTeetor, Oreilly: R Cookbook [R CKBK] [Paperback] R Cookbook [RKBK] [Paperback]Mar 31, 2011 by Paul Teetor.

2. R in Action,Rob Kabacoff, Manning: R in Action: Data Analysis and Graphics with RNov 5, 2018 | Unabridged by Robert Kabacoff and Dale OgdenR

Software:

- R (http://cran.us.r-project.org) is a free command-line based statistical language.
- RStudio is a free IDE for R (http://www.rstudio.com/ide).

Assessment Rubrics:

Evaluation Type		**Marks**
End Semester Evaluation		**50**
Continuous Evaluation		**25**
a)	Test Paper- 1	5
b)	Model Examination	10
c)	Assignment- 2 Numbers	5

d)	Seminar	5
e)	Book/ Article Review	
f)	Viva-Voce	
g)	Field Report	
Grand Total		**75**

SEMESTER 4

KU4DSCCSC209: Database Management System

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
3	DSC	200-299	KU3DSCCSC209	4	75

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
3	2	-	30	70	100	3 Hrs

Course Description:

Computer databases typically store aggregations of data records or files that contain information, such as sales transactions, customer data, financials and product information. Databases are used for storing, maintaining and accessing any sort of data. They collect information on people, places or things.

Course Prerequisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Summarize and exemplify fundamental nature and characteristics of database systems	U
2	Model real word scenarios given as informal descriptions, using Entity Relationship diagrams	U
3	Implement relational model using query languages	U, A, C
4	Use normalisation techniques to design database.	U, A
5	Identify Big Data Concepts	U

Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C)

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1	3			2			
CO 2		2					
CO 3	3	3	2				
CO 4	2	3	2				3
CO 5	3	3		2			

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1	MODULE1: Database concept		
	1	Introduction – purpose of Database, Applications of Database, DBMS, DBMS software	15
	2	View of Data, Data Models, Transaction management	
	3	Database architecture – Storage manager-Query Processor	
	4	Database Administrator, Data Base Users	

2	MODULE 2: E-R Model		
	1	E-R model- Basic concepts, entity set & attributes.	15
	2	Relationships and constraints, cardinality, participation, notations, Mapping Constraints; Keys; Primary, Foreign, candidate.	
	3	E-R design issues, E-R diagram; Weak entity set; Extended E-R features: generalization and specialization	
	4	Concept Design - Conceptual design for University enterprises	

3	MODULE 3: Relational model and SQL	**15**

	1	Relational model – Structure of Relational database, Integrity constraints.	
	2	Relational Algebra -Fundamental operations , Relational calculus , Tuple and domain calculus	
	3	SQL: database languages; DDL- create, alter, drop, truncate; DML- Insert, Select, update, Delete; DCL, TCL, SQL Functions, Data types in SQL; Creation and deletion of database and user	
	4	SQL queries on single and multiple tables, Nested queries (correlated and non-correlated), Aggregation and grouping.	

4	MODULE 4: Join and Normalization		
	1	SQL Join Operations in Detail, SQL Views, Triggers, Sequences.	*15*
	2	Normalization- Introduction, Normal forms – 1NF, 2NF, 3NF and BCNF, functional dependency	
	3	Cloud database an over view- working of cloud databases-Types of cloud databases--Introduction to AWS-Main features and Advantages	
	4	Big Data- Introduction to Hadoop-Building blocks and components-Architecture	

5	**Teacher Specific Module**	
	Directions	
	Use appropriate methodologies and evaluation metrics related with the topics.	15

Essential Readings:

1. Database System Concepts; Silberschatz, Korth and Sudarsan, 5th Edn; McGraw Hill.
2. The Database Book: Principles and Practice Using MySQL; Gehani; University Press.
3. Database Management Systems Application, Kogent Learning, Solutions Inc, Dreamtech Press 2014, ISBN-978-93- 5119-476-7.
4. Database System Concepts, Kortli FIenery, Tata McGraw Hill Education, 6"' Edition ,ISBN -13:978-93-329-0135-4

Suggested Readings:

1. Fundamentals of Database systems, E. Navathe, 7thedn, Pearson Education.
2. Introduction to data base systems ITL Education Solutions Limited
3. DBMS and ORACLE, Dr. S.B Kishor, 2nd Ed, DAS GANU Prakashan.

Assessment Rubrics:

Evaluation Type		Marks
End Semester Evaluation		**50(Theory)** **20(Practical)**
Continuous Evaluation		**30**
a)	Test Paper- 1	5
b)	Model Exam	10
c)	Assignment(2 numbers)	10
d)	Seminar	5
e)	Book/ Article Review	
f)	Viva-Voce	
g)	Field Report	
Total		**100**

KU4DSCCSC 210 : DATA STRUCTURES

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
4	DSC	200	KU4DSCCSC210	4	75

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
3	2		30	70	100	2hrs.

Course Description: *Understanding data structures and algorithms enables to understand the problem statements on a deeper level and create logical solutions to solve them. Data structures are useful to implement the physical forms of abstract data types.*

Course Prerequisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Discuss the complexity of algorithm.	U
2	Differentiate linear and nonlinear data structures.	U
3	Use suitable data structures for a given problem.	A
4	Design programmes using data structures.	C

Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C)

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1	3	2	3				

CO 2	3	2					
CO 3	3	2	3				3
CO 5	3	3	3				

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1	**MODULE TITLE: Elementary Data Organization**		15
	1	Data Structures	
		a) Data Structure Classification	
		b) Operations of Data Structures	
	2	Linear Arrays	
		a) operations	
		b)Application	
		c)Polynomial- Representation with arrays	
		d)Polynomial addition	
	3	**Stack**	
		a) Operations	
		b) Application	
		c)Evaluation of post fix expression	
	4	Queue	
		a) Operations	
		b) Printer Queue as application,	
		c) Circular Queue	

		d)Deque	
		e)Priority Queue	
		Linked Lists: Definition, Representation of Linked List in memory, Traversing Linked List, Searching a linked list, Memory Allocation and Garbage Collection , Insert into a linked list, Deletion from a linked list; Header Linked Lists; Two-way Lists – Operations.	

2	**MODULE TITLE: Trees**		
	1	Binary Trees, Complete Binary trees, Extended Binary trees; Representing Binary trees in memory, Traversing Binary trees,	15
	2	Binary search trees – Searching and inserting in Binary Search Trees, Deleting in a Binary Search Tree	
	3	Heap – Heap sort,	
	4	Huffman's Algorithm	
	5	General Trees – Computer representation of general trees	

3	**MODULE TITLE: Graphs**		
	1	Graph Theory terminology; Sequential Representation of Graphs – Adjacency Matrix, Path Matrix	

		.	
	2	Operations on graph	15
		a) traversing searching	
		b) inserting	
		c) deleting	
	3	Breadth- First Search and Depth First Search	
4	**MODULE TITLE: Design and Analysis of Algorithms**		
	1	: From Problems to Programs - Algorithms, PseudoLanguage and Stepwise Refinement;	15
		a) Abstract Data Type definition, Data Structures and Abstract Data Types	
	2	Measuring the Running Time of a Program	
		a) Asymptotic Notations – Big O, Omega,Theta	
	3	Search: Linear and Binary search; comparison of searching algorithms.	
		Sort: Insertion, bubble, selection, quick and merge sort; Comparison of Sort algorithms	
5	**Teacher Specific Module**		
	Directions		
	Use appropriate methodologies and evaluation metrics related with the topics.		15

Essential Readings:

1. Schaum's Outline of Theory and Problems of Data Structures – SymourLipschutz Mc-Graw Hill Book Company.

2. Data Structures and Algorithms- Alfred V. Aho, John E. Hopcroft, Jeffrey D.Ullman – Pearson Educatio

Suggested Readings:

1. Data Structures and Algorithms: Concepts, Techniques and Applications; GAV Pai, McGraw Hill, 2008.

2. Data Structures in C, Achuthsankar and Mahalekshmi, PHI, 2008

3. Fundamentals of Data structures in C++, 2nd Edn, Horowitz Sahni, Anderson, Universities Press

4. Classic Data structures, Samanta, Second Edition, PHI

Assessment Rubrics:

Evaluation Type		**Marks**
End Semester Evaluation		**50(Theory)** **20(Practical)**
Continuous Evaluation		**30**
a)	Test Paper- 1	5
b)	Model Examination	10
c)	Assignment- 2 Numbers	10
d)	Seminar	5
e)	Book/ Article Review	
f)	Viva-Voce	
g)	Field Report	
Total		**100**

KU4DSCCSC211: Operating Systems

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
4	DSC	200-299	KU4DSCCSC211	4	60

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
4	0	-	30	70	100	2 Hrs

Course Description:

An operating system is the most important software that runs on a computer. It manages the computer's memory and processes, as well as all of its software and hardware. It also allows you to communicate with the computer without knowing how to speak the computer's language.

Course Prerequisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Outline various concepts and features of Operating systems.	U
2	Compare various operating systems with respect to characteristics and features	U
3	Identify algorithm of CPU Scheduling, Memory Scheduling and disk scheduling.	U, A
4	Explain Linux operating system commands	U, A

****Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C)***

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1	3			2			
CO 2							
CO 3	3		2				
CO 4	3		2				3

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1	MODULE1: Introduction to OS		
	1	Introduction, structure of Operating Systems, Different types of Operating systems-Batch Processing System, Multi programming system, Time Sharing System, Real Time System, Distributed system	12
	2	Functions of operating system-Process management, Main memory management, File management, I/O system management, Secondary storage management	
	3	User mode and Kernel mode, System Calls (Introduction only), Operating System Design and Implementation approaches	
	4	Operating System Design and Implementation approaches, Operating System Structures - simple, layered, micro Kernel	

2	MODULE 2: Process Management		
	1	Processes: Process Concept–The Process, Process State , Process Control Block	12
	2	Process Scheduling–Schedulers, Context Switch-CPU Scheduling: Basic Concepts–CPU scheduler	
	3	Pre-emptive and non pre-emptive scheduling, Dispatcher-Scheduling criteria	
	4	Scheduling algorithms–FCFS, SJFS, Priority Scheduling, Round Robin	

		Scheduling	

3	MODULE 3: Deadlock, Memory Management and Disk Scheduling		**12**
	1	Deadlocks: Characterization – necessary conditions – Resource allocation graph – - Deadlock prevention – mutual exclusion, hold and wait, no pre-emption, circular wait	
	2	Memory: Contiguous Memory Allocation, Segmentation, Paging, Demand Paging	
	3	Page Replacement - Basics, FIFO Page Replacement, Optimal Page Replacement, LRU Page Replacement	
	4	Mass Storage Structure: Disk Structure-Disk Scheduling: FCFS Scheduling, SSTF Scheduling, SCAN Scheduling, C-SCAN Scheduling, LOOK Scheduling, C-LOOK Scheduling	

4	MODULE 4: Introduction to Linux and basic commands		
	1	History of Unix and Linux, Linux Overview, Processes in Linux	12
	2	Memory management in Linux, I/O in Linux, Linux file system, security in Linux	
	3	Linux commands: pwd, cd, absolute and relative paths, ls, mkdir, rmdir, rm, cp, mv, rename, head, tail, cat, chmod	
	4	vi editor, security by file permissions	

5	**Teacher Specific Module**	
	Directions	
	Use appropriate methodologies and evaluation metrics related with the topics.	12

Essential Readings:

1. "Operating System Concepts" by Abraham Silberschatz, Peter B. Galvin, and Greg Gagne.

2. "Modern Operating Systems" by Andrew S. Tanenbaum.

3. "Operating Systems: Internals and Design Principles" by William Stallings.

4. "The Linux Programming Interface: A Linux and UNIX System Programming Handbook" by Michael Kerrisk.

5. Unix and shell Programming Behrouz A. Forouzan, Richard F. Gilberg.Thomson

Suggested Readings:

1. https://www.geeksforgeeks.org/cpu-scheduling-criteria/
2. https://www.geeksforgeeks.org/conditions-for-deadlock-in-operating-system/?ref=lbp
3. Linux System Programming, Robert Love, O'Reilly, SPD
4. Dhananjay M. Dhamdhere, Operating Systems A Concept Based Approach, 3rd Ed, TMH

Assessment Rubrics:

Evaluation Type		**Marks**
End Semester Evaluation		**70**
Continuous Evaluation		**30**
a)	Test Paper- 1	5
b)	Model Exam	10
c)	Assignment(2 numbers)	10
d)	Seminar	5
e)	Book/ Article Review	
f)	Viva-Voce	
g)	Field Report	
Total		**100**

SKILL ENHANCEMENT COURSE 1.1

KU4SECCSC 201 : COMPUTER HARDWARE & NETWORKING

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
4	SEC	200-299	KU4SECCSC201	3	60

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
2	2		25	50	75	1.5 hrs.

Course Description:

The course will help in computer related operation and function involved in office activities regarding software installation, Hardware maintenance, network maintenance .after completion of the course the student will be able work as a Hardware Analyst and Network Administrator

Prerequisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Identify the basics of computer systems along with peripherals.	U
2	Solve different computer hardware related issues.	A
3	Identify and select appropriate security measures in system maintenance .	U/A
4	Use troubleshooting tools and tips in software and hardware problems related to internet applications	A/An

Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C)

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1	3			3			2
CO 2	3	2					2
CO 3	3			3			2
CO 4	3			3			3

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1	**MODULE TITLE :** Computer Fundamentals		12
	1	Computer Fundamentals & Basics of Power System in a Computer	
	2	Install Test and Troubleshoot Switch Mode Power Supply & UPS (Uninterrupted Power Supply).	
	3	Introduction to Basic Input Output System.	
	3	Introduction to Operating System	

2	**MODULE TITLE: Computer Management.**		12
	1	Manage the resources of a Computer System (Windows and or Linux) according to users need.	
	2	Disk Partitioning	
	3	Details about Central Processing Unit & Main board	
	4	Primary and Secondary Memory	

3	**MODULE TITLE : M**aintaining devices and software		**12**
	1	Install & connect accessories like optical drive, keyboard, mouse, monitor, Printer and troubleshoot them	
	2	Identify different types of Virus attack and take suitable course of action to disinfect a system	

4	**MODULE TITLE : Networking**		12
	1	Working Principle of Communication and utility of Network in a big System.	
	2	Network Topologies, Networking Devices,	
	3	Transmission Media, Sharing of resources.	
	4	Connect computers in a networking system and able to share, files, printers or other resources in a system.	
	5	Configure the router or modem and setup a secured connection via Internet	

5	**Teacher Specific Module**	
	Use appropriate methodologies and evaluation metrics related with the topics	12

Essential Readings:

1. PC Hardware: The Complete Reference by Craig Zacker, John Rourke

2. Mastering Pc Hardware And Networking **Paperback – Big Book, 1 January 2014**

   by Ajit Mittal (Author), Ajay Rana (Author)

Assessment Rubrics:

Evaluation Type		Marks
End Semester Evaluation		**50**
Continuous Evaluation		**25**
a)	Test Paper- 1	5
b)	Model Examination	10
c)	Assignment- 2 Numbers	5
d)	Seminar	5
e)	Book/ Article Review	
f)	Viva-Voce	
g)	Field Report	
Total		**100**

SKILL ENHANCEMENT COURSE 1.2

KU4SECCSC202 : CYBER ETHICS

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
4	SEC	200	KU4SECCSC202	3	45

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
3	0	-	25	50	75	1.5hrs.

Course Description:

This course explores the ethical issues arising from the use of technology and the internet. It covers fundamental ethical concepts, decision-making frameworks, and the impact of technology on privacy, security, and intellectual property. Students will examine case studies and engage in discussions to develop critical thinking skills in ethical reasoning and apply them to real-world scenarios.

