University Of Kerala

Four Year Undergraduate Programme (UoK FYUGP)

Syllabus

Major Discipline: Computer Applications

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(UoK FYUGP)

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Major Discipline Computer Applications

May 2024

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About the Discipline

Bachelor of Computer Applications(BCA)

The Four-Year Bachelor of Computer Applications (BCA) program at the University of Kerala, adhering to UGC FYUGP guidelines, offers a comprehensive curriculum blending theoretical knowledge with practical application. This course equips students with a strong foundation in computer applications, programming languages, and software development methodologies. Through hands-on projects and internships, students gain valuable industry exposure, enhancing their problem-solving and analytical skills. The program covers a wide range of subjects including computer programming, data structures, algorithms, database management, web development, and software engineering. Additionally, students receive training in emerging technologies as electives like Web Development, artificial intelligence, machine learning, and cyber security, ensuring they stay abreast of industry trends. With state-of-the-art facilities and experienced faculty, the BCA program fosters holistic development, preparing students for rewarding careers in the dynamic field of computer science.

Graduate Attributes

Graduate attributes bridge the gap between academia and the real world, fostering lifelong learning and meaningful contributions. They denote the skills, competencies and high-level qualities that a student should acquire during their university education. Apart from gathering content knowledge, these attributes go beyond the assimilation of information to its application in various contexts throughout a graduate's life. It aims in inculcating the art of critical thinking, problem solving, professionalism, leadership readiness, teamwork, communication skills and intellectual breadth of knowledge. The University of Kerala envisages to pave the path in guiding the student's journey to shape these attributes uniquely, making them integral to personal growth and success in various spheres of life. The University strives to ensure that these graduate attributes are not just checkboxes, but they play a pivotal role in shaping the students into capable, compassionate and responsible individuals with a high degree of social responsibility.

Programme Outcomes (PO)

No.	Programme Outcomes (POs)
PO-1	Critical thinking o analyze information objectively and make a reasoned judgment o draw reasonable conclusions from a set of information, and discriminate between useful and less useful details to solve problems or make decisions o identify logical flaws in the arguments of others o evaluate data, facts, observable phenomena, and research findings to draw valid and relevant results that are domain-specific
PO-2	Complex problem-solving o solve different kinds of problems in familiar and no-familiar contexts and apply the learning to real-life situations o analyze a problem, generate and implement a solution and to assess the success of the plan o understand how the solution will affect both the people involved and the surrounding environment
PO-3	Creativity o produce or develop original work, theories and techniques o think in multiple ways for making connections between seemingly unrelated concepts or phenomena o add a unique perspective or improve existing ideas or solutions o generate, develop and express original ideas that are useful or have values o
PO-4	Communication skills o convey or share ideas or feelings effectively o use words in delivering the intended message with utmost clarity o engage the audience effectively o be a good listener who are able to understand, respond and empathize with the speaker o confidently share views and express himself/herself o
PO-5	Leadership qualities o work effectively and lead respectfully with diverse teams o build a team working towards a common goal o motivate a group of people and make them achieve the best possible solution.

	○ help and support others in their difficult times to tide over the adverse situations with courage ○
PO-6	Learning 'how to learn' skills ○ acquire new knowledge and skills, including 'learning how to learn skills, that are necessary for pursuing learning activities throughout life, through self-paced and self-directed learning ○ work independently, identify appropriate resources required for further learning ○ acquire organizational skills and time management to set self-defined goals and targets with timelines ○ inculcate a healthy attitude to be a lifelong learner ○
PO-7	Digital and technological skills ○ use ICT in a variety of learning and work situations, access, evaluate, and use a variety of relevant information sources ○ use appropriate software for analysis of data ○ understand the pitfalls in the digital world and keep safe from them
PO-8	Value inculcation ○ embrace and practice constitutional, humanistic, ethical, and moral values in life including universal human values of truth, righteous conduct, peace, love, nonviolence, scientific temper, citizenship values ○ formulate a position/argument about an ethical issue from multiple perspectives ○ identify ethical issues related to work, and follow ethical practices, including avoiding unethical behavior such as fabrication, falsification or misrepresentation of data, or committing plagiarism, and adhering to intellectual property rights ○ adopt an objective, unbiased, and truthful actions in all aspects of work

Programme Specific Outcomes (PSO)

	Upon completion of the programme the student will be able to
PSO-1	Demonstrate in-depth knowledge of core computer science and ethical principles and their application in developing modern software applications
PSO-2	Cultivate proficiency in industry-standard programming languages and frameworks for building user-centric and innovative applications
PSO-3	Gain hands on experience in diverse application domains with an emphasis on emerging technologies
PSO-4	Employ advanced data analytics and methods for innovative research.

PROGRAMME STRUCTURE				
Course Code	**Name of The Course**	**Credit**	**Work Load**	**Speciali-zation**
SEMESTER I				
Discipline Specific Core				
UK1DSCCAP100	Fundamentals of IT & Computers	**4**	**3T+2P**	
UK1DSCCAP101	Problem Solving using C	**4**	**3T+2P**	
UK1DSCCAP102	Desktop Management	**4**	**3T+2P**	
UK1DSCCAP103	Open Office	**4**	**3T+2P**	
UK1DSCCAP104	Introduction to Cyber law	**4**	**4T**	
UK1DSCCAP105	Web Designing Using HTML	**4**	**3T+2P**	
Multi-Disciplinary Course (Can Select One)				
UK1MDCCAP100	Web Designing using HTML5 and CSS3	**3**	**2T+2P**	
UK1MDCCAP101	Introduction to IT	**3**	**3T**	
UK1MDCCAP102	Basics of Microprocessors	**3**	**2T+2P**	
UK1MDCCAP103	Digital Marketing	**3**	**2T+2P**	
UK1MDCCAP104	Introduction to Animation	**3**	**2T+2P**	
SEMESTER II				
Discipline Specific Core				
UK2DSCCAP100	Object Oriented Programming using C++	**4**	**3T+2P**	
UK2DSCCAP101	E-commerce	**4**	**4T**	
UK2DSCCAP102	Introduction to Multimedia	**4**	**3T+2P**	
UK2DSCCAP103	Introduction to Data structures	**4**	**3T+2P**	
UK2DSCCAP104	Introduction to Data Science	**4**	**3T+2P**	
UK2DSCCAP105	Modern Web Technologies	**4**	**3T+2P**	
Multi-Disciplinary Course (Can Select One)				
UK2MDCCAP100	Office Automation	**3**	**2T+2P**	
UK2MDCCAP101	Social Media Management	**3**	**2T+2P**	

UK2MDCCAP102	Digital Logic Systems	3	2T+2P	
UK2MDCCAP103	Python for Data Science	3	2T+2P	
SEMESTER III				
Discipline Specific Core				
UK3DSCCAP200	FOSS	4	3T+2P	
UK3DSCCAP201	Database Management	4	3T+2P	
UK3DSCCAP202	Principles of Secure Coding	4	4T	
UK3DSCCAP203	Modern Information Systems	4	4T	
UK3DSCCAP204	Computer Graphics	4	3T+2P	
UK3DSCCAP205	System Software	4	3T+2P	
UK3DSCCAP206	Low Code App Development	4	3T+2P	
Discipline Specific Elective				
UK3DSECAP200	Introduction to Cyber Security	4	4T	Cyber security
UK3DSECAP201	Data Science Fundamentals	4	3T+2P	Data Science
UK3DSECAP202	Introduction to Artificial Intelligence	4	4T	Machine Learning
UK3DSECAP203	Web Development using HTML5 and CSS3	4	3T+2P	Web Development
Value Added Course (Can Select One)				
UK3VACCAP200	Entrepreneurship in IT	3	3T	
UK3VACCAP201	Professional Ethics in Computer Science	3	3T	
SEMESTER IV				
Discipline Specific Core				
UK4DSCCAP200	Game Development	4	3T+2P	
UK4DSCCAP201	Software Engineering	4	3T+2P	
UK4DSCCAP202	Data Mining	4	3T+2P	
UK4DSCCAP203	Python Programming	4	3T+2P	
UK4DSCCAP204	Cryptography and Network security	4	4T	
UK4DSCCAP205	Trends in computing	4	4T	
Discipline Specific Elective (Can Select either One or Two)				
UK4DSECAP200	Ethical Hacking	4	3T+2P	Cyber security
UK4DSECAP201	Python for Data Analytics	4	3T+2P	Data Science
UK4DSECAP202	Knowledge Representation and Intelligent Agents	4	3T+2P	Machine Learning

UK4DSECAP203	Web Scripting using JavaScript	**4**	**3T+2P**	**Web Development**
	INTERNSHIP			
UK4INTCAP200	Summer Internship	**2**		
	Skill Enhancement Course (Can Select One)			
UK4SECCAP200	Content Management System	**3**	**2T+2P**	
UK4SECCAP201	Computer Hardware Maintenance	**3**	**2T+2P**	
UK4SECCAP202	Android Programming using Kotlin	**3**	**3T**	
Value Added Course (Can Select Two)				
UK4VACCAP200	Ethical Hacking	**3**	**2T+2P**	
UK4VACCAP201	Software Quality Management	**3**	**3T**	
UK4VACCAP202	Ethical AI and Responsible Computing	**3**	**3T**	
UK4VACCAP203	Preface to Cyber Laws	**3**	**3T**	
SEMESTER V				
Discipline Specific Core				
UK5DSCCAP300	PHP and MySQL	**4**	**3T+2P**	
UK5DSCCAP301	Computer Network	**4**	**3T+2P**	
UK5DSCCAP302	Artificial Intelligence	**4**	**3T+2P**	
UK5DSCCAP303	Operating system	**4**	**4T**	
UK5DSCCAP304	Software Project Management	**4**	**3T+2P**	
UK5DSCCAP305	Java Programming	**4**	**3T+2P**	
Discipline Specific Elective (Can Select Two)				
UK5DSECAP300	Cryptography and Network Security	**4**	**4T**	**Cyber security**
UK5DSECAP301	Cyber Forensics	**4**	**4T**	**Cyber security**
UK5DSECAP302	Data Mining Concepts and Techniques	**4**	**3T+2P**	**Data Science**
UK5DSECAP303	Data Visualisation	**4**	**4T**	**Data Science**
UK5DSECAP304	Introduction to Machine Learning	**4**	**3T+2P**	**Machine Learning**
UK5DSECAP305	Artificial Neural Networks	**4**	**3T+2P**	**Machine Learning**
UK5DSECAP306	PHP And MySQL	**4**	**3T+2P**	**Web Development**
UK5DSECAP307	Web Application Development using Django	**4**	**3T+2P**	**Web Development**
Skill Enhancement Course				
UK5SECCAP300	Data Analysis Using Excel	**3**	**2T+2P**	
UK5SECCAP301	Software Testing	**3**	**2T+2P**	
UK5SECCAP302	Web Application Development	**3**	**2T+2P**	
UK5SECCAP303	Object Oriented Analysis and Design	**3**	**2T+2P**	

SEMESTER VI				
Discipline Specific Core				
UK6DSCCAP300	Machine Learning	**4**	**3T+2P**	
UK6DSCCAP301	Visual Programming	**4**	**3T+2P**	
UK6DSCCAP302	Internet of Things	**4**	**3T+2P**	
UK6DSCCAP303	Software Testing	**4**	**3T+2P**	
UK6DSCCAP304	Cloud Computing	**4**	**3T+2P**	
UK6DSCCAP306	Operating System Concepts and Techniques	**4**		
Discipline Specific Elective (Can select Two)				
UK6DSECAP300	Image Processing and Applications	**4**	**3T+2P**	**Cyber security**
UK6DSECAP301	Mobile & Wireless Security	**4**	**4T**	**Cyber security**
UK6DSECAP302	Data Analytics with R	**4**	**3T+2P**	**Data Science**
UK6DSECAP303	Big Data Technologies using Hadoop	**4**	**3T+2P**	**Data Science**
UK6DSECAP304	Recommendation Systems	**4**	**3T+2P**	**Machine Learning**
UK6DSECAP305	Deep Learning	**4**	**3T+2P**	**Machine Learning**
UK6DSECAP306	Mobile Application Development	**4**	**3T+2P**	**Web Development**
UK6DSECAP307	Emerging Trends in Web Development	**4**	**3T+2P**	**Web Development**
Skill Enhancement Course (Can Select One)				
UK6SECCAP300	Mobile Application Development	**3**	**2T+2P**	
UK6SECCAP301	Game Application Development	**3**	**2T+2P**	
UK6SECCAP302	Cloud Computing	**3**	**3T**	
UK6SECCAP303	Entrepreneurship in IT	**3**	**3T**	
SEMESTER VII				
Discipline Specific Core				
UK7DSCCAP400	Cloud Architecture	**4**	**4T**	
UK7DSCCAP401	Mobile and wireless security	**4**	**4T**	
UK7DSCCAP402	DevOps	**4**	**3T+2P**	
UK7DSCCAP403	Full Stack Development	**4**	**3T+2P**	
UK7DSCCAP404	Network Administration	**4**	**3T+2P**	
UK7DSCCAP405	Augmented Reality	**4**	**4T**	
UK7DSCCAP406	Man- Machine interface	**4**	**4T**	
UK7DSCCAP407	Research Methodology	**4**	**4T**	
UK7DSCCAP408	Haskell Programming	**4**	**3T+2P**	

UK7DSCCAP409	Academic Writing and Publishing	**4**	**3T+2P**	
UK7DSCCAP410	Big Data Analytics	**4**	**3T+2P**	
UK7DSCCAP411	E-governance	**4**	**4T**	
UK7DSCCAP412	Prompt Engineering	**4**	**3T+2P**	
Discipline Specific Elective (Can select One)				
UK7DSECAP400	Cloud Computing and Security	**4**	**4T**	**Cyber security**
UK7DSECAP401	Social Media Analytics	**4**	**4T**	**Data Science**
UK7DSECAP402	Computer Vision	**4**	**4T**	**Machine Learning**
UK7DSECAP403	Full Stack Development	**4**	**3T+2P**	**Web Development**
SEMESTER VIII				
	Online Course 1			
	Online Course 2			
UK8CIPCAP400	Internship Project (For UG Honors)	**12**		
UK8RPHCAP400	Research Project (For UG Honors with Research) ---Mandatory	**12**		

SPECIALIZATION STREAMS	
Cyber Security	UK3DSECAP200, UK4DSECAP200, UK5DSECAP300, UK5DSECAP301, UK6DSECAP300, UK6DSECAP301, UK7DSECAP400
Data Science	UK3DSECAP201, UK4DSECAP201, UK5DSECAP302, UK5DSECAP303, UK6DSECAP302, UK6DSECAP303, UK7DSECAP401
Machine Learning	UK3DSECAP202, UK4DSECAP202, UK5DSECAP304, UK5DSECAP305, UK6DSECAP304, UK6DSECAP305, UK7DSECAP402
Web Development	UK3DSECAP203,UK4DSECAP203, UK5DSECAP306, UK5DSECAP307, UK6DSECAP306, UK6DSECAP307, UK7DSECAP403

SEMESTER -1

COURSE CODE	NAME OF THE COURSE	CREDIT	Workload
Discipline Specific Core			
UK1DSCCAP100	Fundamentals of IT & Computers	**4**	**3T+2P**
UK1DSCCAP101	Problem Solving using C	**4**	**3T+2P**
UK1DSCCAP102	Desktop Management	**4**	**3T+2P**
UK1DSCCAP103	Open Office	**4**	**3T+2P**
UK1DSCCAP104	Introduction to Cyber law	**4**	**4T**
UK1DSCCAP105	Web Designing Using HTML	**4**	**3T+2P**
Multi-Disciplinary Course (Can Select One)			
UK1MDCCAP100	Web Designing using HTML5 and CSS3	**3**	**2T+2P**
UK1MDCCAP101	Introduction to IT	**3**	**3T**
UK1MDCCAP102	Basics of Microprocessors	**3**	**2T+2P**
UK1MDCCAP103	Digital Marketing	**3**	**2T+2P**
UK1MDCCAP104	Introduction to Animation	**3**	**2T+2P**

Discipline Specific Core

UK1DSCCAP100- FUNDAMENTALS OF IT & COMPUTERS

Discipline	COMPUTER APPLICATION				
Course Code	UK1DSCCAP100				
Course Title	FUNDAMENTALS OF IT & COMPUTERS				
Type of Course	**DSC**				
Semester	I				
Academic Level	1				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week

	4	3 hours	-	2 hours	5 hours
Pre-requisites	Basic knowledge of computers is desirable				
Course Summary	This class offers an overview of fundamental computer science principles, including basics, internet tech, upcoming advancements, and AI. Participants will develop a solid grasp of computer functioning and contemporary developments. Students will gain a foundational understanding of how computers work and current trends of computer science				

Detailed Syllabus:

Module	Unit	Content	Hrs (L+P)
I		**Introduction to Computer**	**15**
	1	Introduction, Characteristics of a computer, Stored Programme Concept	
	2	Inside a computer: SMPS, Motherboard, BIOS, CMOS, Ports and Interfaces, Expansion Cards, Ribbon Cables	
	3	Memory Classification Cache, RAM, ROM, Secondary Memory, Memory hierarchy	
	4	Computer Software and categories: System software, Application software	
	5	Terminology software: Firmware, Liveware, Public-domain software, Freeware, Shareware, Commercial software, Proprietary software, Semi-free software	
II		**Internet Basics and Tools**	**15**
	6	Basics of Internet: WWW, URL, Electronic mail, Search Engines, Chatting and Instant Messaging, Video conferencing	
	7	User Generated Content: Blogs and Wikis	
	8	Online Data Acquisition Tools: Form creation, customization, data validation, response management, collaboration features	

	9	Learning Management System, e-library, and Google Scholar	
III	**Emerging technologies**		**15**
	10	Cloud computing: Definition, Types of cloud computing (Public, Private, Hybrid), Types of cloud services (SaaS, PaaS, IaaS)	
	11	E-Commerce	
	12	Virtual /Augmented Reality	
	13	Crypto Currency	
IV	**Introduction to AI tools**		**15**
	14	Artificial Intelligence, History of AI, Types of AI: Narrow AI, General AI, Strong AI, Applications	
	15	Tools for Machine translation, Speech recognition and image recognition	
	16	Introduction to Generative AI, How Generative AI works, Generative AI tools: Chat GPT, GitHub Copilot, Geminy, SciSpace	
	17	Recommendation systems: Definition, Advantages, Challenges, Applications	
V	**(Flexi Module- Not included for External Evaluation)**		**15**
	18	Digital Society, Digital Divide, Social Network- Services, Issues, Popular networks	
	19	Cybercrime, Cyber Security, Cyber Addiction, e-waste, e-waste Management	
	20	IPR, Copyrights, Patents, Plagiarism	

References

Core Book

1. ReemaThareja. Fundamentals of Computers. Oxford University Press, 2019.
2. Introduction to Information Technology, 2nd Edition, ITL Education Solutions Limited, Pearson, 2012.

3. AkshayKulkarni ,AdarshaShivananda , Anoosh Kulkarni , Dilip Gudivada. “Applied Generative AI for Beginners- Practical Knowledge on Diffusion Models, ChatGPT, and Other LLMs”, APress, 2023.

Additional References

4. Vijayakumaran Nair K, Vinod Chandra S S, “Informatics”, PHI 2014.
5. Rajaraman, “Introduction to Information Technology”, PHI, Third Edition.
6. Pradeep.K.Sinha, PritiSinha“Information Technology”.
7. Balaguruswamy, “Fundamentals of Computers”.

Lab Exercises

PART A

1. Familiarization of components of a computer.
2. Create a resume using a document editor.
3. Create a student rank list using spreadsheet.
4. Create a presentation.
5. Create blog sites.
6. Edit Wikipedia.
7. Create a data form to capture data for student feedback/satisfaction survey on a course and analyse it.
8. Identify the features of a sample Learning Management System.
9. Familiarise with a sample e-library.
10. Familiarise with Google Scholar.

PART B

11. Scheduling tasks in Google Calendar.
12. Create/Upload documents / spreadsheets and presentations online.
13. Share and collaborate in real time.
14. Safely store and organize your work in an online storage system.
15. Create brochures.
16. Create videos.
17. Create posters.
18. Familiarise Tools for Machine translation, Speech recognition and image recognition
19. Develop Contents using AI tools.
20. Create Presentation using AI tool

Course Outcomes

No.	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO1	Summarize the basic concepts about computer	U	PSO-1, 3
CO2	Illustrate internet basics and tools usage	Ap	PSO-1, 3
CO3	Make use of emerging technologies in Computer Science	Ap	PSO- 1, 3
CO4	Identify some foundation level tools used in Artificial Intelligence	Ap	PSO- 1, 3

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Credits: 3:0:1 (Lecture:Tutorial:Practical)

CO No.	CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L)/Tutorial (T)	Practical (P)
CO1	Summarize the basic concepts about computer	PO- 5, 6,7 PSO-1, 3	U	F, C	L	P
CO2	Illustrate internet basics and tools usage	PO-5, 6, 7 PSO-1, 3	Ap	F, C, P	L	P
CO3	Make use of emerging technologies in Computer Science	PO-5, 6, 7 PSO-1,2, 3	Ap	F, C, P	L	P
CO4	Identify some foundation level tools used in Artificial Intelligence	PO-5, 6, 7, PSO-1,2, 3	Ap	F, C, P	L	P

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4
CO 1	-	-	-	-	1	2	2	-	2	-	1	-
CO 2	-	-	-	-	1	2	3	-	2	-	2	-
CO 3	-	-	-	-	1	2	3	-	2	-	2	-
CO 4	-	-	-	-	1	2	3	-	2	-	2	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Discussion / Seminar
- Midterm Exam
- Lab Assignments
- Final Exam

Mapping of COs to Assessment Rubrics:

	Internal	Quiz	Assignmen	Lab	End Semester
CO 1	✓	✓		✓	✓
CO 2	✓		✓	✓	✓
CO 3	✓	✓		✓	✓
CO 4	✓		✓	✓	✓

UK1DSCCAP101- PROBLEM SOLVING USING C

Discipline	COMPUTER SCIENCE				
Course Code	UK1DSCCAP101				
Course Title	PROBLEM SOLVING USING C				
Type of Course	**DSC**				
Semester	I				
Academic Level	100-199				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	3 hours	-	2 hours	5 hours
Pre-requisites	Basic knowledge about computer				
Course Summary	This course inroduces programming concepts to learners using C .The course starts from programming basics and gives a holistic view of the C programming, detailing all the aspects of the C language.				

Detailed Syllabus:

Module	Unit	Content	Hrs (L+P)
I		**Introduction to Programming**	**15**
	1	Introduction to Algorithm & Flow charts	
	2	Program coding and execution – Structure of the Program, Source code, Object code, Executable file, Extensions of different files, Program Compilation, Running of a program; Header file concept.	
	3	Variables and Constants, Rules for naming the Variables/Identifiers.	
	4	Basic data types of C, int, char, float, double; storage capacity – range of all the data types; Storage classes.	
II		**Basic Concepts**	**15**
	5	Operators and Expressions: Assignment Operator, Arithmetic Operator and Arithmetic expression, Relational Operator and Relational expression. Logical Operators, Expression Evaluation (Precedence of Operators)	
	6	Control Structures: Decision Making- if, if else, nested if, switch-case, Looping Statements- for, while, do-while, break, continue	
	7	Simple I/O statements: Formatted and Unformatted I/O statements.	

	8	Arrays: Introduction, defining simple arrays, multi-dimensional arrays, declaration, initialization, and processing	
	9	String Management : Declaration and Initialization, string handling functions.	
III	**Functions & Pointers**		**15**
	10	Functions: Library, User defined functions, declaration, definition & scope, Recursion	
	11	Pointers: The & and * Operators, pointer declaration, assignment, arithmetic pointers, call by value and call by reference	
	12	Dynamic memory allocation (Concepts only)	
IV	**Structures and Files**		**15**
	13	Declaration and definition of Structures, Array of Structures, Structures within structures.	
	14	Union: Declaration and definition of Union.	
	15	File handling: text and binary files, modes of files, file operations	
V	**Flexi Module: Not included for End Semester Examination**		**15**
	16	Header file creation, Preprocessor Directives, Command line arguments.	
	17	Advanced programs using pointers and files	

Core Textbooks

1. E. Balaguruswamy, Programming in ANSI C, McGrawhill, Sixth Edition

Reference Books

1. Ashok N. Kamthene, Programming in C, Pearson Education, Second edition
2. Yashavant Kanitkar, Let us C Authentic Guide to C programming Language, 17th edition.
3. Computer Fundamentals and Programming in C by Reema Thareja, 2nd Edition, Oxford publication

Web Resources

1. https://www.tutorialspoint.com/cprogramming/index.htm
2. https://www.programiz.com/c-programming
3. https://www.w3schools.in/c-tutorial

LAB SYLLABUS

Part A (Minimum 15 Questions)

- ✔ Program to demonstrate the syntax and use of basic data types,
- ✔ Program to demonstrate the syntax and use of operators.
- ✔ Program to demonstrate the syntax and use of decision-making statements.
- ✔ Program to demonstrate the syntax and use of looping statements.

Part B (Minimum 15 Questions)

- ✔ Arrays: Program related to arrays and its operations
- ✔ Strings: Programs related to string handling functions.
- ✔ Functions- Simple Examples of declaring and using functions, call by value, call by reference, Recursive functions.
- ✔ Pointers: Simple program to demonstrate pointers, array of pointers.
- ✔ Structures and union: Simple program to declare and define a structure, array of structures.
- ✔ Files: Simple programs to demonstrate file concepts.

Course Outcomes

No.	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO-1	Illustrate the concepts and structure of a C program.	Ap	PSO-1,2,3
CO-2	Make use of control structures, arrays and strings.	Ap	PSO-1,2,3
CO-3	Develop programs using functions and pointers.	Ap	PSO-1,2,3
CO-4	Demonstrate the concepts of structures, union and files.	Ap	PSO-1,2,3

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Credits: 3:0:1 (Lecture:Tutorial:Practical)

CO No.	CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L)/Tutorial (T)	Practical (P)
1	Describe the algorithmic	PO-1,2,3,6,7,8	Ap	F,C,P,M	L	P

2	Illustrate the concepts of	PO-1,2,3,6,7,8	Ap	F,C,P,M	L	P
3	Construct programs using	PO-1,2,3,5,6,7,8	Ap	F,C,P,M	L	P
4	Explain the concepts of	PO-1,2,3,5,6,7,8	Ap	F,C,P,M	L	P

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs :

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO 1	2	1	2	-	-	2	2	1	1	2	2	-
CO 2	2	2	2	-	-	2	2	1	2	3	2	2
CO 3	2	2	2	-	1	2	2	1	2	3	2	2
CO 4	2	2	2	-	1	2	2	2	2	3	2	2

Correlation Levels:

Level	**Correlation**
-	Nil
1	Slightly / Low
2	Moderate /
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics:

	Internal Exam	Assignment	Lab Program	End Semester
CO 1	✓	✓	✓	✓
CO 2	✓		✓	✓
CO 3	✓		✓	✓
CO 4	✓	✓	✓	✓

UK1DSCCAP102 - DESKTOP MANANGEMENT

Discipline	COMPUTER SCIENCE				
Course Code	UK1DSCCAP102				
Course Title	DESKTOP MANANGEMENT				
Type of Course	**DSC**				
Semester	I				
Academic Level	1				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	3 hours	-	2 hours	5
Pre-requisites	Nil				
Course Summary	This course is designed to provide beginners with essential skills for using and managing computer systems effectively by the beginners.				