Course Prerequisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Discuss the ethical implications of technology and the internet.	U
2	Examine the ethical theories and principles to analyze and evaluate cyber ethical issues.	A,An,E
3	Develop strategies for ethical decision-making in cyberspace.	C,A
4	Criticise ethical challenges in technology and the internet.	U,An

5	Develop a sense of responsibility and integrity in online behaviour and digital interactions.	U,A,C

Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C)

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1	3			3			2
CO 2	3			3			3
CO 3	3	3		3			
CO 4	3						
CO 5	3			3		2	2

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1	**INTRODUCTION TO CYBER ETHICS**		9
	1	Ethical concepts and principles	
		a) Definition of ethics	
		b) Ethical theories	
	2	Ethical decision-making frameworks	
		a) Steps in ethical decision-making, Ethical frameworks	
	3	Impact of technology on ethics	
		a) Technology's influence on privacy, security, and intellectual property	
		b) Ethical issues in emerging technologies	

	4	Ethical issues in information dissemination	
		a) Misinformation, fake news, and propaganda	
		b) Ethics of information sharing and dissemination on the internet	

2	**PRIVACY AND SECURITY IN CYBERSPACE**		
	1	Privacy in the digital age	9
	2	Cybersecurity challenges	
	3	Data breaches and their implications	
	4	Cybercrime and cyber laws	
	5	Emerging trends in cybersecurity	

3	**INTELLECTUAL PROPERTY**		
	1	Intellectual Property Rights	9
	2	Protecting Intellectual Property	
		a) Trade Secrets	
		b) Trademarks and Service Marks	
		c) Patents, Copyrights	
	3	Open access and open-source software	

4	**SOCIAL MEDIA ETHICS AND ONLINE BEHAVIOR**		
	1	Ethical issues in social media use	
		a) Online identity and anonymity, Cyberbullying and online harassment	9
	2	Professional ethics in cyberspace	
		a) Ethical behaviour in online communities and professional contexts	
		b) Digital citizenship and responsible online behaviour	
	3	Digital addiction and mental health	
		a) Impact of excessive internet use on mental health	

5	**Teacher Specific Module**	
	Directions: Use appropriate methodologies and evaluation metrics related with the topics	9

Essential Readings:

8. Tavani, H. T. (2018). Ethics and Technology: Controversies, Questions, and Strategies for Ethical Computing. John Wiley & Sons.
9. Quinn, M. J. (2014). *Ethics for the Information Age* (6th ed.). Pearson.
10. Himma, K. E., & Tavani, H. T. (2019). The Handbook of Information and Computer Ethics. John Wiley & Sons.
11. Johnson, D. G, Computer Ethics (4th ed.). Prentice Hall.

Suggested Readings:

3. Spinello, R. A. (2014). CyberEthics: Morality and Law in Cyberspace (5th ed.). Jones & Bartlett Learning

Assessment Rubrics:

Evaluation Type		**Marks**
End Semester Evaluation		**50**
Continuous Evaluation		**25**
a)	Test Paper- 1	5
b)	Model Examination	10
c)	Assignment- 2 Numbers	5
d)	Seminar/viva	5
e)	Book/Article review	
f)	Field report	
Total		**75**

SKILL ENHANCEMENT COURSE 1.3

KU4SECCSC 203 : DATA ANALYTICS USING EXCEL

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
4	SEC	200-299	KU4SECCSC203	3	60

Learning Approach (Hours/ Week63)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
2	2		30	70	100	2hrs.

Course Description:

The course helps to learn how to clean data in spreadsheets using foundational spreadsheet functions. You will also learn how to calculate summary statistics in spreadsheets as well as how to identify data trends and relationships between variables.

Prerequisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	List out the analytics tools available in Excel	U
2	use advanced sorting and advanced conditional formatting for descriptive analysis	U/A
3	Demonstrate selected analytics functions such as DSUM, DAVERAGE, DMAX and AGGREGATE	U/A
4	Use What-If Analysis Tools and their applications.	A
5	Design excel analytical tool to analyse real data	E/An

****Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C)***

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1	3						2
CO 2	3	2	2				2
CO 3	3	3	3	3			2
CO 4	3			3			3
CO5	3	3	2				3

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1	**MODULE TITLE:: introduction to EXCEL**		12
	1	About Excel & Microsoft, Uses of Excel, Excel software, , ,	
	2	Spreadsheet window pane, Title Bar, Menu Bar, Standard Toolbar, Formatting Toolbar	
	3	Formula Bar, Workbook Window, Status Bar, Task Pane, Workbook & sheets	
	3	Selecting Columns & Rows, Changing Column Width & Row Height, Autofitting Columns & Rows, Hiding/Unhiding Columns & Rows	
	4	Inserting & Deleting Columns & Rows, Cell, Address of a cell, Components of a cell – Format, value, formula, Use of paste and paste special	

2	**MODULE TITLE: : Functionality Using Ranges**		12
	1	Using Ranges, Selecting Ranges, Entering Information Into a Range, Using AutoFill	

	2	Creating Formulas : Using Formulas Formula Functions – Sum, Average, if, Count, max, min, Proper, Upper, Lower, Using AutoSum,	
	3	Advance Formulas :Concatenate, Vlookup, Hlookup, Match, Countif, Text, Trim	

3	**MODULE TITLE : Spreadsheet Charts**		**12**
	1	Creating Charts, Different types of chart, Formatting Chart Objects, ,	
	2	Changing the Chart Type, Showing and Hiding the Legend- Showing and Hiding the Data Table	
	3	Data Analysis -Sorting, Filter, Text to Column, Data Validation	

4	**MODULE TITLE : PivotTables**		12
	1	Creating PivotTables, Manipulating a PivotTable, Using the PivotTable	
	2	Toolbar, Changing Data Field, Properties, Displaying a PivotChart	
	3	Setting PivotTable Options, . Adding Subtotals to PivotTables	
	4	Moving between Spreadsheets, Selecting Multiple Spreadsheets, Inserting and Deleting Spreadsheets Renaming Spreadsheets	
	5	Splitting the Screen, Freezing Panes, Copying and Pasting Data between Spreadsheets, Hiding , Protecting worksheets	

5	**Teacher Specific Module**	
	Use appropriate methodologies and evaluation metrics related with the topics	12

Essential Readings:

1 Excel with Microsoft Excel: Comprehensive & Easy Guide to Learn Advanced MS Excel

By Naveen Mishra

2. 101 Most Popular Excel Formulas by John Michaloudis , Bryan Hong

Assessment Rubrics:

Evaluation Type		**Marks**
End Semester Evaluation		**50**
Continuous Evaluation		**25**
a)	Test Paper- 1	5
b)	Model Examination	10
c)	Assignment- 2 Numbers	5
d)	Seminar	5
e)	Book/ Article Review	
f)	Viva-Voce	
g)	Field Report	
Grand Total		**75**

SKILL ENHANCEMENT COURSE 1.4

KU4SECCSC 204 : DATABASE ADMINISTRATION

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
4	SEC	200	**KU4SECCSC204**	3	60

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
3			25	50	75	1.5hrs.

Course Description:

This course attempts to develop skills in the area of database administration. After learning this course students would be able to design, edit, manage and maintain databases, and administer them professionally.

Course Prerequisite: Nil

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Execute SQL queries related to Transaction Processing & Locking using concept of Concurrency control.	U /A
2	Demonstrate use of Database Object.	U
3	Identify database implementation life cycle and information system.	U
4	Use various administrative techniques in database management .	A

Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C)

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7

CO 1	3	2	3				
CO 2	3	2	2				2
CO 3	3			2			
CO 5	2	2	3	2			2

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1		**MODULE TITLE: Advanced SQL**	12
	1	Transactional Control: Commit, Save point, Rollback	
	2	DCL commands : Grant and Revoke	
	3	Types of locks -Row level locks -. Table level locks-. Shared lock -. Exclusive lock - Deadlock	
	4	Synonym : Create synonym -Sequences	
	5	Create and alter sequences Index : Unique and composite - Views : Create/Replace, Update and alter views	
2		**MODULE TITLE: Database Design And Implementation**	12
	1	Database Application Life Cycle - Conceptual Database application	
	2	Design -Retrieve transaction -Update Transaction - Mixed Transaction	
	3	Logical and Physical Database Design - Response Time	
	4	Space Utilization - Transaction Throughput	
3		**MODULE TITLE: Transaction Processing**	12

	1	Transaction concepts - Concurrency	
	2	Methods for Concurrency control	
	3	Locking Methods -Timestamp methods - Optimistic methods	

4	**MODULE TITLE : Database Administrator**		12
	1	Types of Database Users- User Creation and management	
	2	Tasks of a Database Administrator- Submitting Commands and SQL to the Database	
	3	About Database Administrator Security and Privileges -Database	
	4	Administrator Authentication - Creating and Maintaining a Password File - Data Utilities	

5	**Teacher Specific Module**	
	Directions	
	Use appropriate teaching methodologies and evaluation metrics related with the topics.	12

Essential Readings:

1. Database Systems Concepts, design and Applications

Singh, S. K. Pearson Education, New Delhi, 2012

2. An Introduction to Database Systems Date, C. J. Pearson Education, New Delhi, 2012

3. Database System Concepts, Korth, Henry MGH

Assessment Rubrics:

Evaluation Type	Marks
End Semester Evaluation	**50**
Continuous Evaluation	**25**

a)	Test Paper- 1	5
b)	Model Examination	10
c)	Assignment- 2 Numbers	5
d)	Seminar	5
e)	Book/ Article Review	
f)	Viva-Voce	
g)	Field Report	
Total		**75**

VALUE ADDED C OURSE 2.1

KU4VACCSC204 : WIRELESS SENSOR NETWORKS

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
3	VAC	200	**KU4VACCSC204**	3	45

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
3			25	50	75	1.5hrs.

Course description: The course will introduce students to data transfer over wireless media. Digital signal modulation and coding schemes, electromagnetic waves propagation and data decoding are considered. IEEE 802.11 (Wi-Fi) is a wireless data link-layer protocol engineered specially for wireless media. Students will learn wireless network design, operation and testing; wireless network equipment configuration, wireless network security. Course.

Prerequisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Discuss challenges and technologies for wireless networks	U
2	Examine the architecture of sensors networks.	U
3	Describe the communication, energy efficiency, computing, storage and transmission	U/A
4	Design infrastructure and simulations	A/An

Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C)

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1	3			3			
CO 2	3	2					2
CO 3	2	2					
CO 4	2			3			2

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1	**MODULE TITLE:** OVERVIEW OF WIRELESS SENSOR NETWORKS		9
	1	Single-Node Architecture - Hardware Components - ,	
	2	Network Characteristics- unique constraints and challenges	
	3	Enabling Technologies for Wireless Sensor Networks - Types of wireless sensor networks.	
2	**MODULE TITLE:** ARCHITECTURES		9
	1	Network Architecture - Sensor Networks-Scenarios - Design Principle, Physical Layer and Transceiver	
	2	Design Considerations, Optimization Goals and Figures of Merit, Gateway Concepts, Operating	
	3	Systems and Execution Environments - introduction to Tiny OS and nesC - Internet to WSN Communication	

3	**MODULE TITLE:** NETWORKING SENSORS		**9**
	1	MAC Protocols for Wireless Sensor Networks, Low Duty Cycle Protocols And Wakeup Concepts – Wakeup Radio Concepts, Address and Name Management, Assignment of MAC Addresses, Routing Protocols Energy-Efficient Routing, Geographic Routing.	
	2	SMAC, - B-MAC Protocol, IEEE 802.15.4 standard and ZigBee, the Mediation Device Protocol,	
	3	Wakeup Radio Concepts, Address and Name Management, Assignment of MAC Addresses, Routing	

4	**MODULE TITLE :** INFRASTRUCTURE ESTABLISHMENT		9
	1	Topology Control, Clustering, and Positioning,	
	2	Time Synchronization, Localization	
	3	Sensor Tasking and Control.	

5	**Teacher Specific Module**	
	Use appropriate teaching methodologies and evaluation metrics related with the topics.	**9**

ESSENTIAL READING BOOKS :

4. Holger Karl & Andreas Willig, "Protocols And Architectures for Wireless Sensor Networks", John Villey

5. Feng Zhao & Leonidas J.Guibas, “Wireless Sensor Networks- An Information Processing Approach", Elsevier, 2007.

6. . Waltenegus Dargie , Christian Poellabauer, “Fundamentals of Wireless Sensor Network Theory and Practice”, John Wiley & Sons Publications, 2011

RECOMMONDED READING BOOKS :

1. Kazem Sohraby, Daniel Minoli, & Taieb Znati, “Wireless Sensor Networks-Technology, Protocols, and Applications”, John Wiley, 2007.

2 Anna Hac, “Wireless Sensor Network Designs”, John Wiley, 2003

WEB LINKS FOR REFERENCE

1. https://nptel.ac.in/courses/106/105/106105160/
2. https://onlinecourses.swayam2.ac.in/arp19_ap52/preview
3. https://cse.iitkgp.ac.in/~smisra/course/wasn.html

Assessment Rubrics:

Evaluation Type		**Marks**
End Semester Evaluation		**50**
Continuous Evaluation		**25**
a)	Test Paper- 1	5
b)	Model Examination	10
c)	Assignment- 2 Numbers	5
d)	Seminar	5
e)	Book/ Article Review	

f)	Viva-Voce	
g)	Field Report	
Grand Total		**75**

VALUE ADDED C OURSE 2.2

KU4VACCSC205: ETHICAL HACKING

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
4	VAC		KU4VACCSC205	3	45

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
3	0		25	50	75	1.5 /hrs.

Course Description:

This course introduces students to the field of ethical hacking, focusing on techniques used to secure information systems. Students will learn about different types of hackers, threats, and vulnerabilities. They will also gain hands-on experience with tools and methodologies used in ethical hacking, including information gathering, footprinting, scanning, enumeration, password cracking, privilege escalation, and system hacking. Legal and ethical aspects of ethical hacking will also be covered to ensure responsible and lawful use of hacking techniques.

Course Prerequisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Discuss the fundamental concepts of ethical hacking, including its principles and methodologies.	U
2	Demonstrate proficiency in using various ethical hacking tools and techniques for information gathering, scanning, and enumeration.	A

3	Use ethical hacking principles to identify and exploit vulnerabilities in systems and networks.	A
4	Judge on legal and ethical considerations in ethical hacking practices.	E

Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C)

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1	3			3			2
CO 2	3			3			
CO 3	3			3			
CO 4	3	2	3	3			2

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1		**INTRODUCTION TO ETHICAL HACKING**	9
	1	**Introduction to ethical hacking**	
		a) Hacker types	
		b) Threats and attacks, Vulnerabilities	
	2	**Terminologies in hacking**	
		a) Black Hat, White Hat, and Grey Hat Hackers, Exploit, Phishing, Malware	
	3	**Ethics and laws in hacking**	
		a) Ethical principles in hacking	
		b)Legal implications and laws related to hacking, International cybersecurity laws and regulations	

	4	Need of Ethical hacking, Roles and responsibilities.	
		a) Importance of ethical hacking in cybersecurity	
		b) Roles of ethical hackers in organizations	
		c) Responsibilities and code of conduct for ethical hackers	

2	**INFORMATION GATHERING AND RECONNAISSANCE**		
	1	Information Gathering : Information gathering techniques	9
	2	Foot printing and reconnaissance: definitions and techniques	
	3	Tools and methodologies for information gathering	
	4	Legal and ethical considerations	

3	**SCANNING AND ENUMERATION**		
	1	**Scanning Techniques**: Port Scanning Techniques, Vulnerability Scanning, Network Mapping	9
	2	**Enumeration Methods**	
		a) Service Enumeration	
		b) Enumerating Systems	
		c) Enumerating Services	
	3	**Advanced Enumeration Techniques**: SNMP Enumeration, NetBIOS Enumeration, LDAP Enumeration	

4	**EXPLOITATION AND POST-EXPLOITATION**		
	1	**Password Cracking Techniques**	9
		a) Techniques for cracking passwords, Tools for password cracking, Countermeasures against password cracking	
	2	**Privilege Escalation**	
		a) Methods for privilege escalation, Techniques for exploiting vulnerabilities,	
		b) Executing applications: Methods for executing applications, Remote code execution, Persistence techniques	

	3	**Hacking Operating Systems, Trojans, and Backdoors**	
		a) Techniques for hacking operating systems, Understanding and using Trojans, Creating and deploying backdoors, Detection and prevention strategies.	

5	**Teacher Specific Module**	
	Directions	
	Use appropriate teaching methodologies and evaluation metrics related with the topics.	9

Essential Readings:

12. The Basics of Hacking and Penetration Testing: Ethical Hacking and Penetration Testing Made Easy , Patrick Engebretson
13. Gray Hat Hacking: The Ethical Hacker's Handbook, Allen Harper, Daniel Regalado, Ryan Linn, Stephen Sims, Branko Spasojevic, and Linda Martinez.
14. Penetration Testing: A Hands-On Introduction to Hacking" by Georgia Weidman

Suggested Readings:

3. Metasploit: The Penetration Tester's Guide" by David Kennedy, Jim O'Gorman, Devon Kearns, and Mati Aharoni
4. The Hacker Playbook 3: Practical Guide To Penetration Testing, Peter Kim

Assessment Rubrics:

Evaluation Type		**Marks**
End Semester Evaluation		**50**
Continuous Evaluation		**25**
a)	Test Paper- 1	5
b)	Model Examination	10
c)	Assignment-	5

	2 Numbers	
d)	Seminar	5
e)	Book/ Article Review	
f)	Viva-Voce	
g)	Field Report	
Grand Total		**75**

- **Employability for the Course:**

  Overall, a course in ethical hacking can significantly enhance an individual's employability by providing them with the skills, knowledge, and certifications required to succeed in the field of cybersecurity.