Detailed Syllabus:

Module	Unit	Content	Hrs
I		**General Desktop Management**	15
	1	Fundamentals of computer system devices, Device, User Interfaces-CLI, GUI, Connecting external and mobile devices, Software and classifications- Operating System Classification-based on user interface, based on mode of user, Free and Open Source, Proprietary Operating Systems, Mobile Operating Systems	
	2	Introduction to the Welcome Screen,, desktop, desktop icons and manipulations	
	3	Folder creation, Introduction to taskbar, Start Menu, Widger and Snap Assist	
	4	Working with windows- Window hierarchy, Working with File Explorer	
II		**Desktop Management**	15
	5	Settings panel, User account creation, Managing user accounts- Creation of Standard user account, local administrator account, switching accounts.	
	6	Personalization-Wallpaper personalization, Color personalization, Lock screen personalization, Themes	
	7	Task bar personalization, Start Menu Personalization, managing desktop components, Connecting to WiFi Networks, VPN setup	
	8	Using of browsers, Integrated browsers- eg Edge, Interface of browsers- elements- address bar, favorites, bookmark, control panel, sidebar, home screen, searching information, search engines, effective search techniques, formulation of queries, downloading and installing applications and software, Creating Accounts	
III		**Setting up of operating systems**	15
	9	Setting up of Windows OS, System Requirements, key board settings, Changing keyboard layouts, Storage drives, Using Applications- classification- Utility software, office applications, Multimedia applications, browsers, games and entertainment applications	
	10	System Utilities of Windows-Task Manager, Event Viewer, Performance Monitor, System Configuration Utility, Regedit, Managing software applications on Desktop, Drive Usage and Disk Partitioning- Understanding primary and extended partitions, File systems- FAT32, NTFS, exFAT, APFS, ext4, partitioning tools- eg Disk management in Windows, GParted in Linux, Partition creation, Disk fragementation – built in utilities for	

		fragmentation- eg. disk defragmenter, fsck in linux, defragmentation tools,	
	11	Advanced System Settings- Performance Setting, Startup and Recovery Settings, Introduction to Antivirus software, free antivirus softwares, installing antivirus, Controlled Folder Access, enabling ransomware protection, phishing protection, firewall settings and protection, face.fingerprint recognition, Dynamic lock, blocking unwanted apps	
	12	Introduction and configuration of Linux, Features of Linux, Shell, kernel, understanding shells, Boot from Bootable Disk DVD or USB Flash Drive, Commands for listing files and directories, creating and viewing files, , checking disk free spaces, Essential Linux commands, Printing commands, File related commands	
IV	**Specifics of Windows Operating Systems**		**15**
		Updates- Monor. Major updates, Patches, basic windows applications- Calendar, Media Player, OneNoteMpas, Snipping Tools, Paint , Notepad, Sticky Notes	
		Internet Security Measures, Google search security, General tips on Online Safety, Using Copilot search	
		Common problems in Windows OS, Solutions, trouble shooting	
		Hotkeys in Windows, Shortcuts- Windows shortcuts, File Explorer keyboard shortcuts , Upgrading Windows, Installing and Reinstalling Windows, Accessing BIOS	
V	**Flexi Module- Not included for End Semester Exams**		**15**
	17	Multitasking Tips, Accessibility options, Narrator, Magnifier, Colour visibility and colur filters, accessibility features for hearing impaired- live captions, voice access, Immersive Reader, Enabling Disk encryption, Smart App Control feature, Core isolation, Startup, factory reset and recovery options, Creating system restore points	
	18	Reducing Data usage, setting metered connections, disabling background activity, disabling automatic updates, pause window updates, speed up Pc using advanced system features, disabling startup programs. Performing clean boot.	
	19	Turning off ad tracking, turning of activity history, managing search permissions, turn off online speech recognition, excluding folders from search, bluetooth trouble shooting,	

References:

- Archer Fox, Windows 11 for Beginners and Seniors 2024 a Visual Guide to Learn How to Use Your PC with large text and Illustrated Instructions, 2024
- Andrew West,Windows 11 for Beginners and Seniors 2024
- Andy Rathbone, Microsoft Windows for Dummies, Wiley, 2nd Edition,2023
- Computers for Beginners" by Barbara Presley
- Introduction to Computers and Information Technology" by Pethia Carey

Web Resources:

https://support.microsoft.com/en-us
https://developers.google.com/certification
https://youtu.be/y2kg3MOk1sY?si=VKw-YeFUZSY5BTrf
https://training.linuxfoundation.org/
https://aws.amazon.com/dynamodb/resources/training-linux-academy/
https://www.youtube.com/c/TheLinuxExperiment
https://help.ubuntu.com/
https://developers.redhat.com/

Lab Exercises

1. Commands for files and directories cd, cp, mv, rm, mkdir, more, less, creating and viewing files, using cat, file comparisons, View files, disk related commands, checking disk free spaces, Essential Linux commands.
2. Processes in Linux – process fundamentals, connecting processes with pipes, redirecting input output, manual help, Background processing, managing multiple processes, changing process priority, scheduling of processes at command, batch commands, kill, ps, who, sleep
3.Printing commands, grep, fgrep, find, sort, cal, banner, touch, file, file related commands – ws, sat, cut, grep, dd, etc.
4. Exercises on general desktop management.
5. Using shortcut keys
6.Using File manipulation commands
7. Installing applications
8. Partitioning disks
9.Practicing solutions for troubleshooting

Course Outcomes

No.	Upon completion of the course the graduate will be able to	Cognitive	PSO addressed
CO-1	Relate with the concepts of a desktop	U	PSO-1,3
CO-2	Experiment with desktop activities	Ap	PSO-1,3
CO-3	Illustrate general usage of systems	Ap	PSO-1,3
CO-4	Utilize the specifics on a desktop	Ap	PSO-1,3

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Credits: 3:0:1 (Lecture:Tutorial:Practical)

CO No.	CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L)/Tutoria	Practical (P)
CO-1	Relate with the concepts of a desktop	PSO-1,3	U	F, C,P	L	P
CO-2	Experiment with desktop activities	PSO-1,3	Ap	F,C,P	L	P
CO-3	Illustrate general usge of systems	PSO-1,3	Ap	F,C,P	L	P
CO-4	Experiment with Specifics of	PSO-1,3	Ap	F,C,P	L	P

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO 8	PSO1	PSO2	PSO3	PSO4
CO 1					-	2	2		2	-	1	-
CO 2					-	2	2		2	-	2	-
CO 3					-	2-	2		2	-	2	-
CO 4					-	2	2		2	-	2	

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Lab Exercises	End Semester Examinations
CO 1	✓		✓	✓
CO 2	✓		✓	✓
CO 3	✓	✓	✓	✓
CO 4	✓	✓	✓	✓

UK1DSCCAP103: OPEN OFFICE

Discipline	COMPUTER APPLICATION				
Course Code	UK1DSCCAP103				
Course Title	**OPEN OFFICE**				
Type of Course	DSC				
Semester	I				
Academic Level	1				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	3 hours	-	2 hours	5hours
Pre-requisites	Basic Knowledge in operating Computers				
Course Summary	The course covers the basic sofwares required for document preparation, data manipulation and presentation automation tools for day to day functioning of an office				

Detailed Syllabus:

Module	Unit	Content	Hrs (L+P)
I		**Document Preparation using Word Processor**	**15hrs**
	1	Introduction to Office automation- Advantages of office automation, Software classification, Proprietary software, free software , Open	

		access software, Office automation packages	
	2	Documentation using Open Office writer:- features of the software, creating and editing document, Auto-text, Autocorrect	
	3	Spelling and Grammar Checkingl, Document Dictionary ,Find and Replace	
	4	Formatting the document- character formatting, paragraph formatting, page formatting, bulleted and numbered list, inserting images, header & footer, page number.	
II		**Advanced features of Open Office Writer**	**15hrs**
	5	Creating tables	
	6	Using Mail merge	
	7	Creating document from templates, pre viewing and printing documents	
III		**Data Manipulation using Spreadsheet**	**15hrs**
	8	Electronic Spread Sheet - Introduction to Spread Sheet, adding and removing worksheet, inserting, deleting ,copying , moving and formatting cells.	
	9	Working with Formula , cell reference –Absolute, relative and mixed	
	10	Functions – Mathematical, statistical, logical functions	
	11	Charts- types of charts, Components of charts, Creating and formatting charts	
	12	Advanced features – Pivot table & Pivot Chart, Linking and Consolidation.	
IV		**Presentation Software**	**15hrs**
	13	Presentation using Open Office Impress- , Creating presentation, Adding , removing , moving ,rearranging and enhancing Slides	
	14	Inserting picture, Word Art, formatting background, adding sounds and video clips	
	15	Inserting Charts & Organizational Charts	
	16	Setting animation and transitions	

	17	creating hyperlinks in presentations, rehearsing and setting up slide show	
V	**Flexi Module: Not included for End Semester Exams**		
	18	Familiarization of other automation packages for word processing, data manipulation and presentation	**15hr**s

Lab Exercises:

- **Open Office Writer**
    1. Creating Resumes/CVs: Design and format professional resumes or curriculum vitae (CV) using Writer's formatting tools
    2. Create brocure for organizations, clubs, or businesses using text formatting, and graphics insertion
    3. Design and create business letters and proposals using formatting features.
    4. Create Product Catalogs/Inventory lists using table and images
    5. Create tables to summarize sales data, including revenue, units sold, product categories
    6. Create personalized form letters by merging recipient-specific information such as names, addresses, and salutations into a standard letter
- **Open Office Calc**
    1. Create an Spreadsheet for preparation of Marklist
    2. Create an Spreadsheet for preparation of Ranklist of students
    3. Create an Spreadsheet for preparation of Payroll Processing
    4. Create an Spreadsheet for sales analysis of salesmen using suitable chart
    5. Using suitable charts compare performance metrics such as sales figures over time periods.
- **Open Office Impress**
    1. Create orientation presentations for new students
    2. Create visually appealing presentations for presenting a topic in the class
    3. Design dynamic presentations for a product launch to highlight the features
    4. Design presentations for an awareness program
    5. Compile activity reports summarizing the activities of student clubs, organizations, or academic departments.

Text Books

1. Office Automation: A User-Driven Method, DonTapscott ,Springer-Verlag New York Inc
2. OpenOffice.org For Dummies, GurdyLeete, Ellen Finkelstein, Mary Leete
3. OpenOffice 3.4 Volume I: Write,:Christopher N. Cain and Riley W. Walker, Quantum Scientific Publishing,
4. OpenOffice 3.4 Volume II: Calc,Christopher N. Cain and Riley W. Walker, Quantum Scientific Publishing,

5. OpenOffice 3.4 Volume III: Base, Christopher N. Cain and Riley W. Walker, Quantum Scientific Publishing

Web Resources:

OpenOffice.org 3.3 Writer Guide by OOoAuthors Team:
https://www.openoffice.org/documentation/manuals/userguide3/0200WG3-WriterGuide.pdf

Course Outcomes

No.	Upon completion of the course the graduate will be	Cognitive	PSO
CO-1	Use different types of software create, edit, format, save	Ap	PSO-1, 3
CO-2	Learn advanced features of word processor	Ap	PSO-1,3
CO-3	Manipulate data using spread sheet software.	Ap	PSO-1,2,3
CO-4	Develop professional presentation using Presentation	Ap	PSO-1,2,3

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Credits: 3:0:1 (Lecture:Tutorial:Practical)

CO No.	CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L)/Tutorial	Practical (P)
1	Use different types of software create, edit,	PO-6,7	U	F, C	L	P
2	Learn advanced features of word	PO-4,6,7	Ap	F,C,P	L	P
3	Manipulate data using spread sheet software.		Ap	F,C,P	L	P
4	Develop professional presentation using	PO-4,6,7	Ap	F,C,P	L	P

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4
CO 1	-	-	-	-	-	1	1	-	1	-	-	-
CO 2	-	-	-	2	-	1	2	-	1	1	1	-
CO 3	-	-	-	-	-	1	2	-	1	1	2	-
CO 4	-	-	-	2	-	1	2	-	1	1	2	-

Correlation Levels:

Level	Correlation
-	Nil
	Slightly / Low
2	Moderate /
3	Substantial /

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Lab	End Semester Examinations
CO 1	✓	✓	✓	✓
CO 2	✓		✓	✓
CO 3	✓	✓	✓	✓
CO 4	✓		✓	✓

UK1DSCCAP104 - INTRODUCTION TO CYBER LAW

Discipline	COMPUTER APPLICATION				
Course Code	UK1DSCCAP104				
Course Title	INTRODUCTION TO CYBER LAW				
Type of Course	DSC				
Semester	I				
Academic Level	1				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	4 hours	-	-	4 hours
Pre-requisites	Basic understanding of computer systems and cyber security will be desirable.				
Course Summary	This course explores various cybercrimes, and the legal frameworks governing cyberspace and analysing legislation to understand the complexities of prosecuting and defending against digital offenses in an increasingly interconnected world.				

Detailed Syllabus:

Module	Unit	Content	Hrs
I		**Cyber Crimes and Categories**	**12**
	1	**Cyber Crime:** Definition and Origin of the Word, Cyber Crime and Cyber Security – Typology of Cyber Crime – Extent & impact of Cyber crime	6
	2	**Classification of Cybercrimes:** E-mail Spoofing, Spamming, Cyber Defamation, Salami Attack, Data Diddling, Forgery, Online Frauds, Pornographic Offenders, Software Piracy, Computer Sabotage Email Bombing, Computer Network Intrusion, Password Sniffing, Credit Card Frauds,	6
II		**Phishing and Identity Theft**	**12**
	4	**Phishing:** Methods of Phishing, Phishing Techniques, Types of Phishing Scams, Phishing countermeasures,	6

	5	**Identity theft**, Types and Techniques of identity thefts and its counter measures	6
III		**IT ACT, Offenses and Penalties**	**12**
	8	**Information Technology Act:** Evolution of the IT Act, Salient Features of the IT Act, 2000; Various Authorities Under IT Act; Penalties & Offences, Amendments, Cyber Space Jurisdiction, Jurisdiction Issues Under IT Act, 2000.	6
	9	**E-commerce and Laws in India:** Digital/Electronic Signature in Indian Laws, E-Commerce; Issues and Provisions in Indian Law, E-Governance; Concept and Practicality in India, E-Taxation Issues in Cyberspace, E-Contracts and its Validity in India, Cyber Tribunal & Appellate Tribunal, Cyber Regulations.	6
IV		**Intellectual Property Rights**	**12**
	11	**Intellectual Property Rights:** Domain Names and Trademark Disputes, Concept of Trademark in Internet Era, Cyber-squatting, Reverse Hijacking, Jurisdiction in Trademark Disputes, Copyright in the Digital Medium, Copyright in Computer Programmes, , Concept of Patent Right, Relevant Provisions of Patent Act 1970.	6
	12	**Personal Data Security:** Sensitive Personal Data or Information (SPDI) in Cyber Law, SPDI Definition and Reasonable Security Practices in India, International Perspective, Cloud Computing & Law.	6
V ((Flexi)		**Cyber Forensics**	**12**
	14	Introduction to Digital Forensics – Types of Digital forensics	5
	15	Cyber Security Trends	4
	16	Cyber Laws of other countries, Case Studies.	3

CORE TEXT BOOKS

1. Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Nina Godbole, SunitBelapur, Wiley
2. Understanding Cybercrime: Phenomena, and Legal Challenges Response, ITU 2012
3. Cyber Crimes and Laws, Sushma Arora, Raman Arora

REFERENCES

1. Cyber Security and Cyber laws :Nilakshi Jain , Ramesh Menon , Wiley
2. Security in Computing, Charles P. Pfleeger, Shari Lawrence Pfleeger, Pearson Publication, Fifth Edition 2015
3. Introduction to Information Security and Cyber Law, Surya Prakash Tripathi, Dreamtech Press,2014
4. Cyber Law & Cyber Crimes Simplified , Adv. Prashant Mali - Cyber Infomedia
5. Cyber Crimes and Penalities, Adv.Prasant Mali

Web Resources:

- https://www.itu.int/ITU-D/cyb/cybersecurity/docs/Cybercrime%20legislation%20EV6.pdf
- https://baou.edu.in/assets/pdf/PGDCL_202_slm.pdf
- https://ia600709.us.archive.org/21/items/ATextBookOfCyberCrimeAndPenalties/ATextBookOfCyberCrimesAndPenaltiesByAdv.PrashantMali.pdf
- https://www.bbau.ac.in/dept/Law/TM/1.pdf
- https://iritm.indianrailways.gov.in/uploads/files/1360312590693-12.Cyber-Laws-chapter-in-Legal-Aspects-Book.pdf
- https://osou.ac.in/eresources/introduction-to-indian-cyber-law.pdf

Course Outcomes

No.	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO-1	Understand the definition, origin, typology, and impact of cyber crimes and cyber security	U	**PSO-1**
CO-2	Interpret the methods and techniques of phishing, and identity thefts and devise countermeasures against them.	U	**PSO-1**
CO-3	Analyze the evolution, features, authorities and jurisdictions under IT Act, and understand penalties for offences	An	**PSO-1,3**
CO-4	Analyze legislative aspects of cyberspace, related to trademark and copyright laws .	U	**PSO-1,3**

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Credits: 4:0:0 (Lecture:Tutorial:Practical)

CO No.	CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L)/Tutorial	Practical (P)
1	Understand the definition,	**PO - 6,7 PSO - 1**	**U**	**F**	**L**	**-**
2	Interpret the methods and	**PO – 6,7,8**	**U**	**F, C,P**	**L**	**-**

3	Analyze the authorities,	**PO – 6,7,8**	**U**	**F,C**	**L**	**-**
4	Analyse legislative	**PO -6,7,8**	**An**	**F**	**L**	**-**

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PSO**	**PSO**	**PSO**	**PSO4**
CO 1	-	-	-	-	-	2	2	-	2	-	-	-
CO 2	-	-	-	-	-	2	2	1	2	-	-	-
CO 3	1	-	-	-	-	2	2	2	2	-	1	-
CO 4	-	-	-	-	-	2	2	2	3	-	1	-

Correlation Levels:

Level	**Correlation**
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/Discussion / Seminar
- Midterm Exam
- Final Exam

Mapping of COs to Assessment Rubrics:

	Internal Exam	Assignment	Discussion / Seminar	End Semester Examinations
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓	✓	✓	✓
CO 4	✓		✓	✓

UK1DSCCAP105-WEB DESIGNING USING HTML

Discipline	COMPUTER APPLICATION				
Course Code	UK1DSCCAP105				
Course Title	WEB DESIGNING USING HTML				
Type of Course	**DSC**				
Semester	I				
Academic Level	1				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	3 hours	-	2 hours	5 hours
Pre-requisites	Nil				
Course Summary	This course is crafted to equip students with these proficiencies, covering areas such as information architecture, user interface, site organization, navigation, arrangement, color theory, font selection, and imagery. Additionally, it familiarizes students with foundational web design elements including layout, color palette, typography, navigation, and content structuring Practical application is facilitated through the creation of basic web pages utilizing HTML5 and CSS3.				

Detailed Syllabus:

Module	Unit	Content	Hrs (L+P)
I		**Basic HTML5 Commands**	**15**
	1	HTML foundations, usage of Doctype and charset	
	2	Basic html tags –Empty tags and container tags,headings, paragraphs and text formats	
	3	Managing information with lists and designing tables	
	4	Making connections with links – hyperlinks, anchors, urls	
	5	Adding Images to your pages – Image and ImageMaps	
	6	Working with audio and video	
II		**Advanced Features in HTML5**	**15**

	7	Sectioning Elements – nav, article, main, header, footer and section tags	
	8	Progress Elements	
	9	Div and Frames	
	10	IFrames	
	11	Creating Forms using input elements	
III	**Introduction to CSS3**		**15**
	12	Style Element and Stylesheet	
	13	Specifying colors in CSS	
	14	Fonts and typefaces	
	15	Selectors – IDs, Classes and Pseudo classes	
	16	Borders and Backgrounds	
	17	Levels of CSS	
	18	Using HTML with CSS	
IV	**Stylesheets for high level visual designs**		**15**
	19	CSS3 Gradients	
	20	Special effects – images	
	21	Special effects – text	
	22	Introduction to Float Mechanism	
	23	Creating a basic two-column design	
	24	Creating dynamic lists	
	25	Building a basic menu system	
V		**Flexi Module: Not included for end semester exams**	15
	26	New features in HTML5 and CSS3,	
	27	Designing a static website of student's choice	
	28	Case study on some recent web designing tools.	

References

Core:
Andy Harris, "HTML5 and CSS3 All-in-one for Dummies", A Wiley Brand, Third Edition
Additional:
https://books.goalkicker.com/HTML5Book/

Practical Questions

Part A

1. Design a page having suitable background colour and text colour with title "My First Web Page" using all the attributes of the Font tag.
2. Create a HTML document giving details of your [Name, Age], [Address, Phone] and [Register_Number, Class] aligned in proper order using alignment attributes of Paragraph tag
3. Create a page to show different character formatting (B, I, U, SUB, SUP) tags and heading tags
4. Create web pages using Anchor tag with its attributes for external links.
5. Create a web page with different sections and internal links using links and sectioning elements; when the user clicks on different links on the web page it should go to the appropriate locations/sections in the same page.
6. Create a web page, showing ordered list of semesters and an unordered list of names of all the Diploma Programmes (Branches) in your institution
7. Create a web page which divides the page in two equal frames and place the audio and video clips in frame-1 and frame-2 respectively

Part B

8. Create a registration form using form input tags
9. Use tables to provide layout to your HTML page describing your college infrastructure
10. Create a table to show your class time table. Specify font and border attributes using css.
11. Write a program in html to design a Bio-Data and set style attributes in css using ids and selectors
12. Write a programme in html to create a webpage with four iframes (Picture, table, list, and hyperlink)
13. Design a web page with color background and give gradient effects using css.
14. Create a web page to show text and image special effects.
15. Design a static website for your institution containing at least five web pages (ensure to use iframes, forms, css including special effects, float mechanism and menu system).

Course Outcomes

No.	Upon completion of the course the graduate will be able	Cognitive	PSO addressed
CO1	Illustrate the basic features of HTML5	Ap	PSO – 1, 2, 3
CO2	Use advanced HTML features for web designing	Ap	PSO – 1, 2, 3
CO3	Develop basic stylesheets in various CSS levels	Ap	PSO – 1, 2, 3
CO4	Develop stylesheets for high level visual designs	Ap	PSO – 1, 2, 3

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Credits: 3:0:1 (Lecture:Tutorial:Practical)

CO No.	CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture(L)/ Tutorial(T)	Practical (P)
1	Illustrate the basic features of HTML5	PO – 3, 6, 7 PSO – 1, 2, 3	Ap	F, C, P, M	L	P
2	Use advanced HTML features for web designing	PO – 3, 6, 7 PSO – 1, 2, 3	Ap	F, C, P, M	L	P
3	Develop basic stylesheets in various CSS levels	PO – 3, 5, 6, 7 PSO – 1, 2, 3	Ap	F, C, P, M	L	P
4	Develop stylesheets for high level visual designs	PO – 3, 5, 6, 7 PSO – 1, 2, 3	Ap	F, C, P, M	L	P

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO	PSO	PSO3	PSO4
CO1	-	-	3	-	-	3	3	-	2	1	2	-
CO2	-	-	3	-	-	3	3	-	2	1	2	-
CO3	-	-	3	-	1	3	3	-	2	1	2	-
CO4	-	-	3	-	1	3	3	-	2	1	2	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics:

	Internal Exam	Assignment	Lab Assessment	End Semester Examinations
CO1	✓		✓	✓
CO2	✓	✓	✓	✓
CO3	✓		✓	✓
CO4	✓	✓	✓	✓

Multi-Disciplinary Courses

UK1MDCCAP100-:WEB DESIGNING USING HTML5 AND CSS3

Discipline	COMPUTER APPLICATION				
Course Code	UK1MDCCAP100				
Course Title	WEB DESIGNING USING HTML5 AND CSS3				
Type of Course	**MDC**				
Semester	I				
Academic Level	1				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	3	2 Hours	-	2	4Hours
Pre-requisites	Basic knowledge of internet				
Course Summary	The objective of this course is to impart the skills for web design such as information architecture, user interface, site organization,				

	navigation, layout, color theory, typography, and visual elements. Furthermore, it educates students on fundamental web design components such as overall page structure, color coordination, typography, navigation, and content arrangement. Basic web pages are constructed using HTML5 and CSS3 as part of the learning process.

Detailed Syllabus:

Module	Unit	Content	Hrs
I		**Common Tags for Webpage Creation**	**12**
	1	HTML document structure, , usage of Doctype and charset	
	2	Basic html tags-structure tag, headings, paragraphs and text formats	
	3	Design using basic html tags	
	4	Managing information with lists and tables	
	5	Hyperlinks-internal and external hyper links – hyperlinks, anchors, urls	
	6	Design of various lists, tables and links	
II		**Additional Features of HTML5**	**12**
	7	Images –Adding images to your pages – Image and ImageMaps	
	8	Working with a-Multimedia-audio and video	
	9	Design using image and media elements (Practical)	
	10	Sectioning Elements – nav, article, main, header, footer and section tags	
	11	Progress Elements	
	12	Design using sectioning and progress elements (Practical)	
III		**Advanced Features of HTML5**	**12**
	13	Div and Frames	
	14	IFrames	
	15	Design of web pages as frames and iframes (Practical)	

	16	Creating Forms using basic input elements	
	17	New Form Input Types	
	18	Designing of Forms (Practical)	
IV		**Introduction to CSS3**	**12**
	19	Style Element and Stylesheet	
	20	Specifying colors in CSS	
	21	Creating your own color scheme	
	22	Fonts and typefaces	
	23	Setting various font attributes	
	24	Selectors – IDs, Classes and Pseudo classes	
	25	New CSS3 Selectors	
	26	Borders and Backgrounds	
	27	New CSS3 border techniques	
V		**Flexi Module: Not included for End Semester Exams**	**12**
	28	Levels of CSS	
	29	Using HTML with CSS	
	30	Designing web pages with stylesheets (Practical)	
	31	Creating dynamic lists	
	32	Building a basic menu system	
	33	Create a simple website using HTML and CSS (Project)	

References:

Core:
Andy Harris, "HTML5 and CSS3 All-in-one for Dummies", A Wiley Brand, Third Edition

Additional:

https://books.goalkicker.com/HTML5Book/

LAB EXERCISES

Programs (Part A)

1. Design using basic html tags
2. Design of various lists, tables and links
3. Design using image and media elements
4. Design using sectioning and progress elements

Programs(Part B)

1. Design of web pages as frames and iframes
2. Designing of Forms
3. Designing web pages with stylesheets
4. Create a simple website using HTML and CSS

Course Outcomes

No.	Upon completion of the course the graduate will be able to	Cognitive	PSO addressed
CO-1	Illustrate the basic features of HTML5	Ap	PSO-1,2
CO-2	Use advanced HTML features for web designing	Ap	PSO-1,2,3
CO3	Develop basic stylesheets in various CSS levels	Ap	PSO-1,2,3
CO4	Build websites using HTML and CSS	Ap	PSO-1,2,3

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: BASICS OF WEB DESIGNING

Credits: 2:0:1 (Lecture:Tutorial:Practical)

CO No.	CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture(L)/ Tutorial(T)	Practical (P)
1	Illustrate the basic features of HTML5	PO 1, 5, 6, 7 PSO-1,2,3	Ap	F, C, P	L	P
2	Use advanced HTML features for web	PO 1, 5, 6, 7 PSO-1,2,3	Ap	F, C, P	L	P

3	Develop basic stylesheets in various CSS	PO 1, 5, 6, 7 PSO-1,2,3	Ap	F, C, P	L	P
4	Build websites using HTML and CSS	PO 1, 5, 6, 7 PSO-1,2,3	Ap	F, C, P	L	P

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs :

	PO1	**PO2**	**PO3**	**PO4**	**PO**	**PO6**	**PO7**	**PO8**	**PSO1**	**PSO2**	**PSO3**	**PSO**
CO 1	1	-	-	-	1	3	3	-	3	3	3	-
CO 2	1	-	-	-	1	3	3	-	3	3	3	-
CO 3	1	-	-	-	1	3	3	-	3	3	3	-
CO 4	1	-	-	-	1	3	3	-	3	3	3	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics:

	Internal	Assignment	Lab	End Semester
CO 1	✓		✓	✓
CO 2	✓	✓	✓	✓
CO 3	✓		✓	✓
CO 4	✓	✓	✓	✓

UK1MDCCAP101-INTRODUCTION TO IT

Discipline	Computer Application				
Course Code	UK1MDCCAP101				
Course Title	Introduction to IT				
Type of Course	MDC				
Semester	I				
Academic Level	1				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	3	3 hours	-	-	3 hours
Pre-requisites	Basic knowledge about computers and Information Technology				
Course Summary	This course provides basic knowledge about Information technology and Computers.				

Detailed Syllabus:

Module	Unit	Content	Hrs
I	**Fundamentals of Computer Technology**		**9**
	1	Introduction, Characteristics of a computer, Stored Programme Concept	
	2	Hardware inside the computer:: SMPS, Motherboard, BIOS, CMOS, Ports and Interfaces, Expansion Cards, Ribbon Cables	
	3	Computer Software and categories: System software, Application software	
	4	Terminology software: Firmware, Liveware, Public-domain software, Freeware, Shareware, Commercial software, Proprietary software, Semi-free software	
II	**Computer Hardware**		**9**

	5	Building blocks of Computer- CPU, Memory, Input devices, output devices. Memory units: RAM (SDRAM, DDR RAM, RDRAM etc. feature wise comparison only); ROM-different types: Flash memory;	
	6	Secondary storage: Magnetic devices, Optical Devices; Floppy, Hard disk, Memory stick, CD, DVD, CD-Writer;	
	7	Input devices - keyboard, mouse, scanner, speech input devices, digital camera, Touch screen, Joystick, Optical readers, bar code reader;	
	8	Output devices: Display device, size and resolution; CRT, LCD; Printers: Dotmatrix, Inkjet, Laser; Plotters, Sound cards & speaker.	
III	**Software Classification**		**9**
	9	System software, Application software;	
	10	Operating systems, different types	
	11	Programming Languages, Compiler, Interpreter, Databases; Application softwares:	
	12	Computer Viruses & Protection, Free software, open source.	
IV	**Networks and Internet**		
	13	Connecting computers, Requirements for a network: Server, Workstation, switch, router	**9**
	14	Network Types, Topologies	
	15	Internet: brief history, World Wide Web, Websites, URL, browsers, search engines, search tips	
	16	Internet Protocol- TCP/IP, FTP, HTTP	
	17	Electronic Mail	
V	**Flexi Module: Not included for End Semester Exams**		**9**
	18	Artificial Intelligence, IoT, Digital Twins, 3G, 4G, 5G	
	19	Block Chain, DLT, Biometric Authentication	
	20	Extended Reality – AR, VR, MR	

	21	Cyber Security Techniques, Cloud Computing Basics	
Reference:		1. Vijayakumaran Nair K, Vinod Chandra S S, Informatics, PHI 2014 2. Introduction to Information Technology, V.Rajarama, PHI, Third Edition 3. Information Technology: Theory and Practice Kindle Edition, Pradeep.K.Sinha, Priti Sinha	

Course Outcomes

No.	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO-1	Summarize the basic ideas of Computer Technologies	U	PSO-1
CO-2	Identify Computer Hardware components	U	PSO-1
CO-3	Explain the basics of Software	U	PSO-1
CO-4	Discuss the tools and applications of Network	U	PSO-1

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Credits: 3:0:0 (Lecture:Tutorial:Practical)

CO No.	CO	PO/ PSO	Cognitive Level	Knowledge Category	Lecture (L)/Tutorial	Practical (P)
CO-1	Summarize the basic ideas of Computer	PSO -1	U	F, C	L	
CO-2	Identify Computer Hardware components	PSO -1	U	F, C	L	
CO-3	Explain the basics of Software	PSO -1	U	F, C	L	
CO-4	Discuss the tools and applications of Network	PSO -1	U	F, C	L	

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO	PSO	PSO	PSO
CO	-	-	-	-	-	3	3	-	1	-	-	-
CO	-	-	-	-	-	3	3	-	2	-	-	-
CO	-	-	-	-	-	3	3	-	3	-	-	-
CO	-	-	-	-	-	3	3	-	3	-	-	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate /
3	Substantial /

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics :

	Internal	Assignment	Seminar	End Semester Examinations
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓		✓	✓
CO 4		✓	✓	✓

UK1MDCCAP102: BASICS OF MICROPROCESSORS

Discipline	Computer Application				
Course Code	UK1MDCCAP102				
Course Title	BASICS OF MICROPROCESSORS				
Type of Course	**MDC**				
Semester	I				
Academic Level	1				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	3	2 hours	-	2hours	4 hours
Pre-requisites	Knowledge on number systems - Binary and Hexadecimal				
Course Summary	This course covers the architecture and functionality of 8085 and 8086 microprocessors, with a specific emphasis on their instruction cycles, system buses, and management of binary/hexadecimal data. It provides comprehensive insights into pin functionalities and instruction sets, with a strong focus on developing assembly language programming competencies. Additionally, students will gain proficiency in assembler commands and TASM programming tailored for the 8086 microprocessor.				

Detailed Syllabus:

Module	Unit	Content	Hrs
I		**Introduction to 8085**	**9**
	1	Introduction to microprocessors	
	2	8085 Architecture	
	3	Buses and demultiplexing of buses, Instruction set	
	4	Addressing modes (8085)	
II		**Pins, signals and Instruction Cycle**	**9**
	5	Pin Diagram and Signals	

	6	Fetch, Decode and Execute cycles	
	7	Instruction Cycle - Timing diagram	
III	**Introduction to 8086**		**9**
	9	8086 Architecture	
	10	Flag register and its functions (8086)	
	11	Instruction set of 8086	
	12	Addressing modes	9
		8086 -Fetch, Decode and Execute cycles	
	13	Instruction Cycle	
	16	Buses and Demultiplexing of Buses	
	17	8086 Memory banks (Even bank, Odd Bank)	
IV	**Assembly Language Programming**		**9**
	18	Program Development Tools	
	19	Assembler Directives	
		Introduction to TASM programs-8086	
V		**Flexi Module : Not included for End-Semester Exams**	**9**
		Comparison between 8085 and 8086 microprocessors,	
		Discuss the applications of 8086 microprocessor.	

ASSEMBLY LANGUAGE PROGRAMMING LAB

LIST OF EXPERIMENTS:

PART B (TASM PROGRAMS-8086)

1. Basic Arithmetic Operations (Addition, Subtraction, Multiplication, Division)
2. Program to find the sum of numbers in an array
3. Program to search a number in an array
4. Program to find out the Smallest among N numbers.

TEXT BOOKS

1. Ramesh S Gaonkar, Microprocessor Architecture, Programming, and Applications with the 8086 .
2. Ramesh S. Gaonkar, Microprocessor Architecture, Programming and Applications with the 8085, 1st edition.
3. NagoorKani A, 8085 Microprocessor and Applications, 4th edition.
4. N. Mathivanan, Microprocessors, PC Hardware and Interfacing, PHI Edition, Publisher: PHI.

REFERENCES

1. B. Ram, Fundamentals of Microprocessors and Microcomputers, 1st edition, Publisher: Unknown, Publication Year: Unknown
2. McGraw Hill, 8086 Microprocessor and its applications, 2nd edition, Publisher: McGraw Hill, Publication Year: Unknown
3. John D Carpinelli, Computer system organization and architecture, Publisher: Pearson Education, Publication Year: Unknown

Web Resources

https://www.youtube.com/playlist?list=PLgwJf8NK-2e5vHwmowy_kGtjq9Ih0FzwN
https://www.javatpoint.com/instruction-set-of-8085
https://www.geeksforgeeks.org/architecture-of-8086/
https://en.wikipedia.org/wiki/Intel_8086

Course Outcomes

No.	Upon completion of the course the graduate will be able to	Cognitive	PSO addressed
CO-1	Describe the basic architecture and Instruction set of 8085 microprocessor	U	PSO1
CO-2	Discuss 8085 Instruction set, Learn Fetch, Decode and Execute operations and draw timing diagrams	U	PSO1
CO-3	Discuss 8086 architecture, instruction set and draw the timing diagram for 8086 microprocessors	U	PSO1
CO-4	Develop Assembly Language Programs	Ap	PSO1, 2, 3,

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Credits: 2:0:1 (Lecture: Tutorial: Practical)

CO No.	CO	PO/PSO	Cognitive Level	Knowledge	Lecture (L)/Tuto	Practical (P)
CO-1	Describe the basic architecture and Instruction set of 8085	PSO - 1	U	F, C	L	P
CO-2	Discuss 8085 Instruction set, Learn Fetch, Decode and Execute operations	PSO - 1, 2	U	F,C,P	L	P
CO-3	Discuss 8086 architecture, instruction set and draw the timing diagram for	PSO - 1, 2	U	F, C, P	L	P
CO-4	Develop Assembly Language Programs	PSO - 2, 3	Ap	F,C,P	L	P

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs:

	PO	PO	PO	PO	PO	PO	PO	PO	PS	PS	PS	PS
CO 1	-	-	-	-	-	1	1		**3**	-	-	-
CO 2	1	-	1	-	-	1	1		**3**	-	-	-
CO 3	1	-	1	-	-	1	1		**3**	-	-	-
CO 4	2	-	2	-	-	1	2		3	1	3	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics:

	Internal Exam	Assignment	Lab Assessment	End Semester Examinations
CO 1		✓		✓
CO 2	✓			✓
CO 3	✓	✓		✓
CO 4		✓	✓	✓

UK1MDCCAP103-DIGITAL MARKETING

Discipline	COMPUTER APPLICATION				
Course Code	UK1MDCCAP103				
Course Title	DIGITAL MARKETING				
Type of Course	MDC				
Semester	I				
Academic Level	1				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	3	2 hours	-	2hour	4 hours
Pre-requisites	Basic understanding of Information Technology				
Course Summary	This course provides an introduction to digital marketing strategies, platforms, and the fundamentals of e-banking concepts. .				

Detailed Syllabus:

Module	Unit	Content	Hrs
I		**Introduction**	**12**
	1	Digital Marketing- Nature, Scope and Importance; Evolution of Digital Marketing	

	2	Core Concepts-Inbound Marketing, Content Marketing, Email Marketing, Influential Marketing;	
	3	Holistic Digital Marketing Concept, 10Ps of digital marketing	
	4	Digital Marketing Environment: Macro and Micro Environment.	
II		**E-banking**	**12**
	5	E-banking approaches, devices, services, benefits, drawbacks	
	6	Electronic payment systems credit cards, debit cards, smart cards, credit accounts	
	7	Cyber security, encryption, secret key cryptography, public key cryptography	
	8	Digital signatures, firewalls	
III		**Digital Marketing**	**12**
	9	Search Engine Optimization (SEO), Social Media, Content Marketing	
	10	Email Marketing, Mobile Marketing.	
	11	Challenges for Digital Marketing: Increased Security Risk, Cluttered Market, Less Focus on Keywords, More Ad Blockers, Increased Ad Costs**.**	
IV		**Digital Marketing Techniques**	**12**
	12	Pay per Click-Search Engine Advertising, Advantages, Factors, Conversion Rate Optimization (CRO)	
	13	Digital Marketing- Web Analytic. Social Media Marketing: Facebook, Pinterest, Twitter, LinkedIn, YouTube, Google Adwords, Google Analytics;	
	14	Issues and Future enhancement of Digital Marketing. Case study	
V		**Flexi Module (Not for end semester exam)**	12
	15	Collection of current marketing tools, case studies, new trends	

Hands on Experience

1. Implenmenting SEO concepts to a website
2. Creating Social Media content for the created website
3. Implement simple cryptographic methods
4. IPLTeams's Digital Marketing Strategy by KKR
5. 'Mom's Touch' by Nivea India
6. The Great Indian Freedom Sale by Amazon India

CORE TEXT

Ian Dodson-*The art of Digital Marketing*, Wiley; ISBN:9781119265702

ADDITIONAL REFERENCES

Puneet Singh Bhatia- *Fundamentals of Digital Marketing*, Pearson Education

Course Outcomes

No.	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO-1	Infer about various types of digital marketing (DM) and marketing environment	U	PSO 1
CO-2	Discuss about the payment systems and security strategies adopted in e-banking	U	PSO 1,2
CO-3	Identify the challenges involved in digital marketing strategies	U	PSO 1, 2
CO-4	Use different digital marketing techniques	Ap	PSO 1, 2, 3

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Digital Marketing

Credits: 2:0:1 (Lecture:Tutorial:Practical)

CO No.	CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L)/Tutorial (T)	Practical (P)
1	Infer about various types of digital marketing (DM) and marketing environment	PO 6,7 PSO 1	U	F,C	L	-
2	Discuss about the payment systems and security strategies adopted in e-banking	PO 6,7 PSO 1, 2	U	F,C	L	-
3	Identify the challenges involved in digital marketing strategies	PO 6,7 PSO 1, 2	U	F,C	L	-

4	Use different digital marketing techniques	PO 6,7 PSO 1, 2, 3	An	F, C, P	L	P

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4
CO 1	-	-	-	-	-	2	2	-	3	-	-	-
CO 2	-	-	-	-	-	2	2	-	3	2	-	-
CO 3	-	-	-	-	-	2	2	-	3	2	-	-
CO 4	-	-	-	-	-	2	2	-	3	2	2	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics :

	Internal	Assignmen	Lab Assessment	End Semester
CO 1	✓			✓
CO 2	✓	✓		✓
CO 3	✓	✓		✓
CO 4	✓		✓	✓

UK1MDCCAP104 : INTRODUCTION TO ANIMATION

Discipline	COMPUTER SCIENCE				
Course Code	UK1MDCCAP104				
Course Title	INTRODUCTION TO ANIMATION				
Type of Course	**MDC**				
Semester	I				
Academic Level	1				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	3	2 hours	-	2	4 hours
Pre-requisites	Nil				
Course Summary	This course offers a thorough exploration of the Blender interface, focusing on mastering essential navigation skills. It covers fundamental modeling techniques that empower the creation of 3D objects and characters.				

Detailed Syllabus:

Module	Unit	Content	Hrs (L+P)
I		**Basics Of Blender**	**12**
	1	Introduction to Blender, Commercial Software vs Open-source Software	
	2	History of Blender, Downloading and Installing Blender	
	3	Blender UI: Splash screen, Top bar and Status bar, Default Editors	
	4	Understanding Areas and Editors: Resizing areas, Splitting and joining areas, Understanding the types of editors	
II		**Blender Objects**	**12**
	5	Interface Elements: Panels, Pie Menus; 3D Viewport, 3D Scene	
	6	Creating Object, Moving, Rotating, Scaling, Active Tools, Manipulators, Menus	
	7	Modifiers, Workbench, Light options, Rendering	
	8	Stages of a Project, Defining the Stages, Character-Creation plan	

	9	Character Design: Description, Designing Character, adding colour, Finalizing the design	
III	**Modelling in Blender**		**12**
	10	Modelling tools: Vertices, Edges, Faces, making selections, Mesh modelling tools, Modelling Add-ons, LoopTools	
	11	Character Modelling: Mesh topology, modelling methods: Box Modelling, Poly to poly, Sculpt and Retopology, Modifiers	
	12	Hot air balloon modelling, Cartoon Giraffe modelling, Kite Modelling	
IV	**Rigging**		**12**
	13	Unwrapping, Painting, Shading, Character Rigging, Skinning	
	14	Lighting the scene, Analysing the real footage	
	15	Creating and Testing lights	
V	**Flexi Module : Not included for End Semester Exams**		**12**
	16	Animating the character	
	17	Showing/Hiding objects in Render	
	18	Exporting the final Render	

References

1. Oliver Villar, Learning Blender: A Hands-On Guide to Creating 3D Animated Characters, Third Edition, Addison-Wesley, 2021.
2. James Chronister, Blender Basics, Second Edition, 2006.
3. James Chronister, Blender Basics: A Classroom Tutorial Book, 5th Edition, cdscholls.org, 2017.

LAB EXERCISES

Design following models

1. Chair
2. Table
3. Pizza in Blender
4. Coffee Mug
5. French Fries
6. Piggy Bank
7. Donut
8. Table lamp in Blender
9. Penguin
10. Toy

Course Outcomes

No.	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO-1	Outline fundamental aspects of Blender	U	PSO-1
CO-2	Develop knowledge of Blender interface elements, such as panels, menus, and editor.	Ap	PSO-1, 3
CO-3	Use basic modelling techniques in Blender	Ap	PSO-1,2,3
CO-4	Develop models of various objects	Ap	PSO-1,2, 3

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Credits: 2:0:1 (Lecture:Tutorial:Practical)

CO No.	CO	PO/PSO	Cognitive	Knowledge Category	Lecture (L)/	Practical (P)
CO-1	Outline fundamental aspects of Blender	PO-3, 6, 7 PSO-1	U	F, C	L	-
CO-2	Develop knowledge of Blender interface elements, such as panels, menus, and editor.	PO-3, 6, 7 PSO-1,2,3	Ap	F, C, P	L	P
CO-3	Use basic modelling techniques in Blender	PO-1, 3, 6, 7	Ap	F,C,P	L	P
CO-4	Develop models of various objects	PO-1, 3, 6, 7	Ap	F, C, P	L	P

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs :

	PO1	PO2	PO3	PO4	PO	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4
CO 1	-	-	1	-	-	2	2	-	2	-	-	-
CO 2	-	-	2	-	-	2	2	-	2	1	2	-
CO 3	1	1	3	-	1	2	2	-	2	1	2	-
CO 4	1	1	3	-	1	2	2	-	2	1	2	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Lab	End Semester
CO 1	✓			✓
CO 2	✓	✓	✓	✓
CO 3	✓		✓	✓
CO 4	✓	✓	✓	✓

SEMESTER 2

SEMESTER II			
Discipline Specific Core			
UK2DSCCAP100	Object Oriented Programming using C++	**4**	**3T+2P**
UK2DSCCAP101	E-commerce	**4**	**4T**
UK2DSCCAP102	Introduction to Multimedia	**4**	**3T+2P**
UK2DSCCAP103	Introduction to Data structures	**4**	**3T+2P**
UK2DSCCAP104	Introduction to Data Science	**4**	**3T+2P**
UK2DSCCAP105	Modern Web Technologies	**4**	**3T+2P**
Multi-Disciplinary Course (Can Select One)			
UK2MDCCAP100	Office Automation	**3**	**2T+2P**
UK2MDCCAP101	Social Media Management	**3**	**2T+2P**
UK2MDCCAP102	Digital Logic Systems	**3**	**2T+2P**
UK2MDCCAP103	Python for Data Science	**3**	**2T+2P**

Discipline Specific Core Courses

UK2DSCCAP100 - OBJECT ORIENTED PROGRAMMING USING C++

Discipline	COMPUTER APPLICATION
Course Code	UK2DSCCAP100
Course Title	OBJECT ORIENTED PROGRAMMING USING C++
Type of Course	DSC
Semester	II

Academic Level	1				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	3 hours	-	2 hours	5
Pre-requisites	Nil				
Course Summary	This course introduces object oriented programming concepts Students will acquire practical experience through hands-on assignments, projects, and real-world applications, equipping them with the skills to design, develop, and troubleshoot C++ programs proficiently				

Detailed Syllabus:

Module	Unit	Content	Hrs
I	**Introduction to C++**		**15**
	1	Introduction to OOP-Characteristics and applications of OOP	
	2	Concepts: Object, class, data abstraction, data encapsulation, inheritance, and Polymorphism	
	3	Basic C++ program structure-Keywords-Basic data types-Streams in C+-Operators, variables, and constant declarations	
	4	Decision and Control Structures-if statement- if-else statement, switch statement	
	5	Loop: while, do-while, for;	

	6	Jump statements: break, continue, go to.	
II	**Classes and Objects**		**15**
	7	Introduction to objects-classes- Declaration of classes in C++.	
	8	Components of function: prototype, function call, definition, parameter, passing arguments; types of function, inline function,	
	9	Creating Objects- Polymorphism- Member functions of a class as friends of another class. Friend classes.	
	10	Constructors-Instantiation of objects-Default Constructor-Parameterized Constructor-Copy constructor	
	11	Destructors-Constraints on constructors and destructors	
III	**Operator Overloading**		**15**
	12	Overloading unary operators: Operator keyword, arguments and return value.	
	13	Overloading unary and binary operators: arithmetic operators, manipulation of strings using operators.	
	14	Arrays and Strings-One-dimensional and multi-dimensional arrays	
	15	Strings and string class-Array and string manipulation	

IV	**Inheritance**		**15**
	16	Introduction to code reuse-Containership-Parent and Derived classes-public- private and protected.	
	17	Types- Single, multilevel, multiple, hierarchical, hybrid.	
	18	Function overriding- virtual Functions.	
	19	Objects and pointers, this pointer, pointers to derived class	
	20	Derived class and base class: Defining a derived class-Accessing the base class member.	
	21	Virtual base class, Abstract class	
V	**File I/O and Exception Handling**		15
	22	C++ Exception Handling: Try Throw, Catch, Throwing an Exception, Catching an Exception.	
	23	File classes-Opening and Closing a file.	
	24	File modes- Manipulation of file pointers-Functions for I/O operations.	

References

Core:

1. Object oriented Programming with C++- E Balagurusamy – Sixth Edition

2. Object-oriented Programming with C++ - A. K. Sharma – Second edition
3. Object-oriented Programming in C++- Robert Lafore - Fourth Edition
4. Starting Out with C++: Early Objects by Tony Gaddis
5. C++ Primer by Stanley B. Lippman, Josée Lajoie, and Barbara.
6. Bjarne Stroustrup: The C++ programming language.

Additional:

https://www.w3schools.com/cpp/

Practical Questions

Part A

1. Testing out and interpreting a variety of simple programs to demonstrate the syntax and use of the following features of the language: basic data types, operators, and control structures
2. Solving problems using classes, array of objects and objects as function arguments
3. Class definitions and usage involving variety of constructors and destructors

Part B

4. Programs involving various kinds of inheritances
5. Programs involving function overloading and operator overloading
6. Programs involving virtual base classes, friend functions
7. Programs to demonstrate early binding and late binding
8. Programs to demonstrate Exception handling
9. Programs to demonstrate class and function templates

Course Outcomes

No.	Upon completion of the course the graduate will be	Cognitive	PSO addressed
CO1	Understand the concepts of classes and object	U	PSO – 1, 2, 3
CO2	Apply the object initialization and destroy	Ap	PSO – 1, 2, 3
CO3	Apply the concept of polymorphism to implement	Ap	PSO – 1, 2, 3
CO4	Apply the concept of inheritance to reduce the	Ap	PSO – 1, 2, 3
CO5	Apply the concept of file I/O and exception	Ap	PSO – 1, 2, 3

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Credits: 3:0:1(Lecture:Tutorial:Practical)

CO No.	CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture(L) /	Practica l (P)
1	Understand the concepts of classes	PO – 3, 6, 7	Ap	F, C, M	L	P
2	Apply the object initialization and	PO – 3, 6, 7	Ap	F, C, M	L	P
3	Apply the concept of polymorphism to	PO – 3, 5, 6, 7	Ap	F. C, M	L	P
4	Apply the concept of inheritance to reduce	PO – 3, 5, 6, 7	Ap	F. C, M	L	P
5	Apply the concept of file I/O and	PO – 3, 5, 6, 7	Ap	F. C, M	L	P

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with POs and PSOs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4
CO1	-	-	3	-	-	3	3	-	2	1	2	-
CO2	-	-	3	-	-	3	3	-	2	1	2	-
CO3	-	-	3	-	1	3	3	-	2	1	2	-
CO4	-	-	3	-	1	3	3	-	2	1	2	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- § Quiz / Assignment/ Quiz/ Discussion / Seminar
- § Midterm Exam
- § Programming Assignments
- § Final Exam

Mapping of COs to Assessment Rubrics:

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓			
CO 2	✓	✓	✓	✓
CO 3	✓		✓	✓
CO 4	✓	✓	✓	✓
CO5	✓		✓	✓

UK2DSCCAP101: E-COMMERCE

Discipline	COMPUTER APPLICATION				
Course Code	UK2DSCCAP101				
Course Title	E-COMMERCE				
Type of Course	DSC				
Semester	II				
Academic Level	1				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	4 hours	-	-	4 hours
Pre-requisites	Basic knowledge of computers				
Course Summary	This course provides an overview of the evolution, strategies, and implementation of e-commerce, exploring its impact on business and consumer behavior in the digital age.				

Detailed Syllabus:

Module	Unit	Content	Hrs
I		**Introduction to E-Commerce**	**12**

	1	e-Commerce: Definition, Difference between E-Commerce and E-Business, Technological Building Blocks, Major trends in E-Commerce.	
	2	Brief History of E-commerce, Unique Features: Ubiquity, Global Reach, Universal Standards, Richness, Interactivity, Information density, Personalization and Customization.	
	3	Types of E-Commerce: B2C, B2B, C2C, M-Commerce, Social E-Commerce and Local E-Commerce.	
	4	Understanding E-Commerce: Technology, Business, Society	
II		**E-commerce Business Strategies**	**12**
	5	Business Models : Introduction, Eight key Elements of a Business Model.	
	6	B2C: Online Retailer, Community Provider, Content Provider, Portal, Transaction Broker, Market Creator.	
	7	B2B: E-distributer, E-procurement, Exchanges, Industry Consortia	
	8	Industry Structure, Industry Value Chain, Firm Value Chains, Firm Value Webs, Business Strategy.	
III		**Technology Infrastructure**	**12**
	8	The Internet Backbone, Internet Exchange Points, Tier 3 ISP, Mobile Internet Access	
	9	E-Commerce System Development Life Cycle, Alternative Web Development Methodologies	
	10	Choosing Software, Choosing Hardware, E-Commerce Site Tools.	
	11	E-Commerce Security Environment, Security Threats, E-Commerce Payment systems.	
IV		**Business Concepts and Social Issues**	**12**
	12	Digital Commerce Marketing and Advertising Strategies and Tools	
	13	Online Marketing Technologies, Online Marketing Metrics: Lexicon.	
	14	Social Marketing, Mobile Marketing, Local and Location based Mobile Marketing.	
V		**Flexi Module: Not included for End Semester Exams**	12
	15	Case Study: Uber-Everything on Demand.	
	16	Case Study: Skyscanner- The One Stop Travel Platform.	

TEXT BOOK

1. Kenneth C. Laudon, Carol Guercio Traver, E-Commerce2023-24: Business, Technology, Society,18th Edition(Global), Pearson
2. S. J. Joseph, E-Commerce: an Indian perspective, PHI
3. E-Commerce, Fundamentals And Applications By Henry Chan, Raymond Lee, Tharam Dillon, Elizabeth Chang ·Wiley India Pvt. Limited
4. Introduction to E-commerce,By Jeffrey F. Rayport, Bernard J. Jaworski McGraw-Hill

Course Outcomes

No.	Upon completion of the course the graduate will be able to	Cognitive	PSO addressed
CO-1	Outline E-commerce basics	U	PSO-1
CO-2	Identify various types of E-commerce strategies	U	PSO-1,2
CO-3	Explain E-commerce Technology Infrastructure	U	PSO-1,2
CO-4	Differentiate between various digital commerce technologies and tools	U	PSO-1,2

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Credits: 4:0:0 (Lecture: Tutorial: Practical)

CO No.	CO	PO/PSO	Cognitive	Knowledge Category	Lecture (L)/Tutorial	Practical (P)
CO-1	Outline E-commerce basics	PSO-1	U	F, C	L	
CO-2	Identify various types of E-commerce	PSO-1,2	U	F,C	L	
CO-3	Explain E-commerce Technology	PSO-1,2	U	F,C	L	
CO-4	Differentiate between various digital commerce technologies	PSO-1,2	U	F,C	L	

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs :

	PO1	PO2	PO3	PO4	PO	PO6	PO7	PO	PSO	PSO	PSO3	PSO4
CO					-	-			2	-	-	-
CO					-	-			2	1	-	-
CO					-	-			2	1	-	-
CO					-	-			2	1	-	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate /
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Discussion	End Semester Examinations
CO 1	✓			✓
CO 2	✓	✓		✓
CO 3	✓		✓	✓
CO 4		✓		✓

UK2DSCCAP102- INTRODUCTION TO MULTIMEDIA

Discipline	COMPUTER APPLICATION				
Course Code	UK2DSCCAP102				
Course Title	**INTRODUCTION TO MULTIMEDIA**				
Type of Course	**DSC**				
Semester	II				
Academic Level	1				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	3 hours	-	2 hours	5 hours
Pre-requisites	Nil.				
Course Summary	This course introduces students to the multifaceted realm of multimedia, encompassing foundational concepts, practical skills, and ethical considerations. Through exploration of multimedia's definition, characteristics, and applications, students will develop a comprehensive understanding, practical proficiency in content creation and editing, and an awareness of ethical implications. This equips them for further studies or careers in multimedia-related fields.				

Detailed Syllabus:

Module	Unit	Content	Hrs (L+P)
I		**Fundamentals of Multimedia**	**15**
	1	Introduction to Multimedia: Definition and characteristics of Multimedia.	

	2	Multimedia applications, Classification -Multimedia Hardware - Multimedia software - Image editing softwares, Video editing softwares, Audio editing softwares, Slideshow creation- Prezi, Screen recording tools-Camtasia, OBS Studio (basic concepts of all tools only)	
	3	Overview of Multimedia elements: text, images, audio, video, animations, and interactive elements.	
	4	Multimedia Text: Text in Multimedia -Multimedia graphics: coloring - digital imaging fundamentals - development and editing - file formats - scanning and digital photography.	
II	**Multimedia Representation and Formats**		**15**
	5	Understanding Multimedia data representation and storage formats.	
	6	Common Multimedia file formats (e.g., JPEG, MP3, MPEG, GIF) and their properties.	
	7	Compression techniques for reducing Multimedia file sizes while preserving quality.	
	8	Multimedia Audio: Digital medium - Digital audio technology - sound cards - recording - editing - MP3 - MIDI fundamentals - Working with MIDI - audio file formats - adding sound to Multimedia project.	
III	**Multimedia Content Creation**		**15**
	9	Multimedia Project: Stages of a project - Multimedia skills - design concept - authoring - planning and costing –Multimedia Team.	
	10	Introduction to Multimedia authoring software tools and platforms. What is Multimedia authoring Software, Necessity of Multimedia Authoring software, Types of Multimedia Authoring tools- just basics and examples, (e.g., Adobe Creative Suite, Blender, Unity).	
	11	Creating Multimedia projects using authoring tools, incorporating text, images, audio, and video.	
	12	Multimedia Content Creation: Techniques for creating and editing multimedia content. Multimedia Animation: Computer animation fundamentals - Kinematics - morphing - animation s/w tools and techniques	
	13	Image editing and manipulation basics and examples (e.g., Photoshop, GIMP), Image Editing software: selection tools, working with layers, masks and channels, correcting and enhancing photographs	
	14	Audio recording, editing, and mixing (e.g., Audacity, Adobe Audition).	

	15	Multimedia Video: How video works - broadcast video standards - digital video fundamentals – digital video production and editing techniques - file formats Video editing and post-production (e.g., Adobe Premiere Pro, Final Cut Pro).	
IV	**Multimedia Programming and Applications**		**15**
	16	Basics of multimedia programming languages and frameworks (e.g., HTML5, JavaScript, Python with libraries like OpenCV and Pygame) (basics only).	
	17	Integration of multimedia elements into web pages, mobile apps, and interactive environments.	
	18	Multimedia Applications and Platforms: Analysis of multimedia applications across various domains (e.g., entertainment, education, advertising, healthcare).	
	19	Legal and Ethical Issues: Copyright and intellectual property considerations in multimedia content creation and distribution. Ethical implications of multimedia technologies (e.g., privacy concerns, representation and bias in media).	
V	**Flexi Module - Not included for End Semester Exams**		**15**
	20	Scripting multimedia interactions and animations, Interactive animations.	
	21	Virtual reality (VR) and augmented reality (AR) systems, 3D multimedia content creation and rendering	
	22	Multimedia-looking towards Future: Digital Communication and New Media, Interactive Television, Digital Broadcasting, Digital Radio, Multimedia Conferencing	
	23	Immersive multimedia experiences and interactive storytelling, Wearable multimedia devices and applications	
	24	Multimedia Analytics- Multimedia content analysis and understanding	

References

1. S.Gokul, “Multimedia Magic”, BPB Publications, 2nd Edition.
2. Tay Vaughen, “Multimedia Making it Work”, TMH, 9th Edition.
3. Ralf Steinmetz and Klara Nahrstedt, Introduction to Multimedia Systems
4. Ze-Nian Li, Mark S. Drew, and Jiangchuan Liu, Fundamentals of Multimedia

Lab Exercises

- Hands on experience with any text, audio, video, authoring tools.
- Create a multimedia project using Multimedia tools and techniques learnt.
- Case studies of successful Multimedia projects and platforms.
- Report Writing on Emerging trends and future directions in multimedia technology (e.g., virtual reality, augmented reality, immersive experiences etc.).

Course Outcomes

No.	Upon completion of the course the graduate will be able to	Cognitive	PSO addressed
CO-1	Have an outline of multimedia concepts	U	PSO-1
CO-2	Interpret the various multimedia representations	U	PSO-1
C0 -3	Develop basic multimedia content	Ap	PSO-1,2,3
CO -4	Summarize programming aspects applicable for multimedia	U	PSO-1

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Credits: 3:0:1 (Lecture: Tutorial: Practical)

CO No.	CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L)/Tutorial (T)	Practical (P)
1	Have an outline of multimedia concepts	PSO1	U	F, C	L	
2	Interpret the various multimedia representations	PSO1	U	F, C	L	

3	Develop basic multimedia content	PSO1.2, 3	Ap	F, C, P	L	P
4	Summarize programming aspects applicable for multimedia	PSO1	U	F, C	L	

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO 1	-		-	-	-	2	2	-	2	-	-	-
CO 2	-	--	-	-	-	2	2	-	2	3	-	-
CO 3	-	-	2	1	1	2	2	1	2	2	2	-
CO 4	-	-	-	-	-	2	2	-	2	-	-	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Discussion / Seminar– Can be given from all modules
- Trivial content creation assignments- based on Module 3
- Midterm Exam – From first 4 modules
- Final Exam – From first 4 modules

Mapping of COs to Assessment Rubrics:

	Internal Exam	Assignment	Lab Assessment	End Semester Examinations
CO 1	✓	✓		✓
CO 2	✓	✓		✓
CO 3	✓	✓	✓	✓
CO 4	✓	✓		✓

UK2DSCCAP103: INTRODUCTION TO DATA STRUCTURES

Discipline	COMPUTER APPLICATION				
Course Code	UK2DSCCAP103				
Course Title	INTRODUCTION TO DATA STRUCTURES				
Type of Course	**DSC**				
Semester	II				
Academic Level	1				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	3 hours	-	2 hours	5 hours
Pre-requisites	Basic knowledge of C Programming				
Course Summary	This course helps to understand the basic concepts involved in organizing, storing, retrieving and modifying data using various data structures.				