VALUE ADDED C OURSE 2.3

KU4VACCSC206: INTELLECTUAL PROPERTY RIGHTS

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
4	VAC	200-299	KU4VACCSC206	3	45

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
3	0		25	50	75	1.5hrs.

Course Description:

This course provides a comprehensive introduction to Intellectual Property Rights (IPR), covering the fundamental concepts, types of intellectual property, legal framework, management strategies, and emerging issues. Students will explore the origins of intellectual property, its significance in modern society, and the impact of IPR on innovation, creativity, and economic development. Through case studies and discussions, students will gain practical insights into the application of IPR in various industries and the importance of ethical considerations in intellectual property management.

Course Prerequisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Discuss the concept of intellectual property, its historical development, and its role in fostering innovation and creativity.	U
2	Identify and differentiate between various types of intellectual property, including patents, copyrights, trademarks, and trade secrets.	U

3	Examine the legal framework for intellectual property rights at national and international levels, including key treaties and agreements.	An
4	Develop strategies for managing intellectual property, including IP policy development, licensing, technology transfer, and valuation.	C
5	Appraise emerging issues in intellectual property law, such as open-source software, and their implications for IP protection and enforcement.	E

Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C)

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1	3			3			3
CO 2	3	2		3			3
CO 3	3			3			
CO 4	3	2	2	3			
CO 5	3	2		3			2

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1	**INTRODUCTION TO IPR**		9
	1	**Introduction to IPR**	
		a) Meaning of property, origin, nature	
		b) Meaning of Intellectual Property Rights.	
	2	**Types of Intellectual Property**	
		a) Patents, copyrights, trademarks, and trade secrets	
	3	**Legal Framework for IPR**	

		a) National and International IP Laws	
		b) Role of WIPO (World Intellectual Property Organization), TRIPS Agreement	
	4	**IP Management and Policy**	
		a) IP Strategy and Management, IP Policy Development	
		b) Licensing and Technology Transfer	
		c) IP Valuation and Commercialization	

2	**PATENTS AND INDUSTRIAL DESIGNS**		
	1	Patents: Origin, meaning of patent, types.	9
	2	Criteria for Patentability	
	3	Patent Application Process	
	4	Patent Infringement and Remedies	
	5	Rights and Limitations of Patent Holders	

3	**TRADEMARKS AND COPYRIGHTS**		
	1	**Trademark Law:** Concepts, registration process, and infringement.	9
	2	**Copyright Law**	
		a) Basics, protection	
		b) fair use	
		c) digital rights management.	
	3	Rights and Limitations of Trademark and Copyright Owners	

4	**TRADE SECRETS AND EMERGING ISSUES**		
	1	Trade Secrets: Definition and Importance of Trade Secrets	9
		a) Protection and Enforcement of Trade Secrets	
	2	Emerging Issues in Intellectual Property Law	
		a) Discussion on current trends and developments in IP law.	
		b) Analysis of recent court cases and their implications on IP protection.	

	3	Open Source Software and Intellectual Property	
		a) Definition, Comparison between open source and proprietary software in terms of IP implications.	

5	**Teacher Specific Module**	
	Directions	
	Use appropriate teaching methodologies and evaluation metrics related with the topics.	9

Essential Readings:

1. Intellectual Property Law" by Lionel Bently and Brad Sherman

2 Intellectual Property Rights: Legal and Economic Challenges for Development" by Mario Cimoli, Giovanni Dosi, et al.

3 Intellectual Property: A Very Short Introduction" by Siva Vaidhyanathan

Assessment Rubrics:

Evaluation Type		**Marks**
End Semester Evaluation		**50**
Continuous Evaluation		**25**
a)	Test Paper- 1	5
b)	Model Examination	10
c)	Assignment- 2 Numbers	5
d)	Seminar	5
e)	Book/ Article Review	
f)	Viva-Voce	
g)	Field Report	
Grand Total		**75**

VALUE ADDED C OURSE 3.1

KU4VACCSC207: INFORMATION STORAGE MANAGEMENT

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
4	VAC	200 -299	KU4VACCSC207	3	45

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
3			25	50	75	1.5hrs.

Course Description:

Information Storage and Management (ISM) is a unique course that provides a comprehensive understanding of the various storage infrastructure components in data center environments. The course enables participants to make informed decisions on storage-related technologies in increasingly complex IT environments, which are fast changing with the adoption of software-defined infrastructure management and third platform technologies (cloud, Big Data, social, and mobile technologies).

Course Prerequisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Identify storage architectures and key data centre elements in classic, virtualized and cloud environments	U
2	Explain physical and logical components of a storage infrastructure including storage subsystems, RAID and intelligent storage systems	U
3	Describe storage networking technologies such as FCSAN, IP-SAN, FCoE, NAS and object-based, and unified storage	U
4	Articulate business continuity solutions – backup and replications, along with archive for managing fixed content	U/A

5	Explain key characteristics, services, deployment models, and infrastructure components for a cloud computing	U

Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C)

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1	3		3		2		
CO 2	3						2
CO 3	3						
CO 4	3		2				2
CO 5	3						2

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1	**MODULE TITLE:** Introduction to Information Storage Technology		9
	1	Introduction to Information Storage -Digital data and its types - Information storage - Key characteristics of data center -Evolution of computing platforms	
	2	Challenges in Data Storage and Management	
	3	Data Storage Infrastructure- Components of a Storage System Environment: Disk drive components - Disk Drive Performance, Logical Components.	
	4	Third Platform Technologies -Cloud computing and its essential characteristics -Cloud services and cloud deployment models -Big data analytics	

2	**MODULE TITLE:** Data protection:		9
	1	Concept of RAID and its Components,	

	2	Different RAID levels and their suitability for different application environments: RAID 0, RAID 1, RAID 3, RAID 4, RAID 5, RAID 0+1, RAID 1+0, RAID 6, Comparison of Levels	
	3	Intelligent Storage Systems: Components, Intelligent Storage Array, High-level architecture and working of an intelligent storage system.	

3	**MODULE TITLE :** Introduction to Networked Storage		**9**
	1	Evolution of networked storage, Architecture, Overview of FC-SAN, NAS, and IP-SAN	
	2	Network-Attached Storage (NAS): Benefits of NAS, Components	
	3	Implementations, File Sharing, I/O operations, Performance and Availability.	
	4	Content Addressed Storage (CAS): features and Benefits of a CAS. CAS Architecture	

4	**MODULE TITLE:** Storage Security and Management		**9**
	1	Storage Security and Management	
	2	Security Framework	
	3	Storage security domains- List and analyzes the common threats in each domain	
	4	Security Implementations	
	5	Managing The Storage Infrastructure -Monitoring the Storage Infrastructure	

5	**Teacher Specific Module**	
	Directions	
	Use appropriate teaching methodologies and evaluation metrics related with the topics.	9

Essential Readings:

1. **Information Storage and Management" by Pankaj Sharma**
2. Information Storage and Management Storing, Managing, and Protecting Digital Information Edited by G. Somasundaram Alok Shrivastava EMC Education Services
3. Storage Network Management And Retrieval -Vaishali D. Khairnar, Nilima M.Dongre

Assessment Rubrics:

Evaluation Type		**Marks**
End Semester Evaluation		**50**
Continuous Evaluation		**25**
a)	Test Paper- 1	5
b)	Model Examination	10
c)	Assignment- 2 Numbers	5
d)	Seminar	5
e)	Book/ Article Review	
f)	Viva-Voce	
g)	Field Report	
Grand Total		**75**

VALUE ADDED C OURSE 3.2

KU4VACCSC208: INFORMATION SECURITY

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
3	VAC	200-299	KU4VACCSC208	3	60

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
3	0	-	25	50	75	1.5 hrs.

Course Description:

This course introduces the basics of information security, covering key concepts such as the importance of security policies, the CIA Triad, threats and vulnerabilities, and common security measures. Students will learn about cryptography, including symmetric and asymmetric key systems, and explore network security fundamentals and ethical considerations in information security. The course aims to provide a foundational understanding of information security principles and practices.

Course Prerequisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Identify the foundational concepts and principles of information security.	U
2	Use the principles of confidentiality, integrity, and availability in information security..	A
3	Recognize different types of security threats and vulnerabilities.	U
4	Use cryptographic techniques in securing data	A

5	Identify .network security protocols and technologies to secure network communications.	U

**** Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C)***

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1	3			3			
CO 2	3			3			3
CO 3	3			3			3
CO 4	3	2	2				
CO 5	3			3			3

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	**UNIT**	**DESCRIPTION**	**HOURS**
1	**FOUNDATIONS OF INFORMATION SECURITY**		
	1	**Foundations of Information Security**	9
		a) Definition, Importance of Information Security	
		b) Evolution of Information Security	
	2	**Security Policies, Standards, and Guidelines**	
		a) Overview of Security Policies, Types of Security Standards	
	3	**CIA Triad**	
		a) Confidentiality, Integrity, Availability	
		b) Balancing the CIA Triad: Trade-offs and Challenges	
	4	**Threats and Vulnerabilities**	

		a) Types of Threats	
		b) Attacks and Malwares	
		c) Firewalls, Common Security Vulnerabilities	

2	**CRYPTOGRAPHY**		
	1	Introduction to Cryptography : Basic concepts, encryption and decryption, symmetric and asymmetric cryptography	9
	2	Symmetric Key Cryptography: DES,AES, modes of operations	
	3	Asymmetric Key Cryptography: RSA, ECC, key exchange protocols	
	4	Cryptographic Hash Functions : Hash Functions and their properties, SHA family (SHA-1, SHA-2, SHA-3)	
	5	Key Management: Key Generation and Distribution, Public Key Infrastructure (PKI), Digital Certificates and Certificate Authorities	

3	**NETWORK SECURITY**		
	1	Network Security Fundamentals	9
	2	Network Security Protocols and Technologies	
		a) Secure Sockets Layer (SSL) and Transport Layer Security (TLS)	
		b) Internet Protocol Security (IPSec)	
		c) Virtual Private Networks, Firewalls	
	3	Wireless Network Security	

4	**ETHICAL CONSIDERATIONS**		
	1	Ethics in Information Security	9
		a) Ethical Principles, Professional Codes of Conduct	
	2	Ethical Hacking and Penetration Testing	
		a) Principles of Ethical Hacking	
		b) Penetration Testing Methodologies	

	3	Legal and Ethical Responsibilities	
		a) Legal Frameworks and Compliance, Ethical Responsibilities of Security Professionals	

5	**Teacher Specific Module**	
	Directions	
	Use appropriate teaching methodologies and evaluation metrics related with the topics.	9

Essential Readings:

15. Stallings, William. "Cryptography and Network Security: Principles and Practices." Pearson Education, 2016.
16. Whitman, Michael E., and Herbert J. Mattord. "Principles of Information Security." Cengage Learning, 2018.
17. Schneier, Bruce. "Applied Cryptography: Protocols, Algorithms, and Source Code in C." John Wiley & Sons, 1996.
18. Cisco Networking Academy. "CCNA Security 210-260 Official Cert Guide." Cisco Press.
19. Pfleeger, Charles P., and Shari Lawrence Pfleeger. "Security in Computing." Pearson Education.
20. NIST Special Publication 800-53, Revision 4, "Security and Privacy Controls for Federal Information Systems and Organizations."

Suggested Readings:

5. Harris, S. CISSP All-in-One Exam Guide. McGraw-Hill Education.
6. Tavani, H. T. Ethics and Technology: Controversies, Questions, and Strategies for Ethical Computing. Wiley.

Assessment Rubrics:

Evaluation Type		Marks
End Semester Evaluation		**50**
Continuous Evaluation		**25**
a)	Test Paper- 1	5
b)	Model Examination	10
c)	Assignment- 2 Numbers	5
d)	Seminar/viva	5
e)	Book/Article review	
f)	Field report	
Grand Total		**75**

VALUE ADDED C OURSE 3.3

KU4VACCSC 209 : IMPACT OF SOCIAL MEDIA NETWORKS

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
6	VAC	200-299	KU4VACCSC209	3	45

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
3			25	50	75	1.5 hrs.

Course Description:

This course will introduce the theory of social networking, the study and analysis of diverse social networks, as well as cover the impact of social networks on individuals and on the local and global environment.

Prerequisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Identify the types of social media networks and its uses.	U
2	Describe the impact of social media on society& commerce	U
3	Identify the impact of social media on work, training & development and on relationships	U
4	Criticise challenges of social media in terms of privacy, security & health	E

****Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C)***

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1	3			2			2
CO 2	3		2	2			2
CO 3	3			3			2
CO 4	3			3			3

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1	**MODULE TITLE**:: Introduction to Social Media networks		9
	1	Types of Social Media- Uses of Social Media Networks-Popular Social Media Websites	
	2	Types of Users- Growth of social media networks Impact of Social Media on Society	
	3	Sharing of information and its need: -Mobile social media-: -social issues- social cause	
	3	Impacts on Politics Pros and Cons- Positive and negative effects of Social media on Society.	
2	**MODULE TITLE:** Impact of Social Media on the Training & Development		9
	1	Social media in Learning-Online Long Distance Learning-.	
	2	Impact of Blogs, Wikis, LinkedIn, Twitter, Facebook and Podcast-Privacy and Frauds	
	3	Impact of Social Media on relationship: Bonding and Friendships – Pros and Cons- Issues Arising Impact of Social Media on Kids, Teens & Youth	

3	**MODULE TITLE :** Impact of Social Media on Commerce		**9**
	1	Impact of Social Media on Commerce: Social media Marketing-Promotion of Business -Digital Marketing & SMM.	
	2	Advantages to Business-Knowledge sharing and Collaborative Work Management- Customer Benefits-Impacts-pros and cons	
	3	Impact of Social Media on the World of Work: Job Recruitment and Hiring-Benefits- Researching Job Candidates-Impact of professional social media networks.	

4	**MODULE TITLE :** Challenges of Social Media		9
	1	Criticism on Social Media-Cyber bullying-Lack of Privacy Security Issues.	
	2	Addictions to Social media – Games- Impact on Education: Positive and negative effects	
	3	Impact on Physical and Mental Health-Emotional Insecurities-Depression-Anxiety-Behavioural Issues Wastage of Time etc	
	4	Future of Social Media Networks.	

5	**Teacher Specific Module**	
	Use appropriate teaching methodologies and evaluation metrics related with the topics.	9

Essential Readings:

CORE TEXT :

1. Hana S. Noor Al-Deen, John Allen Hendricks, “Social Media-Usage & Impact”, Rowman & Little field Publishing Group

REFERENCES :

1. Dedria Bryfonski, ”The Global Impact of Social Media”-Greenhaven Press

2. Dr.Sanjay Singh Baghel, Dr Uma s singh,’Social Media and Indian Youth” Apple Books Publishers 2. Melanie Swa, “Block chain ”,O'Reilly Media 2014.

WEB REFERENCES:

NPTEL & MOOC courses titled blockchain technology ¬ blockgeeks.comguide/what-is-block-chain-technology

https://nptel.ac.in/courses/106105184/

Assessment Rubrics:

Evaluation Type		**Marks**
End Semester Evaluation		**50**
Continuous Evaluation		**25**
a)	Test Paper- 1	5
b)	Model Examination	10
c)	Assignment- 2 Numbers	5
d)	Seminar	5
e)	Book/ Article Review	
f)	Viva-Voce	
g)	Field Report	
Grand Total		**75**

SEMESTER 5

KU5DSCCSC 301 : SOFTWARE ENGINEERING

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
5	DSC	300-399	KU5DSCCSC301	4	60

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
4	-	-	30	70	100	2hrs.

Course Description:

The course provide experience on various processes used in Software industry for the development of a software product. The course enable attain knowledge in testing and maintenance of software products.