Detailed Syllabus:

Module	Unit	Content	Hrs (L + P)
I		**Introduction to Data Structures**	15
	1	Introduction to Data Structures: Definition, Classification of data structures -Linear and Non- Linear, Static and Dynamic, Data Structure Operations, Applications of Data Structures	
	2	Array-Single dimensional array, memory representation, Operations- insertion, deletion	
	3	Searching: Linear search, Binary search	
	4	Sorting: Bubble Sort, Selection Sort, and Insertion Sort.	
	5	Time and Space complexities of algorithm	
	6	Multidimensional array- memory representations- row major & column major, Sparse matrix – array representation	
II		**Linked List**	15
	4	Linked List: Concept of Linked List, Memory representation , Difference of Linked List and Array.	
	5	Singly Linked List – Memory Representation, Operations - Traversing, Searching, Insertion, Deletion	
	6	Doubly Linked List- Memory representation, Operations-Traversing, Searching, Insertion, Deletion; Circular linked list- concepts only	
		Stack & Queue	15
	8	Stack: Implementation and operations on Stack using arrays and linked list	
	9	Applications of Stack – Polish & Reverse Polish notations, Conversion of arithmetic expressions- infix to postfix using stack. Evaluation of postfix expression using stack	

III	10	Queue: Implementation and operations on Queue using arrays and linked list, Applications of queue, Deque - Types- Input and output restricted, Priority Queues (Basic concepts)	
IV		**Trees**	**15**
	11	Trees: Concept of Trees, Tree terminologies, Binary tree: Types- Complete Binary tree, Full Binary Tree & Perfect Binary tree, Expression trees.	
	12	Representation of Binary Tree, Traversing Binary Trees – Preorder, Inorder, Postorder	
	13	Binary Search Tree (BST): Creating a Binary Search Tree, Search, Insertion and Deletion operations, applications of trees	
	14	Graphs - Terminologies,Representations, DFS & BFS	
V		**Flexi Module: Not included for End Semester Exams**	**15**
	15	Circular Linked List - Insertion & Deletion Header Linked List - Grounded and Circular Applications of Graphs	

CORE TEXTS

1. Seymour Lipschutz, Data Structures, Schaum's outline Series. The McGraw Hill

2. S.K.Srivastava, Deepali Srivastava. Data Structures Through C in Depth. BPB Publications.

ADDITIONAL REFERENCES

1. K Sharma. Data Structures using C. Pearson, Second Edition.

2. Ashok N. Kamthane, Introduction to Data Structures in C, Pearson

3.Jean-Paul Tremblay ,Paul G. Sorenson, An Introduction to Data Structures with Application, MCGrawhill, Second Edition.

4. Ten Baum Publisher , Data Structures using C & C++ , Prentice-Hall International.

DATA STRUCTURES Lab Exercises

The laboratory work will consist of 20-25 experiments that should be implemented in C language

Part A

1. Implementation of different searching techniques
   - Linear Search
   - Binary Search
2. Implementation of different sorting technique.
   - Bubble Sort
   - Selection Sort
   - Insertion Sort
3. Stack Operations implemented as array
4. Queue Operations implemented as array

Part B

5. Singly Linked List Operations
6. Doubly Linked List Operations.
7. Stack operations implemented as Linked List
8. Queue operations implemented as Linked List
9. Tree traversals

Course Outcomes

No.	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO1	Discuss about data structure classification and applications in searching and sorting	Ap	PSO-1,2
CO2	Demonstrate the concept and usage of linked lists	Ap	PSO-1,2,3
CO3	Summarize about stack, queue and its applications	Ap	PSO-1,2,3
CO4	List various types of trees and operations	Ap	PSO-1,2,3

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Credits: 3:0:1 (Lecture:Tutorial:Practical)

CO No.	CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L)/Tutorial (T)	Practical (P)
1	Discuss about data structure classification and applications in searching and sorting	PO-1,2,3,6,7 PSO-1,2	Ap	F, C, P, M	L	P
2	Demonstrate the concept and usage of linked lists	PO-1,2,3,6,7 PSO-1,2,3	Ap	F, C, P, M	L	P
3	Summarize about stack, queue and its applications	PO-1,2,3,6,7 PSO-	Ap	F, C, P, M	L	P
4	List various types of trees and operations	PO-1,2,3,6,7	Ap	F, C, P, M	L	P

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs :

	PO	PO2	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO	PSO
CO 1	2	1	2	-	-	2	2	-	1	2	-	-
CO 2	2	2	2	-	-	2	2	-	2	2	2	-
CO 3	2	2	2	-	-	2	2	-	2	2	2	2
CO 4	2	2	2	-	-	2	2	-	2	2	2	2

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Lab Program	End Semester
CO 1	✓		✓	✓
CO 2	✓	✓	✓	✓
CO 3	✓	✓	✓	✓
CO 4	✓		✓	✓

UK2DSCCAP104 - INTRODUCTION TO DATA SCIENCE

Discipline	COMPUTER APPLICATION				
Course Code	UK2DSCCAP104				
Course Title	INTRODUCTION TO DATA SCIENCE				
Type of Course	**DSC**				
Semester	II				
Academic Level	1				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	3 hours	-	2 hours	5 hours
Pre-requisites	NIL				
Course Summary	This course aims to introduce the student to the main concepts of data science, understand the essential principles and to implement spreadsheet-based data analysis. Through a blend of theoretical understanding and hands-on practice, learners will develop a solid foundation in data preprocessing, data integration, data transformation, data reduction and skills to apply statistical analysis techniques using Spreadsheet.				

Detailed Syllabus:

Module	Unit	Content	Hrs(L +P)
I		**Fundamentals of Data Science**	**15 hrs**
	1	Introduction, Why Data Science, Types of Data analysis: Descriptive analysis, Diagnostic analysis, Predictive analysis and Prescriptive analysis.	
	2	Data Analytics life cycle: Data discovery, Data Preparation, Model planning, Model Building, Communicate Results, and Operationalization.	
	3	Data Science tools: Python programming, R programming, SAS, Spreadsheet, Tableau Public, RapidMiner, Knime, Apache Spark.	
	4	Fundamental areas of study in data science: Machine Learning, Deep Learning, NLP, Statistical data analysis, Knowledge discovery and data mining, Text mining, Recommender systems, Data visualization, Computer Vision, and Spatial data management.	
	5	Role of SQL in data science, Pros and Cons of data science	
II		**Data Pre-processing**	**15**
	6	Introduction, data types and forms, possible data error types,	
	7	Various data pre -processing operations: Data Cleaning: Filling missing values, Smoothing noisy data, Detecting and removing outliers.	
	8	Data Integration: Virtual integration, physical data integration, Application based integration, Manual Integration, and middleware data integration.	
	9	Data Transformation: Rescaling data, Normalizing data, Binarizing data, Standardizing data.	
	10	Data Reduction: Dimensionality reduction, Data cube aggregation, Numerosity reduction. Data Discretization: Top-down discretization, Bottom-up discretization.	
III		**Data Analysis with Worksheet**	**15**
	11	Introduction to Worksheet: Creation and Formatting.	
	12	Ranges and Tables-Data Cleaning with Text Functions, Containing Date Values and Containing Time Values	
	13	Conditional Formatting, Sorting and Filtering	
	14	Subtotals with Ranges, Creating Macros, Pivot Table.	

IV	**Data Plotting and Visualization**		**15**
	15	Introduction, Visual encoding, Basic data visualization tools: Histograms, Bar Charts/Graphs, Scatter plots and Area plots. Data visualization types: Temporal data, Hierarchical data, Network data, Multi-dimensional data, Geospatial data and Multivariate data.	
	16	Lookup Functions: LOOKUP and VLOOKUP and HLOOKUP.	
	17	Data Visualization using Band Chart, Thermometer Chart, Gantt chart, Waterfall Chart and Pivot Charts. Types of jobs in data analytics: Data Analyst, Data scientist, Data engineer, Database administrator, Data architect, and Analytics manager.	
V		**Flexi Module (Not Included for End Semester Examination)**	**15**
	18	Advanced data visualization tools	
	19	Visualization of geospatial data	
	20	Statistical Data Analysis : Probability theory	

REFERENCES

Core

- Gypsy Nandi and Rupam Kumar Sharma, Data Science fundamentals and practical approaches, First Edition, BPB Publication, 2020 **.**
- Bernd Held, Excel Functions and Formulas, BPB Publications.

Additional

- V K Jain, Data Science and Analytics, Khanna Publishing.
- Joel Grus, Data Science From Scratch, Second Edition, Oreilly.

Practical Questions

PART A

1. Create a workbook and perform the operations: Selecting range of columns, hiding /show rows and columns and rename the worksheet.
2. Create workbook with student mark details. Include formulas to calculate total, percentage and grade.
3. Create worksheet with student mark details and perform the following operations
   i. Find the number of students having percentage more than 70.

ii. Find the number of students having percentage between 60 and 80.
iii. Find the number of students passed in a subject
iv. Find the student who got highest mark in a subject.

4. Create a worksheet with Employee salary details. Find mean, median, mode, standard deviation and variance.
5. Create a workbook with sales details and use the functions: TRIM and CLEAN.
6. Create worksheet with student mark details. Use sorting and filtering functions.
7. Create a worksheet with employee details. Use date and time values. Calculate salary details and bonus using functions.
8. Create a worksheet with student name as a column. Add three more columns First name, Last name and e-mail. Find the values of First name, Last name and e-mail(Firstname_lastname@gmail.com). Use text functions.
9. Enter your date of birth and today's date in two cells. Find your age in days, months and years.
10. Prepare a worksheet with sales details. Make pivot table having product and category in row label.

PART B

11. Create a worksheet for flower shop with invoiceid, flower name, price, qty and total price. Enter 10 records. Make pivot table and pivot charts.
12. Create a worksheet with Fruits supply details. Apply LOOKUP, VLOOKUP and HLOOUP functions.
13. Assign a macro to a command button to display "welcome" in a cell.
14. Assign a macro to a command button to display "welcome" in a message box.
15. Assign a macro to a command button to find total number of sheets in a workbook.
16. Assign a macro to a command button to add a new worksheet.
17. Assign a macro to a command button to add a new workbook.
18. Prepare a worksheet with wildlife population of different states in India. Display in Pie chart and Bar chart.
19. Prepare a worksheet with total number of primary schools in each district of Kerala. Include different charts.
20. Create a worksheet with employee salary details. Include charts.

Course Outcomes

No.	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO-1	Discuss about the fundamentals of Data Science	U	PSO -1

CO-2	Illustrate the usage of Data Pre-processing techniques	Ap	PSO-1,2,3
CO-3	Use data science concepts in real world problems	An	PSO-1,2,3
CO-4	Build Data Analytics and management Skill	Ap	PSO-1,2,3,4

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Credits: 3:0:1 (Lecture:Tutorial:Practical)

CO No.	CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L)/Tutorial (T)	Practical (P)
CO-1	Discuss about the fundamentals of Data Science	PO-7 PSO-1,2	U	F, C	L	-
CO-2	Illustrate the usage of Data Pre-processing	PO-7 PSO-1,2,3	Ap	C, P	L	P
CO-3	Use data science concepts in real world problems	PO-7 PSO-1,2,3	An	F, C, P	L	P
CO-4	Build Data Analytics and management	PO-7 PSO-1,2,3,4	Ap	F, C, P	L	P

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4
CO 1	-	-	-	-	-	-	1	-	1	1	-	-
CO 2	-	-	-	-	-	-	2	-	2	2	2	-
CO 3	-	-	-	-	-	-	2	-	1	2	2	-
CO 4	-	-	-	-	-	-	2	-	2	2	2	2

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Quiz	End Semester Examinations
CO 1	✓		✓	✓
CO 2	✓		✓	✓
CO 3	✓	✓		✓
CO 4		✓		✓

UK2DSCCAP105- MODERN WEB TECHNOLOGIES

Discipline	COMPUTER APPLICATION				
Course Code	UK2DSCCAP105				
Course Title	Modern Web Technologies				
Type of Course	**DSC**				
Semester	II				
Academic Level	1				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	3 hours	-	2 hours	5 hours

Pre-requisites	Basics of Web Design (HTML and CSS)
Course Summary	This course provides a comprehensive introduction to web scripting using JavaScript, with a focus on building dynamic and interactive web applications using the React JS library. Students can explore the principles of component-based UI development using React JS, including state management, props, event handling, and component lifecycle methods. Through hands-on projects and exercises, students will gain practical experience in building modern web applications with JavaScript and React JS.

Detailed Syllabus:

Module	Unit	Content	Hrs (L+ P)
I	**JavaScript : Introduction**		**15**
	1	Introduction to JavaScript, JavaScript Basics: Variables and data types,	
	2	Operators and expressions	
	3	Control Structures: Conditional statements, Loop statements	
	5	Functions: Declaring functions, Parameters and arguments, Returning values	
	6	Dialog boxes: Prompt, Confirm, Alert boxes.	
II	**JavaScript : Arrays, Objects, Events, Form and Exception Handling**		**15 hrs**
	5	Arrays and Objects: Working with arrays, Working with objects, Iterating through arrays and objects	
	6	Events: click event, mouse events, key events	
	7	Forms and Form Validation: Working with forms, Client-side form validation	
	8	Exception Handling	
III	**React JS: Introduction**		**15 hrs**
	9	Introduction to React JS, Need, Applications, Features, Architecture, Virtual DOM	

	10	Installation: Setting up a React development environment (Node.js, npm, create-react-app)	
	11	JSX**:** JSX syntax, Conditional rendering with if/else and element variables, Ternary operators and logical && in JSX, Expressions in JSX	
	12	Creating and rendering React Components	
	13	Components and Props: Components vs Elements**,** Built in components, Attributes vs props, Types of Components: Function components, Passing and using props	
IV		**React JS: Events, Styles, Forms in React JS**	**15 hrs**
	14	Understanding component state, managing state using setState(), Component Life Cycle methods , React Hooks	
	15	Handling Events: Event handling in React, Event Handler Functions, Binding event handlers Functions	
	16	Forms: Controlled vs uncontrolled inputs, Handling form submission and user input	
	17	Styling in React.js CSS in React, Different approaches for styling (CSS, CSS-in-JS, CSS Modules), Inline styles, Styling Libraries, Popular CSS frameworks (Bootstrap, Material-UI)	
V		**Flexi Module: Not included for End Semester Exams**	15 hrs
	18	Cookies in JavaScript, Introduction to React Router: Setting up routes in React applications, Navigating between routes, Passing parameters to routes	

Text books

1. The Complete Reference JavaScript by Fritz Schneider and Thomas A Powell, Second Edition
2. BEGINNING React JS Foundations Building User Interfaces with React JS An Approachable Guide by Chris Minnick

References

- Eloquent JavaScript: A Modern Introduction to Programming by Marijn Haverbeke, Fourth Edition
- Learning React: A Hands-On Guide to Building Web. Applications Using React and Redux by Kirupa Chinnathambi, Addison Wesley
- React.js Essentials by Artemij Fedosejev

- Fullstack React: The Complete Guide to ReactJS and Friends by Anthony Accomazzo, Nate Murray, and Ari Lerner

Web Resources

1. https://www.tutorialsteacher.com/javascript
2. https://www.guru99.com/reactjs-tutorial.html

Lab Experiments

Part A (JavaScript)

1. Experiments based on Operators
2. Experiments based on Control Statements
3. Experiments based on Loop statements
4. Experiments based on Functions
5. Experiments based on Dialog boxes
6. Experiments based on Arrays
7. Experiments based on Objects
8. Experiments based on Form validation
9. Experiments based on Events
10. Experiments based on Exception Handling

Part B (React JS)

Develop a simple application using React by integrating concepts learned throughout the course.

Course Outcomes

No.	Upon completion of the course the graduate will be able to	Cognitive	PSO addressed
CO-1	Illustrate the basic skills in JavaScript	Ap	PSO-1,2,3
CO-2	Develop the client-side scripts using JavaScript	Ap	PSO-1,2,3
CO-3	Illustrate the main ideas behind React JS	Ap	PSO-1,2,3
CO-4	develop interactive user interfaces using React JS	Ap	PSO-1,2,3

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Credits: 3:0:1 (Lecture:Tutorial:Practical)

CO No.	CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L)/Tutorial	Practical (P)
1	Illustrate the basic skills in JavaScript	PO – 3, 6, 7 PSO – 1, 2,	Ap	F, C, P	L	P
2	Develop the client-side scripts using JavaScript	PO – 3,5 6, 7	Ap	F, C, P	L	P
3	Illustrate the main ideas behind JSX	PO – 3, 6, 7	Ap	F, C, P	L	P
4	Develop interactive user interfaces using React.js.	PO – 3, 5, 6, 7 PSO – 1, 2, 3	Ap	F, C, P	L	P

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO 8	PSO1	PSO2	PSO3	PSO4
CO 1	-	-	3	-	-	3	3	-	2	1	3	-
CO 2	-	-	3	-	1	3	3	-	2	1	3	-
CO 3	-	-	3	-	-	3	3	-	2	1	3	-
CO 4	-	-	3	-	1	3	3	-	2	1	3	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate /
3	Substantial /

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics :

	Internal	Assignment	Project	End Semester Examinations
CO 1	✓		✓	✓
CO 2	✓		✓	✓
CO 3	✓	✓	✓	✓
CO 4	✓	✓	✓	✓

Multi-Disciplinary Courses

UK2MDCCAP100- OFFICE AUTOMATION

Discipline	COMPUTER APPLICATION
Course Code	UK2MDCCAP100
Course Title	**OFFICE AUTOMATION**
Type of Course	MDC
Semester	II
Academic Level	1

Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	3	2 hours	-	2 hours	4 hours
Pre-requisites	Basic Knowledge in operating Computers				
Course Summary	The course covers both theoretical aspects and practical skills in office automation tools for day to day life.				

Detailed Syllabus:

Module	Unit	Content	Hrs (L+P)
I		**Open Office Writer for Document Preparation**	**12hrs**
	1	Introduction to Office automation- Advantages of office automation, Software classification, Proprietary software, free software , Open access software, Office automation packages	
	2	Documentation using Open Office writer:- features of the software, creating and editing document, Auto-text, Autocorrect	
	3	Spelling and Grammar Tool, Document Dictionary ,Find and Replace	
	4	Formatting the document- character formatting, paragraph formatting, page formatting, bulleted and numbered list, inserting images, header & footer, page number.	
II		**Advanced features of Open Office Writer**	**12hrs**
	5	Creating tables	
	6	Using Mail merge	
	7	Creating document from templates, pre viewing and printing documents	
III		**Open Office Calc for Data Manipulation**	**12hrs**
	8	Electronic Spread Sheet - Introduction to Spread Sheet, adding and removing worksheet, inserting, deleting ,copying , moving and formatting cells.	
	9	Working with Formula , cell reference –Absolute, relative and mixed	
	10	Functions – Mathematical, statistical, logical functions	

	11	Charts- types of charts, Components of charts, Creating and formatting charts	
	12	Advanced features – Pivot table & Pivot Chart, Linking and Consolidation.	
IV	**Open Office Impress for Presentation**		**12hrs**
	13	Presentation using Open Office Impress- , Creating presentation, Adding , removing , moving ,rearranging and enhancing Slides	
	14	Inserting picture, Word Art, formatting background, adding sounds and video clips	
	15	Inserting Charts & Organizational Charts	
	16	Setting animation and transitions	
	17	creating hyperlinks in presentations, rehearsing and setting up slide show	
V	**Flexi Module: Not included for End Semester Exams**		
	18	Familiarization of other automation packages for word processing, data manipulation and presentation	**12h**rs

Lab Exercises:

- **Open Office Writer**
  1. Creating Resumes/CVs: Design and format professional resumes or curriculum vitae (CV) using Writer's formatting tools
  2. Create brochure for organizations, clubs, or businesses using text formatting, and graphics insertion
  3. Design and create business letters and proposals using formatting features.
  4. Create Product Catalogues/Inventory lists using table and images
  5. Create tables to summarize sales data, including revenue, units sold, product categories
  6. Create personalized form letters by merging recipient-specific information such as names, addresses, and salutations into a standard letter
- **Open Office Calc**
  1. Create an Spreadsheet for preparation of Marklist
  2. Create an Spreadsheet for preparation of Rank list of students
  3. Create an Spreadsheet for preparation of Payroll Processing
  4. Create an Spreadsheet for sales analysis of salesmen using suitable chart

5. Using suitable charts compare performance metrics such as sales figures over time periods.

- **Open Office Impress**
  1. Create orientation presentations for new students
  2. Create visually appealing presentations for presenting a topic in the class
  3. Design dynamic presentations for a product launch to highlight the features
  4. Design presentations for an awareness program
  5. Compile activity reports summarizing the activities of student clubs, organizations, or academic departments.

Text Books

1. Office Automation: A User-Driven Method, Don Tapscott ,Springer-Verlag New York Inc
2. OpenOffice.org For Dummies, Gurdy Leete, Ellen Finkelstein, Mary Leete
3. OpenOffice 3.4 Volume I: Write,:Christopher N. Cain and Riley W. Walker, Quantum Scientific Publishing,
4. OpenOffice 3.4 Volume II: Calc,Christopher N. Cain and Riley W. Walker, Quantum Scientific Publishing,
5. OpenOffice 3.4 Volume III: Base, Christopher N. Cain and Riley W. Walker, Quantum Scientific Publishing

Web Resources:

1. OpenOffice.org 3.3 Writer Guide by OOoAuthors Team: https://www.openoffice.org/documentation/manuals/userguide3/0200WG3-WriterGuide.pdf

Course Outcomes

No.	Upon completion of the course the graduate will be	Cognitive	PSO
CO-1	Use different types of software create, edit, format,	Ap	PSO-1, 3
CO-2	Learn advanced features of word processor	Ap	PSO-1,3
CO-3	Manipulate data using spread sheet software.	Ap	PSO-1,2,3
CO-4	Develop professional presentation using Presentation	Ap	PSO-1,2,3

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Credits: 2:0:1 (Lecture:Tutorial:Practical)

CO No.	CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L)/Tuto	Practical (P)
1	Use different types of software create, edit, format, save and print office documents.	PO-6,7 PSO-1	U	F, C	L	P
2	Learn advanced features of word processor	PO-4,6,7	Ap	F,C,P	L	P
3	Manipulate data using spread sheet software.	PO-6,7	Ap	F,C,P	L	P
4	Develop professional presentation using Presentation software.	PO-4,6,7 PSO-1,2,3	Ap	F,C,P	L	P

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs :

	PO1	PO 2	PO 3	PO4	PO5	PO6	PO7	PO8	PSO 1	PSO2	PSO 3	PSO 4
CO 1	-	-	-	-	-	1	1	-	1	-	-	-
CO 2	-	-	-	2	-	1	2	-	1	1	1	-
CO 3	-	-	-	-	-	1	2	-	1	1	2	-
CO 4	-	-	-	2	-	1	2	-	1	1	2	-

Correlation Levels:

Level	Correlation
-	Nil
	Slightly / Low
2	Moderate /
3	Substantial /

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Lab	End Semester Examinations
CO 1	✓	✓	✓	✓
CO 2	✓		✓	✓
CO 3	✓	✓	✓	✓
CO 4	✓		✓	✓

UK2MDCCAP101- SOCIAL MEDIA MANAGEMENT

Discipline	COMPUTER APPLICATION				
Course Code	UK2MDCCAP101				
Course Title	**SOCIAL MEDIA MANAGEMENT**				
Type of Course	MDC				
Semester	II				
Academic Level	1				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	3	2 hours	-	2 hours	4 hours

Pre-requisites	Basic knowledge on Social Media
Course Summary	The course will deliver the basic ideas various social media channels available to users, learning how to build social media strategies, and practicing how to track their effectiveness.

Detailed Syllabus:

Module	Unit	Content	Hrs (L+P)
I		**Introduction and Social media content publishing**	**12**
	1	Introduction to social media, Finding a way through social media, Social Media Marketing, SMM & Public Relations, Logic of social media, Social Media Strategy and Planning, Content Strategy.	
	2	Overview of popular social media platforms (e.g., Facebook, Instagram, Twitter, LinkedIn, TikTok).	
	3	Publishing Blogs; Publishing Podcasts and Webinars; Publishing articles, white papers and E-books.	
	4	Sharing Videos; Sharing Photos and images; Webinar.	
II		**Social Network, Microblogging and Discussion Boards**	**12**
	5	**Social Network**: A Brief History of Social Networks; Benefits of Marketing with Social Networks; White label social Networks; Pros and cons of creating a white label social network; Future of Social Network.	
	6	**Microblogging**: Microblogging; A Brief History of Microblogging; Different Uses for Microblogging; Tips for Brand Building with Twitter.	
	7	**Discussion Boards**: Discussion Board; Discussion Forum Structure; A Brief History of Discussion Boards; Discussion Board Netiquette; Marketing with Discussion Forums; Guidelines for Moderators of Online Discussion Groups; Get Product Creation Ideas from Discussion Forums.	
III		**Social News Site, Mobile computing and Location marketing**	**12**
	8	**Social News Site**: Social News Site; A Brief History of Social News Sites; Marketing with Social News Sites	

	9	**Q & A sites:** Q&A Site; A Brief History of Q&A Sites; Marketing with Q&A Sites	
	10	**Mobile computing and Location marketing:** Mobile computing, Marketing with mobile computing, Location Based Social Network, Location-based Social Networks and Gaming , The Growth of Location-based Social Networks, Marketing with Location-based Social Networks, The Future of Mobile Computing and Location Marketing	
IV	**Social Media Monitoring and Social Media Marketing Plan**		**12**
	11	**Social Media Monitoring**: A Brief History of Social Media Monitoring; Tracking; Measuring; Qualitative Key Performance Indicators (KPIs); The Net Promoter Score; Return on Investment; Evaluation; Selecting Social Media Monitoring Tools (Radian 6) The Future of Social Media Monitoring.	
	13	**Social Media Marketing Plan:** Creating an Informative and Eye-Catching Title Page, Automatically Generating a Table of Contents, Writing a Compelling Executive Summary, Composing a Brief Overview, Observing Social Media Presence, Conducting a Competitive Analysis, Setting Goals, Determining Strategies, Identifying the Target Market, Selecting Tools, Implementing, Monitoring, Getting C-Suite Buy-In	
V	**Flexi Module (Not included for end semester exam)**		**12**
		Community Management, Social Networking Sites (SNS): LinkedIn & Twitter, Facebook in Business, YouTube and Live streaming, Trends.	

References:

CORE

1. Stephen, A. & Bart, Y. (2017).“Social Media Marketing: Principles and Strategies”.

ADDITIONAL

2. Buyer, L. (2016). Social PR Secrets: How to Optimize, Socialize, and Publicize Your Brand. 3rd edition.

LAB EXERCISES

1. Identify the features of various popular social media sites.
2. Analyse the features of various popular blogging sites.
3. Analyse the future of social networks.
4. Prepare features of various microblogging sites.
5. Prepare product creation ideas from discussion forums.
6. Prepare a report of social media monitoring using Radian6

7. Prepare a Social Media Marketing Plan of a company.

Course Outcomes

No.	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO1	State the concepts in social media and relevance of popular social media platforms	U	PSO 1, 3
CO2	Illustrate the role of social networks, microblogging and discussion boards	Ap	PSO 1, 3
CO3	Summarize about Social news, Q&A sites, Mobile computing and Location marketing	Ap	PSO 1, 3
CO4	Focus on the process of social media monitoring, tools used and Social Media Marketing Plan	An	PSO 1, 2, 3

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Credits: 2:0:1 (Lecture:Tutorial:Practical)

CO No.	CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L)/Tutorial	Practical (P)
CO1	State the concepts in Social Media and relevance of popular social media platforms	PO 5,6,7 PSO 1, 3	U	F, C	L	P
CO2	Illustrate the role of social networks, microblogging and discussion boards	PO 5,6,7 PSO 1, 3	Ap	F, C	L	P
CO3	Summarize about Social news and Q&A sites	PO 5,6,7 PSO 1, 3	Ap	F, C	L	P
CO4	Focus on the process of social media monitoring and tools	PO 5,6,7 PSO 1, 2, 3	Ap	F, C, P	L	P

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs :

	PO1	PO2	PO3	PO4	PO 5	PO 6	PO7	PO8	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	-	-	-	-	1	2	2	-	2	-	2	-
CO 2	-	-	-	-	1	2	2	-	2	-	2	-
CO 3	-	-	-	-	1	2	2	-	2	-	2	-
CO 4	-	-	-	-	1	2	2	-	2	1	2	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate /
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Lab Assignments
- Final Exam

Mapping of COs to Assessment Rubrics :

	Internal Exam	Quiz/Assignment	Lab Assessment	End Semester Examinations
CO 1	✓	✓	✓	✓
CO 2	✓	✓	✓	✓
CO 3	✓	✓	✓	✓
CO 4	✓	✓	✓	✓

UK2MDCCAP102- DIGITAL LOGIC SYSTEMS

Discipline	COMPUTER APPLICATION				
Course Code	UK2MDCCAP102				
Course Title	DIGITAL LOGIC SYSTEMS				
Type of Course	MDC				
Semester	II				
Academic Level	1				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	3	2 hours	-	2 hours	4 hours
Pre-requisites	Knowledge of basic mathematics is desirable				
Course Summary	Course provides a comprehensive understanding of digital logic, covering various number systems, Boolean algebra, logic gates, combinational and sequential logic circuits.				

Detailed Syllabus:

Module	Unit	Content	Hrs (L+P)
I		Data Representation	12
	1	Concept of number systems– Binary, decimal, Octal, Hexadecimal and BCD	
	2	1's and 2's compliment of binary numbers	
	3	Binary arithmetic operations: Addition, Subtraction, Multiplication	
II		**Boolean Algebra**	12
	5	Basic Laws of Boolean Algebra	

	6	**Logic Gates** - OR, AND, NOT, NOR, NAND, XOR, XNOR, Universal gates	
	7	**Realising Boolean Functions**: Min-terms, Max-terms, SOP and POS Expressions, De-Morgan's theorem, simplification of Boolean expression, Karnaugh maps.	
III		**Sequential Logic Circuits**	**12**
	9	Introduction to sequential and combinational circuits	
	10	2- bit synchronous counters and 2-bit asynchronous counters	
	11	Flip flops — SR Flip Flop, JK Flip Flop, D Flip Flop, T Flip Flop	
IV		**Combinational Logic Circuits**	**12**
	18	Arithmetic Circuits: Half adder, Full adder	
	19	2 -4 Decoder, Encoder	
	22	Multiplexer and Demultiplexer	
V		**Flexi Module : Not included for End-Semester Exams**	**12**
		Shift Registers-SI-SO, SI-PO, PI-SO, PI-PO	
		Seminar / Discussion- Applications of Digital Electronics in day today life	

LIST OF EXPERIMENTS

1. Truth table verification of basic gates.
2. Realization of Boolean functions.
3. Verify the NAND and NOR gates as universal logic gates.
4. Verify the truth table of a J-K flip-flop.
5. Test an S-R flip-flop using XNOR/NAND gates.
6. Verify the truth tables of Half and Full adder circuits.
7. Construct 2X1 MUX.
8. Verify of the truth table of a 2-4 decoder.

CORE TEXT BOOK

1. Thomas L. Floyd, Digital Fundamentals, 11th edition, Publisher: Pearson,
2. Navas K. and Sam Jose, Digital Electronics Lab Manual, Publisher: Unknown,
3. M Morris Mano, Digital Logic and Computer Design, Publisher: Pearson, Publication Year: 2013

ADDITIONAL REFERENCES

1. D.A. Godse, A.P. Godse, Digital Electronics.
2. R. P. Jain, Digital Electronics.
3. B L Theraja, Basic Electronics, Publisher: Chand Publications.
4. V K Mehta, Rohit Mehta, Principles of Electronics, 12th edition, Publisher: S. Chand & Company.

Web Resourses

https://www.nutsvolts.com/magazine/article/April2016_Beginner-Guide-to-Digital-Electronics

Course Outcomes

No.	Upon completion of the course the graduate will be able to	Cognitive	PSO addressed
CO-1		U	PSO-1
CO-2	illustrate the basic laws of Boolean algebra and concepts of logic circuits	U	PSO-1,2
CO-3	Develop sequential circuits, such as counters and flip-flops.	Ap	PSO1, 2.3
CO-4	Design various combinational logic circuits and apply it	Ap	PSO1,2,3

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Credits: 2:0:1 (Lecture:Tutorial:Practical)

CO No.	CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L)/Tutorial	Practical (P)
CO-1	Summarize the concepts of	PO -6,7	U	F, C,P	L	P
CO-2	illustrate the basic laws of	PO-6,7	Ap	F, C, P	L	P

CO-3	Develop sequential	PO-6,7 /PSO-1, 2,	Ap	F,C,P	L	P
CO-4	Design various combinational	PO - 6,7 / PSO-1,	Ap	F, C,P	L	P

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs :

	PO1	PO2	PO3	PO4	PO	PO6	PO7	PO8	PSO1	PSO2	PSO3	PO4
CO 1	-	-	-	-	-	3	3	-	3	-	-	-
CO 2	-	-	-	-	-	3	3	-	3	2	-	-
CO 3	-	-	-	-	-	3	3	-	3	2	3	-
CO 4	-	-	-	-	-	3	3	-	3	2	3	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Seminar	End Semester Examinations
CO 1	✓	✓		✓
CO 2				✓
CO 3	✓		✓	✓
CO 4		✓	✓	✓

UK2MDCCAP103: PYTHON FOR DATA SCIENCE

Discipline	COMPUTER SCIENCE				
Course Code	UK2MDCCAP103				
Course Title	PYTHON for DATA SCIENCE				
Type of Course	MDC				
Semester	II				
Academic Level	1				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	3	2 hours	-	2	4 hours
Pre-requisites	Basic Knowledge about Programming and Computer Technologies				
Course Summary	This course will help to learn the basics of Python along with different techniques in data science.				

Detailed Syllabus:

Module	Unit	Content	Hrs (L+P)
I	**Basics of Python Programming**		**12**
	1	Introduction to Python, Python tokens, Literal constants, Type conversion	
	2	Variables and identifiers, Creating variables	
	3	Data types of identifiers, Input operation	
	4	Comments, Reserved words, Indentation	
	5	Operators and expressions, Expressions in Python, Decision control statements	
	6	Selection/conditional branching statements, Iterative statements, The range () function, Selecting an appropriate loop, Nested loops	
	7	Break statement, The continue statement, The pass statement, The else statement used with loops	
II	**Basic Data structures in Python**		**12**

	8	Revisiting Data Structures in Python, Introduction to Python strings, String indexing, Finding the number of characters in a string, Traversing a string, Concatenating, appending and multiplying strings, The str() function, Strings are immutable, String formatting operator, The format() function	
	9	Built-in string methods and functions, Comparing strings, ord() and chr() functions, In and not in operator	
	10	Lists, Accessing values in lists, The eval() function, Updating values in lists, Relational operations on lists, Nested lists, List aliasing and cloning, Deleting elements, Deep copies and shallow copies in Python, Basic list operations, List methods	
	11	Tuple, Creating tuple. Utility of tuples, Accessing values in a tuple, Updating tuple, Deleting elements in tuple, Joining tuples, Unpacking tuples, Basic tuple operations, Tuple assignment, Accessing using index, Tuples for returning multiple values, Nested tuples, The count() method, The zip() function, Advantages of tuple over list	
III		**Dictionaries and functions in Python**	**12**
	12	Dictionaries, Creating dictionary, Accessing values in a dictionary, Adding an item in a dictionary, Modifying an item in a dictionary, Deleting items, Traversing a dictionary, Nested dictionaries, The copy() method	
	13	Built-in dictionary functions and methods, Difference between a list and a dictionary.	
	14	Function declaration and function definition, Function definition, Function call, Function parameters, Parameter passing mutable/immutable properties, The return statement, Types of function parameters, Passing strings, lists, tuples, dictionaries to functions, Modules	
IV		**Data Handling Using Numpy and Python Pandas**	**12**
	15	Data and its purpose, Data science and its applications, The numpy module, Creating numpy arrays, Array attributes, Converting 2D numpy array into 1D array	
	16	Array slicing: Accessing subarrays, Reshaping of arrays, Array concatenation (joining) and splitting	
	17	How numpy broadcasting works, Performing mathematical operations on numpy arrays, Transposing arrays, Inserting and deleting array elements	
	18	Find the index of a value, Sorting a numpy array, Normalize array, Array subsets	

	19	Python Pandas, Data frame, Pandas data frame functions and attributes, Pivoting data frame, Sorting, Missing data, Combining data frames	
	20	Descriptive statistics, Summarizing or describing data, Function application, Aggregation (group by), Transform function in Python, Reindexing in Pandas dataframe, Altering column labels, Data wrangling, Time series data structures	
V		**Flexi Module: Not included for End Semester Exams**	**12**
	21	Plotting Graphs, Importance of data visualization, Bar chart, Plotting histograms, Frequency polygon, Box plot, Scatter plot, Correlation matrix plot, The Seaborn library, The color palette, Plotting univariate distribution, Plotting bivariate distribution	
	22	Visualizing pairwise relationship, Box Plot in Seaborn, Violin plots, Statistical estimation, Plotting categorical data, Facet grid and facetgridmap(), Pair grid, Linear relationships, Heatmap, Bubble chart, Plotting time series data, Visualizing sparse matrix	

References

- Dr. Reema Thareja, Data Science and Machine Learning using Python, McGraw Hill Education (India) Private Limited
- Bharti Motwani, Data Analytics using Python,Wiley,2022
- Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data,EMC Education services Wiley Publication

REFERENCES

1. Joel Grus,Data Science from Scratch: First Principles with Python,O'Reilly Media,2015
2. Wes McKinney,Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython,O'Reilly Media,2017
3. Jake VanderPlas,Python Data Science Handbook: Essential Tools for Working with Data,O'Reilly Media,2016
4. Aurélien Géron,Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow,O'Reilly Media,2019
5. Python for Data Analysis: 3rd Edition, Wes McKinney ,Publisher(s): O'Reilly Media, Inc.

LAB EXERCISES

1. Programs using Python strings, lists, tuples, and dictionaries.
2. Read and write data from/to files in Python.
3. Programs to demonstrate creating and handling of modules and packages
4. Programs involving regular expressions
5. Programs to draw simple bar chart, pie chart, histogram and scatter plot
6. Create a python program to draw a Histogram, Column Chart, Box plot chart, Pie

Chart, and Scatter plot using pandas and mat plot lib.

7. Create a python program to export data (store Data Frame in CSV Format)
8. Create a python program to handle the missing data from a dataset using numpy and pandas.
9. Create a python program to import data from any .csv file and analyze using the statistical functions of pandas tools
10. Programs using Python strings, lists, tuples, and dictionaries.
11. Read and write data from/to files in Python.
12. Programs to demonstrate creating and handling of modules and packages
13. Programs involving regular expressions
14. Programs to draw simple bar chart, pie chart, histogram and scatter plot
15. Create a python program to draw a Histogram, Column Chart, Box plot chart, Pie Chart, and Scatter plot using pandas and mat plot lib.
16. Create a python program to export data (store Data Frame in CSV Format)
17. Create a python program to handle the missing data from a dataset using numpy and pandas.
18. Create a python program to import data from any .csv file and analyze using the statistical functions of pandas tools

    (a) Create a python program to draw a Histogram, Column Chart, Box plot chart, Pie Chart, and Scatter plot using pandas and mat plot lib for the following data. The categorical data on 1997 U.S. Health Care Expenditures. The data are in file healthexpendituresdata.csv.

    (b) The monthly data on the total return from the Standard and Poor 500 stock index (with reinvestment of dividends) from 1970 to 2018. The data are in file SandP500stockpricedata.csv. Create a python program to import data from any .csv file and analyze using the statistical functions of pandas tools. Also create a python program to draw different charts.

    (c)If at the end of each month, a saver deposited $100 into a savings account that paid 6% compounded monthly, h o w much would he have at the end of 10 years? Create a python program to calculate it?

	A	B
1	Category	Expenditures
2	Hospital	371
3	Physician	218
4	Drugs and Supplies	109
5	Other Personal	92
6	Nursing Home	83
7	Dental	51
8	Admin & Insurance	50
9	Public Health	39
10	Home Health	32
11	Research	18
12	Construction	17
13	Eye and Equipment	14

(d)Draw a pie chart and other charts that shows the amount of subscription generated for Indian Bonds from different categories of Investors. Create a python program for the above problem Use pandas and mat plot lib to draw charts

(e)The share holding pattern of a company WIPRO is given. Create a python program for the above problem. Use pandas and matplotlib to draw charts

Course Outcomes

No.	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO-1	Develop knowledge on Python	Ap	PSO-1,2,3
CO-2	Identify basic Data structures in Python	Ap	PSO-1,2,3
CO-3	Use Dictionaries and functions in Python	Ap	PSO-1,2,3
CO-4	Manipulate Data Using Numpy and Python Pandas	Ap	PSO-1,2,3

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: DATA SCIENCE USING PYTHON

Credits: 2:0:1 (Lecture:Tutorial:Practical)

CO No.	CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L)/Tutorial (T)	Practical (P)
CO-1	Develop knowledge on Python	PO-1, 2, 6,7 PSO-1,2, 3	Ap	F, C, P	L	P
CO-2	Identify basic Data structures in Python	PO-1, 2, 6, 7 PSO-1,2, 3	Ap	F, C,P	L	P
CO-3	Use Dictionaries and functions in Python	PO-1, 2, 6, 7 PSO-1, 2, 3	Ap	F, C, P	L	P
CO-4	Manipulate Data Using Numpy and Python Pandas	PO-1, 2, 6, 7 PSO-1,2, 3	Ap	F, C, P	L	P

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4
CO 1	1	1	-	-	-	2	2	-	3	1	2	-
CO 2	2	1	-	-	-	2	2	-	3	2	2	-
CO 3	2	1	-	-	-	2	2	-	3	2	2	-
CO 4	2	2	-	-	-	2	2	-	3	2	2	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Lab Assignment	End Semester Examinations
CO 1	✓	✓	✓	✓
CO 2	✓		✓	✓
CO 3	✓		✓	✓
CO 4	✓	✓	✓	✓

SEMESTER 3

Discipline Specific Core			
UK3DSCCAP200	FOSS	4	3T+2P
UK3DSCCAP201	DataBase Management	4	3T+2P
UK3DSCCAP202	Principles of Secure Coding	4	4T
UK3DSCCAP203	Modern Information Systems	4	4T
UK3DSCCAP204	Computer Graphics	4	3T+2P
UK3DSCCAP205	System Software	4	3T+2P
UK3DSCCAP206	Low Code App Development	4	3T+2P
Discipline Specific Elective (Can Select One)			
UK3DSECAP200	Introduction to Cyber security	4	4T
UK3DSECAP201	Data Science Fundamentals	4	3T+2P
UK3DSECAP202	Introduction to Artificial Intelligence	4	4T
UK3DSECAP203	Web Development using HTML5 and CSS3	4	3T+2P
Value Added Course (Can Select One)			
UK3VACCAP200	Entrepreneurship in IT	3	3T
UK3VACCAP201	Professional Ethics in Computer Science	3	3T

Discipline Specific Core Courses

UK3DSCCAP200: FOSS

Discipline	COMPUTER APPLICATION
Course Code	UK3DSCCAP200
Course Title	FOSS
Type of Course	**DSC**

Semester	III				
Academic Level	2				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	3 hours	-	2 hours	5 hours
Pre-requisites	Nil				
Course Summary	Free software is a software that respects users' freedom to run, copy, distribute, study, change and improve the software.This course is designed to ensure that students understand the incidence and usage of open source software in the industry and also the ethical and social impact leading the students to make precise decisions on software selection based on the usage scenarios.				

Detailed Syllabus:

Module	Unit	Content	Hrs (L)
I		**Basics of FOSS**	
	1	Introduction to Open-Source: Open Source, Need and Principles of OSS, Open Standards Requirements for Software, OSS success, Free Software, Examples, Free Vs. Proprietary Software, Free Software Vs. Open-Source Software, Public Domain. Proprietary Vs Open-Source Licensing Model, use of Open- Source Software, FOSS does not mean no cost. The Free Software Foundation and the GNU Project.	**15hrs**
II		**Free and Open-Source Software**	**15 hrs**
	2	Initiatives, Principle and methodologies, Software Freedom, Open-Source Software Development, Economics of FOSS: Zero Marginal Cost, Income-generation opportunities, Problems with traditional commercial software, Internationalization	
		Open Source Ecosystem	
	3	Open Source Operating Systems: GNU/Linux, Android, Free BSD, Open Solaris. Open Source Hardware, Virtualization Technologies, Containerization Technologies: Docker, Development tools, IDEs, debuggers, Programming languages, LAMP, Open Source database technologies	
		Open Source Projects	
	4	Introduction to GitHub, interacting with the community on GitHub, Communication and etiquette, testing Open-source code, reporting issues, contributing code. Introduction to Wikipedia, contributing to Wikipedia or contributing to any	

III		prominent open source project of students choice	
	Open-Source Ethics & Social Impact		
	5	Open source vs. closed source, Ethics of Open source. Social and Financial impacts of Open source technology, Shared software, Shared source, Open Source in Government, Open Source as a Business Strategy.	**12 hrs**
IV	**Licensing**		**12 hrs**
	6	Open Source Development Model Licenses and Patents: What Is A License, Important FOSS Licenses (Apache, BSD, PL, LGPL), copyrights and copy lefts, Patent.	
	Basic Linux and open source applications		
	7	GNU/Linux, Android, Mozilla (Firefox), Wikipedia, Drupal, WordPress, GCC, GDB, GitHub, Libre Office. Basic Linux commands, sample Shell scripting programs	
V		**Flexi Module: Not included in End Semester Exams**	**12** hrs
		Study: Understanding the developmental models, licensing, commercial/non-commercial use. (The students must address key questions about the development processes, and the software that is the result of these processes)	

Core Textbooks

1. "Open-Source Technology", Kailash Vadera&Bhavyesh Gandhi, University Science Press, Laxmi Publications, 2009

Reference Books

1. "Open-Source Technology and Policy", Fadi P. Deek and James A. M. McHugh, Cambridge University Press, 2008.
2. "Perspectives on Free and Open-Source Software", Clay Shirky and Michael Cusumano, MIT press.
3. "Understanding Open Source and Free Software Licensing", Andrew M. St. Laurent, O'Reilly Media.
4. "Open Source for the Enterprise", Dan Woods, GautamGuliani, O'Reilly Media

Web Resources

http://kernel.org/

https://opensource.org/
http://www.linuxfoundation.org/
http://www.tldp.org/
http://www.docker.com
https://en.wikipedia.org/
https://en.wikipedia.org/wiki/Wikipedia:Contributing_to_Wikipedia
https://help.github.com/

Lab Exercises
Part A
Linux Installation
Familiarize with GitHub, Libre Office, Wordpress
Part B
Basic linux commands
Shell scripting programs.
How to contribute to Wikipedia or to any prominent open source project of students choice.

Course Outcomes

No.	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO-1	Differentiate Open Source and Proprietary software	U	PSO-1,3
CO-2	Explain the policies, licensing, and ethics	U	PSO-1,3
CO-3	Illustrate the open-source ecosystem and methodologies	U	PSO-1,3
CO-4	Compare the benefits, features and applications of Open-source technologies	Ap	PSO-1,3

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Credits: 3:0:1 (Lecture:Tutorial:Practical)

CO No.	CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L)/ Tutorial (T)	Practical (P)
1	Differentiate Open Source	PO-1,6,7	U	F,C	L	

	and Proprietary software	PSO- 1,3				
2	Explain the policies, licensing, and ethics	PO- 1,6,7,,8 PSO- 1,3	U	F,C	L	
3	Illustrate the open-source ecosystem and methodologies	PO-1,6,7 PSO- 1,3	U	F,C	L	
4	Compare the benefits, features and applications of Open-source technologies	PO-1,6,7 PSO- 1,3	Ap	F,C,P	L	P

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs :

	PO1	**PO 2**	**PO 3**	**PO 4**	**PO5**	**PO6**	**PO7**	**PO 8**	**PSO 1**	**PSO2**	**PSO3**	**PSO 4**
CO 1	1	-	-	-	-	2	2	-	2	-	2	-
CO 2	1	-	-	-	-	2	2	3	2	-	1	-
CO 3	1	-	-	-	-	2	2	-	2	-	2	-
CO 4	1	-	-	-	-	2	2	-	2	-	2	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics:

	Internal Exam	**Assignment**	**Case Study Evaluation**	**End Semester Examinations**
CO 1	✓			✓
CO 2	✓	✓		✓
CO 3	✓	✓		✓
CO 4	✓		✓	✓

UK3DSCCAP201 - DATABASE MANAGEMENT SYSTEMS

Discipline	COMPUTER APPLICATION				
Course Code	UK3DSCCAP201				
Course Title	DATABASE MANAGEMENT SYSTEMS				
Type of Course	**DSC**				
Semester	III				
Academic Level	2				
Course Details	Credit	Lecture	Tutorial	Practical	Total

		per week	per week	per week	Hours/Week
	4	3 hours	-	2 hours	5 hours
Pre-requisites	Basic knowledge in data structures				
Course Summary	This course covers the principles, design, and implementation of database systems.				

Detailed Syllabus:

Module		Unit	Content	Hrs (L+P)
I		**INTRODUCTION**		**15**
		1	Database system, Purpose of database systems, Advantages of database systems view of data, Database languages, Database design, Database engine, Database Architectures two-tier and three-tier, Database users and administrators	
		2	**Data models:** Relational model, Hierarchical model, Network model, Entity-Relationship model, Object-oriented data model,	
		3	Introduction to Relational model: Structure of relational database, Database schema, Keys, Schema diagrams, Relational algebra.	
II		**Structured Query Language**		**15**
		4	Overview of the SQL query language, SQL – Basic structure of SQL queries, classification of SQL-DDL, DML, DCL, TCL.	
		5	Additional basic operations, Set operations-union, intersection, set difference, Null values, Aggregate functions, Nested subqueries.	
		6	Views, triggers, cursor, functions, procedure – Embedded SQL.	
III		**DATABASE DESIGN USING ER MODEL**		**15**
		7	Overview of the design process, Entity relational model, Types of attributes-Simple, composite, derived, complex and Multivalued attributes and its latest representations. ER diagrams.	

		8	Mapping cardinalities, Primary key, removing redundant attributes in entity sets	
		9	Reducing ER diagram to relational schema, Entity relationship design issues.	
IV		**NORMALIZATION**		**15**
		10	Features of good relational design, Decomposition using Functional Dependencies-Amstrong axioms, Types of FDS, Normal forms (1NF,2NF, 3NF, BCNF)	
		11	Database-Design Process	
V			**Flexi Module: Not included for end semester exams**	
		12	Security Issues-Basic Security issues, types of Security issues and its solutions	**15**
		13	Database design issues	
		14	NoSQL	

Textbooks

1.Avi Silberschatz, Henry F. Korth, S. Sudarshan, Database System Concepts, Seventh Edition.

References books

1. Ramon AM and Pauline K. Cushman, Database Management Systems, McGraw Hill Edn.

2. AtulKahate, Introduction to Database Management Systems.

Web Resources:

NPTEL: Course name: -Database Management Systems.

https://onlinecourses.nptel.ac.in/noc22_cs51/preview

LAB WORK

PART A

1. SQL statements for creating, dropping and updating tables.

2. Record manipulation using insert, delete and update.

3. Experiments that clarify the importance of keys.

4. Practice all constraints of attributes.

5. Queries with substring comparison.

6. Usage of BETWEEN.

7. Aggregate functions.

8. Finding values with a certain range.

9. Queries with string comparison and ordering.

10. Usage of GROUP BY clause

11. Create and delete view

12. Usage of Procedures.

PART B

CASE STUDY

Draw an ER diagram and Perform normalization on the database.

EXAMPLE: Hospital Management system, Railway Reservation system.

Course Outcomes

No.	Upon completion of the course, the graduate will be able to	Cognitive Level	PSO addressed
CO1	Understand the concept of database.	U	PSO-1
CO2	Create a database using SQL and perform operations in SQL.	Ap	PSO-1,2
CO3	Build ER diagrams using ER design concepts	Ap	PSO-1,2,3
CO4	Demonstrate the design concepts and normalization in the database.	Ap	PSO-1,2,3

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Credits: 3:0:1 (Lecture:Tutorial:Practical)

CO No.	CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L)/Tutorial (T)	Practical (P)
1	Understand the concept of database.	PO –3,6 PSO-1	U	F, C	L	
2	Create a database using SQL and perform operations in SQL.	PO – 3, 6, 7 PSO-1,2	Ap	F, C, P	L	P
3	Build ER diagrams using ER design concepts	PO – 3,5, 6, 7 PSO-1,2,3	Ap	F, C, P	L	P
4	Demonstrate the design concepts and normalization in the database.	PO – 3,5, 6, 7 PSO-1,2,3	Ap	F, C, P	L	P

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4
CO 1	-	-	1	-	-	2	-	-	3	-	-	-
CO 2	-	-	2	-	-	2	1	-	2	2	3	-
CO 3	-	-	1	-	2	3	2	-	2	1	3	-
CO 4	-	-	2	-	2	2	3	-	3	3	3	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate /
3	Substantial /

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics:

	Internal Exam	Assignment	Case Study /Lab Program	End Semester Examinations
CO1	✓		✓	✓
CO2	✓		✓	✓
CO3	✓	✓	✓	✓
CO4	✓	✓	✓	✓

.

UK3DSCCAP202 - PRINCIPLES OF SECURE CODING

Discipline	COMPUTER APPLICATION
Course Code	UK3DSCCAP202
Course Title	Principles of Secure Coding
Type of Course	**DSC**
Semester	II
Academic Level	2

Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	4 hours	-	-	4 hours
Pre-requisites	1. Basic understanding of programming concepts 2. Familiarity with at least one programming language (e.g., Python, Java, C++) 3. Knowledge of data structures and algorithms				
Course Summary	This course provides undergraduate students with an understanding of secure coding principles and practices to develop software systems resilient to security vulnerabilities and attacks. Through theoretical lectures, hands-on exercises, and case studies, students will learn how to identify common security threats, apply secure coding techniques, and implement security controls to mitigate risks in software development.				

Detailed Syllabus:

Module	**Unit**	**Content**	**Hrs**
I	Introduction to C and C++		**12**
	1	Introduction to programming, Introduction to C and C++ A brief history Identifying problem with C, Legacy code and other languages. Difference between C and C++, Procedure vs. Object oriented Programming, Covering Basics of programming C & C++.	3
	2	Development Platforms, Basics of Compiler, Fundamentals of Operating System	3
	3	Strings, Character Strings and Problem associated, String as a Class, Common string Manipulation Errors, Bounded String: Null Termination, String Vulnerability and Exploits	3

	4	Security Flaws: Password Security, Buffer Overflow: String vs Character Array, Attacks using different type string injection, Handling string inputs, associated standard function for basic string	3
II	Dynamic Memory Management		**12**
	5	C Memory management, Standard Memory management functions, Common C Memory Management Errors	4
	6	Initialization Errors, Failing to Check Return Values, Memory Leaks, C++ Dynamic Memory Management	3
	7	Allocation Functions / Deallocation Functions, Garbage Collection, Common C++ Memory Management Errors, Memory Managers,.	3
	8	Mitigation Strategies	2
III	Introduction to Integer Security		**12**
	9	Integer Data Types, Integer Conversions, Integer Operations, Integer Vulnerabilities	3
	10	Conversion and Truncation Errors, Nonexceptional Integer Logic Errors, Mitigation Strategies, Integer Type Selection	3
	11	Formatted Output, Variadic Functions, Formatted Output Functions, Stack Randomization, Mitigation Strategies , Notable Vulnerabilities	3
	12	Concurrency, Multithreading, Parallelism: Data and Task, Performance Goals, Common Errors: Race Conditions, Mitigation Strategies, and Notable Vulnerabilities	3

IV	File I/O		**12**
	17	File I/O, File I/O Basics, File Systems, Special Files, File I/O Interfaces	3
	18	Data Streams, Opening and Closing Files, POSIX Notation, File I/O in C++	3
	19	Access Control, UNIX File Permissions, File Identification, Race Conditions	3
	20	Mitigation Strategies Eliminating the Race Object, Recommended Practices	3
V	Recommended Practices		12
	21	The Security Development Lifecycle, Security Training, Secure Coding Standards, Design, Implementation and Verification	6
	22	Verification, Static Analysis, Penetration Testing, Fuzz Testing and Code Audits	6

Core References

1) Secure Coding in and C++, Robert Seacord, Addison Wesley.

Additional References

1)The Secure Coding Cookbook for C and C++ , John Viega and Matt Messier
2)Object Oriented Programming by E Balaguruswamy
3) C++ How To Program 10th Edition by Paul Deitel and Harvey M Deitel

Course Outcomes

No.	Upon completion of the course the graduate will be able	Cognitive	PSO
CO-1	Describe the difference between C and C++ and to identify	U	PSO-2

CO-2	Explain dynamic memory management in C and C++	U	PSO-1
CO-3	Explain the problems and solutions in Integer security,	U	PSO-1
CO-4	Describe File/IO and access control	U	PSO-1

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Credits: 4:0:0 (Lecture:Tutorial:Practical)

CO No.	CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L) /Tutorial (T)	Practical (P)
CO-1	Describe the difference between C and C++ and the problems in C and C++	PO-1,2,7 PSO-2	U	F,C	L	-
CO-2	Explain dynamic memory management in C and C++	PO—2,7 PSO-1	U	F,C	L	-
CO-3	Explain the problems and solutions in Integer security, formatted output and concurrency	PO-2,7 PSO-1	U	F,C	L	-
CO-4	Describe File/IO and access control	PO-2,7 PSO-1	U	F,C	L	-

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs :

	PSO 1	PSO2	PSO3	PSO4	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO 1		1			2	1					1	
CO 2	1					1					1	
CO 3	1					1					1	
CO 4	1					1					1	

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	End Semester Examinations
CO1	✓		✓
CO2	✓	✓	✓
CO3	✓		✓
CO4	✓	✓	✓

UK3DSCCAP203- MODERN INFORMATION SYSTEMS

DISCIPLINE	COMPUTER APPLICATIONS				
Course Code	UK3DSCCAP203				
Course Title	MODERN INFORMATION SYSTEMS				
Type of Course	**DSC**				
Semester	III				
Academic Level	2				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
		4	--	--	4
Pre-requisites	Knowledge on Informatics				
Course Summary	This course provides a thorough understanding of modern information systems, covering their evolution, components, and role in decision-making. Students will explore Transaction Processing Systems (TPS) and Management Information Systems (MIS), Decision Support Systems (DSS) and Executive Information Systems (EIS), Executive Support Systems (ESS), and Knowledge Management Systems (KMS). Additionally, it discusses integration, emerging technologies like big data analytics and AI, and ethical/legal considerations, preparing students for future challenges in information systems management.				

Detailed Syllabus:

Module	Unit	Content	Hrs
I	**Introduction to Modern Information Systems**		**12**

	1	Overview of Information Systems: Definitions, functions and importance in contemporary organizations.	
	2	Evolution of Information Systems: Historical context and technological advancements.	
	3	Examine the key components of information systems	
	4	Identify different types of information systems	
	5	Role of Information Systems in Decision Making: Understanding the impact on organizational effectiveness.	
	6	The significance of modern information systems in diverse industries.	
II	**Transaction Processing Systems (TPS) and Management Information Systems (MIS)**		**12**
	7	Transaction Processing Systems (TPS): Definition, components, and functionalities.	
	8	Management Information Systems (MIS): Scope, objectives, and integration with organizational processes.	
	9	TPS and MIS Architecture: Design principles and implementation strategies.	
	10	Data Management in TPS and MIS: Storage, retrieval, and security considerations.	
III	**Decision Support Systems (DSS) and Executive Information Systems (EIS)**		**12**
	11	Decision Support Systems (DSS): Conceptual framework, models, and components.	
	12	Types of DSS: Model-driven, data-driven, and knowledge-driven decision support.	
	13	Executive Information Systems (EIS): Providing strategic information to top-level management.	

	14	Design and Implementation of DSS and EIS: Tools, techniques, and best practices.	
IV	**Executive Support Systems (ESS) and Knowledge Management Systems**		**12**
	15	Executive Support Systems (ESS): Features, functionalities, and role in organizational leadership.	
	16	Knowledge Management Systems (KMS): Capturing, sharing, and leveraging organizational knowledge.	
	17	Types of KMS: Document management, expert systems, and collaborative platforms.	
	18	Implementation Challenges and Solutions for ESS and KMS.	
	19	Impact of ESS and KMS on organizational innovation and efficiency.	
V	**Integration and Future Trends**		**12**
	20	Integration of TPS, MIS, DSS, EIS, ESS, and KMS for comprehensive information management.	
	21	Emerging Technologies and Trends: Big data analytics, artificial intelligence, and blockchain.	
	22	Ethical and Legal Considerations in Modern Information Systems.	
	23	Future Directions and Challenges in Information Systems Management.	