Course Prerequisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Identify various phases of software development.	U
2	Select appropriate process model depending on the user requirements.	A
3	Identify various processes used in all the phases of the product.	U
4	Design software projects	A

Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C)

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1	3			2			2
CO 2	2	3	3		2	2	
CO 3	3		2				
CO 4	3	2	2	2		2	2

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1		**INTRODUCTION TO SOFTWARE ENGINEERING**	12
	1	a)Program and Software	
		b) Definition, program versus software	
		c) software process	
	2	software characteristics	
	3	a) Product and Process	
		b) brief introduction about product and process	
		c) software process and product matrices	
	4	Software life cycle models – Definition, selection of the life cycle model	
		a) waterfall model	
		b) increment process model	
		c) evolutionary process model	

		SOFTWARE REQUIREMENT ANALYSIS AND SPECIFICATION	
	1	a) Requirements engineering,	

2		b) types of requirements	12
	2	feasibility studies	
	3	a) requirement elicitation	
		b) requirement elicitation	
		c) various steps of requirement analysis	
	4	a) requirement documentation	
		b) requirement validation	

3	**SOFTWARE DESIGN**		12
	1	a) Definition and various types of design	
		b) Objectives and importance of design phase	
	2	a) modularity	
		b) strategy of design	
	3	a) Function-oriented design. Objected Oriented Design – Analysis, design concept	
		b) design notations and specifications, design methodology	

4	**SOFTWARE TESTING**		12
	1	a) What is testing?, Why should we test?, who should do testing	
		b) Test case and Test suit	
	2	a) verification and validation definition and comparison	
		b) alpha beta and acceptance testing, functional testing	
		c) techniques to design test cause effect	
		d) cases Boundary value analysis, equivalence class testing, decision table based testing,	
	3	a) graphing techniques	
		b) structural testing, path testing, cyclomatic complexity, mutation testing, levels of testing, unit testing, integration testing, system testing, validation testing	

5	**Teacher Specific Module**	
	Directions	

	Use appropriate teaching methodologies and evaluation metrics related with the topics.	12

Essential Readings:

1. Software Engineering (Third Edition), K K Aggarwal, Yogesh Singh, New age International Publication (For Module 1,2,4 and case study of Module 3)
2. An integrated approach to software Engineering (Second Edition), Pankaj Jalote, Narosa Publishing House - (For Module 3).
3. Computer system Architecture – M. Morris Mano - PHI Pvt Limited.
4. Fundamentals of Software Engineering Rajib Mall PHI Publication
5. Software Engineering (Seventh edition), Ian Sommerville – Addison Wesley.
6. Software Engineering A practitioner's approach (Sixth Edition), Roger S Pressman- Mc Graw Hill.
7. Fundamentals of Software Engineering (Second Edition), Carlo Ghezzi, Mehdi Jazayeri, Dino Mandrioli – Pearson Education.

Assessment Rubrics:

Evaluation Type		**Marks**
End Semester Evaluation		**70**
Continuous Evaluation		**30**
a)	Test Paper- 1	5
b)	Model Examination	10
c)	Assignment- 2 Numbers	10
d)	Seminar	5
e)	Book/ Article Review	
f)	Viva-Voce	
g)	Field Report	
Total		**100**

Major 9

KU5DSCCSC302: PYTHON PROGRAMMING

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
5	DSC	300-399	KU5DSCCSC302	4	75

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
3	2		30	70	100	2hrs.

Course Description:

This course includes an overview of the various tools available for writing and running Python, and gets students coding quickly. It also provides hands-on coding exercises using commonly used data structures, writing custom functions, and reading and writing to files.

Course Prerequisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Identify basic features of python	U
2	Implement OOPs concepts in programming	A
3	Use Arrays, and Data structures in programming	A/An
4	Implement database connectivity in programming	A/An
5	Create an application with the support of graphics in Python	U/C

Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C)

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7

CO 1	3	2	3	2			
CO 2	3	3	3	2	2		
CO 3	2	3	3		2		
CO 4	2	3	3				
CO 5	3	3	3				2

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1		**BASIC ELEMENTS AND CONTROL STATEMENTS**	15
	1	a) Features of Python, Different Methods to Run Python,	
		b) Basic Elements (Objects, Expressions, Numerical Types, Strings, Variables)	
		c) Comments, Indentation in Python	
		d) Input and Output in Python	
	2	Import function	
	3	a) Branching (if, else, elif)	
		b) Iteration (while, for)	
		c) Range and enumerate functions	
	4	a) Tuples, Lists, Sets, Dictionaries	
		b) Built-in methods of lists	
		c) Sets and dictionaries	
		d) Mutable and Immutable Objects	

	FUNCTIONS, MODULES AND EXCEPTION HANDLING		
	1	c) Functions Definition, Function Calling, Function Arguments (Required, Keyword, Default)	

2		d) Recursion	15
	2	a) Modules, Built-in Modules	
		b) Creating Modules	
	3	d) File Handling	
		e) Opening, Closing, Writing and Reading files	
	4	c) Exceptions	
		d) Built-in Exceptions (IndexError, OverflowError, ZeroDivisionError, RuntimeError)	
		e) Exception Handling	

3	**OBJECT ORIENTED PROGRAMMING, NUMPY ARRAYS AND DATA VISUALIZATION**		
	1	a) Class Definition	15
		b) Object Creation	
		c) Built-in Attribute Methods	
		d) Object Oriented Programming Features of Python	
	2	c) Arrays in Python	
		d) Numpy Module, ndarray, Creating Arrays (array, zeros, ones, empty, linspace, arrange, random)	
	3	c) Two-Dimensional Array, Indexing, Slicing, Iterating, Copying, Splitting	
		d) Shape Manipulation (reshape, transpose, resize)	
		e) Arithmetic Operations on Arrays	
	4	a) Data Visualization in Python matplotlib Module, pyplot, plot(), scatter, bar charts, Formatting, figure(), subplot(), text(), xlabel(), ylabel(), title(),	
		b) Plotting Simple Mathematical Functions (sin x, x^2)	

4	**CONNECTING TO DATABASE AND GUI PROGRAMMING**		
	1	a) Connecting to a Database	15
		b) Basic Operations on Database (Crater, Insert, Update, Delete)	
		c) Fetching Data from a Database	
	2	e) Transaction Control	
	3	c) GUI Programming using Tkinter	

		d) Tkinter Widgets (Label, Message, Entry, Text, Button, tkMessagebox, RadioButton, Checkbutton, Listbox, Menu, Menubutton, Scale, Scrollbar, Canvas)	
		e) Layout Managers	

5	**Teacher Specific Module**	
	Directions	
	Use appropriate teaching methodologies and evaluation metrics related with the topics.	15

Essential Readings:

1. Taming Python By Programming, Dr. Jeeva Jose, Khanna Publishing
2. Introduction to Computation and Programming Using Python with Application to Understanding Data - John V. Guttag, PHI (2016)
3. Introduction to Computer Science using Python - Charles Dierbach, Wiley (2015)
4. Python for Education by Ajith Kumar B P
5. Introduction to Computer Science and Programming Using Python Provided by Massachusetts Institute of Technology (MITx)
   Available at: (https://www.edx.org/course/introduction-to-computer-science-and-programming-using-python-2)

Reference Links:

1. https://www.numpy.org/devdocs/user/quickstart.html
2. https://matplotlib.org/users/pyplot_tutorial.html
3. https://www.tutorialspoint.com/python/
4. https://docs.python.org/3/tutorial/index.html

Assessment Rubrics:

Evaluation Type		Marks
End Semester Evaluation		**70**
Continuous Evaluation		**30**
a)	Test Paper- 1	5

b)	Model Examination	10
c)	Assignment- 2 Numbers	10
d)	Seminar	5
e)	Book/ Article Review	
f)	Viva-Voce	
g)	Field Report	
Total		**100**

Major 10

Major 10

KU5DSCCSC 303 : Web Technology

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
5	DSC	300-399	KU5DSCCSC303	4	75

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
3	2	-	30	70	100	2 Hrs

Course Description:

Web technology refers to the means by which computers communicate with each other using mark-up languages and multimedia packages. It gives us a way to interact with hosted information, like websites. Web technology involves the use of hypertext mark-up language (HTML) and cascading style sheets (CSS).

Course Prerequisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Discuss various components in web technology and WWW	U
2	Use HTML Forms and CSS Styling in designing documents.	U,A
3	Develop interactive Webpages using Javascript	U, A, C
4	Design a web document with server-side scripting using PHP	U, A, C
5	Identify the basics of AJAX	U

Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C)

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1	3						
CO 2		2	2				
CO 3	3	3			2		
CO 4		3	2		2		3
CO 5	3	3					3

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1	MODULE1: Introduction to Web		
	1	Introduction to Internet and WWW, Evolution of the Internet and World Wide Web, Web Basics	15
	2	Static Vs Dynamic web pages, Client-Side Scripting versus Server-Side Scripting, World Wide Web Consortium (W3C)	
	3	Web hosting, Types of web hosting, Hosting Space	
	4	Domain Name Registration, Free Hosting, Responsive Web designing	

2	MODULE 2: Introduction to HTML and CSS		
	1	Introduction to HTML, Editing HTML5, W3C HTML5 Validation Service, Headings, Linking, Images, Special Characters and Horizontal Rules	15
	2	Lists, Tables, Forms, HTML5 Form Input types, input and data list Elements and autocomplete Attribute, Frames and frameset	
	3	Introduction to Cascading Style Sheets(CSS)- Concept of CSS ,Creating Style Sheet , CSS Properties ,CSS Styling(Background, Text	

		Format, Controlling Fonts), CSS Id and Class	
	4	Working with block elements and objects ,Working with Lists and Tables	

3	MODULE 3: Scripting with JavaScript		**15**
	1	Introduction to JavaScript , operators	
	2	Arrays-declaring and allocating arrays, examples using arrays	
	3	Functions-Function Definitions, Notes on Programmer-Defined Functions, scope rules and recursion,	
	4	Document Object Model, Objects-math, string and date objects, dialog boxes	

4	MODULE 4: PHP and Ajax Enabled Rich Internet Applications		
	1	Introduction to PHP Evaluation of Php, Basic Syntax, Defining variable and constant, Php Data type, Operator and Expression	*15*
	2	Function What is a function, Define a function, Array -Creating index based and Associative array Accessing array, Element Looping with Index based array	
	3	Looping with associative array using each () and foreach(), Handling Html Form with Php Capturing Form, Data Dealing with Multi-value filed	
	4	Introduction to AJAX, Traditional Web Applications vs. Ajax Applications, Traditional web applications, Ajax applications, Rich Internet Applications (RIAs) with Ajax, History of Ajax	

5	**Teacher Specific Module**	
	Directions	
	Use appropriate teaching methodologies and evaluation metrics related with the topics.	15

Sample Lab List

1. Create a webpage with HTML describing your department. Use paragraph and list tags. Apply various colours to suitably distinguish key words. Also apply font styling like italics, underline and two other fonts to words you find appropriate. Also use header tags. Insert appropriate images.
2. Design a webpage showing the mark list of student.
3. Design a website for your college .Include frames, links, and lists.
4. Design a Registration form.
5. Write a javascript code using functions to perform arithmetic operations two numbers
6. Write a javascript code to sort and reverse array elements
7. Javascript code to find the factorial of a number using recursion.
8. Javascript code to show the working of math object (Use at least 3 math functions).
9. Javascript code to display the current date and time
10. Javascript code to illustrate Dialog boxes

Essential Readings:

1. Internet & World Wide Web How to Program, 5/e – Paul J Deitel, Harvey M Deital, AbbaeyDeital
2. Julie C. Meloni, HTML and CSS in 24 Hours, Sams Teach Yourself (Updated for HTML5 and CSS3), Ninth Edition
3. Javascript The Definite Guide David Flanagan OR'EILLY
4. Programming in PHP, O'Reilly

Suggested Readings:

1. Mastering HTML, CSS &Javascript Web Publishing Paperback,2016 - by Laura Lemay, Rafe Colburn & Jennifer Kyrnin , BPB Publications
2. HTML & CSS: The Complete Reference, Fifth Edition - Thomas a Powell, Tata McGraw Hill

Assessment Rubrics:

Evaluation Type	Marks

End Semester Evaluation		**50 (Theory)** **20 (Practical)**
Continuous Evaluation		**30**
a)	Test Paper- 1	5
b)	Model Exam	10
c)	Assignment(2 numbers)	10
d)	Seminar	5
e)	Book/ Article Review	
f)	Viva-Voce	
g)	Field Report	
Total		**100**

DISCIPLINE SPECIFIC ELECTIVE 1.1

KU5DSECSC 301: COMPILER DESIGN

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
5	DSE	300-399	KU5DSECSC301	4	60

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
4			30	70	100	2hrs.

Course Description:

This course deals with the basic techniques of Compiler Construction and tools that can used to perform Syntax-directed translation of a high-level programming language into an executable code. This will provide deeper insights into the more advanced semantics aspects of programming languages, code generation, machine independent optimizations, dynamic memory allocation, types and their inferences.

Course Prerequisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Identify different phases and passes of the compiler	U
2	Examine the parser and its types	A
3	Implement the compiler using syntax-directed translation method and get knowledge about the synthesized and inherited attributes.	A
4	Describe run time data structure like symbol table organization and different techniques used in it.	U

**Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C)*

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1	3	2					
CO 2	3	2	2				
CO 3	3	2	2				2
CO 4	2	3	2				

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1		**MODULE TITLE**	12
	1	INTRODUCTION TO COMPILING	
		a) Compilers	
		b) Analysis of the Source program	
	2	a)phases of a compiler	
		b) grouping of phases	
	3	cousins of the compiler	
	4	compiler construction tools.	

2		**MODULE TITLE: LEXICAL ANALYSIS**	
	1	Role of Lexical Analyzer	12
	2	Input buffering	
	3	Specification of tokens	
	4	recognition of tokens	

	5	Finite Automata	

3	**MODULE TITLE: SYNTAX ANALYSIS**		
	1	The role of a Parser	12
	2	context free grammars	
	3	Top down parsing	
		a)Recursive Descent Parsing	
		b)Predictive Parsers	
	4	a) bottom up parsing,	
		b) shift reduce parsing	
		c) operator precedence parsing.	

4	**MODULE TITLE: CODE GENERATION & OPTIMIZATION**		
	1	Symbol table, Intermediate languages,	12
	2	Issues in the design of code generator	
		a) the target machine	
		b) basic blocks and flow graphs	
	3	a)peep-hole optimization	
		b) principal sources of optimization	
		c)optimization of basic blocks	
		d)Loops in flow graphs	

5	**Teacher Specific Module**	
	Directions	

	Teacher can supplement additional methodologies and evaluation metrics to appropriate topics.	12

Essential Readings:

1. Alfred V Aho, Ravi Sethi& Jeffrey D Ullman, "Compilers- Principles, Techniques and Tools", Pearson education

Suggested Readings:

5. Parag H Dave, Himanshu B Dave, Compilers –Principles and Practice
6. KVN Sunitha,Compiler Construction, Pearson Education

Assessment Rubrics:

Evaluation Type		**Marks**
End Semester Evaluation		**70**
Continuous Evaluation		**30**
a)	Test Paper- 1	5
b)	Model Examination	10
c)	Assignment- 2 Numbers	10
d)	Seminar	5
e)	Book/ Article Review	
f)	Viva-Voce	
g)	Field Report	
Total		**100**

DISCIPLINE SPECIFIC ELECTIVE 1.2

KU5DSECSC302: DESIGN AND ANALYSIS OF ALGORITHMS

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
5	DSE	300-399	KU5DSECSC302	3	60

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
3	-	-	30	70	100	2hrs.

Course Description:

This course introduces basic methods for the design and analysis of efficient algorithms emphasizing methods useful in practice. Different algorithms for a given computational task are presented and their relative merits evaluated based on performance measures. The following important computational problems will be discussed: sorting, searching, elements of dynamic programming and greedy algorithms.

Course Prerequisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Compare the complexity of algorithm.	A
2	Identify various programming Paradigm.	U/A
3	Design the appropriate Algorithm for a given problem.	A
4	Use the various types of Algorithms to develop programmes	A/An

****Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C)***

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1	3			2			2
CO 2	3	2					
CO 3	2	2	3				2
CO 4	3	2	3				2

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1	**MODULE TITLE:** Algorithm Analysis:		
	1	Algorithm, Properties of a good algorithm, efficiency considerations, Complexity: Time and Space complexity	12
	2	Asymptotic notations: Big O notations, best case, worst case, average case, simple examples	
	3	recursion and its elimination- recursive and no-recursive algorithms for binary search.	
2	**MODULE TITLE:** Algorithm design techniques		
	1	Divide and conquer method: binary search as a divide-and conquer algorithm, finding maximum and minimum, ,	
	2	Strassen's matrix multiplication, Greedy method:	12
	3	Knapsack problem, minimum cost spanning trees	
	4	Prim's algorithm, Kruskal's algorithm	
3	**MODULE TITLE:** Dynamic programming		
	1	principle of optimality, all pair shortest paths, single source shortest path.	12

	2	Travelling salesperson's problem, Back tracking	
		Implicit constraints and explicit constraints	
	3	N queen problem, Branch and bound: LC search.	