Course Outcomes

No.	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO-1	Understand the fundamental principles of information systems within contemporary organizational environments	R,U	1

CO-2	Analyze, evaluate and integrate transaction processing systems (TPS) and management information systems (MIS)to enhance organizational efficiency and decision-making processes.	A,E	1
CO-3	Evaluate the influence of decision support systems (DSS) and executive information systems (EIS) on organizational decision-making processes.	A,E	1
CO-4	Evaluate the functions, challenges, and effects of executive support systems (ESS) and knowledge management systems (KMS) within organizations.	A,E	1
CO-5	Create information systems by integrating various types by examining emerging technologies with ethical and legal considerations.	C	4

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

REFERENCES

- Management Information Systems: Managing the Digital Firm" by Kenneth C. Laudon and Jane P. Laudon – 2018, Publisher: Pearson, 2018
- Information Systems: A Manager's Guide to Harnessing Technology" by John Gallaugher, Publisher: FlatWorld 2014
- Decision Support Systems for Business Intelligence" by Vicki L. Sauter, Publisher: John Wiley & Sons,2010
- Knowledge Management: Concepts and Best Practices" by Kai Mertins, Peter Heisig, Jens Vorbeck, and Joachim Nottrott., Publisher: Springer,2003
- Information Systems Today: Managing the Digital World" by Joseph Valacich and Christoph Schneider, Publisher: Pearson,1999
- Ethical and Legal Issues in Modern Information Systems" edited by Marian Quigley and Tom Butler, Publisher: IGI Global,2007
- Information Systems Management in the Big Data Era" by Peter F. Drucker, Publisher: Springer,2017

Name of the Course: Credits: 4:0:0 (Lecture:Tutorial:Practical)

CO No.	CO	PO/ PSO	Cognitive Level	Knowledge Category	Lecture (L)/ Tutorial	Practical (P)

					(T)	
1	Understand the fundamental principles of information systems within contemporary organizational environments	1	C		L	
2	Analyze, evaluate and integrate transaction processing systems (TPS) and management information systems (MIS)to enhance organizational efficiency and decision-making processes.	1	P		L	
3	Evaluate the influence of decision support systems (DSS) and executive information systems (EIS) on organizational decision-making processes.	1	E		L	
4	Evaluate the functions, challenges, and effects of executive support systems (ESS) and knowledge management systems (KMS) within organizations.	1	E		L	
5	Create information systems by integrating various types by examining emerging technologies with ethical and legal considerations.	4	M		L	

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs :

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6
CO 1	3	-	-	-	-	-						
CO 2	2	-	1	2	-	-						
CO 3	2	-	1	2	-	-						
CO 4	2	-	2	2	-	-						
CO 5	2	-	2	2	-	-						
CO 6	-	-	-	-	-	-						

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

§Quiz / Assignment/ Quiz/ Discussion / Seminar
§Midterm Exam
§Programming Assignments
§Final Exam

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓			✓
CO 4		✓		✓
CO 5		✓		✓

UK3DSCCAP204- COMPUTER GRAPHICS

Discipline	COMPUTER APPLICATION				
Course Code	UK3DSCCAP204				
Course Title	COMPUTER GRAPHICS				
Type of Course	DSC				
Semester	III				
Academic Level	2				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	3 hours	-	2 hours	5 hours
Pre-requisites	Basic C programming Skill				
Course Summary	Computer graphics is a sub-field of computer science which deals with the methods for digitally manipulating visual content.This course is designed to familiarize the various algorithms in computer graphics using C programming language.				

Detailed Syllabus:

Module	Unit	Content	Hrs (L+P)
I		**Introduction to Computer Graphics**	**15**
	1	Computer graphics, application of computer graphics, pixel, resolution, aspect ratio, frame buffer, Raster scan, horizontal and vertical retrace, Random scan, video adapter, video controller, Graphics card.	
	2	Display devices- LCD, LED, DVST, 3D viewing devices, stereoscopic and virtual reality systems,	
	3	Properties of Light, Color models (RGB, YIQ, CMY, HSV.	
II		**Output primitives**	**15**
	4	Coordinate systems- modelling coordinates, world coordinates,	

		device coordinates	
	5	Output primitives: Straight line, DDA algorithm, Bresenham's Line drawing algorithm, midpoint circle algorithm.	
	6	Polygon filling algorithms-boundary fill, flood fill, scan line algorithm	
III	**Two dimensional transformations and clipping**		**15**
	7	Basic transformations: Translation, Rotation, Scaling, homogenous coordinates for uniform matrix operations, composite transformation	
	8	Other transformations: reflection, shearing, transformations with respect to arbitrary points, matrix formulation and concatenation of transformations	
	9	2D clipping; clip window, Point clipping, Line clipping, Cohen-Sutherland Line Clipping algorithms, Midpoint subdivision algorithm.	
IV	**3D concepts and techniques**		15
	10	3D display techniques, 3D object representations, basic 3D transformations	
	11	Projections: parallel and perspective projections.	
	12	Visible surface detection algorithms-scan line method, Z buffer algorithm, A- buffer algorithm, depth sorting.	
V	**Flexi Module** (Not for end semester Examination)		15
	13	Curves: B-Spline, Bezier	
	14	Animation: Morphing, Tweening, Zooming, Panning, Scissoring	
	15	Shading	

CORE TEXT:

1. Donald D. Hearn, M. Pauline Baker, "Computer Graphics" (C Version) 2/e , Pearson

https://archive.org/details/DonaldHearnM.PaulineBakerComputerGraphicsBookFi.org/page/n58/mode/1up (pdf link)

2. Zhigandxiang, Roy Plastock, “Computer Graphics Second edition”, Schaum’s outlines, Tata Mc Graw hill edition.

ADDITIONAL REFERENCE:

1. Amarendra N Sinha and Arun D Udai, Computer Graphics, McGraw Hill Publications.

2. Foley, Van Dam, Feiner and Hughes, “Computer Graphics Principles & practice”, second edition in C, Pearson Education.

3. David F Rogers, “Procedural elements for Computer Graphics”, Tata Mc Graw hill, 2nd edition.

NPTEL Web Course:

1. http://nptel.ac.in/courses/106106090/

NPTEL Video Course:

1. http://nptel.ac.in/courses/106106090/#

Computer Graphics Using C - Lab program List

Module 1

1.Use functions to draw different shapes

Module 2

2. Implementing DDA algorithm

3. Implementing Bresenham’s line drawing algorithm

4. Implementing Midpoint circle generation algorithm

5. Implementing Boundary fill & flood fill algorithm

Module 3

6. Program for performing the basic 2D transformations such as translation, Rotation, Scaling for a given 2D object

7. Program for performing the other 2D transformations Reflection along x-axis and y-axis, x direction shearing and y- direction shearing for a given 2D object

8. Implement composite transformations

Module 4

9. Program for performing the basic 3D transformations such as translation, Rotation, Scaling for a given 3D object (Hint: bar3d() from graphics.h)

10. Programs for designing simple animations using transformations

Course Outcomes

CO-No.	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO-1	Familiarize the basic principles of computer graphics, different input/output devices and graphic operations.	U	PSO-1, PSO-2, PSO-3
CO-2	Experiment with algorithms to generate computer graphic primitives, specifically straight line and polygon filling.	U,Ap	PSO-1, PSO-2, PSO-3
CO-3	Illustrate 2D transformations and clipping operations in computer graphics, different methods for transformations.	U,Ap,An	PSO-1, PSO-2, PSO-3
CO-4	Demonstrate 3D computer graphics techniques, the concept of projections and various surface detection algorithms.	U,Ap	PSO-1, PSO-2, PSO-3

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: COMPUTER GRAPHICS USING C

Credits: 3:0:1 (Lecture:Tutorial:Practical)

CO No.	CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L)/Tutorial (T)	Practical (P)

1	CO-1	PO-1 , PO-4, P0-7 /PSO-1,PSO-2, PSO-3	U	F, C,P	L	P
2	CO-2	PO-2, P0-6, PO-7/ PSO-1,PSO-2,PSO-3	U,Ap	P	L	P
3	CO-3	PO-2, P0-6, PO-7/ PSO-1,PSO-2,PSO-3	U,Ap,An	P	L	P
4	CO-4	PO-2, P0-6, PO-7/ PSO-1,PSO-2,PSO-3	U,Ap	F,C	L	

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4
CO-1	1	-	-	2	-	-	2	-	2	1	2	-
CO-2	-	2	-	-	-	1	2	-	2	2	2	-
CO-3	-	2	-	-	-	1	2	-	2	2	2	-
CO-4	-	2	-	-	-	1	2	-	2	2	2	-

Correlation Levels:-

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate /
3	Substantial /

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics :

	Internal	Assignment	Quiz	Seminar	Programming Assignments	Observation of Practical	End Semester Examinations
CO 1	✓	✓		✓	✓	✓	✓
CO 2	✓	✓			✓	✓	✓
CO 3	✓		✓		✓	✓	✓
CO 4	✓		✓	✓			✓

UK3DSCCAP205- SYSTEM SOFTWARE

Discipline	COMPUTER APPLICATION				
Course Code	UK3DSCCAP205				
Course Title	System Software				
Type of Course	DSC				
Semester	III				
Academic Level	2				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	3hours	-	2 hours	5 hours
Pre-requisites	Basic knowledge on Operating Systems				
Course	This course is designed to provide students with an understanding of the				

Summary	core principles, components, and functionalities of system software.

Detailed Syllabus:

Module	Unit	Content	Hrs(L+P)
I		**Types of Software**	**15**
	1	System Software vs Application Software, Different System Softwares– Assembler, Linker, Loader, Macro Processor, Text Editor, Debugger, Device Driver, Compiler, Interpreter, Operating Systems	
	2	System software and machine architecture – The simplified Instructional Computer (SIC)	
	3	Machine architecture - Data and instruction formats - addressing modes - instruction sets	
II		**Assemblers**	**15**
	4	Basic assembler functions - A simple SIC assembler – Assembler algorithm and data structures -	
	5	Machine dependent assembler features - Instruction formats and addressing modes – Program relocation -	
	6	Machine independent assembler features - Literals – Symbol-defining statements – Expressions -	
	7	One pass Assembler and Multi pass Assemblers	
III		**Linkers & Loaders**	**15**
	8	Basic loader functions - Design of an Absolute Loader - Machine dependent loader features - Relocation – Program Linking	
	9	Machine-independent loader features – Automatic Library Search –	

		Loader Options	
	10	Linkage Editors – Dynamic Linking – Bootstrap Loaders	
IV		**MACROPROCESSOR AND SYSTEM SOFTWARE TOOLS**	**15**
	11	Basic macro processor functions - Macro Definition and Expansion.	
	12	Macro Processor system software tools, Text editors - Overview of the Editing Process - User Interface – Editor Structure.	
	13	Interactive debugging systems - Debugging functions and capabilities – Relationship with other parts of the system – User-Interface Criteria.	
V		**Flexi Module: Not included in End Semester Exams**	15
		Introduction to compilers, Phases of compilation, Finite Automata, Context-free Grammars	

TEXT BOOK

1. Leland L. Beck, *System Software – An Introduction to Systems Programming*, 3rd Edition, Pearson Education Asia, 2006.
2. D. M. Dhamdhere, *Systems Programming and Operating Systems*, Second Revised Edition, Tata McGraw-Hill, 2000.

List of Experiments

1. Implement pass one of a two pass assembler.

2. Implement pass two of a two pass assembler.

3. Implement a single pass assembler.

https://www.vtuloop.com/system-software-lab-all-in-one/

Course Outcomes

No.	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed

CO 1	Differentiate between various types of system software and their specific roles.	U	PSO -1
CO 2	Explain basic assembler and loader functions,	Ap	PSO -1,2
CO 3	Identify basic functions of loaders and linkers	Ap	PSO -1,2
CO 4	Gain proficiency in macro processor functionalities, text editing tools, and interactive debugging systems	Ap	PSO -1,2

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Credits: 3:0:1 (Lecture:Tutorial:Practical)

CO No.	CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L)/Tutorial (T)	Practical (P)
1	Differentiate between various types of system	PSO -1	U	F,C	T	P
2	Explain basic assembler and loader functions,	PSO -1,2	Ap	F,C,P	T	P
3	Identify basic functions of loaders and linkers	PSO -1,2	Ap	F,C, P	T	P
4	Gain proficiency in macro processor functionalities, text	PSO -1,2	Ap	F,C, P	T	P

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs :

	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO	PSO4

	1	2	3	4	5	6	7	8	1	2	3	
CO 1									1	-	-	-
CO 2									2	3	-	-
CO 3									-	-	1	-
CO 4									-	-	2	3

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate /
3	Substantial /

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Lab Assessment	End Semester Examinations
CO 1	✓			✓
CO 2	✓		✓	✓
CO 3	✓		✓	✓
CO 4		✓	✓	✓

UK3DSCCAP206-LOW CODE APP DEVELOPMENT

Discipline	COMPUTER APPLICATION				
Course Code	UK3DSCCAP206				
Course Title	Low Code App Development				
Type of Course	DSC				
Semester	III				
Academic Level	2				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	3 hours		2 hours	5 hours
Pre-requisites	Basic awareness on computer science domain.				
Course Summary	This course aids any beginner without profound knowledge in computers in developing applications.				

Detailed Syllabus:

Module	Unit	Content	Hrs (L+P)	CO
I	**Foundations of No-Code Development and Web Scraping**		**15**	1
	1	No Code Fundamentals - What is No-Code Development? - Top Benefits and Limitations of No-Code Apps - What can you build with No-Code? - Who can use zero-code platforms? – What is the history and future of no-code? – Popular No-Code development platforms - Fundamentals of Workflow - How can workflow automation help your business? Examples of Workflow Automation.	6	
	2	Introduction to Web Scraping - What is No-Code Web Scraping? - ScrappingBee for Web scraping	3	

		API		
II	**No Code Web Development with WebFlow and Bubble**		**15**	
	3	Introduction to WebFlow - How websites are built? - Overview of Designer Interface - The Box Model - Webflows Designer - The User Interface - Changing Font Style And Elements Size - Editing Content - Editing Button And Using Classes - Changing Background Color And Size - Reusing elements with Symbols - Publishing with WebFlow	5	2
	4	Introduction to Bubble - Bubble Core Concepts - What you can build with Bubble? - How to navigate Bubble.io? - Structuring a Bubble Database - Flexbox responsive design - Workflow creation in Bubble	4	
III	**App Development Essentials with ChatGPT Integration**		**15**	
	5	Evolution of Mobile App Builders - The Fundamentals of Glide - Benefits of Glide for App Development - Glide App Editor Overview - Glide Settings Overview - Glide Components - Google Sheets Vs Glide Data Editor - Understanding Table Relations - Glide Actions	4	**3**
	6	Introduction to Thunkable - Getting Started: Sign In, Creation of New Projects - App Settings, Table View - Assets, UI Components Core Blocks - OpenAIChatGPT Integration - Publish to App and Web Store.	5	
IV	**Chatbot Development Essentials**		**15**	
	7	Traditional AI Journey - Key AI Components - AI Superpowers - No-Code AI Market - Popular No-Code AI Platforms - No-Code AI Considerations - What is Google Teachable Machine? - Model Training and Testing in Google Teachable Machine - Introduction to Microsoft Lobe.ai - Lobe Overview and Tool	4	**4**

		Walkthrough - Lobe.ai Examples		
	8	What is a Chatbot? - How a Chatbot can improve your business? - No-Code in Chatbots - Advantages of No-code chatbot development - Popular No-code chatbot builders - How to select the right no-code AI chatbot builder? - Getting Started with Landbot - Optimize the welcome message, Add the first sequence - Ask Questions with different question types (button, button with pics, multiple choice, email)	5	
V	**Flexi Module: Not included for End Semester Exams**		**15**	**5**
	9	Introduction to No-Code Databases and Automation - AirTable Sign Up and Create Database - Design the Workflow - Formula Field Type - Exporting/Importing Bases - Working with Filters - Managing Data with Groups - Sorting Functionality in AirTable - Views offered by AirTable - Kanban View, Form View, Calendar View - Working with multiple tables	5	
	10	Introduction to No-Code E-commerce App - What is Shopify? - Features of Shopify Platforms - Benefits of the Shopify platform for online store - Steps to create an online store in Shopify - Create a Shopify Account - Add Products to the Catalog - Customizing Your Shopify Online Store and Domain Setup - Payment Processor Activation - Market and Advertise Shopify e-commerce website -	4	

Text Books and Materials	Books: 1. Paul.E.Love, "Mastering No-Code: Create Professional Quality Apps Without Coding (Vol.1)", ISBN: 979-8749478402 Websites: https://powerapps.microsoft.com/en-us/low-code-development-guide/

Practical Topics included in the Syllabus

1. Tour around the different No-Code Tool Landscape
2. Building Workflow Automation using Low-Code
3. Create a web scraping tool using No-Code
4. Working with the Designer interface of WebFlow
5. Create a Responsive WebPage using WebFlow
6. Using Bubble build features like sign-up forms, expense trackers, inboxes, shopping carts
7. Build a Mindfulness app using Glide
8. Build a Task Tracker App Using Glide
9. Detect and Classify Face Masks using GoogleTeachable machine.
10. Build an Image Classification Model Using Lobe.ai
11. Build a Conversational Chatbot using LandBot
12. Create a workflow in AirTable
13. Build an Online Store using Shopify
14. Develop a website using a No-Code Stack of your choice

Course Outcomes

No.	Upon completion of the course, the graduate will be able to	Cognitive Level	PSO addressed
CO-1	Understand the fundamentals of No-Code, Workflows and perform Web Scraping using a No-Code App	Ap	PSO1, 2,3
CO-2	Build a Website using the popular No-Code Apps Webflow and Bubble.io	Ap	PSO1,2,3
CO-3	Build Mobile Apps using the popular No-Code Apps Glide and Thunkable	Ap	PSO1,2,3
CO-4	Build AI-powered apps using No-Code AI Tools	Ap	PSO1,2, 3

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Credits: 3:0:1 (Lecture: Tutorial: Practical)

CO No.	CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L)/Tutoria	Practical (P)

1	CO1	PSO1, PSO3	Ap	F, C, P	L	
2	CO2	PSO5, PSO6	Ap	F, C, P	L	
3	CO3	PSO6, PSO2	Ap	F, C, P	L	
4	CO4	PSO2, PSO5	Ap	F, C, P	L	

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs:

	PO 1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO 1	-	-	-	-	-	2	2		2	2	3-	-
CO 2	-	-	-	-	-	2	2		2	3	3	-
CO 3	-	-	-	-	-	2	2		3	3	3	-
CO 4	-	-	-	-	-	2	2		3	3	3	

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Lab Assessment	End Semester Examinations
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓			✓
CO 4		✓	✓	✓

Notes:

1. Kindly use the font Times New Roman and Font Size 12
2. The Above template is for a course with 3 credit theory and 1 credit Practicum.
3. Try to Keep 5 Modules in all courses.
4. A Theory Course with 4 Credits shall be divided into 5 modules with 12 lecture hours for each module.
5. A Theory Course with 3 Credits shall be divided into 5 modules with 9 lecture hours for each module.
6. A course with 2 credit Theory and one credit practicum shall be divided into 5 Modules with 12 hours .
7. If BoS want to change the above module wise hour distribution, try to keep the last module as 20 per cent of the total hours of the course.
8. Programme Outcomes (PO) were already distributed and not given in this template.

Discipline Specific Elective Courses

UK3DSECAP200- INTRODUCTION TO CYBER SECURITY

Discipline	COMPUTER APPLICATION
Course Code	UK3DSECAP200
Course Title	**Introduction to Cyber Security**
Type of Course	DSE
Semester	III
Academic Level	2

Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	4 hours		0	4 hours
Pre-requisites	Basic understanding of computer systems and networking will be desirable.				
Course Summary	The course Introduction to Cyber security highlights the importance of Cyber security in modern society, exploring its evolution, and recognizing the various threats that digital systems face. besides providing insights into the security policies, principles, procedures, and best practices for maintaining a secure environment, The Course provides a solid foundation for individuals seeking to pursue careers in cybersecurity. By mastering the fundamental concepts and techniques covered in this course, students will be better equipped to defend their digital assets, mitigate cyber threats, and contribute to the overall security of information systems in today's digital age.				

Detailed Syllabus:

Module	Unit	Content	Hrs
I	**Title of the Module: Introduction to Cyber Security**		**12**
	1	Information Security, Importance, Classification of information, Classification of Information Systems, LAN Classifications, threats- internal, external threats, threat agents, Malicious threat, non-malicious threats, threat intent	
	2	Threats to Security, Employees, Amateur hackers and Vandals, Criminal hackers and Saboteurs,	
	3	Cyber Security, - The C I A Triad, reasons for Cyber-crimes. Importance of Cyber security, Cyber-attacks- damages, history of cyber-crime, evolution of cyber-crime, cyber-crime classification, types of cyber-crimes- categories	
	4	Current scenario- Internet of Things, Challenges faced by Internet of things- Weak passwords, unsecured network access, inappropriate update protocols, unsecured interfaces, default settings, no device management, data storage and transfer challenges, inappropriate privacy protection, outdated components, Evolution of hacking equipments, tools and techniques, growing demand for data access.	
II	**Title of the Module**: **Application Security**		**12**
	5	Introduction, Database Security, Internet Security	
	6	Application Security- types, End Point Security- types, Identity and Access management, Identity management solutions and features	

	7	Mobile Security, Data Security, Drive by download, Infrastructure security, Disaster recovery	
	8	Email Security- S/MIME. PGP, MOSS, PEM, Net Security- SSL. SHTTP, browser scripts.	
III	**Title of the Module**: **Security Threats**		**12**
	9	Introduction to Security threats, Virus, Worms, Trojan Horse, Bombs, Trap Door, Email Spoofing,	
	10	Email Virus, Virus Life cycle, How virus works? Macro Viruses, Malicious Softwares, Network and Services Attack,	
	11	Denial of Service Attack (DOS), Types of DOS, Methods of attack,	
	12	SYN Flood attack, TCP Flooding, UDP Flooding, ICMP Flooding, Smurf, Ping of death, Tear Drop, LAND, Echo-CharGEN, Naptha Attacks	
IV	**Title of the Module: Cyber Security Components and Defence Mechanism**		**12**
	13	OSI Layer, Zero-day attacks- risks of Zero-day attacks	
	14	Network Security- types of attacks- common types of common attacks, port scanning techniques, Unauthorized access, man in the middle attacks, Types of attacks	
	15	Code and SQL injection attacks, types of SQL injections, inferential SQL	
	16	Identity and Access management, Mobile Security	
	17	Fighting Cyber-attacks- Defence in depth, Authentication, Cryptography, Security Technology -Firewall, Data loss Prevention, Antivirus Solutions, Intrusion Detection, Access Control, Access Control Models- discretionary, mandatory, role based, Virtual Private networks, web browsers, Data backup- differential, incremental, biometrics- physiological, behavioral characteristics, authentication factors- two factor, multi factor authentication, passwords- password managers.	
V	**Flexi Module- Not included for End Semester Exams**		**12**
	18	Electronic payment Systems. Credit cards, Debit Cards, Pros and Cons of using Debit vs Credit Cards, Types of Debit Cards, Types of Credit Cards, Credit card payment process, Smart Cards, Emoney, Electronic Fund Transfer. Ecommerce Business Model, Advantages, Disadvantages, Ecommerce Security systems, measures to ensure security Security Protocols in Internet, Electronic Cash, How is it used? Relevance, Cryptography in Information security Symmetric, Asymmetric, Digital	

		Signature, Digital Signature Process, Role of Data Encryption and Challenges in implementing encryption protocols.	

References

Books: 1. MayankBhushan, Rajkumar Singh Rathore, AatifJamshed Fundamentals of Cyber Security Principles Theory and Practices, , BPB Publishers, 2017

2. AnandShinde, Notion press, Introduction to Cyber Security- Guide to the world of Cyber Security, 2021

Course Outcomes

No.	Upon completion of the course the graduate will be able to	Cognitive	PSO addressed
CO-1	Gain a solid understanding of the fundamental principles and concepts of cyber security.	U	PSO-1
CO-2	Identify best practices for securing digital assets.	Ap	PSO-1,2
CO-3	Demonstrate awareness of common cyber threats and techniques used by attackers.	U	PSO-1
CO-4	Identify measures for implementing cyber security.	Ap	PSO-3

15R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Credits: 4:0:0 (Lecture:Tutorial:Practical)

CO No.	CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L)/Tutorial (T)	Practical (P)
1	Gain a solid understanding of the fundamental	PO-1,2,3,6,7 PSO-1	U	F, C	L	-
2	Identify best practices for securing digital assets.	PO-1,2,3,6,7 PSO-1,2	Ap	F, C, M	L	-

3	Demonstrate awareness of common cyber threats and	PO-1,2,3,6,7 PSO-1	U	F, C	L	-
4	Identify measures for implementing cyber security.	PO-1,2,3,6,7 PSO-3	Ap	F, C, M	L	-

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs:

	PO	**PO2**	**PO**	**PO**	**PO**	**PO6**	**PO7**	**PO**	**PSO**	**PSO**	**PSO**	**PSO**
CO 1	2	1	1	-	-	2	2	1	1	-	-	-
CO 2	2	2	1	-	-	2	2	1	2	3	-	-
CO 3	2	2	1	-	-	2	2	1	2	-	-	-
CO 4	2	2	1	-	-	2	2	2	-	-	-	3

Correlation Levels:

Lev	**Correlation**
-	Nil
1	Slightly / Low
2	Moderate /
3	Substantial /

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Final Exam

Mapping of COs to Assessment Rubrics:

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓			✓
CO 4		✓		✓

UK3DSECAP201- DATA SCIENCE FUNDAMENTALS

Discipline	COMPUTER APPLICATION				
Course Code	UK3DSECAP201				
Course Title	Data Science Fundamentals				
Type of Course	**DSC**				
Semester	III				
Academic Level	1				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	3 hours	-	2 hours	5 hours
Pre-requisites	NIL				
Course Summary	The goal of this course is to familiarize students with the core principles of data science, enabling them to grasp fundamental concepts and apply spreadsheet-based data analysis. By combining theoretical knowledge with practical exercises, students will establish a strong base in data preprocessing, integration, transformation, and reduction, as well as gain proficiency in employing statistical analysis techniques using spreadsheets.				

Detailed Syllabus:

Module	Unit	Content	Hrs
I	**Fundamentals of Data Science**		**15**
	1	Introduction, Why Data Science, Types of Data analysis: Descriptive analysis, Diagnostic analysis, Predictive analysis and Prescriptive analysis.	
	2	Data Analytics life cycle: Data discovery, Data Preparation, Model planning, Model Building, Communicate Results, and Operationalization.	
	3	Data Science tools: Python programming, R programming, SAS, Spreadsheet, Tableau Public, RapidMiner, Knime, Apache Spark.	
	4	Fundamental areas of study in data science: Machine Learning, Deep Learning, NLP, Statistical data analysis, Knowledge discovery and data mining, Text mining, Recommender systems, Data visualization, Computer Vision, and Spatial data management.	

	5	Role of SQL in data science, Pros and Cons of data science	
II		**Data Pre-processing**	**15**
	6	Introduction, data types and forms, possible data error types,	
	7	Various data pre -processing operations: Data Cleaning: Filling missing values, Smoothing noisy data, Detecting and removing outliers.	
	8	Data Integration: Virtual integration, physical data integration, Application based integration, Manual Integration, and middleware data integration.	
	9	Data Transformation: Rescaling data, Normalizing data, Binarizing data, Standardizing data.	
	10	Data Reduction: Dimensionality reduction, Data cube aggregation, Numerosity reduction. Data Discretization: Top-down discretization, Bottom-up discretization.	
III		**Data Analysis with Worksheet**	**15**
	11	Introduction to Worksheet: Creation and Formatting.	
	12	Ranges and Tables-Data Cleaning with Text Functions, Containing Date Values and Containing Time Values	
	13	Conditional Formatting, Sorting and Filtering	
	14	Subtotals with Ranges, Creating Macros, Pivot Table.	
IV		**Data Plotting and Visualization**	**15**
	15	Introduction, Visual encoding, Basic data visualization tools: Histograms, Bar Charts/Graphs, Scatter plots and Area plots. Data visualization types: Temporal data, Hierarchical data, Network data, Multi-dimensional data, Geospatial data and Multivariate data.	
	16	Lookup Functions: LOOKUP and VLOOKUP and HLOOKUP.	
	17	Data Visualization using Band Chart, Thermometer Chart, Gantt chart, Waterfall Chart and Pivot Charts. Types of jobs in data analytics: Data Analyst, Data scientist, Data engineer, Database administrator, Data architect, and Analytics manager.	
V		**Flexi Module (Not Included for End Semester Examination)**	**15**
	18	Advanced data visualization tools	
	19	Visualization of geospatial data	
	20	Statistical Data Analysis : Probability theory	

REFERENCES

Core

- Gypsy Nandi and Rupam Kumar Sharma, Data Science fundamentals and practical approaches, First Edition, BPB Publication, 2020 **.**
- Bernd Held, Excel Functions and Formulas, BPB Publications.

Additional

- V K Jain, Data Science and Analytics, Khanna Publishing.
- Joel Grus, Data Science From Scratch, Second Edition, Oreilly.

Practical Questions

PART A

1. Create a workbook and perform the operations: Selecting range of columns, hiding /show rows and columns and rename the worksheet.
2. Create workbook with student mark details. Include formulas to calculate total, percentage and grade.
3. Create worksheet with student mark details and perform the following operations
   i. Find the number of students having percentage more than 70.
   ii. Find the number of students having percentage between 60 and 80.
   iii. Find the number of students passed in a subject
   iv. Find the student who got highest mark in a subject.
4. Create a worksheet with Employee salary details. Find mean, median, mode, standard deviation and variance.
5. Create a workbook with sales details and use the functions: TRIM and CLEAN.
6. Create worksheet with student mark details. Use sorting and filtering functions.
7. Create a worksheet with employee details. Use date and time values. Calculate salary details and bonus using functions.
8. Create a worksheet with student name as a column. Add three more columns First name, Last name and e-mail. Find the values of First name, Last name and e-mail(Firstname_lastname@gmail.com). Use text functions.
9. Enter your date of birth and today's date in two cells. Find your age in days, months and years.
10. Prepare a worksheet with sales details. Make pivot table having product and category in row label.

PART B

11. Create a worksheet for flower shop with invoiceid, flower name, price, qty and total price. Enter 10 records. Make pivot table and pivot charts.
12. Create a worksheet with Fruits supply details. Apply LOOKUP, VLOOKUP and HLOOUP functions.
13. Assign a macro to a command button to display "welcome" in a cell.
14. Assign a macro to a command button to display "welcome" in a message box.
15. Assign a macro to a command button to find total number of sheets in a workbook.
16. Assign a macro to a command button to add a new worksheet.
17. Assign a macro to a command button to add a new workbook.

18. Prepare a worksheet with wildlife population of different states in India. Display in Pie chart and Bar chart.
19. Prepare a worksheet with total number of primary schools in each district of kerala. Include different charts.
20. Create a worksheet with employee salary details. Include charts.

Course Outcomes

No.	Upon completion of the course the graduate will be able	Cognitive	PSO
CO-1	Discuss about the fundamentals of Data Science	U	PSO -1
CO-2	Illustrate the usage of Data Pre-processing techniques	Ap	PSO-1,2,3
CO-3	Use data science concepts in real world problems	An	PSO-1,2,3
CO-4	Build Data Analytics and management Skill	Ap	PSO-1,2,3,4

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Credits: 3:0:1 (Lecture:Tutorial:Practical)

CO No.	CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L)/Tutorial	Practical (P)
CO-1	Discuss about the fundamentals of Data Science	PO-7 PSO-1,2	U	F, C	L	-
CO-2	Illustrate the usage of Data Pre-processing techniques	PO-7 PSO-1,2,3	Ap	C, P	L	P
CO-3	Use data science concepts in real world problems	PO-7 PSO-1,2,3	An	F, C, P	L	P
CO-4	Build Data Analytics and management Skill	PO-7 PSO-1,2,3,4	Ap	F, C, P	L	P

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs :

	PO1	PO 2	PO 3	PO4	PO5	PO 6	PO7	PO 8	PSO 1	PSO 2	PSO3	PSO 4
CO 1	-	-	-	-	-	-	1	-	1	1	-	-
CO 2	-	-	-	-	-	-	2	-	2	2	2	-
CO 3	-	-	-	-	-	-	2	-	1	2	2	-
CO 4	-	-	-	-	-	-	2	-	2	2	2	2

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics :

	Internal	Assignment	Quiz	End Semester Examinations
CO 1	✓		✓	✓
CO 2	✓		✓	✓
CO 3	✓	✓		✓
CO 4		✓		✓

UK3DSECAP202- INTRODUCTION TO ARTIFICIAL INTELLIGENCE

Discipline	COMPUTER APPLICATION				
Course Code	UK3DSECAP202				
Course Title	INTRODUCTION TO ARTIFICIAL INTELLIGENCE				
Type of Course	DSE				
Semester	III				
Academic Level	2				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	4 hours	-	-	4 hours
Pre-requisites	Knowledge in basic concepts about inference and logic preferred				
Course Summary	This course aims to give students a brief idea about Artificial Intelligence and its associated concepts and applications. Artificial intelligence, or AI, as generally termed, is an umbrella term and refers to the simulation of human intelligence by software-coded heuristics. The ideal characteristic of artificial intelligence is its ability to rationalize and take actions, similar to that of human mind, that have the best chance of achieving a specific goal.				

Detailed Syllabus:

Module	Unit	Content	Hrs
I		**Part 1: Introduction to Artificial Intelligence**	**12**
	1	What is Artificial Intelligence	
	2	Foundations and History of Artificial Intelligence	
	3	Applications of Artificial Intelligence	
	4	Intelligent Agents	
	5	Structure of Intelligent Agents	
		Part 2: Search Strategies	

	6	Introduction to Search	12
	7	Searching for solutions	
	8	Uninformed search strategies (Breadth First Search, Depth First Search, Depth Limited Search, Uniform Cost Search)	
	9	Informed search strategies (Best First Search, A*, Hill Climbing)	
	10	Local search algorithms and optimistic problems (Travelling Salesman Problem)	
	11	Adversarial Search (Algorithms not needed)	
	12	Current-best-hypothesis search (only basic concept & list of applications)	
II	**Knowledge Representation & Reasoning**		**12**
	13	Overview of Inference, Propositional & Predicate Logic	
	14	Logical Reasoning	
	15	Forward &Backward Chaining	
	16	Resolution	
	17	AI languages and tools - Lisp, Prolog, CLIPS	
III	**Problem Solving**		**12**
	18	Formulating problems	
	19	Problem Types	
	20	Solving Problems by Searching	
	21	Heuristic search techniques	
	22	Constraint satisfaction problems (Only basic concepts)	
	23	Stochastic search methods (Simulated Annealing, Genetic Algorithms)	
IV	**Learning**		**12**
	24	Overview of different forms of learning	
	25	Decision trees	
	26	Rule-based learning	

	27	Neural networks	
	28	Reinforcement learning	
V		**Flexi Module: Not include in End Semester Exams**	**12**
	29	New features in HTML5 and CSS3,	
	30	Designing a static website of student's choice,	
	31	Case study on some recent web designing tools.	

Text Books

- Stuart Russell, Peter Norvig, "Artificial Intelligence – A Modern Approach", Pearson Education

References

- Elaine Rich and Kevin Knight, "Artificial Intelligence", McGraw-Hill
- E Charniak and D McDermott, "Introduction to Artificial Intelligence", Pearso

Course Outcomes

No.	Upon completion of the course the graduate will be able to	Cognitive	PSO addressed
CO1	Infer basic ideas about Artificial Intelligence (AI) and Intelligent Agents	U	PSO - 1
CO2	Demonstrate the different searching techniques practised in AI	Ap	PSO - 1, 2, 3
CO3	Summarize knowledge representation and reasoning in the context of AI	U	PSO - 1, 2
CO4	Illustrate AI Problems and different ways of problem solving	Ap	PSO - 1, 2

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Credits: 4:0:0 (Lecture:Tutorial:Practical)

CO No.	CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture(L)/ Tutorial(T)	Practical (P)

1	Infer basic ideas about Artificial Intelligence (AI)	PSO - 1	U	F, C	L	-
2	Demonstrate the different searching	PSO - 1, 2, 3	Ap	F, C, P	L	-
3	Summarize knowledge representation	PSO - 1, 2	U	F, C	L	-
4	Illustrate AI Problems and different ways of	PSO - 1, 2	Ap	F, C, P	L	-

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs :

	PO1	**PO2**	**PO3**	**PO4**	**PO 5**	**PO6**	**PO7**	**PO8**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	-	-	-	-	-	**2**	**2**	-	**3**	-	-	-
CO2	**2**	**1**	-	**2**	**1**	**2**	**2**	-	**3**	**2**	**1**	-
CO3	**3**	**2**	-	-	-	**2**	**3**	-	**3**	**2**	-	-
CO4	**2**	**3**	-	-	-	**2**	**2**	-	**3**	**2**	-	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments

- Final Exam

Mapping of COs to Assessment Rubrics:

Mapping of COs to Assessment Rubrics:

	Internal Exam	Assignment	Seminar *	Quiz	End Semester Examinations
CO1	✓				✓
CO2	✓		✓		✓
CO3	✓			✓	✓
CO4	✓	✓			✓
CO5	✓	✓			✓

UK3DSECAP203- WEB DEVELOPMENT USING HTML 5

Discipline	COMPUTER APPLICATION				
Course Code	UK3DSECAP203				
Course Title	WEB DEVELOPMENT USING HTML 5				
Type of Course	**DSE**				
Semester	I				
Academic Level	1				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	3 hours	-	2 hours	5 hours
Pre-requisites	Nil				
Course Summary	Web design is the planning and creation of websites. This includes a number of separate skills that all fall under the umbrella of web design. This course aims to instill in students these skills which includes information architecture, user interface, site structure, navigation, layout, colours, fonts, and overall imagery. It also trains students on basic web design elements like overall layout, colour scheme, typography, navigation and content. Simple web pages are designed using HTML5 and CSS3.				

Detailed Syllabus:

Module	Unit	Content	Hrs (L+ P)
I		**Basics of HTML5**	**15 hrs**
	1	HTML foundations, usage of Doctype and charset	
	2	Familiarization of basic html tags including headings, paragraphs and text formats	
	3	Managing information with lists and tables	
	4	Making connections with links – hyperlinks, anchors, urls	
	5	Adding Images to your pages – Image and ImageMaps	
	6	Working with audio and video	
II		**Advanced Features in HTML5**	**15 hrs**
	7	Sectioning Elements – nav, article, main, header, footer and section tags	
	8	Progress Elements	
	9	Div and Frames	
	10	IFrames	
	11	Creating Forms using input elements	
III		**Introduction to CSS3**	**15 hrs**
	12	Style Element and Stylesheet	
	13	Specifying colors in CSS	
	14	Fonts and typefaces	
	15	Selectors – IDs, Classes and Pseudo classes	
	16	Borders and Backgrounds	
	17	Levels of CSS	
	18	Using HTML with CSS	
IV		**Stylesheets for high level visual designs**	**15 hrs**

	19	CSS3 Gradients	
	20	Special effects – images	
	21	Special effects – text	
	22	Introduction to Float Mechanism	
	23	Creating a basic two-column design	
	24	Creating dynamic lists	
	25	Building a basic menu system	
V		**Flexi Module: Not included for end semester exams**	**15 hrs**
	26	New features in HTML5 and CSS3,	
	27	Designing a static website of student's choice	
	28	Case study on some recent web designing tools.	

References:

Core:
Andy Harris, "HTML5 and CSS3 All-in-one for Dummies", A Wiley Brand, Third Edition
Additional:
https://books.goalkicker.com/HTML5Book/

Practical Questions (35 hours)

Part A

1. Design a page having suitable background colour and text colour with title "My First Web Page" using all the attributes of the Font tag.
2. Create a HTML document giving details of your [Name, Age], [Address, Phone] and [Register_Number, Class] aligned in proper order using alignment attributes of Paragraph tag
3. Create a page to show different character formatting (B, I, U, SUB, SUP) tags and heading tags
4. Create web pages using Anchor tag with its attributes for external links.
5. Create a web page with different sections and internal links using links and sectioning elements; when the user clicks on different links on the web page it should go to the appropriate locations/sections in the same page.
6. Create a web page, showing ordered list of semesters and an unordered list of names of all the Diploma Programmes (Branches) in your institution
7. Create a web page which divides the page in two equal frames and place the audio and video clips in frame-1 and frame-2 respectively

Part B

8. Create a registration form using form input tags
9. Use tables to provide layout to your HTML page describing your college infrastructure
10. Create a table to show your class time table. Specify font and border attributes using css.
11. Write a program in html to design a Bio-Data and set style attributes in css using ids and selectors
12. Write a programme in html to create a webpage with four iframes (Picture, table, list, and hyperlink)
13. Design a web page with color background and give gradient effects using css.
14. Create a web page to show text and image special effects.
15. Design a static website for your institution containing at least five web pages (ensure to use iframes, forms, css including special effects, float mechanism and menu system).

Course Outcomes

No.	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO1	Illustrate the basic features of HTML5	Ap	PSO – 1, 2, 3
CO2	Use advanced HTML features for web designing	Ap	PSO – 1, 2, 3
CO3	Develop basic stylesheets in various CSS levels	Ap	PSO – 1, 2, 3
CO4	Experiment with stylesheets for high level visual designs	Ap	PSO – 1, 2, 3

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Credits: 3:0:1 (Lecture:Tutorial:Practical)

CO No.	CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture(L)/ Tutorial(T)	Practical (P)
1	Illustrate the basic features of HTML5	PO – 3, 6, 7 PSO – 1, 2, 3	Ap	F, C, P	L	P
2	Use advanced HTML features for web designing	PO – 3, 6, 7 PSO – 1, 2, 3	Ap	F, C, P	L	P

3	Develop basic stylesheets in various CSS levels	PO – 3, 5, 6, 7 PSO – 1, 2, 3	Ap	F, C, P	L	P
4	Experiment with stylesheets for high level visual designs	PO – 3, 5, 6, 7 PSO – 1, 2, 3	Ap	F, C, P	L	P

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO	PSO	PSO3	PSO4
CO1	-	-	3	-	-	3	3	-	2	1	2	-
CO2	-	-	3	-	-	3	3	-	2	1	2	-
CO3	-	-	3	-	1	3	3	-	2	1	2	-
CO4	-	-	3	-	1	3	3	-	2	1	2	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics:

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO1	✓		✓	✓
CO2	✓	✓	✓	✓
CO3	✓		✓	✓
CO4	✓	✓	✓	✓

Value Added Courses

UK3VACCAP200- ENTREPRENEURSHIP IN IT

Discipline	COMPUTER APPLICATION				
Course Code	UK3VACCAP200				
Course Title	Entrepreneurship in IT				
Type of Course	SEC				
Semester	VI				
Academic Level	3				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	3	3 hours	-		3 hours
Pre-requisites	General foundations in computer science.				
Course Summary	This course is a launchpad for aspiring entrepreneurs. It equips the student with the principles, concepts and emerging IT trends supporting Entrepreneurship.				

Detailed Syllabus:

Module	Unit	Content	Hrs
I		**Introduction to Entrepreneurship**	**12**
	1	Understanding Entrepreneurship- Concept, Relevance, Role of Entrepreneurship in growth of economy- economic growth, job creation, new Industry formation	
	2	Nature of Entrepreneurship startups- Risks and Entrepreneurship venture, Characteristics of Entrepreneurship	

	3	History of Entrepreneurship Revolution, Emergence of Entrepreneurship Class in India- Ancient Period, Early Pre-Independence period, Late Pre -Independence period, Post-Independence Entrepreneurship period,	
	4	Role of IT in business development- Tools used – Asana, Jira, Trello Current Entrepreneurial Trends -Digital anonymity, Return on domestic manufacturing and crafts, Data Analysis, Big Data, Mobile Computing and Commerce, IT virtualization, Social Media, Cloud Computing, IOT, AI, Role of SaaS, Principles, Data driven Decision making, Remote work and Collaboration Tools, Lean startup Movement, Minimum Viable Product, Lean vs DevOps vs Agile, Examples of Lean Startup Companies.	
II	**Paths to Entrepreneurship**		**12**
	5	Categories of Entrepreneurs-Pure and Non pure Entrepreneurs, Home based Entrepreneur, Serial or portfolio Entrepreneur, Nonprofit Entrepreneur, Corporate Entrepreneur, Qualities of an Entrepreneur	
	6	Qualities of an Entrepreneur	
	7	What is an Enterprise? Features of an Enterprise, Challenges and Opportunities of Entrepreneurship, Problems faced- Economic, Non-Economic and barriers	
	8	Theories of Entrepreneurship- Schumpter's Theory of innovation, Peter Drucker Theory of Entrepreneurship	
III	**Preparing for Entrepreneurship**		**12**
	9	Preparing to become and Entrepreneur- Find a mentor, Build a Professional Network, Learn about Entrepreneurs, Understand Personal and Business preferences, Improve or acquire critical skills, Study an Industry,	
	10	Understanding Business Environment, Creativity, Innovation and value Creation	
	11	Process of setting up a new business, Problems of a new venture-Marketing Problems, Production problems, Financial problems, Managerial and Administerial problems, selection of a viable project-strengths and weaknesses	
	12	New venture Action Plan- Significance of writing a business plan	
	13	Role of IT in Entrepreneurship-Entrepreneurial Opportunities in IT -E-	

		commerce, Graphics designing, 3D animaton, Web designer, Medical Transcription, Enabled Services Call Centres, Geographical Information systems, Networking, Data Mining & Warehousing, System software Companies, e-Education	
	14	Indian Start Up Ecosystem	
	15	Starup India Initiative	
	16	Raising Funds for startups- Means and sources of Finances	
	17	Venture Capital- meaning, Role, Significance	
IV	**Protecting Startup Assets**		**12**
	18	Intellectual Property Rights, Trademarks, Trade secrets, Copyrights	
	19	The Digital Millenium Copyright Act, Obtaining Copyright Protection	
	20	Patents, Inventions and patents, Patent types, Patent Process, Patent infringement	
	21	Intellectual Property Strategy	
	22	Relevant case studies	
V	**Flexi Module: Not included for End Semester Exams**		**12**
	23	Lean Startup Methodology Case Study- e.g. Dropbox, Uber, Spotify, Airbnb, General Electric, Qualcomm, Intuit	
	24	Business Incubators- Types- Academic Institutions, Non-Profit development corporations, For profit property development ventures, , Venture Capital Firms, Regional Incubators, Business Incubators vs Business Acclerators.	
	25	Contemporary Role Models- E.g.-Case 1-Flipkart Online Services Case 2- Absolute Sports Pvt Ltd Case 3- Narayana Hrudayalaya Pvt Ltd Case 4- MittiCool Clay Creations	

References

Kathleen R Allen, Launching New Ventures, An Entrepreneurial Approach, CengageLearning, 2016.

Sangeeta Sharma, Entrepreneurship Development, PHI Learning Pvt. Ltd, 2021.

Robert D. Hisrich, Michael P. Peters, Dean A. Shepherd, Sabyasachi Sinha, Entrepreneurship, 11th Edition, 2020, McGraw Hill

Ramesh Parihar, Chandra Sharma, Entrepreneurships and Start ups, Shree Ram Publications, 2023

Peter Thiel and Blake Masters, Zero to One: Notes on Startups, or How to Build the Future, Crown Currency, 1!e, 2014

Eric Ries, The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses, Crown publisher, 2011

Web Resources

https://www.startupindia.gov.in/
https://www.makeinindia.com/
https://skillindia.gov.in/
htthttps://msme.gov.in/ps://www.india.gov.in/website-ministrycommerce-and-industry

Course Outcomes

No.	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO-1	Summarize basic concepts of Entrepreneurship	U	PSO-1
CO-2	Categorize entrepreneurs and features of enterprises	U	PSO-1
CO-3	Explain the principles and tools that support building a startup	U	PSO-1
CO-4	Identify concepts that provide legal protection to startups and enterprises	U	PSO-1

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Credits: 3:0:0 (Lecture:Tutorial:Practical)

CO No.	CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L)/Tutorial (T)	Practical (P)

CO-1	Summarize basic concepts of Entrepreneurship	PO-6,7 PSO-1	U	F, C	L	-
CO-2	Categorize entrepreneurs and features of enterprises	PO-6,7 PSO-1	U	F, C	L	
CO-3	Explain the principles and tools that support building a startup	PO-6,7 PSO-1	U	F, C	L	--
CO-4	Identify concepts that provide legal protection to startups and	PO-6,7 PSO-1	U	F, C	L	-

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4
CO 1	-	-	-	-	-	2	2	-	2	-	-	-
CO 2	-	-	-	-	-	2	2	-	2	-	-	-
CO 3	-	-		-	-	2	2	-	2	-	-	-
CO 4	-	-	--	-	-	2	2	-	-2	-	-	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics :

	Internal	Assignmen	Semina	End Semester
CO 1	✓			✓

CO 2	✓			✓
CO 3	✓	✓	✓	✓
CO 4	✓	✓		✓

UK3VACCAP201-PROFESSIONAL ETHICS IN COMPUTER SCIENCE

Discipline	COMPUTER APPLICATION				
Course Code	UK3VACCAP201				
Course Title	Professional Ethics in Computer Science				
Type of Course	**VAC**				
Semester	III				
Academic Level	2				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	3	3 hours	-		3 hours
Pre-requisites	Nil				
Course Summary	To provide students awareness of professional ethics and on importance of human values in a profession.				

Detailed Syllabus:

Module	Unit	Content	Hrs
I		**Module 1 – Human Ethics and Values.**	9
	1	Morals, values and Ethics – Integrity- Academic integrity-Work Ethics.	

	2	Service Learning- Civic Virtue-Respect for others- Living peacefully- Caring and Sharing- Honestly-courage	
	3	Cooperation commitment- Empathy-Self Confidence -Social Expectations.	
II	**Module 2 - Ethics & Professionalism.**		**9**
	4	Senses of Ethics - Variety of moral issues- Types of inquiry- Moral dilemmas – Moral Autonomy.	
	5	Kohlberg's theory- Gilligan's theory- Consensus and Controversy-Profession and Professionalism**.**	
	6	Models of professional roles-Theories about right action –Self interest-Customs and Religion- Uses of Ethical Theories.	
III	**Module 3- Social Experimentation.**		**9**
	7	Graduates as experimentation, Graduates as responsible experimenters, Codes of Ethics-Understanding its types, uses, Plagiarism.	
	8	A balanced outlook on law - Challenges case study-Bhopal gas tragedy	
IV	**Module 4- Responsibilities and Rights.**		**9**
	9	Collegiality and loyalty – Managing conflict- Respect for authority- Collective bargaining.	
	10	Confidentiality-Role of confidentiality in moral integrity-Conflicts of interest.	
	11	Occupational crime- Professional rights-Employee right- IPR Discrimination.	
V	**Flexi Module: Not included for End Semester Exams**		**9**
	12	Multinational Corporations- Environmental Ethics- Business Ethics- Computer Ethics	
	13	Moral leadership	

REFERENCE:

1. M Govindarajan, S Natarajan and V S Senthil Kumar, Engineering Ethics, PHI Learning

Private Ltd, New Delhi,2012.

2. R S Naagarazan, A text book on professional ethics and human values, New age international (P) limited ,New Delhi,2006.

Course Outcomes

No.	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO-1	Cite the core values that shape the ethical behaviour of a professional.	U	PSO-1
CO-2	Adopt a good character and follow an ethical life.	U	PSO-1
CO-3	Explain the role and responsibility in technological development by keeping personal ethics and legal ethics.	U	PSO-1
CO-4	Solve moral and ethical problems through exploration and assessment by established experiments.	U	PSO-1

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Credits: 3:0:0(Lecture:Tutorial:Practical)

CO No.	CO	PO/ PSO	Cognitive Level	Knowledge Category	Lecture (L)/Tutorial (T)	Practical (P)
CO1	Cite the core values that shape the ethical behaviour of a professional.		U	F, C	L	-
CO2	Adopt a good character and follow an ethical life.		U	F,C	L	
CO3	Explain the role and responsibility in technological development		U	F,C	L	-
CO4	Solve moral and ethical problems through exploration and assessment		U	F,C	L	-

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

	P	PO2	PO	PO	PO5	PO	PO	PO8	PSO	PS	PS	PSO
CO 1	-	-	-	-	-	2	2		2	-	-	-
CO 2	-	-	-	-	-	2	2		2	2	-	-
CO 3	-	-	-	-	-	2	2		2	-	-	-
CO 4	-	-	-	-	-	2	2		-2	-	2	

Mapping of COs with PSOs and POs :

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate /
3	Substantial /

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Lab Assignments
- Final Exam

Mapping of COs to Assessment Rubrics:

	Internal	Quiz/Assignment	Discussion	End Semester Examinations
CO 1	✓	✓		✓
CO 2	✓			✓
CO 3	✓		✓	✓
CO 4	✓	✓		✓

SEMESTER 4

Discipline Specific Core			
UK4DSCCAP200	Game Development	**4**	**3T+2P**
UK4DSCCAP201	Software Engineering	**4**	**3T+2P**
UK4DSCCAP202	Data Mining	**4**	**3T+2P**
UK4DSCCAP203	Python Programming	**4**	**3T+2P**
UK4DSCCAP204	Cryptography and Network Security	**4**	**4T**
UK4DSCCAP205	Trends in computing	**4**	**4T**
Discipline Specific Elective (Can Select either One or Two)			
UK4DSECAP200	Ethical Hacking	**4**	**3T+2P**
UK4DSECAP201	Python for Data Analytics	**4**	**3T+2P**
UK4DSECAP202	Knowledge Representation and Intelligent Agents	**4**	**3T+2P**
UK4DSECAP203	Web Scripting using JavaScript	**4**	**3T+2P**
Value Added Course (Can Select Two)			
UK4VACCAP200	Ethical Hacking	**3**	**2T+2P**
UK4VACCAP201	Software Quality Management	**3**	**3T**
UK4VACCAP202	Ethical AI and Responsible Computing	**3**	**3T**
UK4VACCAP203	Preface to Cyber Laws	**3**	**3T**
Skill Enhancement Course (Can Select One)			
UK4SECCAP200	Content Management System	**3**	**2T+2P**
UK4SECCAP201	Computer Hardware Maintenance	**3**	**2T+2P**
UK4SECCAP202	Android Programming using Kotlin	**3**	**3T**
	INTERNSHIP		
UK4INTCAP200	Internship	**2**	

DISCIPLINE SPECIFIC CORE COURSES

UK4DSCCAP200- GAME DEVELOPMENT

Discipline	Computer Application
Course Code	UK4DSCCAP200

Course Title	Game Development				
Type of Course	DSC				
Semester	IV				
Academic Level	2				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	3 hours	-	2 hours	5 hours
Pre-requisites	Basic understanding of programming concepts Familiarity with computer systems and software usage				
Course Summary	This course introduces students to the fundamentals of game design and development using Unity as the primary tool. It covers various aspects of game creation, from conceptualization to implementation, focusing on both theoretical and practical elements.				

Detailed Syllabus:

Module	Unit	Content	Hrs
I		**Introduction to Game Design**	15
	1	Understanding the concept of game design	
	2	History and evolution of game design	
	3	Elements of game design: mechanics, dynamics, aesthetics	
	4	Principles of game design: immersion, balance, feedback	
	5	Tools used in game design	
II		**Fundamentals of Game Design**	15
	6	Game genres and classifications	
	7	Gameplay mechanics and dynamics	
	8	Storytelling in games	
	9	Player psychology and engagement	

III	**Stages of Game Development Process**		**15**
	10	Conceptualization and idea creation	
	11	Pre-production: game design documents, prototyping	
	12	Production: asset creation, coding, testing	
	13	Post-production: debugging, polishing, release	
IV	**Game Development using Unity**		**15**
	14	Overview of Unity interface and workspace	
	15	Basic game development concepts in Unity	
	16	Creating scenes, game objects, and scripts	
	17	Implementing basic gameplay mechanics in Unity	
V	**Flexi Module**		**15**
		Exploration of emerging trends and techniques in game development	
		Case studies of innovative games and development processes	
		Comparison of different game engines and development tools	
		Introduction to virtual reality (VR) and augmented reality (AR) in game development	

References:

1. Game Development : Gaming Design & Programming Paperback – 1 January 2021 byK.Patinson
2. Hands-On Unity 2022 Game Development - Third Edition Paperback – Import, 31 October 2022by Nicolas Alejandro Borromeo
3. Schell, J. (2019). The Art of Game Design: A Book of Lenses. CRC Press.
4. Fullerton, T., Swain, C., & Hoffman, S. (2014). Game Design Workshop: A Playcentric Approach to Creating Innovative Games. CRC Press.
5. https://www.coursera.org/specializations/game-design-and-development
6. Unity Technologies. (n.d.). Unity Documentation. Retrieved from https://docs.unity3d.com/Documentation/

List of Experiments

Experiment 1: Installation and Familiarization

- Installation: Download and install Unity Hub and the latest version of Unity. Follow the instructions provided on the Unity website.
- Project Creation: Create a new 2D/3D project in Unity Hub.
- Interface Tour: Familiarize yourself with the Unity interface by exploring different panels such as Hierarchy, Scene, Game, Inspector, Project, and Console.

Experiment 2: Creating Objects and Manipulating Transformations

- Create Objects: Create primitive objects like cubes, spheres, and cylinders in the scene.
- Transformations: Experiment with moving, rotating, and scaling objects using the Transform component in the Inspector panel.

Experiment 3: Applying Materials and Textures

- Materials: Create basic materials and apply them to objects to change their appearance.
- Textures: Import textures and apply them to materials to add details to objects.

Experiment 4: Lighting and Shadows

- Directional Light: Add a directional light to the scene and observe how it affects the lighting and shadows.
- Point Light: Experiment with point lights and their effects on the scene.

Experiment 5: Scripting Basics

- Basic Scripting: Write a simple script to move an object based on user input (e.g., arrow keys or mouse input).
- Script Attachments: Attach the script to an object and observe the behavior in the game.

Experiment 6: Physics and Colliders

- Rigidbody: Add a Rigidbody component to an object and observe how it interacts with physics.
- Colliders: Experiment with different types of colliders (e.g., BoxCollider, SphereCollider) and their interactions.

Experiment 7: User Interface (UI) Elements

- Canvas Creation: Create a UI Canvas and add UI elements like buttons, text, and images.
- Button Interaction: Write scripts to handle button clicks and perform actions in the game.

Experiment 8: Particle Effects

- Particle System: Create a simple particle system (e.g., fire, smoke, sparks) and adjust its properties like emission rate and color.

Experiment 9: Audio Integration

- Audio Sources: Add audio sources to objects and play sounds (e.g., background music, footsteps) using scripts.

Experiment 10: Building and Deployment

- Building the Game: Build the game for different platforms (e.g., PC, mobile) using Unity's build settings.
- Testing: Test the built game on various devices and platforms to ensure compatibility and functionality.

Course Outcomes

No.	Upon completion of the course the graduate will be able to	Cognitive	PSO addressed
CO-1	Understand the principles of game design and development.	U	PSO 1
CO-2	Learn the fundamentals of designing interactive and engaging gameplay experiences.	R, U	PSO 1
CO-3	Explore the stages of the game development process.	U, An	PSO 2. 3
CO-4	Gain proficiency in using Unity for game creation and development.	Ap, E	PSO 2. 3

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Credits: 3:0:1 (Lecture:Tutorial:Practical)

CO No.	CO	PO/ PSO	Cognitive	Knowledge	Lecture (L)/	Practic
CO-1	Understand the principles of game design and development.	PO 2, 7 PSO 1	U	F, C	L	P
CO-2	Learn the fundamentals of designing interactive and	PO 2, 7 PSO 1	R, U	C, P	L	P
CO-3	Explore the stages of the game development process.	PO 3, 6, 7 PSO 2. 3	U, An	P	L	P
CO-4	Gain proficiency in using Unity for game creation and	PO 2, 3, 5, 7 PSO 2. 3	Ap, E	M	L	P

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4
CO 1	-	2	-	-	-	-	3	-	3	-	-	-
CO 2	-	2	-	-	-	-	3	-	3	3	-	-
CO 3	-	-	3	-	-	2	3	-	1	2	3	-
CO 4	-	2	3	-	2	-	3	-	1	3	3	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics :

	Internal	Assignmen	Programming	End Semester
CO 1	✓	✓		✓
CO 2	✓	✓	✓	✓
CO 3	✓		✓	✓
CO 4	✓		✓	✓

UK4DSCCAP201-SOFTWARE ENGINEERING

Discipline	Computer Application				
Course Code	UK4DSCCAP201				
Course Title	Software Engineering				
Type of Course	**DSC**				
Semester	IV				
Academic Level	2				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	3 hours	-	2 hours	5 hours
Pre-requisites	Knowledge of database systems and programming is desirable				
Course Summary	This course is structured to facilitate comprehension of Software Engineering concepts and the application of project management and analysis principles to software project development.				