4	**MODULE TITLE :** Standard Algorithms		
	1	Sorting-quicksort, merge sort, complexity of sorting algorithms, ,	
	2	Deterministic and non-deterministic algorithms	12
	3	NP- hard and NP complete- basic concepts.	

5	**Teacher Specific Module**	
	Directions	
	Teacher can supplement additional methodologies and evaluation metrics to appropriate topics.	12

Essential Readings:

1. Ellis Horowitz, Sartaj Sahni, S Rajasekharan–Computer Algorithms/C++- Second Edition, Universities press, 2008 (Paperback Edn)

Suggested Readings:

1. Introduction to the design and Analysis of Algorithms, Anany Levitin, 2nd Edn, Pearson education.
2. The design and analysis of computer Algorithms Alfred V Aho John E Hopcroft Pearson Education.
3. Algorithm Design, Foundation, Analysis and Examples, Dr. Vijayakumar and Dr. Juby Mathew, Vimala Publications

Assessment Rubrics:

Evaluation Type		Marks
End Semester Evaluation		**70**
Continuous Evaluation		**30**
a)	Test Paper- 1	5
b)	Model Examination	10
c)	Assignment- 2 Numbers	10
d)	Seminar	5
e)	Book/ Article Review	
f)	Viva-Voce	
g)	Field Report	
Total		**100**

DISCIPLINE SPECIFIC ELECTIVE 1.3

KU5DSECSC 303 :ARTIFICIAL INELLIGENCE AND MACHINE LEARNING

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
5	DSE	300-399	KU5DSECSC303	4	60

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
4			30	70	100	2hrs.

Course Description:

This course serves as an introduction to the fascinating and rapidly evolving field of Artificial Intelligence (AI) and Machine Learning (ML). Designed for students with varying levels of background knowledge, the course provides a comprehensive overview of fundamental concepts, techniques, and applications in AI and ML.

Course Prerequisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Discuss the concept of Artificial Intelligence and problem solving	U
2	Identify advanced problem solving paradigms and knowledge representation.	U /An
3	Describe the basic machine learning concepts	U
4	Relate how neural networks are used to solve various classification problems.	A/E
5	Examine deep neural networks and its applications9.	A/E

Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C)

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1	3						
CO 2	3	2					
CO 3	3						
CO 4	3	3	2	2			2
CO 5	3	3	3	2			2

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1	**MODULE TITLE: introduction to artificial intelligence**		12
	1	Introduction To Artificial Intelligence :Definition – Future of Artificial Intelligence	
	2	Intelligent Agents: Agents and Environments, The Concept of Rationality, The Nature of Environments, The structure of Agents	
	3	Problem solving by Searching: Heuristic search and state space search	
	4	Techniques for Heuristic Search, State Space Search	
	5	Applications of Search Techniques in Game Playing- Minimax strategy and Alpha Beta Pruning, and Planning	
2	**MODULE TITLE: Knowledge Representation**		
	1	Knowledge Representation: Logical Agents	
	2	Propositional and first order Predicate logic	12
	3	Using First-order logic, Inference in First-order logic, forward and Backward Chaining	
	4	Probabilistic reasoning	

3	**MODULE TITLE : Introduction to Machine Learning**		
	1	Concept of learning, different types of learning; supervised learning, unsupervised learning, reinforcement learning- Measuring classifier performance, Confusion matrix	12
	2	Supervised Learning: Introduction, SVM, learning multiple classes, model selection and generalization, linear regression and feature selection, Bayesian and Decision Tree learning.	
	3	Unsupervised Learning: Introduction, clustering; mixture densities, k-means clustering, expectation maximization algorithm, spectral and hierarchical clustering	
	4	Dimensionality reduction; principal component analysis	
	5	Introduction to Machine Learning: Concept of learning, different types of learning; supervised learning, unsupervised learning, reinforcement learning- Measuring classifier performance, Confusion matrix	
4	**MODULE TITLE: Introduction to Artificial Neural Network**		
	1	Understanding brain, perceptron, Multi-Layer perceptron, general architecture of artificial neural network, feed forward and back-propagation,	12
	2	Linear and nonlinear activation functions for binary and multi class classification.	
	3	Introduction to Deep Learning: Fundamentals of deep learning, Existing Deep neural networks, Regularization for Deep Learning, Optimization for Training Deep Models	
	4	Introduction to Convolutional Networks, Classification and segmentation using CNN, Sequence Modelling using Recurrent Nets, overview of LSTM, Generative adversarial network.	
5	**Teacher Specific Module**		
	Directions		
	Teacher can adopt suitable methodologies and evaluation metrics to identify real world problems connected with the topics.		12

Essential Readings:

1. Russell, S. and Norvig, P, Artificial Intelligence: A Modern Approach, Third Edition, Prentice- Hall
2. Artificial Intelligence, E Rich, K Knight, and S B Nair Tata Mc-Graw Hill 3rd Ed
3. Pattern Recognition and Machine Learning" by Christopher M. Bishop:
4. Deep Learning" by Ian Goodfellow, Yoshua Bengio, and Aaron Courville

Suggested Readings:

1. Duda, Richard, Peter Hart, and David Stork. Pattern Classification. 2nd ed. New York, NY: Wiley-Interscience, 2000. ISBN: 9780471056690.

2. Hastie, T., R. Tibshirani, and J. H. Friedman. The Elements of Statistical Learning: Data Mining, Inference and Prediction. New York, NY: Springer, 2001. ISBN: 9780387952840.

3. MacKay, David. Information Theory, Inference, and Learning Algorithms. Cambridge, UK: Cambridge University Press, 2003. ISBN: 9780521642989.

4. Mitchell, Tom. Machine Learning. New York, NY: McGraw-Hill, 1997. ISBN: 9780070428072.

5. https://www.andrewng.org/

6. https://www.coursera.org/

7. https://ocw.mit.edu/

Assessment Rubrics:

Evaluation Type		**Marks**
End Semester Evaluation		**70**
Continuous Evaluation		**30**
a)	Test Paper- 1	5
b)	Model Examination	10
c)	Assignment- 2 Numbers	10
d)	Seminar	5
e)	Book/ Article Review	
f)	Viva-Voce	
g)	Field Report	
Total		**100**

DISCIPLINE SPECIFIC ELECTIVE 1.4

KU5DSECSC 304 : INTRODUCTION TO DEEP LEARNING

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
5	DSE	300-399	**KU5DSECSC304**	4	60

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
4			30	70	100	2hrs.

Course Description:

This course provides an introduction to deep learning, a subset of machine learning that uses neural networks to model complex patterns in data. Students will learn the foundational concepts of deep learning, including neural networks, activation functions ,and optimization algorithms.

Course Prerequisite: knowledge in Basic Statistics & Mathematics

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Identify the basic concepts and principles of deep learning.	U
2	Compare different types of neural networks and their architectures.	A
3	Examine common activation functions and optimization algorithms used in deep learning.	A
4	Solve problems in building and training deep learning models.	A/An

Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C)

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1	3			3			
CO 2	3						2
CO 3	3	2	2	3			2
CO 4	3	2	3	3			2

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1	**MODULE TITLE: Introduction to Deep Learning**		12
	1	What is deep learning?	
	2	History and evolution of deep learning	
	3	Applications of deep learning	
	4	Tools and frameworks for deep learning (TensorFlow, PyTorch)	
2	**MODULE TITLE: Artificial Neural Networks**		12
	1	Basics of artificial neural networks	
	2	Perceptron model	
	3	Multilayer perceptron (MLP)	
	4	Feedforward and backpropagation	
3	**MODULE TITLE: Convolutional Neural Networks (CNNs)**		12
	1	Introduction to CNNs	
	2	Convolutional and pooling layers	
	3	CNN architectures (LeNet, AlexNet, VGG, ResNet)	

4	**MODULE TITLE :** Recurrent Neural Networks (RNNs)		12
	1	Basics of RNNs Long Short-Term Memory (LSTM) and Gated Recurrent Unit (GRU)	
	2	Applications of RNNs (sequence prediction, language modeling	
	3	Optimization Algorithms Gradient descent Stochastic gradient descent (SGD)	
	4	Adam, RMSprop, and other optimization algorithms Learning rate scheduling	

5	**Teacher Specific Module**	
	Teacher can adopt different methodologies and evaluation metrics to identify and analyse , 1.Real-World Applications 2. Case studies and examples of deep learning in image recognition, natural language processing, and other domains 3. conduct discussion on ethical considerations and challenges in deep learning	12

Essential Readings:

1. "Deep Learning" by Ian Goodfellow, Yoshua Bengio, and Aaron Courville

2. Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow" by Aurélien Géron

3. Introduction to Deep Learning By Eugene Charniak

- Online resources, research papers, and tutorials

Assessment Rubrics:

Evaluation Type		Marks
End Semester Evaluation		**70**
Continuous Evaluation		**30**
a)	Test Paper- 1	5
b)	Model Examination	10
c)	Assignment- 2 Numbers	10
d)	Seminar	5
e)	Book/ Article Review	
f)	Viva-Voce	
g)	Field Report	
Total		**100**

DISCIPLINE SPECIFIC ELECTIVE 1.5

KU5DSECSC305: BASICS OF IMAGE PROCESSING

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
5	DSE	300 -399	**KU5DSECSC305**	4	60

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
4	0	-	30	70	100	2hrs.

Course Description:

This course provides an introduction to the principles and techniques of digital image processing. It covers the basics of digital images, including their representation and types, as well as fundamental steps in image processing such as acquisition, enhancement, restoration, and compression. The course also explores digital image fundamentals, including visual perception, sampling, quantization, and pixel representation. Additionally, students will learn about basic mathematical tools used in image processing, such as matrix operations, arithmetic operations, logical operations, and geometric operations.

Course Prerequisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Distinguish between different types of images and image file formats.	U,A
2	Identify fundamental steps in digital image processing, including image acquisition, enhancement, restoration, and compression.	U, A

3	Discuss digital image fundamentals, including elements of visual perception, image sampling, quantization, and pixel representation.	U
4	Develop proficiency in basic mathematical tools used in image processing, such as matrix operations, arithmetic operations, logical operations, and geometric operations.	A
5	Use various image enhancement techniques, including spatial domain methods, spatial filtering, frequency domain methods, and noise reduction techniques.	A

Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C)

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1	3			2			2
CO 2	2						
CO 3	2						
CO 4	3		2	2			2
CO5	3	2	2				2

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	**UNIT**	**DESCRIPTION**	**HOURS**
I	**INTRODUCTION TO IMAGE PROCESSING**		
	1	**Basics of Digital Images**	12
		a) Definition and representation of digital images	
		b) Types of images, image file format	
	2	**Fundamental Steps in Digital Image Processing**	
		a)Image Acquisition, image enhancement, image restoration, image compression	
	3	**Digital Image Fundamentals**	

		a) Elements of visual perception	
		b) Image Sampling and Quantization, Pixel representation and intensity values	
	4	**Basic Mathematical Tools Used in Image Processing**	
		a) Matrix operations: Addition, Subtraction	
		b) Arithmetic operations, Logical operations	
		c) Geometric operations (translation, scaling, rotation)	

2	**IMAGE ENHANCEMENT TECHNIQUES**		
	1	**Spatial Domain Methods**: Point processing**,** Histogram-based techniques	12
	2	**Spatial Filtering:** Smoothing ,Sharpening	
	3	**Frequency Domain Methods:** Fourier transform and its properties	
	4	**Noise Reduction:** Types of noise, Techniques for noise reduction	

3	**IMAGE TRANSFORMATION AND RESTORATION**		
	1	**Image Transformations:** Discrete Fourier Transform (DFT),Discrete Cosine Transform (DCT),Wavelet Transform	12
	2	**Image Compression**	
		a) Lossless compression	
		b) Lossy compression	
		c) Performance metrics	
	3	**Image Restoration, Morphological Processing**	

4	**IMAGE COMPRESSION**		
	1	*Image Segmentation And Representation*	12
		a) Segmentation Techniques	
	2	**Feature Extraction**	
		a) Texture analysis	
		b) Shape descriptors	

	3	**Image Representation**	
		a) Boundary representation, Region representation, Segmentation-based representation	

5	**Teacher Specific Module**	
	Directions	
	Teacher can supplement additional methodologies and evaluation metrics to appropriate topics.	12

Essential Readings:

1. Gonzalez, R. C., & Woods, R. E. Digital Image Processing. Pearson Education.
2. Pratt, W. K. (2007). Digital Image Processing: PIKS Scientific Inside. Wiley-Inter science.
3. Jain, A. K. (1989). Fundamentals of Digital Image Processing. Prentice-Hall.
4. Russ, J. C. (2011). The Image Processing Handbook. CRC Press.

Suggested Readings:

1. Sonka, M., Hlavac, V., & Boyle, R. (2014). Image Processing, Analysis, and Machine Vision. Cengage Learning.
2. Umbaugh, S. E. (2010). *Digital Image Processing and Analysis: Human and Computer Vision Applications with CVIPtools*. CRC Press.

Assessment Rubrics:

Evaluation Type		**Marks**
End Semester Evaluation		**70**
Continuous Evaluation		**30**
a)	Test Paper- 1	5
b)	Model Examination	10
c)	Assignment- 2 Numbers	5
d)	Group project: data	10

	collection, analytics	
e)	Report	
f)	presentation	
Total		**100**

Employability for the Course:

This course provides essential skills for careers in image processing, computer vision, multimedia, and software development, preparing students for roles such as Image Processing Engineer, Computer Vision Specialist, and Multimedia Specialist. These skills are applicable in various industries, including healthcare, entertainment, and technology.

DISCIPLINE SPECIFIC ELECTIVE 1.6

KU5DSECSC306: BIG DATA ANALYTICS

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
5	DSE	300-399	KU5DSECSC306	4	60

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
3	-	-	30	70	100	2 hrs.

Course Description:

In the age of big data, data science (the knowledge of deriving meaningful outcomes from data) is an essential skill that should be equipped by software engineers. It can be used to predict useful information on new projects based on completed projects. This course provides a practitioner's approach to some of the key techniques and tools used in Big Data analytics. Knowledge of these methods will help the students to become active contributors to the field of Data Science and Big Data Analytics

Course Prerequisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Discuss on predictive modeling techniques for data analytics	U
2	Use data preprocessing techniques for big data	A
3	Demonstrate the performance of data classification and regression models	A
4	Implement the use of Classification Trees and Rule-Based Models in big data analytics project	A

**Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C)*

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1	3	2		2			2
CO 2	2	2			2		
CO 3	3						
CO 4	3	2					2

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1	PREDICTIVE MODELS		12
	1	Process, Data Pre-processing.	
	2	Data Transformations.	
	3	Over-Fitting and Model Tuning.	
	4	Data Splitting, Resampling Techniques.	

2	MEASURING PERFORMANCE IN REGRESSION MODELS		12
	1	The Variance-Bias Trade-off.	
	2	Penalized Models, Nonlinear Regression Models.	
	3	Linear Regression for Solubility Data, Multivariate Adaptive Regression. Splines	
	4	Support Vector Machines, K-Nearest Neighbors.	

3	DISCRIMINANT ANALYSIS AND OTHER LINEAR CLASSIFICATION MODELS		
	1	Linear Discriminant Analysis	12

	2	Partial Least Squares Discriminant Analysis.	
	3	Nearest Shrunken Centroids, Nonlinear Discriminant Analysis.	
	4	Flexible Discriminant Analysis.	

4	MEASURING PERFORMANCE IN CLASSIFICATION MODELS		
	1	Class Predictions.	12
	2	Class Probabilities, Evaluating Predicted Classes.	
	3	Two-Class Problems, Evaluating Class Probabilities.	
	4	Receiver Operating Characteristic (ROC) Curves.	

5	**Teacher Specific Module**	
	Directions	
	Teacher can provide appropriate learning and evaluation methods related to the topics.	12

Essential Readings:

1. Max Kuhn and Kjell Johnson, Applied Predictive Modeling, Springer 2013,2nd printing 2018 edition

2. AnkamVenkat, Big Data Analytics, Packt Publishing Limited, Birmingham, UK, 2016

3. EMC Education Services, Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data, Wiley; 1st edition (2015)

4. Hadley Wickham, Garrett Grolemund, R for Data Science: Import, Tidy, Transform, Visualize, and Model Data, Shroff/O'Reilly; First edition (2017)

5. Joel Grus, Data Science fromScratch, Shroff , O'Reilly Media (2015)

6. James D. Miller, Statistics for Data Science, Packt Publishing Limited (2017)

7. Thomas Rahlf, Data Visualisation with R: 100 Examples, Springer, 1st ed. (2017

Assessment Rubrics:

Evaluation Type		**Marks**
End Semester Evaluation		**70**
Continuous Evaluation		**30**
a)	Test Paper- 1	5

b)	Model Examination	10
c)	Assignment- 2 Numbers	10
d)	Seminar	5
e)	Book/ Article Review	
f)	Viva-Voce	
g)	Field Report	
Total		**100**

SKILL ENHANCEMENT COURSE 2.1

KU5SECCSC 301 : FREE AND OPEN SOURCE SOFTWARES (FOSS)

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
5	SEC	300-399	KU5SECCSC301	3	45

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
3	-	-	25	50	100	1.5 hrs

Course Description:

The Free and Open Source Software (FOSS) course is designed to familiarise students with the development process using free and open source software, which includes Linux operating system, service configuration management, application software, and development tools..

Prerequisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	State various FOSS concepts, features.	U
2	Discuss the features of Linux OS	U
3	Execute shell programming	U/A
4	Compare and execute various Linux commands	A/An
5	Evaluate conditional and looping statements	E

****Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C)***

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1	3						2
CO 2	3						2
CO 3	3	2		3			2
CO 4	3			3			3

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1	**MODULE TITLE**: Open source software		9
	1	concepts, features, benefits over proprietary software, examples,	
	2	Free software: concepts, features, advantages, Free software Vs Open Source software	
	3	Free and Open Source Software (FOSS), Four essential freedoms	
	3	Free software movements, free software foundation(FSF), history, policies, GPL, free operating systems	

2	**MODULE TITLE: :** Linux		9
	1	features, history, various Linux distributions,	
	2	Linux architecture, kernel and shell- Linux desktop environments- GNOME and KDE,	
	3	Linux File System and Directories, types of files, Installing and Configuring Linux, File access permissions.	

3	**MODULE TITLE :** Linux Commands		9
	1	Date , time, who, echo, man, info, cal, pwd, more, less, head, tail, chmod.	

	2	mkdir, cd, cp, mv, rm, touch, sort, wc, cut, cat with options, ls with options ,grep with options,	
	3	Mounting the file system, command line processing etc. Types of editors-, in Linux, Introduction to vi editor, modes in vi editor, common vi editor	
	4	Commands for open a file, save a file, delete a file, quit a file etc	

4	**MODULE TITLE :** Shell Programming		9
	1	Introduction to Linux Shell and Shell Scripting, types of shells in Linux, steps in creating a shell script, write and run shell scripts,	
	2	shell variables and printing, deleting shell variable	
	3	Script permissions and names, scripting guidelines, adding shell comments, shell variables,	
	4	Constants , operators, conditional statements, looping statements	

5	**Teacher Specific Module**	
	Teacher can supplement additional methodologies and evaluation metrics to appropriate topics.	9

Essential Readings:

1. Christopher Negus, Red Hat Linux 9 Bible, WILEY- Dreamtech, New Delhi,

2. Thomas Schenk, Red Hat Linux System Administration, Techmedia, New Delhi, 2003

ADDITIONALREFERENCES

https://www.tutorialspoint.com/unix/shell_scripting.htm

Assessment Rubrics:

Evaluation Type		**Marks**
End Semester Evaluation		**50**
Continuous Evaluation		**25**
a)	Test Paper- 1	5

b)	Model Examination	10
c)	Assignment- 2 Numbers	5
d)	Seminar	5
e)	Book/ Article Review	
f)	Viva-Voce	
g)	Field Report	
	Grand Total	**75**

SKILL ENHANCEMENT COURSE 2.2

KU5SECCSC302: Basics of Data Science

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
5	SEC	300-399	**KU5SECCSC302**	3	45

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
3	0	-	25	50	75	1.5 hrs

Course Description:

This course introduces the fundamental concepts, techniques, and tools used in data science. Students will learn how to collect, clean, analyze, and visualize data using various programming languages and libraries. The course will cover topics such as data manipulation, exploratory data analysis, statistical modeling, machine learning, and data visualization.

Course Prerequisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Organize data using statistical methods to draw meaningful conclusions.	U, An
2	Use machine learning algorithms to real-world datasets for problem-solving	U, A
3	Identify data characteristics and patterns through exploratory data analysis (EDA).	U
4	Demonstrate proficiency to collect, clean, and preprocess data	U, A

	using Python and relevant libraries.	

Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C)

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1	3		3	3		3	
CO 2	3	2		2		3	2
CO 3	3		2			3	
CO 4	3	2	3	2		3	2

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1	**MODULE 1 :Introduction to Data Science**		
	1	Overview of data science and its applications	9
	2	Introduction to Python programming for data science	
	3	Introduction to data types, data structures, and libraries (NumPy, Pandas)	
	4	Data collection methods and sources	

2	**MODULE 2 : Exploratory Data Analysis and Statistical Analysis**		
	1	Descriptive statistics and data summarization	9
	2	Data cleaning and preprocessing techniques	
	3	Handling missing data and outliers	
	4	Data visualization techniques (Matplotlib, Seaborn)	

	5	Hypothesis testing, confidence intervals, and correlation analysis	

3	**MODULE 3: Machine Learning Fundamentals**		
	1	Introduction to machine learning	9
	2	Supervised vs. unsupervised learning	
	3	Model evaluation and validation	
	4	Regression analysis (linear regression, multiple regression)	
	5	Classification algorithms (logistic regression, decision trees)	

4	**MODULE 4: Advanced Topics in Data Science**		
	1	Clustering algorithms (K-means, hierarchical clustering)	9
	2	Dimensionality reduction techniques (PCA, t-SNE)	
	3	Introduction to deep learning and neural networks	
	4	Natural Language Processing (NLP) basics	
	5	Data visualization principles and techniques	

5	**Teacher Specific Module**	
	Directions	
	Provide appropriate learning strategies, methodologies and evaluation metrics	9

Essential Readings:

4. "Introduction to Data Science", Jeffrey Stanton, Chapman and Hall/CRC in 2013.
5. **"Data Science from Scratch: First Principles with Python", Joel Grus, O'Reilly Media.**

6. **"Python for Data Analysis", Wes McKinney, O'Reilly Media**

Suggested Readings:

2. "Data Science for Business: What You Need to Know about Data Mining and Data-Analytic Thinking", Foster Provost and Tom Fawcett**,** O'Reilly Media, 1st Edition (2013)

Assessment Rubrics:

Evaluation Type		**Marks**
End Semester Evaluation		**50**
Continuous Evaluation		**25**
a)	Test Paper- 1	5
b)	Model exam	10
c)	Assignment	5
d)	Seminar	5
e)	Book/ Article Review	
f)	Viva-Voce	
g)	Field Report	
Total		**75**

SKILL ENHANCEMENT COURSE 2.3

KU5SECCSC 303 : INTRODUCTION TO NO-SQL DATABASE

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
5	SEC	300-399	KU5SECCSC303	3	45

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
3			25	50	75	1.5hrs.

Course Description:

The course will provide students with an introduction, overview and history of NoSQL databases (non-relational databases). The four types of NoSQL databases (e.g. Document-oriented, Key-Value Pair, Column-oriented and Graph) will be explored in detail.

Course Prerequisite: Basic Knowledge about DBMS

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Explain and compare different types of NoSQL Databases	U
2	Compare and contrast RDBMS with different NoSQL databases	An
3	Demonstrate the detailed architecture and performance tune of Document-oriented NoSQL databases	U /A
4	Explain performance tune of Key-Value Pair NoSQL databases.	U
5	Use No-Sql development tools on different types of NoSQL Databases	A

Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C)

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1	3			2			
CO 2	3			3		2	2
CO 3	3	2	2				
CO 4	2		2			2	
CO 5	2	2	3	2			2

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1	**MODULE TITLE: Overview and History of NoSQL Databases**		12
	1	Definition of the Four Types of NoSQL Database	
	2	Value of Relational Databases, Getting at Persistent Data-Concurrency, Integration, Impedance Mismatch,	
	3	Application and Integration Databases	
	4	The Emergence of NoSQL, Key Points.	

2	**MODULE TITLE: Comparison of relational databases to new NoSQL**		12
	1	Comparison of relational databases to new NoSQL stores, MongoDB, Cassandra, HBASE, Neo4j use and deployment	
	2	Application, RDBMS approach, Challenges NoSQL approach- Key-Value and Document Data Models,	
	3	Column-Family Stores, Aggregate-Oriented Databases. Replication and sharding, MapReduce on databases.	
	4	Distribution Models, Single Server, Sharding, Master-Slave	

	5	Peer-to-Peer Replication, Combining Sharding and Replication.	

3	**MODULE TITLE: NoSQL Key/Value databases using MongoDB,**		**12**
	1	Document Databases, Document oriented Database Features, Consistency, Transactions, Availability,	
	2	Query Features, Scaling, Suitable Use Cases, Event Logging	
	3	Content Management Systems, Blogging Platforms	
	4	Web Analytics or Real-Time Analytics, E-Commerce Applications,	

4	**MODULE TITLE : Column- oriented NoSQL databases using Apache HBASE**		12
	1	Column-oriented NoSQL databases using Apache Cassandra, Architecture of HBASE	
	2	Column-Family Data Store Features, Consistency, Transactions, Availability, Query Features	
	3	Scaling, Suitable Use Cases, Event Logging, Content Management Systems, Blogging Platforms, Counters, Expiring Usage.	

5	**Teacher Specific Module**	
	Directions	
	Teacher can supplement additional methodologies and evaluation metrics to appropriate topics.	12

Essential Readings:

Sadalage, P. & Fowler, NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence, Wiley Publications,1st Edition ,2019.

WEB REFERENCES:

1. https://www.ibm.com/cloud/learn/nosql-databases
2. **https://www.coursera.org/lecture/nosql-databases/introduction-to-nosql-VdRNp**
3. **https://www.geeksforgeeks.org/introduction-to-nosql/**
4. **https://www.javatpoint.com/nosql-databa**

Assessment Rubrics:

Evaluation Type		Marks
End Semester Evaluation		**50**
Continuous Evaluation		**25**
a)	Test Paper- 1	5
b)	Model Examination	10
c)	Assignment- 2 Numbers	5
d)	Seminar	5
e)	Book/ Article Review	
f)	Viva-Voce	
g)	Field Report	
Total		**75**

SEMESTER 6

KU6DSCCSC 304 : DATAMINING

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
6	DSC	300-399	KU6DSCCSC304	4	60

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
4	-	-	30	70	100	2hrs.

Course Description:

The course enables to preprocess and analyze data, to choose relevant models and algorithms for respective applications and to develop research interest towards advances in data mining

Course P**rerequisite: NIL**

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Understand different types of data to be mined	U
2	Categorize the scenario for applying different data mining techniques	U/A
3	Evaluate different models used for classification and Clustering	U/A
4	Focus towards research and innovation	E

****Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C)***

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7

CO 1	3						
CO 2	3		2	2			
CO 3	3	2		3			2
CO 4	3			3		3	3

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1	**MODULE TITLE**:: INTRODUCTION AND DATA PREPROCESSING		12
	1	Data Mining – Kinds of data to be mined – Kinds of patterns to be mined —-	
	2	Technologies – Targeted Applications - Major Issues in Data Mining	
	3	Data Objects and Attribute Types – Measuring Data similarity and dissimilarity	
	4	Data Cleaning –Data Integration - Data Reduction – Data Transformation – Data Discretization	

2	**MODULE TITLE:** MINING FREQUENT PATTERNS AND ADVANCED PATTERN MINING		12
	1	Basic Concepts – Frequent Itemset Mining Methods – Pattern Evaluation Methods	
	2	Pattern Mining in Multilevel, Multidimensional space	
	3	Constraint-Based Frequent Pattern Mining – Mining Compressed or Approximate Patterns	
	4	Pattern Exploration and Application.,	

3	**MODULE TITLE :** CLASSIFICATION TECHNIQUES		**12**
	1	Basic Concepts – Decision Tree Induction – Bayes Classification Methods – Rule-Based Classification —	
	2	Model Evaluation and Selection – Techniques to Improve Classification Accuracy	
	3	Bayesian Belief Networks – Classification by Backpropagation	
	4	Support Vector Machines	

4	**MODULE TITLE :** CLUSTERING TECHNIQUES		12
	1	Cluster Analysis – Partitioning Methods - Hierarchical Methods – Density-Based Methods	
	2	Outlier detection and applications Outliers and Outlier Analysis – Clustering-Based Approach –	
	3	Classification-Based Approach – Mining Complex Data Types	
	4	Data Mining Applications	

5	**Teacher Specific Module**	
	Teacher can supplement additional methodologies and evaluation metrics to appropriate topics.	12

Essential Readings:

9. Jiawei Han, Micheline Kamber and Jian Pie, Data Mining Concept and Techniques, Morgan and Kaufmann Publisher, Third Edition, 2012.
10. Arun K Pujari, Data Mining Techniques, Second Edition, Universities Press India Pvt. Ltd. 2010.

Recommended Reading

1. Daniel T. Larose and Chantal D. Larose, Data Mining and Predictive Analytics, Wiley Series on Methods and Applications in Data Mining, Wiley Publications.

2. Ian H. Witten, Eibe Frank and Mark A. Hall, Data Mining: Practical Machine Learning Tools and Techniques, Morgan and Kaufmann Publisher, Third Edition, 2014.

Web Resources:

[1] https://data-flair.training/blogs/data-mining-tutorial/

[2]https://www.tutorialride.com/data-mining/data-mining-tutorial.htm

Assessment Rubrics:

Evaluation Type		**Marks**
End Semester Evaluation		**70**
Continuous Evaluation		**30**
a)	Test Paper- 1	5
b)	Model Examination	10
c)	Assignment- 2 Numbers	10
d)	Seminar	5
e)	Book/ Article Review	
f)	Viva-Voce	
g)	Field Report	
Total		**100**

KU6DSCCSC 305 : COMPUTER ORGANISATION AND ARCHITECTURE

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
6	DSC	300-399	KU6DSCCSC305	4	60

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
4	-	-	30	70	100	2hrs.

Course Description:

This course introduces the principles of computer organization and the basic architecture concepts. The course emphasizes performance and cost analysis, instruction set design, pipelining, memory technology, memory hierarchy, virtual memory management, and I/O systems.

Prerequisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Identify various components of computer and their interconnections	U
2	Identify basic components and design of the CPU: the ALU and control unit	U
3	Compare and select various Memory devices as per requirement	U/A
4	Compare various types of IO mapping technique	A

**Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C)*

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1	3					2	2
CO 2	3					2	2
CO 3	3						2
CO 4	3						3
CO5	2				2		2

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	**UNIT**	**DESCRIPTION**	**HOURS**
1	**MODULE TITLE**: STRUCTURE OF COMPUTERS		**12**
	1	Computer types, Functional units, Basic operational concepts, VonNeumann Architecture.	
	2	Bus Structures, Software, Performance, Multiprocessors and Multicomputer	
	3	Data representation, Fixed and Floating point	
	3	Error detection and correction codes	
2	**MODULE TITLE:** BASIC COMPUTER ORGANIZATION AND DESIGN		**12**
	1	Instruction codes, Computer Registers, Computer Instructions and Instruction cycle.	
	2	Timing and Control, Memory-Reference Instructions, Input-Output and interrupt	
	3	Central processing unit: Stack organization, Instruction Formats,	

		Service providers, challenges and risks in cloud adoption.	
	4	Addressing Modes, Data Transfer and Manipulation.	
	5	Complex Instruction Set Computer (CISC) Reduced Instruction Set Computer (RISC), CISC vs RISC	

3	**MODULE TITLE :** REGISTER TRANSFER AND MICRO-OPERATIONS:		**12**
	1	Register Transfer Language, Register Transfer, Bus and Memory Transfers, ,.	
	2	Arithmetic Micro-Operations, Logic Micro-Operations, Shift Micro-Operations- Arithmetic logic shift unit	
	3	MICRO-PROGRAMMED CONTROL: Control Memory, Address Sequencing, Micro-Program example, Design of Control Unit.	

4	**MODULE TITLE :** MEMORY SYSTEM		12
	1	Memory Hierarchy, Semiconductor Memories, RAM(Random Access Memory), Read Only Memory (ROM), Types of ROM, Cache Memory, Performance considerations	
	2	Virtual memory, Paging, Secondary Storage, RAID.	
	3	Cloud Computing and Security – Risks in Cloud Computing, Types of Risks,	
	4	Multiprocessors: Characteristics of multiprocessors, Interconnection structures, Inter Processor Arbitration, Inter processor Communication and Synchronization, Cache Coherence.	

5	**Teacher Specific Module**	
	Teacher can supplement additional methodologies and evaluation metrics to appropriate topics.	12

TEXT BOOKS:

1. M. Moris Mano (2006), Computer System Architecture, 3rd edition, Pearson/PHI, India. **REFERENCE BOOKS:**

1. Carl Hamacher, Zvonks Vranesic, SafeaZaky (2002), Computer Organization, 5th edition, McGraw Hill, New Delhi, India.

2. William Stallings (2010), Computer Organization and Architecture- designing for performance, 8th edition, Prentice Hall, New Jersy.
3. Anrew S. Tanenbaum (2006), Structured Computer Organization, 5th edition, Pearson Education Inc,
4. John P. Hayes (1998), Computer Architecture and Organization, 3rd edition, Tata McGrawHill.

Assessment Rubrics:

Evaluation Type		Marks
End Semester Evaluation		**70**
Continuous Evaluation		**30**
a)	Test Paper- 1	5
b)	Model Examination	10
c)	Assignment- 2 Numbers	10
d)	Seminar/viva	5
e)	Book/Article review	
f)	Field report	
Total		**100**

KU6DSCCSC306: SOFTWARE DESIGN AND IMPLEMENTATION

DISCIPLINE SPECIFIC E LECTIVE 2.1

KU6DSECSC307:DATA COMMUNICATION AND COMPUTER NETWORKING

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
5	DSE	300-399	KU6DSECSC307	4	60

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
4			30	70	100	2hrs.

Course Description:

The course data communication refers to the exchange of data between two or more networked or connected devices. The topics in this course include networking principles, Transmission Control Protocol/Internet Protocol, naming and addressing (Domain Name System), data encoding/decoding techniques, link layer protocols, routing protocols, transport layer services, congestion control, quality of service, network services, and Software Defined Networks.

Course Prerequisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Explain the basics of data communication, networking, internet and their importance	U
2	Identify the services and features of various protocol layers in data networks.	R/ U

3	Differentiate wired and wireless computer networks	R/U/A
4	Describe TCP/IP and their protocols.	U/A
5	Recognize the different internet devices and their functions.	U/A

Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C)

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1	3			2			2
CO 2	3	2		2			
CO 3	2						2
CO 4	3	2					
CO 5	3	2					2

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	**UNIT**	**DESCRIPTION**	**HOURS**
1	**MODULE TITLEIntroduction to data communication**		
		a) Ccomponents of data communication	12
	2	b) Network Transmission media- Guided media, Unguided media. Synchronous	
		c) Asynchronous data transmission. – Simplex, Half duplex, Duplex communication	
	3	Network topologies – star, Bus, ring, Mesh. , ,	
		a) Computer networks	
		b) Use	
	4	Hardware, network structure	

		a) point to point connection	
		b) multicast, broadcast	
		c) classification of networks-LAN, WAN, MAN	

2	**MODULE TITLE: Reference models**		
	1	The OSI reference model, TCP / IP reference model.	
	2	Comparison between OSI and TCP / Ip models.	12
	3	Data Link Layer, Design issues,	
	4	Services to network layer	
	5	Framing- character count, character stuffing, bit stuffing, physical layer coding violation	
	6	Error control, flow control,	
	7	Elementary data link protocols- unrestricted simplex protocol	
	8	simplex stop and wait protocol, simplex protocol for a noisy channel	

3	**MODULE TITLE: Network layer**		
	1	Design issues, services to the transport layer,	12
	2	a) Routing algorithms- adaptive, Non-adaptive algorithms	
		b) optimality principle, dijkstras shortest path routing algorithm,	
		c) flow-based routing, hierarchical routing	
	3	congestion control algorithms–the leaky bucket algorithm, the token bucket algorithm.	

4	**MODULE TITLE : Transport layer,**		
	1	Design issues , connection management-addressing	
		a) Establishing and releasing connection,	
	2	Transport layer protocols- ,	12
		a) TCP	
		b) UDP	
	3	Application layer – Basic Idea of telnet,	
		a) ftp, http, smtp, pop3	

5	**Teacher Specific Module**	
	Directions	
	Concerned teacher can adopt proper methodologies and evaluation metrics to understand the topics.	12

Essential Readings:

1. Computer Networks, Andrew S. Tanenbaum& David J. Wetherall, Pearson

Suggested Readings:

7. Data Communication and Networking, Behrouz A. Forouzan, McGraw Hill Education.

8. Achyut S. Godbole and AtulKahate, Data communication and Networks, 2nd Ed, McGraw Hill
9. Computer Networking: A Top-Down Approach, Kurose James F. and Ross Keith W., Pearson.
10. R. S. Rajesh, K. S. Easwara Kumar and R. Balasubramanian, Computer Networks Fundamentals and Applications, Vikas Publishing House.

Assessment Rubrics:

Evaluation Type		Marks
End Semester Evaluation		**70**
Continuous Evaluation		**30**
a)	Test Paper- 1	5
b)	Model Examination	10
c)	Assignment- 2 Numbers	10
d)	Seminar	5
e)	Book/ Article Review	
f)	Viva-Voce	
g)	Field Report	
Total		**100**

DISCIPLINE SPECIFIC E LECTIVE 2.2
KU6DSECSC308: Linux Administration

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
5	DSE	300-399	KU6DSECSC308	4	75

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
4	0	-	30	70	100	2 Hrs

Course Description:

Linux system administration is a process of setting up, configuring, and managing a computer system in a Linux environment. System administration involves creating a user account, taking reports, performing backup, updating configuration files, documentation, and performing recovery actions.

Course Prerequisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Discuss basic Linux commands and the file system structure	U
2	Judge the Boot loaders and the configuration files	E
3	Demonstrate different system services and maintenance	U, A
4	Implement Shell Scripting	U, A
5	Demonstrate the steps for Linux installation and System Configuration	U, A

****Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C)***

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1	3			2			
CO 2	2	2					
CO 3	3						3
CO 4	2	3	2				3
CO 5	3						2

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1	MODULE1: Introduction to Linux Operating system		
	1	Linux OS: History, Features and benefits of Linux, basic concepts of multi user system ,open source, free Software concepts	15
	2	Types of users in Linux, Types of files. BASICS :login, password, creating an account	
	3	Shell and commands, logout, changing password, files and directories, relative and absolute pathnames, directory tree, current working directory, referring home directory, creating new directories	
	4	Copying files, moving files, deleting files and directories , wild cards, hidden files, cat command	
2	MODULE 2: Vi editor and shell commands		
	1	Vi editor: different modes-command mode, insert mode, last line mode, vi Editing commands – moving within a file, deleting, editing, Copy and Paste Commands, Saving and Closing the file	15
	2	redirecting input/output-filter, pipes. File permissions: user, group, ls command (long listing), changing file permission	
	3	Shell Scripting: Types of shell, Basic shell configuration for bourne and bash shell: /etc/profile, /etc/bashrc, ~/.bash_profile, ~/.bash_login, ~/.profile,~/.bashrc, ~/.bash_logout, ~/.bash_history	

	4	Bourne shell scripts, script execution, variables and parameters, Control structures - Shell if then else, Shell if then elif, Shell for loop, Shell while loop, Shell until loop, Shell case, Shell function.	

3	MODULE 3: Linux Boot process and services		**15**
	1	LILO - boot process, /edc/lilo.conf file, GRUB - /etc/grub.conf file runlevels, rc files, startup scripts.	
	2	Mounting: mounting file systems, structure of /etc/fstab	
	3	Major services in Linux system - init, /etc/inittab file, login from terminal, syslog and its configuration file /etc/syslog.conf, periodic command execution: at and cron, crontab file	
	4	GUI, X windows. Starting and stopping different services – service command	

4	MODULE 4: System Maintenance and Linux Installation		
	1	System Maintenance: tmpwatch command, logrotate utility	15
	2	Backup and Restore: types of backup - full, differential, incremental, cp, tar commands	
	3	Linux Installation: Partitioning, MBR, SWAP	
	4	File system mount points, rpm utility - installation of packages.	

5	**Teacher Specific Module**	
	Directions	
	Teacher can adopt proper methodologies and evaluation methods related to the topics.	15

Essential Readings:

1. Unix Shell Programming, Yeshwanth kanethkar
2. Essential System Administration, O'reilly & Associates.
3. "The Linux Programming Interface: A Linux and UNIX System Programming Handbook" by Michael Kerrisk.

4. Unix and shell Programming Behrouz A. Forouzan, Richard F. Gilberg.Thomson

Suggested Readings:

1. Unix in a Nutshell, by Daniel Gilly, O'Reilly & Associates.
2. Linux Administration handbook, Nemeth, PHI.
3. Red Hat Linux Bible.
4. A user guide to the Unix system, Thomas, Yates Tata McGraw Hill

Assessment Rubrics:

Evaluation Type		**Marks**
End Semester Evaluation		**70**
Continuous Evaluation		**30**
a)	Test Paper- 1	5
b)	Model Exam	10
c)	Assignment(2 numbers)	10
d)	Seminar	5
e)	Book/ Article Review	
f)	Viva-Voce	
g)	Field Report	
Grand Total		**100**

DISCIPLINE SPECIFIC E LECTIVE 2.3

KU6DSECSC309: CLOUD COMPUTING

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
6	DSE	300-399	KU6DSECSC309	4	75

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
3	2		30	70	100	2hrs.

Course Description:

This course gives students an insight into the basics of cloud computing along with virtualization, cloud computing is one of the fastest growing domain from a while now. It will provide the students basic understanding about cloud and virtualization along with it how one can migrate over it.

Prerequisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Identify the basics of cloud computing	U
2	Discuss the main concepts and key technologies of cloud computing.	U/A
3	Examine the concept of virtualization in the cloud computing	U/A
4	Select the technologies for implementation and use of cloud	E
5	Relate the evolution of cloud from the existing technologies.	A n

**Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C)*

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1	3						
CO 2	3			2			
CO 3	3	2		3			2
CO 4	3			3			3
CO5	2	2		2			2

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1	**MODULE TITLE**: Cloud Computing Foundation		15
	1	Introduction to Cloud Computing- Basics, History, importance, Characteristics, Pros and Cons of Cloud computing	
	2	Types of Cloud – Public and Private Cloud.	
		Cloud Computing infrastructure	
	3	Cloud Services SaaS, DaaS, IaaS, PaaS	
2	**MODULE TITLE:** Cloud Computing Architecture		15
	1	Cloud Computing Technology- Cloud Life Cycle Model. Cloud System Architecture	
	2	Layers in cloud architecture, Software as a Service (SaaS, ,	
	3	Platform as a Service (PaaS), features of PaaS and benefits, Infrastructure as a Service (IaaS), features of IaaS and benefits	
		Service providers, challenges and risks in cloud adoption.	

	4	Cloud deployment model: Public clouds – Private clouds – Community clouds - Hybrid clouds - Advantages of Cloud computing.,	

3	**MODULE TITLE :** Virtualization		**15**
	1	Definition, Adopting Virtualization, Application types.	
	2	Virtualization and Software	
	3	Virtual Clustering, Virtualization applications	
	4	Pitfalls of Virtualization	

4	**MODULE TITLE :** Data Storage & Security		15
	1	Introduction to Enterprise Data Storage, Data Storage Management,.	
	2	File Systems, Cloud Data Stores	
	3	Cloud Computing and Security – Risks in Cloud Computing, Types of Risks,	

5	**Teacher Specific Module**	
		5

Essential Readings:

1 Cloud Computing: Principles and Paradigms, edited by Rajkumar Buyya, James Broberg, Andrzej, Wiley India Publications, 2011

2. Barrie Sosinsky, “Cloud Computing Bible”, 1st Edition, Wiley India Pvt. Ltd., New Delhi, 2011.3.

Assessment Rubrics:

Evaluation Type		**Marks**
End Semester Evaluation		**70**
Continuous Evaluation		**30**
a)	Test Paper- 1	5
b)	Model Examination	10

c)	Assignment- 2 Numbers	5
d)	Group project: data collection, analytics	10
e)	Report	
f)	presentation	
Total		**100**

DISCIPLINE SPECIFIC E LECTIVE 2.4

KU6DSECSC310: PARALLELCOMPUTING

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
6	DSE	300-399	KU6DSECSC310	4	60

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
4	-	-	30	70	100	2hrs.

Course Description:

Parallel computing is a type of computing architecture in which several processors simultaneously execute multiple, smaller calculations broken down from an overall larger, complex problem. The course give an outline of parallel architecture, CUDA etc..

Prerequisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Locate the use and problem solving in of parallel computers.	U
2	Classify Different Structures of Parallel Computers.	U
3	Compare the Performance Evaluation of Parallel Computers	U/An
4	Examine the programmes in CUDA	U

Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C)

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1	3	2					
CO 2	3	2	2				
CO 3	3	2	2				2
CO 4	3			3			3
CO5	2	2		2			2

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1	**MODULE TITLE: INTRODUCTION**		12
	1	History of Parallel Computers. Solving problems in parallel: Utilizing Temporal, Parallel Processing ,	
	2	Utilizing Data Parallelism , Comparison of Temporal and Data Parallelism	
	3	Data Parallel Processing with Specialized Processors.	
2	**MODULE TITLE:** STRUCTURE OF PARALLEL COMPUTERS		12
	1	A Generalized Structure of a Parallel Computer, Classification of Parallel Computers, Vector Computers	
	2	A Typical Vector Super Computer, Array Processors	
	3	Shared Memory Parallel Computers	

	4	Distributed Shared Memory Parallel Computers, Message Passing Parallel Computers.	

3	**MODULE TITLE : OPERATING SYSTEMS FOR PARALLEL COMPUTERS**		**12**
	1	Resource Management , Process Management , Process Synchronization ,	
	2	Inter-process Communication , Memory Management , Input/output (Disk Arrays) ,	
	3	Basics of Performance Evaluation , Performance Measurement Tool	

4	**MODULE TITLE : COMPUTER UNIFIED DEVICE ARCHITECTURE**		12
	1	The age of parallel processing, The rise of GPU computing, CUDA, NVIDIA Device driver	
	2	Applications of CUDA, Development Environment-CUDA Enabled Graphics Processors	
	3	CUDA Development Tool kit, Standard C compiler.	

5	**Teacher Specific Module**	
	Concerned teacher can adopt proper methodologies to apply and enhance the skill in respective topics.	12

Essential Readings:

1. Parallel Computers Architecture and Programming, V. Rajaraman, C. Siva Ram Murthy,PHI.

2. CUDA By Example, Jason Sanders, Edward Kandrot, Addison_Wesley.

References :

1. Introduction to Parallel Computing, Ananth Grama, Anshul Gupta, George Karypis, Vipin Kumar, Pearson Education.

2. Parallel Computing Theory and Practice, Michel j.Quinn

Assessment Rubrics:

Evaluation Type		**Marks**
End Semester Evaluation		**70**
Continuous Evaluation		**30**
a)	Test Paper- 1	5
b)	Model Examination	10
c)	Assignment- 2 Numbers	10
d)	Seminar	5
e)	Book/ Article Review	
f)	Viva-Voce	
g)	Field report	
Grand Total		**100**

DISCIPLINE SPECIFIC E LECTIVE 2.5

KU6SECSC311: INTERNET OF THINGS

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
6	DSE	300-399	**KU6DSECSC311**	4	60

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
4	-	-	30	70	100	2hrs.

Course Description:

This Course focuses on hands-on IoT concepts such as sensing, actuation and communication. It covers the development of Internet of Things (IoT) prototypes—including devices for sensing, actuation, processing, and communication and applications of IoT that helps to develop skills and experiences.

Prerequisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Understand the various concepts, terminologies and architecture of IoT systems..	U
2	Identify the use of sensors and actuators to design IoT	U/A
3	Understand and apply various protocols for design of IoT systems	U/A
4	Understand various applications of IoT	U/An

Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C)

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1	3						2
CO 2	3	2		2			2
CO 3	3	2		3			2
CO 4	3			3			3

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1	**MODULE TITLE**: Fundamentals of IoT		12
	1	Introduction, Definitions & Characteristics of IoT	
	2	IoT Architectures, Physical & Logical Design of IoT	
	3	Enabling Technologies in IoT, History of IoT, About Things in IoT	
	4	The Identifiers in IoT- About the Internet in IoT	
	5	IoT frameworks, IoT and M2M.	

2	**MODULE TITLE:** Sensors Networks		12
	1	Definition, Types of Sensors, Types of Actuators, Examples and Working,	
	2	Development Boards: Arduino IDE and Board Types, RaspberriPi-IoT Development Kit, RFID Principles and components,	
	3	Wireless Sensor Networks: History and Context, The node, Connecting nodes,	
	4	Networking Nodes, WSN and IoT.	

3	**MODULE TITLE :** Wireless Technologies for IoT		12
	1	WPAN Technologies for IoT: IEEE 802.15.4, Zigbee,.	

	2	HART, NFC, Z-Wave, BLE, Bacnet, Modbus	
	3	IP Based Protocols for IoT IPv6, 6LowPAN, RPL, REST, AMPQ, CoAP, MQTT.	
	4	Edge connectivity and protocols	

4	**MODULE TITLE :** Applications of IoT		12
	1	Home Automation, Smart Cities, Energy, Retail Management, Logistics,	
	2	Agriculture, Health and Lifestyle, Industrial IoT	
	3	Legal challenges, IoT design Ethics	
	4	IoT in Environmental Protection.	

5	**Teacher Specific Module**	
		12

Essential Readings:

Text Books:

1. Hakima Chaouchi, — "The Internet of Things Connecting Objects to the Web" ISBN : 978-1- 84821-140-7, Wiley Publications

2. Olivier Hersent, David Boswarthick, and Omar Elloumi, — "The Internet of Things: Key Applications and Protocols", WileyPublications

3. Vijay Madisetti and ArshdeepBahga, — "Internet of Things (A Hands-on-Approach)", 1 st Edition, VPT, 2014.

4. J. Biron and J. Follett, "Foundational Elements of an IoT Solution", O'Reilly Media, 2016. 5. Keysight Technologies, "The Internet of Things: Enabling Technologies and Solutions for Design and Test", Application Note, 2016.

References

1. Daniel Minoli, — "Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications", ISBN: 978-1-118-47347-4, Willy Publications

2. Pethuru Raj and Anupama C. Raman, "The Internet of Things: Enabling Technologies, Platforms, and Use Cases", CRC Press

3. https://onlinecourses.nptel.ac.in/noc17_cs22/course

4. http://www.cse.wustl.edu/~jain/cse570-15/ftp/iot_prot/index.html

Assessment Rubrics:

Evaluation Type		**Marks**
End Semester Evaluation		**70**
Continuous Evaluation		**30**
a)	Test Paper- 1	5
b)	Model Examination	10
c)	Assignment- 2 Numbers	10
d)	Seminar/viva	5
e)	Book/Article review	
f)	Field report	
Grand Total		**100**

DISCIPLINE SPECIFIC E LECTIVE 2.6

KU6DSECSC312: BLOCKCHAIN TECHNOLOGY

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
6	DSE	300-399	KU6DSECSC312	4	60

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
3	-	-	30	70	100	2 hrs.

Course Description:

This course intends to provide a comprehensive insight into various Blockchain techniques. The objectives are to give an insightful introduction to the basic concepts of blockchain and its applications in various domains.

Course Prerequisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Discus the fundamentals of blockchain technology	U
2	Identify the essentials of Bitcoin and beholding bitcoins as blockchains	U
3	Demonstrate the Ethereum Blockchain network	A
4	Identify the powers of blockchains and their applications in various domains	U

Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C)

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1	3			2			2
CO 2	2			2			
CO 3	3						
CO 4	3			2			2

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1	Introduction to blockchain		12
	1	Structure of blockchains, Blockchain life cycle.	
	2	working of a blockchain, picking a blockchain.	
	3	exploring blockchain applications, building trust with blockchains.	
	4	Blockchain in action: Use cases, introducing bitcoin blockchains.	

2	Bitcoin & Ethereum blockchains		12
	1	Understanding bitcoins, comprehending bitcoins as blockchains.	
	2	Analyzing Ethereum blockchains.	
	3	introducing ripple and factom blockchains and their importance.	

3	Powerful blockchain platforms		
	1	Getting introduced to Hyperledger, Hyperledger vision.	12
	2	Hyperledger sawtooth, understanding the blockchain fabric.	
	3	understanding business, and smart blockchains, IBM Blockchains.	
	4	Stellar: an optimized blockchain.	

4	Industry impacts of blockchains		
	1	Blockchains in financial technology, Blockchains in various industries such as insurance, Government.	12
	2	Real-estate, health care, Telecommunication, Transportation.	
	3	Studying different blockchain projects as a case study and submit a report and present the work.	

5	**Teacher Specific Module**	
	Directions	
	Teacher can provide appropriate learning and evaluation methods related to the topics.	12

Essential Readings:

1.Blockchain and Crypto Currency, Editors: Makoto YanoChris DaiKenichi MasudaYoshio Kishimoto,

1 st Edition, Springer, 2020.

2. Blockchain or Dummies, Tiana Laurence, 1 st Edition , John Wiley & Sons, Inc, , 2017.

3. Blockchain Blueprint for a new economy, Melanie Swan, 1 st Edition,O'Reilly, 2017.

4. Blockchain Technology: Applications and Challenges, Panda, S.K., Jena, A.K., Swain, S.K., Satapathy, S.C. , 1 st Edition, Springer, 2021

5. Blockchain and Distributed Ledgers, Alexander Lipton and Adrien Treccani, 1 st Edition, World Scientific Press, 2021

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Assessment Rubrics:

Evaluation Type		**Marks**
End Semester Evaluation		**70**
Continuous Evaluation		**30**
a)	Test Paper- 1	5

b)	Model Examination	10
c)	Assignment- 2 Numbers	10
d)	Seminar	5
e)	Book/ Article Review	
f)	Viva-Voce	
g)	Field Report	
Total		**100**

SKILL ENHANCEMENT COURSE 3.1

KU6SECCSC304: DIGITAL FORENSICS

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
6	SEC	300-399	**KU6SECCSC304**	3	45

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
3	0	-	25	50	75	1.5 hrs.

Course Description:

Digital forensics is a branch of forensic science encompassing the recovery, investigation, examination, and analysis of material found in digital devices, often in relation to mobile devices and computer crime.

Course Prerequisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Identify various digital forensic tools	U
2	Interpret security issues in Information Communication Technology (ICT) world.	A
3	Examine the use of digital forensic investigation in various applications /devices like Windows/Unix system, mobile, email etc	An
4	Collect and examine legal evidences and supporting investigation reports.	A

Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C)

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1	3			2	2		2
CO 2	2	2	3	2			
CO 3	3		3		2		
CO 4	3	2	2				2

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1		**INTRODUCTION TO TRADITIONAL COMPUTER CRIME**	9
	1	Problems associated with computer crime, Identity Theft, Identity fraud.	
	2	Computer Forensics Fundamentals- Type of Computer Forensics Technology	
	3	Type of Vendor and Computer Forensics Services. Scientific method in forensic analysis	

2		**DIGITAL EVIDENCE IN CRIMINAL INVESTIGATIONS**	
	1	The digital crime scene, Investigating Cybercrime, Duties Support Functions and Competencies -	9
	2	Computer investigation and Data Acquisition	
	3	Computer Forensics -Evidence and Capture Data Recovery-Evidence collection and Data Seizure.	
	4	Duplication and preservation of Digital Evidence-Computer image verification and Authentication.	

3		**INTRODUCTION TO INCIDENT**	

	1	Incident Response Methodology - Steps, Activities in Initial Response Phase after detection of an incident	9
	2	Creating response toolkit	
	3	Initial Response & Volatile Data Collection from Unix system Forensic	
	4	Forensic Duplication, Forensic Duplicates as Admissible Evidence,	
	5	Duplication Tool Requirements, Creating a Forensic Duplicate, Forensic Duplicate of a Hard Drive.	

4	COLLECTING NETWORK BASED EVIDENCE		
	1	Investigating Routers - Network Protocols - Email Tracing - Internet Fraud.,	9
	2	Hackers Tools. Cellphone and mobile device forensics.	
	3	Forensics hard wares and softwares, Information Security Investigations	
	4	Corporate Cyber Forensics, Investigating large scale Data breach cases, Analyzing Malicious software.	

5	**Teacher Specific Module**	9
	Directions	

Essential Readings:

1. John R. Vacca, Computer Forensics: Computer Crime Scene Investigation Laxmi Publications, 2015 reprint.

REFERENCES :

2. 1. Dr.Darren R Hayes, A Practical guide to Computer Forensics investigation, Pearson 2015.

3. Aaron Philipp, David Cowen, Chris Davis , Computer Forensics Secrets & Solutions , McGraw-Hill Osborne Media, 2006.

3. Kenneth C.Brancik "Insider Computer Fraud" Auerbach Publications Taylor & Francis Group–2008.

4. Bill Nelson,Amelia Philips and Christopher Steuart, “Guide to computer forensics and investigations”, Cengage Learning; 4th edition, 2009
5. Dejey , Murugan ,” Cyber Forensics”, OXFORD,2018.

Assessment Rubrics:

Evaluation Type		**Marks**
End Semester Evaluation		**50**
Continuous Evaluation		**25**
a)	Test Paper- 1	5
b)	Model Examination	10
c)	Assignment- 2 Numbers	5
d)	Group project: data collection, analytics	5
e)	Report	
f)	presentation	
Grand Total		**75**

SKILL ENHANCEMENT COURSE 3.2

KU6SECCSC305: SOFTWARE TESTING

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
6	SEC	300-399	KU6SECCSC305	3	45

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
3			25	50	75	1.5hrs.

Course Description:

Software Testing helps to gain skills like automation, test case design, defect tracking, test automation, etc., required to test software. Application of these skills helps learners find errors in any software and report the results to the development team.

Course Prerequisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Recognize the theory of testing.	U
2	Develop test plans to guide the testing stage of the software development lifecycle.	A
3	Implement tests for a variety of quality intent, including code coverage, defect finding, and statistical testing.	A
4	Construct defect reports to provide transparency and understanding to supervisors, colleagues, and users.	C

Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C)

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1	3			3			
CO 2	3	3	3				2
CO 3	3	3		3			2
CO 4	3		3	3			2

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1		**MODULE TITLE: The Fundamentals of Testing**	9
	1	Why is testing necessary?	
	2	Why Testing- Testing Principles	
	3	Fundamental Test Process	
	4	The psychology of Testing	

2		**MODULE TITLE: Testing throughout the life-cycle**	9
	1	Software development models	
	2	Test Levels (Ex. Unit testing, Component testing, Integration testing,etc.)	
	3	Test types (Functional, non-functional, structural, change-related testing)	

	4	Maintenance testing	
	5	Software development models	

3	**MODULE TITLE Test design Techniques**		**9**
	1	Identifying test conditions and designing test cases	
	2	Categories of test design techniques	
	3	Specification based or Black Box techniques (eg. BVA, Equivalence Partitioning)	
	4	Structure based or white Box techniques	
	5	Experienced based techniques (Error guessing and Exploratory guessing)- Choosing a Test techniques	

4	**MODULE TITLE : Test Management**		9
	1	Test organization Test Plans, estimates and strategies	
	2	Test progress, monitoring and control	
	3	Risk and testing Incident management	
	4	Configuration management	

5	**Teacher Specific Module**	
	Directions	
	Teacher can adopt proper methodologies to apply and enhance the skill in respective topics.	9

Essential Readings:

1. **Foundations of Software Testing: ISTQB Certification Paperback – 1**

   October2020- Dorothy Graham (Author), Rex Black (Author), Erik van Veenendaal

2. **Software Testing: Principles and Practices- DESIKAN/GOPALASWAMY**

3. **Software Testing: A Craftsman's Approach, Fourth Edition Textbook Binding** by Paul C. Jorgensen (Author)

4. **Software Testing Techniques Paperback – 1 January 2002** by Boris Beizer (Author)

Assessment Rubrics:

Evaluation Type		**Marks**
End Semester Evaluation		**50**
Continuous Evaluation		**25**
a)	Test Paper- 1	5
b)	Model Examination	10
c)	Assignment- 2 Numbers	5
d)	Seminar	5
e)	Book/ Article Review	
f)	Viva-Voce	
g)	Field report	
Grand Total		**75**

SKILL ENHANCEMENT COURSE 3.3

KU6SECCSC306: COMPUTER GRAPHICS

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
4	SEC	300-399	KU6SECCSC306	3	60

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
3	0	-	25	50	75	1.5 hrs.

Course Description:

This course provides an introduction to the principles and practices of computer graphics. It covers fundamental concepts such as 2D and 3D graphics programming, rendering, animation, and graphical user interfaces. Students will learn about graphics systems, primitives, drawing algorithms, transformations, viewing techniques, and illumination models. Practical implementation and application of these concepts will be emphasized through programming assignments and projects.

Course Prerequisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Discuss the basics and history of computer graphics.	U
2	Use 2D graphics techniques like drawing and filling shapes.	A
3	Implement the knowledge to Transform 2D objects with translation, rotation, and scaling.	A
4	Develop rendered images using various shading and rendering techniques.	C

**Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C)*

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1	3						2
CO 2	2	2	3				
CO 3	3	2	2				
CO 4	3	2	2				2

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1		**INTRODUCTION TO COMPUTER GRAPHICS**	12
	1	**Introduction to computer graphics**	
		a) Introduction	
		b) History and evolution	
	2	**Overview of Graphics Systems**	
		a) Display devices, Input devices, Hard-Copy devices	
	3	**Graphics Primitives and Drawing**	
		a) Points, lines, and polygons, Circle and ellipse generation algorithms.	
		b) Drawing algorithms for lines and polygons	
	4	**Graphics Software and Hardware**	
		a) Overview of graphics software	
		b) Graphics hardware	
		c) Graphics standards and file formats	

2	**TWO-DIMENSIONAL GRAPHICS**		
	1	Two-Dimensional primitives: Points, lines, and polygons	12
	2	Scan Conversion: Line, Circle, and Ellipse drawing algorithms	
	3	Polygon Filling Algorithms: Flood fill, Boundary fill	
	4	Geometric Transformations in 2D: Translation, Rotation, Scaling	
	5	Clipping in 2D	

3	**THREE-DIMENSIONAL GRAPHICS**		
	1	Three-Dimensional Primitives: Points, Lines, and Polygons	12
	2	3D Transformations	
		a) Translation	
		b) Rotation	
		c) Scaling	
	3	Viewing in 3D: Perspective and Orthographic projections	

4	**RENDERING AND ANIMATION**		
	1	Introduction to Rendering	12
		a) Types of rendering: wireframe, hidden-line, flat, Gouraud, Phong	
	2	Illumination Models:, Phong Model	
		a) Diffuse and Specular Reflection, Phong Model	
		b) Shading models: flat, Gouraud, Phong	
	3	Ray Tracing Basics	
		a) Ray-object intersection, Reflection and refraction , Ray tracing algorithm	

5	**Teacher Specific Module**	
	Concerned teacher can adopt proper methodologies to apply and enhance the skill in respective topics.	
		12

Essential Readings:

21. Computer Graphics: Principles and Practice by John F. Hughes, Andries van Dam, Morgan McGuire, David F. Sklar, James D. Foley, Steven K. Feiner, Kurt Akeley
22. Hearn, D., & Baker, M. P. (2014). *Computer Graphics with OpenGL*. Pearson Education.
23. Rogers, D. F. (2013). Procedural Elements for Computer Graphics. Springer Science & Business Media.
24. Shirley, P., & Marschner, S. R. (2014). Fundamentals of Computer Graphics. CRC Press.
25. Foley, J. D., van Dam, A., Feiner, S. K., & Hughes, J. F. Computer Graphics: Principles and Practice. Pearson Education.

Suggested Readings:

4. Watt, A., & Watt, M. (2017). Advanced Animation and Rendering Techniques: Theory and Practice. Addison-Wesley Professional.

Assessment Rubrics:

Evaluation Type		**Marks**
End Semester Evaluation		**50**
Continuous Evaluation		**25**
a)	Test Paper- 1	5
b)	Model Examination	10
c)	Assignment- 2 Numbers	5
d)	Seminar	5
e)	Book/ Article Review	
f)	Viva-Voce	
g)	Field report	
Grand Total		**75**

Evaluation of Internship

A student shall do an internship of 2 credits by the end of the fifth / sixth semester. Since one credit corresponds to 25 marks, the internship shall be evaluated for 50 marks. The evaluation of internship shall be done by a committee constituted by the Department Council. The scheme of CCA and ESE is given below:

Components of Evaluation of Internship	**Weightage**	**Marks for Internship** 2 Credit/50 Marks
Continuous Comprehensive Assessment (CCA)	30%	15
End Semester Evaluation	70%	35

KU6DSCCSC306: SOFTWARE DESIGN AND IMPLEMENTATION

A student shall design a software tool and present its working in the end of sixth semester. The credit will be of 4 with 100 marks. Further details of this paper will be updated.

The detailed syllabus of 7&8 semester also will be updated later.