Detailed Syllabus:

Module	Unit	Content	Hrs (L+P)
I	**Introduction to Software Engineering**		

	1	History and Evolution – Software Development projects – Emergence of Software Engineering. Software Life cycle models – Waterfall model – Rapid Application Development – Agile Model – Spiral Model- Comparison of different life cycle models.	**15**
II	**SPM and Software Requirements Specification**		
	2	Software Project Management, Project Planning, Metrics for project size estimations, Project Estimation Techniques, Basic COCOMO model. Basic concepts of CPM, PERT and Gantt Chart. Requirement Analysis and Specification – Gathering and Analysis – SRS-Formal System Specification	**15**
III	**Software Design**		
	3	Software Design – Overview – Characteristics – Cohesion & Coupling - Function Oriented Design – Structured Analysis – DFD – Structured Design Object Modeling using UML – OO concepts – UML – Diagrams – Use case, Class, Activity, State Chart	**15**
IV	**Coding and Testing**		
	4	Coding – code review Testing – Unit testing, Black box testing, white box testing, Integration testing, system testing, Debugging. Software Reliability and quality management- Software reliability, Software quality. Software maintenance- Characteristics of software maintenance.	**15**
V		**Flexi Module: Not included in End Semester Exams**	**15**
		DevOps and Continous Integration/Continuous Delivery, SecOps, Cloud Native Development. Microservices Architecture, Containerization and Orchestration, Serverless Computing, Human-Centric Software Engineering, Low Code/No Code Development, Generative AI for Software Development, Case Study	

Core Textbooks

1. Rajib Mall, “Fundamentals of Software Engineering”, PHI 2018, 5th Edition.
2. Ali Bahrami, “Object Oriented System Development”, McGraw Hill

Reference Books

1. Roger S. Pressman, "Software Engineering - A Practitioner's Approach", McGraw Hill 2010, 7th Edition.
2. Pankaj Jalote, "An Integrated Approach to Software Engineering", Narosa Publishing House.
3. Ian Sommerville, "Software Engineering", 7th edition, Addison-Wesley.

Web Resources

1. https://www.javatpoint.com/software-engineering
2. https://www.geeksforgeeks.org/software-engineering/
3. https://www.tutorialspoint.com/software_engineering/index.htm
4. https://nptel.ac.in/courses/106105182/

Sample Case Study

1. Study the complete Software Development Life Cycle (SDLC) and analyse various activities conducted as a part of various phases. For each SDLC phase, identify the objectives and summaries outcomes.
2. Identifying the Requirements from Problem Statements
3. Consider any project to be developed in any technology and construct a Software Requirement Specification (SRS) document for the project.
4. Modelling DFD.
5. Modelling UML Use Case Diagrams and Capturing Use Case Scenarios.
6. Modelling UML Class Diagrams.
7. Modelling UML Activity and State chart diagram.

Course Outcomes

No.	Upon completion of the course the graduate will be able to	Cognitive	PSO addressed
CO-1	Apply the software development life cycle models in various project contexts.	U	PSO-1,2
CO-2	Infer the role of software project management and software requirement specification (SRS) document.	Ap	PSO-1,2, 3
CO-3	Illustrate the concepts of structured and object oriented analysis & design.	Ap	PSO-1,2,3
CO-4	Demonstrate the principles of coding, testing and the need for software quality management and maintenance.	Ap	PSO-1,2,3

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Credits: 3:0:1 (Lecture:Tutorial:Practical)

CO No.	CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L)/ Tutorial	Practical (P)

1	Apply the software development life cycle models in various	PO-1,2,6,7 PSO-1,2	U	F,C	T	
2	Infer the role of software project management and	PO-1,2,4,5,6,7	Ap	F,C,P	T	P
3	Illustrate the concepts of structured and object oriented	PO-1,2,3,6,7 PSO-1,2,3	Ap	F,C,P	T	P
4	Demonstrate the principles of coding, testing and the need	PO-1,2,3,4,5,6,7,8	Ap	F,C,P	T	P

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs :

	PO	**PO2**	**PO**	**PO**	**PO**	**PO**	**PO**	**PO**	**PS**	**PSO**	**PSO**	**PSO**
CO 1	2	2	-	-	-	-	1	-	2	2	-	-
CO 2	2	2	-	2	2	-	-	-	2	2	-	-
CO 3	3	3	3	-	-	-	-	-	2	2	-	-
CO 4	3	3	3	2	2	2	3	2	2	2	2	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics:

	Internal	Assignment	Lab Assessment	End Semester
CO 1	✓			✓
CO 2	✓		✓	✓
CO 3	✓		✓	✓
CO 4	✓	✓	✓	✓

UK4DSCCAP202-DATA MINING

Discipline	COMPUTER APPLICATION				
Course Code	UK4DSCCAP202				
Course Title	**Data Mining**				
Type of Course	**DSC**				
Semester	IV				
Academic Level	3				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	3 hours	-	2 hours	5 hours
Pre-requisites	Basic knowledge of database concepts				
Course Summary	This course offers students a robust grounding in both the theoretical underpinnings and practical applications of data mining. It equips them with the skills to analyze large datasets and extract meaningful insights across diverse domains, employing a range of data mining algorithms.				

Detailed Syllabus:

Module	Unit	Content	Hrs (L+P)

I	**Introduction**		**15 HRS**
	1	Data, Data Mining, Knowledge, KDD, Need of data mining, Types of Data, Data Mining Functionalities, Application Domain, Major issues in Data Mining	
	2	Attribute Types: Nominal, Binary, Ordinal, Numeric, Discrete versus Continuous Attributes	
	3	Basic Statistical Descriptions of Data: Central Tendency, Mean, Median, Mode, Data Visualization, Measuring Data Similarity and Dissimilarity	
II	**Data Preprocessing and Mining Frequent Patterns**		**15**
	4	Data Preprocessing: Overview, Data Preprocessing Techniques	
	5	Mining Frequent Patterns, Associations, and Correlations: Basic Concepts: Market Basket Analysis	
	6	Frequent Itemset Mining Methods: Apriori Algorithm	
III	**Classification**		**15**
	7	General approach to Classification	
	8	Classification and Prediction	
	9	Decision tree induction	
	10	Bayes Classification method: Naïve Bayesian Classification	
	11	K - Nearest Neighbour method	
	12	Rule–based classification	
IV	**Cluster Analysis Basic Concepts and Methods**		**15**
	13	Definition, Requirements, Characteristics of cluster analysis	
	14	Types of Data in Cluster Analysis	
	15	Overview of Basic Clustering Methods– Partitioning Methods, Hierarchical Methods– Density Based Methods, Grid Based Methods	
	16	K-means and K-Medoids	
	17	Outlier Detection in Cluster Analysis	

		Flexi Module- Not included in End Semester Exams	**15**
V		Mining Time series data, Spatial Data Mining, Mining the WWW,Text Mining	

Text Books

1. Data Mining – Concepts and Techniques – Jiawei Han & Micheline Kamber, 3rd Edition Elsevier.
2. Data Mining Introductory and Advanced topics – Margaret H Dunham, Pearson Education.

References

1. Introduction to Data Mining -Pang-Ning Tan Michael, Steinbach and Vipin Kumar -Pearson Education Limited 2014
2. Data Mining: Practical Machine Learning Tools and Techniques by Ian H. Witten, Eibe Frank, and Mark A. Hall, Second Edition, 2005

Web Resources

1. **https://www.javatpoint.com/data-mining**
2. **https://www.mygreatlearning.com/blog/data-mining-tutorial/**
3. **https://www.slideshare.net/TeamRebel1/weka190429184259pdf**
4. **https://www.tutorialspoint.com/weka/weka_quick_guide.htm**

Lab Exercises

Practical using WEKA Tool

1. Creating a table using WEKA tool
2. List all the categorical (or nominal) attributes and the real-valued attributes separately
3. Calculate: mean, median, mode
4. Demonstration of data preprocessing on dataset
5. Demonstration of data preprocessing on dataset based on missing values
6. Demonstration of Association rule process on dataset using Apriori Algorithm
7. Demonstration of classification rule process on dataset using decision tree induction
8. Demonstration of classification rule process on dataset using naive bayes algorithm
9. Demonstration of clustering rule process on dataset using various clustering methods
10. Practicing outlier detection in clustering on dataset

No.	**Upon completion of the course the graduate will be**	**Cognitive**	**PSO**

CO-1	Understand data mining concepts, applications and	U	PSO-1,2,3
CO-2	Apply data mining techniques and methods to datasets	Ap	PSO-1,2,3
CO-3	Illustrate the concept of classification algorithms and	Ap	PSO-1,2,3
CO-4	Interpret different cluster analysis methods	Ap	PSO-1,2,3

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Credits: 3:0:1 (Lecture:Tutorial:Practical)

CO No.	CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L)/Tutorial	Practical (P)
1	Understand data mining concepts,	PO-6,7	U	F, C	L	P
2	Apply data mining techniques and	PO-3,5,6,7	Ap	F,C,P	L	P
3	Illustrate the concept of	PO-3,5,6,7	Ap	F,C,P	L	P
4	Interpret different cluster analysis	PO-3,5,6,7	Ap	F,C,P	L	P

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs :

	PO1	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO	PSO
CO 1	-	-	-	-	-	2	1	-	2	1	1	-
CO 2	-	-	3	-	1	2	3	-	2	1	2	-
CO 3	-	-	3	-	1	2	3	-	2	1	3	-

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

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate /
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics :

	Internal Exam			**Assignment**
	✓		**Project Evaluation**	**End Semester**
CO 1	✓	✓	✓	✓
CO 2	✓		✓	✓
CO 3	✓	✓	✓	✓
CO 4				

UK4DSCCAP203-PYTHON PROGRAMMING

Discipline	COMPUTER APPLICATION
Course Code	UK4DSCCAP203
Course Title	PYTHON PROGRAMMING
Type of Course	**DSC**
Semester	IV
Academic Level	2

Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	3 hours	-	2 hours	5 hours
Pre-requisites	.				
Course Summary	This course provides a comprehensive introduction to Python, covering fundamental concepts, data structures, control flow, functions, modules, and object-oriented programming thus covering essential concepts and practical applications across various domains.				

Detailed Syllabus:

Module	Unit	Content	Hrs (L+P)
I		**Introduction to Python**	15
	1	Fundamentals of Computing – Identification of Computational Problems, Algorithms, Flow charts and Pseudo codes.	
	2	Introduction to Python - Features of Python, Python interpreter, Interactive and script modes	
	3	Identifiers, Reserved Keywords, Operators ,Comments in Python, Input,Output	
II		**Mutable and Immutable Types**	15
	4	Data Types and Operations - int, float, complex	
	5	Strings - escape characters, string formatting functions;	
	6	List - built-in list functions & methods;	
	7	Tuple - built-in tuple functions;	
	8	Set – built-in set function & methods;	
	9	Dictionary - built-in dictionary functions & methods;	
	10	Mutable and Immutable Objects, Data Type Conversion;	
III		**Flow Control & Functions**	15
	11	Flow control - Decision Making – if,if …else, if….elif, Iteration -for, range() while, loop with else, nested loop, break, continue, pass;	
	12	List comprehension – nested list;	

	13	Functions- Definition, calling, arguments, anonymous function, recursion, return, filter(),reduce(),map()	
IV	**Packages, Files, Exception handling & Object Oriented Concepts**		**15**
	14	Modules & Packages - Built-in Modules, Creating Modules, import statement, Locating, modules ,Namespaces and Scope-local,& global, dir (), reload (),Packages in Python;	
	15	File Handling- open, close, write, read, methods, rename, delete, directories;	
	16	Exception handling- built in exceptions, Handling, Exception with arguments, Raising and User defined exceptions;	
	17	Object oriented programming- OOPs concepts , class, object, method, attribute- static & instance, encapsulation, constructor, destructor, data hiding;	
Flexi Module: Not included for End Semester Exams			
V		Pattern Matching with Regular expression Database Programming: Connecting to a database, Creating Tables,INSERT, UPDATE, DELETE and READ operations	**15**

CORE TEXTS

1. Jeeva Jose, "Taming PYTHON By Programming", Khanna Publications, 2017
2. Python Programming: An introduction to Computer Science, John Zelle
3. Charles Dierbach, "Introduction to Computer Science using Python - A computational Problem solving Focus", Wiley India Edition, 2015.

ADDITIONAL REFERENCES

1. Mark Lutz, "Learning Python Powerful Object Oriented Programming", O'reilly Media 2018, 5th Edition.
2. Timothy A. Budd, "Exploring Python", Tata MCGraw Hill Education Private Limited 2011, 1st Edition.
3. Allen Downey, Jeffrey Elkner, Chris Meyers, "How to think like a computer scientist: learning with Python", 2012.

Web Resources:-

1. https://www.w3schools.com/python/
2. https://automatetheboringstuff.com/
3. https://www.py4e.com/book
4. https://www.amazon.in/Dive-Into-Python-Books-Professionals/dp/1430224150
5. https://nibmehub.com/opac-service/pdf/read/Python%20Programming%20_%20an%20introduction%20to%20computer%20science-%203rd%20Edition.pdf

6. https://www.amazon.in/Introduction-Programming-Python-Sedgewick-Dondero/dp/9332577439/ref=sr_1_1?crid=2Q2M0AQKBAKQQ&dib=eyJ2IjoiMSJ9.WNmkAwL-TXYQrccdHc6aQW7vNvyxJqAkCZthVxl0F8aQOeuFb-6LhLW48B4rCpnUG0UH1kUWiRMv9RxXgvbhFK3Pew1T4laTHxuvQskEqvk.yC2HB2C-isu83fgA8kpmZHYEW7hoonNT38bSVn3BygY&dib_tag=se&keywords=sedgewick+python&qid=1713252780&sprefix=sedgewick+pytho%2Caps%2C221&sr=8-1

PYTHON PROGRAMMING LAB

The laboratory work will consist of 20-25 experiments

Part A

1. Programs to write, test and debug simple Pythons programs (Operators & expressions).
2. Programs to demonstrate conditional and looping statements.
3. Programs to demonstrate strings, list, tuples and dictionaries.
4. Programs using list comprehension.
5. Programs to demonstrate the use of functions.
6. Programs to perform list sorting and searching.

Part B

7. Program to read and write data from/to files in Python.
8. Programs to demonstrate creating and handling of modules and packages.
9. Programs to demonstrate Exception Handling situations.
10. Programs to demonstrate Class and Object.

Course Outcomes

No.	Upon completion of the course the graduate will be able to	Cognitive	PSO addressed
CO1	Discuss basic concepts of Python Programming	Ap	PSO-1,2
CO2	Summarize about mutable and immutable data types in Python	Ap	PSO-1,2
CO3	Illustrate flow control techniques in python programming	Ap	PSO-1,2,3
CO4	Apply object oriented concepts in python programming	Ap	PSO-1,2,3

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Credits: 3:0:1(Lecture:Tutorial:Practical)

CO No.	CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L)/Tutorial (T)	Practical (P)
1	Discuss basic concepts of Python Programming	PO-1,2,3,6,7 PSO-1,2	Ap	F, C, P, M	L	P
2	Summarize about mutable and immutable data types in	PO-1,2,3,6,7 PSO-1,2	Ap	F, C, P, M	L	P
3	Illustrate flow control techniques in	PO-1,2,3,5,6,7	Ap	F, C, P, M	L	P
4	Apply object oriented concepts in	PO-1,2,3,5,6,7	Ap	F, C, P, M	L	P

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs :

	PO1	PO2	PO	PO4	PO	PO6	PO7	PO8	PSO	PS	PS	PSO
CO 1	2	1	2	-	-	2	2	-	1	2	-	-
CO 2	2	2	2	-	-	2	2	-	2	2	-	-
CO 3	2	2	2	-	1	2	2	-	2	2	2	2
CO 4	2	2	2	-	1	2	2	-	2	3	2	2

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate /
3	Substantial /

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Lab Program Evaluation	End Semester Examinations
CO 1	✓	✓	✓	✓
CO 2	✓		✓	✓
CO 3	✓		✓	✓
CO 4	✓	✓	✓	✓

UK4DSCCAP204-CRYPTOGRAPHY AND NETWORK SECURITY

Discipline	Computer Science				
Course Code	UK4DSCCAP204				
Course Title	Cryptography and Network Security				
Type of Course	**DSC**				
Semester	IV				
Academic Level	2				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	4 hours	-	-	4 hours
Pre-requisites	Basic knowledge in Computer Networks				
Course Summary	This course provides students with the knowledge to comprehend the fundamental principles of cryptography and its critical role in securing communications across networks. It enables proficiency in various cryptographic techniques and introduces concepts surrounding digital signatures, emphasizing their importance in verifying the authenticity and integrity of digital documents.				

Detailed Syllabus:

Module	Unit	Content	Hrs (L)
I		**Fundamentals of Security**	**12**
	1	Introduction, The Need for Security, Security Approaches and Principles.	
	2	Cryptography Techniques: Basic Terms, Plain Text, Cipher text, Substitution Techniques, Transposition Techniques, Fiestel Cipher.	
	3	Encryption, Decryption, Symmetric and asymmetric key Cryptography.	
	4	Steganography, Possible types of Attacks.	
II		**Cryptography**	**12**
	5	An Overview of Symmetric key Cryptography.	
	6	Data Encryption Standard (DES) and Advanced Encryption Standard(AES).	
	7	History and Overview of Asymmetric Key Cryptography.	
	8	The RSA Algorithm, Digital signatures: Digital Signature Algorithm. ElGamal Algorithm.	
III		**Public Key Infrastructure**	**12**
	9	Digital certificates, Public Key Cryptography Standard.	
	10	The PKIX Model, Transport Layer Security.	
	11	Secure Socket Layer, Crypto Currency and Bitcoin. Message Digest, SHA Algorithm.	
IV		**Authentication Mechanisms**	**12**
	18	Authentication Basics, Passwords, Biometric Authentication	
	19	Key Distribution Center, Security handshake Pitfalls, Attacks on Authentication Schemes.	
	20	Firewalls: Architecture, Generation and Types. Virtual Private Network. Email Security: PGP and S/MIME.	

V		**Flexi Module (Not included for end Semester Examination)**	
	21	**Case Study :** Cryptographic implementations using Java.	

REFERENCE

Core

- Kahate, "Cryptography and Network Security", McGrawHill
- "Cryptography and Network Security", ITL Education Solutions Limited, Pearson.

Additional

- William Stallings, "Cryptography and Network security", Pearson.
- Dr. Wm. Arthur Conklin, Dr. Gregory White, "Principles of Computer Security Sixth Edition", McGraw Hill.

Course Outcomes

No.	Upon completion of the course the graduate will be able to	Cognitive	PSO addressed
CO-1	Summarize the Basic Concepts of Security	U	PSO-1,2
CO-2	Compare the working and use of Cryptographic Algorithms	U	PSO-1,3
CO-3	Infer about public key infrastructure in cryptography	U	PSO-1,3
CO-4	Present the Various Authentication Systems	U	PSO-1,2,3

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Credits: 4:0:0 (Lecture:Tutorial:Practical)

CO No.	CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L)/Tutorial (T)	Practical (P)
CO-1	Summarize the Basic Concepts of Security	PO-1,7 PSO-1,2	U	F, C	L	-

CO-2	Compare the working and use of Cryptographic Algorithms	PO-1,7,8 PSO-1,3	U	F, C, P	L	-
CO-3	Infer about public key infrastructure in cryptography	PO-6,7,8 PSO-1,3	U	F,C,P	L	-
CO-4	Present the Various Authentication Systems	PO-7,8 PSO-1,2,3	U	F,C	L	-

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs :

	PO1	**PO2**	**PO3**	**PO**	**PO5**	**PO6**	**PO7**	**PO8**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO	1	-	-	-	-	1	2	-	1	1	-	-
CO	1	-	-	-	-	1	2	2	2	-	1	-
CO	-	-	-	-	-	1	2	1	2	-	2	-
CO	-	-	-	-	-	1	2	2	1	2	2	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments /Case Study
- Final Exam

Mapping of COs to Assessment Rubrics :

	Internal	Assignment	Quiz	End Semester Examinations
CO 1	✓		✓	✓
CO 2	✓	✓		✓
CO 3	✓		✓	✓
CO 4		✓		✓

UK4DSCCAP205-TRENDS IN COMPUTING

Discipline	COMPUTER APPLICATION				
Course Code	UK4DSCCAP205				
Course Title	Trends in computing				
Type of Course	**DSC**				
Semester	IV				
Academic Level	2				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	4 hours	-		4 hours
Pre-requisites	Basic Knowledge of Computer Science Principles, Programming Concepts, Networking				
Course Summary	This course offers a broad look at contemporary developments, upcoming technologies, and prospective pathways within the computing domain.				

Detailed Syllabus:

Module	Unit	Content	Hrs(L)
I		**Grid Computing**	**12**
	1	High Performance Computing, Distributed Computing, Cluster Computing, Grid Computing- Definition, Characteristics, Advantages, Disadvantages, Challenges	
	2	Comparison with Cluster Computing	
	3	Applications of Grid Computing	
II		**Cloud Computing**	**12**
	5	Definition, Characteristics, Comparison with Grid Computing,	
	6	Advantages, Disadvantages, Challenges	
	7	Cloud Types- Based on services provided- SPI model-SaaS, PaaS, IaaS, Other Categories-XaaS-Identity as service (IdaaS), Data as Service (DaaS), Database as a Service (DbaaS), Storage as a Service(STaaS), Function as A Service (FaaS), Security as a Service (SECaaS), Desktop as a Service (DaaS)Communication as a Service (CaaS), Monitoring as a Service(MaaS), advantages and disadvantages of each	
	8	Based on deployment – Public, Private, Community, Hybrid Clouds, characteristics of each	
III		**Fog & Edge Computing**	**12**
	9	Fog Computing-Definition, Fog Computing as extension to cloud computing, Characteristics, Applications-Smart cities, healthcare, transportation, retail	
	10	Edge Computing – Definition, Characteristics, Advantages, Disadvantages	
	11	Fog and Edge Completing (FEC) the Cloud, Applications of FEC	
IV		**Quantum Computing**	**12**
	12	Definition, Characteristics- Braket Notation, Qubits (quantum bits)	

	13	Applications- Cryptography, optimization problems, drug discovery, materials science, Tools for Quantum- Qiskit(basic concepts)	
	14	Quantum Machine Learning – definition, applications (basic concepts only)	
V		**Flexi Module: Not included for End Semester Exams**	**12**
	15	Serverless Computing- Definition, Characteristics and Applications- Web and mobile applications, IoT data processing, batch processing.	
	16	Edge Computing Platforms- EdgeX Foundry, OpenFog. Jungle Computing- Concepts and Applications	
	17	Distributed Ledger Technology-Definition, Characteristics, Applications-Blockchain, cryptocurrencies, supply chain management, digital identity	
	18	Cloud IOT, Quantum Cryptography- basics	

REFERENCES

1. Fran Berman, Geoffrey Fox, Anthony J. G. Hey, Grid Computing: Making the Global Infrastructure a Reality, Wiley, April 2003

2. Rajkumar Buyya, Satish Narayana Srirama, "Fog and Edge Computing: Principles and Paradigms", Wiley January 2019.

3. Umang Singh, San Murugesan, Ashish Seth, Emerging Computing Paradigms: Principles, Advances and Applications, Wiley, July 2022

4. Cloud Computing, A practical approach for learning and implementation, A.Srinivasan&J.Suresh, Pearson, 2017

5.Rajkumar Buyya, James Broberg, Andrzej, Cloud Computing: Principles and Paradigms, Wiley India Publications, 2011

Course Outcomes

No.	Upon completion of the course the graduate will be able	Cognitive	PSO
CO-1	Outline on Grid Computing	U	PSO-1

CO-2	Summarize basic concepts on Cloud Computing	U	PSO-1
CO-3	Identify challenges faced in Edge Computing	U	PSO-1,2
CO-4	Explain ideas behind Quantum Computing	U	PSO-1,2

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Credits: 4:0:0 (Lecture:Tutorial:Practical)

CO No.	CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L)/Tutorial (T)	Practical (P)
CO1	Outline on Grid Computing	PSO-1	**U**	**F, C**	**L**	
CO2	Summarize basic concepts on Cloud	PSO-1	**U**	**F, C**	**L**	
CO3	Identify challenges faced in Edge	PSO-1, 2	**U**	**F, C**	**L**	
CO4	Explain ideas behind Quantum Computing	PSO-1, 2	**U**	**F, C**	**L**	

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4
CO 1	-	-	-	-	-	2	2		3	-	-	-
CO 2	-	-	-	-	-	2	2		3	-	-	-
CO 3	-	-	-	-	-	2	2		3	2	--	-
CO 4	-	-	-	–	-	2	2		3	2	-	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Lab Assignments
- Final Exam

Mapping of COs to Assessment Rubrics:

	Internal Exam	**Quiz/Assignment**	**Seminar**	**End Semester Examinations**
CO 1	✓	✓		✓
CO 2	✓		✓	✓
CO 3	✓			✓
CO 4	✓	✓	✓	✓

Discipline Specific Elective Courses

UK4DSECAP200- ETHICAL HACKING

Discipline	COMPUTER APPLICATIONS
Course Code	UK4DSECAP200
Course Title	**ETHICAL HACKING**
Type of Course	**DSE**
Semester	IV

Academic Level	2				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	3 hours	-	2	5 hours
Pre-requisites	Basic Knowledge of Malware, Types of attacks and prevention, and ethical Hacking				
Course Summary	The Ethical Hacking course is tailored to introduce participants to the principles of ethical hacking and its diverse concepts. Covering essential foundations, students will get hands on experience with the tools, techniques, and ethical considerations inherent in ethical hacking practices.				

Detailed Syllabus:

Module	Unit	Content	Hrs
I	**Introduction to Ethical Hacking**		**15**
	1	Define Ethical Hacking? Red Teaming, Blue Teaming ,Purple Teaming, Basic Linux Commands, OSI Layer, Encryption and Encoding, IP address classification, HTTP Methods, TCP Handshake, Cyber Kill Chain(Each step in detail) CIA Triad, AAA- Authentication ,Authorization and Accounting,Worms, viruses, Trojans, Spyware, Root kits	
	2	OWASP Top 10 (2021), MITRE Framework	
	3	Information Disclosure, Insecure Direct Object Reference (IDOR)	
	4	Recently Observed Attacks around the world- Log4j Attack, WannaCry Attack	
II	**Types of Attacks and their Common Prevention Mechanisms**		**15**

	5	Ransomware Attack, Keystroke Logging, Denial of Service (DoS /DDoS),Social Engineering, Phishing, Vishing, Attack cross-site scripting (XSS), cross site request forgery (CSRF/XSRF) SQL injection, input parameter manipulation, broken authentication,Broken access control, Security Misconfiguration,	
	6	Waterhole attack, brute force, Password Spray, , phishing, Eavesdropping, Man-in-the-Middle.	
	7	Click jacking, Cookie Theft, URL Obfuscation	
	8	DNS poisoning, ARP poisoning, Identity Theft,	
III	**Ethical Hacking**		**15**
	9	Introduction: Black Hat vs. Gray Hat vs. White Hat (Ethical) hacking, Why is Ethical hacking needed?	
	10	How is Ethical hacking different from security auditing and digital forensics?	
	11	Signing NDA.	
	12	Black box vs. White box vs. Black box	
	13	Vulnerability assessment and Penetration Testing. Difference between Vulnerability Assessment and Penetration Testing	
	14	Planning - Threat Modelling, set up security verification standards	
	15	Set up security testing plan – When, which systems/apps	
	16	understanding functionality, black/gray/white, authenticated vs. Unauthenticated	
IV	**Systems Hacking and Applications Hacking**		**15**
	17	Crawling/Spidering	
	18	**Systems hacking** – Windows and Linux –Key logging, Buffer Overflows.	
	19	Network hacking - ARP Poisoning, Password Cracking(Eg Rainbow table attack)	
	20	Wireless Attacks, MAC Spoofing, MAC Flooding.	
V	Flexy Module: **Applications hacking & Malware analysis**		15

	21	SMTP/Email-based attacks, VOIP vulnerabilities, Directory traversal, Windows Active Directory and common Attacks	
	22	Netcat Trojan, Wrapping definition, Reverse engineering.	

Core References

1) Certified Ethical Hacker Study Guide v9, Sean-Philip Oriyano, Sybex; Study Guide Edition,2016

2) CEH official Certified Ethical Hacking Review Guide, Wiley India Edition, 2007

Additional References

1) Certified Ethical Hacker: Michael Gregg, Pearson Education,1st Edition, 2013

2) Certified Ethical Hacker: Matt Walker, TMH,2011

3) http://www.pentest-standard.org/index.php/PTES_Technical_Guidelines

4) https://www.owasp.org/index.php/Category:OWASP_Top_Ten_2017_Project

5) https://www.owasp.org/index.php/Mobile_Top_10_2016-Top_10

6) https://www.owasp.org/index.php/OWASP_Testing_Guide_v4_Table_of_Contents

7) https://www.owasp.org/index.php/OWASP_Secure_Coding_Practices_-_Quick_Reference_ Guide

8) https://cve.mitre.org/

9) https://access.redhat.com/blogs/766093/posts/2914051

Practical Questions

1.) Use Google and Whois for Reconnaissance
2.) Use CrypTool to encrypt and decrypt passwords using RC4 algorithm
3.) Use Cain and Abel for cracking Windows account password using Dictionary attack and to decode wireless network passwords
4.) Run and Analyze the output of following commands in Linux – ifconfig, ping, netstat,
5.) Perform ARP Poisoning in Windows
6.) Use NMap scanner to perform port scanning of various forms – ACK, SYN, FIN, NULL, XMAS
7.) Use Wireshark (Sniffer) to capture network traffic and analyze
8.) Use Nemesy to launch DoS attack
9.) Simulate persistent cross-site scripting attack
10.) Session impersonation using Firefox and Tamper Data add-on.

Course Outcomes

No.	Upon completion of the course the graduate will be able to	Cognitive	PSO addressed
CO-1	Describe the ethics, legality, methodologies and techniques of hacking	U	PSO-1
CO-2	Explain the types of attacks and their common prevention mechanisms	U	PSO-1
CO-3	Apply various tools for hacking in real time machines	Ap	PSO-3
CO-4	Illustrate Systems Hacking and Applications Hacking.	Ap	PSO-1

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Credits: 3:0:1 (Lecture:Tutorial:Practical)

CO No.	CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L) /Tutorial (T)	Practical (P)
CO-1	Describe the ethics, legality, methodologies and techniques of hacking	PO-8 PSO-1	U	F,C	L	-
CO-2	Explain the types of attacks and their common prevention mechanisms	PO--1,2 PSO-1	U	F,C	L	-
CO-3	Apply various tools for hacking in real time machines	PO-1,2 PSO-3	Ap	F,C,P	L	P
CO-4	Illustrate Systems Hacking and Applications Hacking.	PO-1,2 PSO-1	Ap	F,C	L	-

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs :

	PSO1	PSO2	PSO3	PSO4	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO 1	2											3
CO 2	2				2	1						
CO 3			2		2	3						
CO 4	1				1	2						

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate /
3	Substantial /

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Practical	End Semester Examinations
CO1	✓		✓	✓
CO2	✓	✓	✓	✓
CO3	✓		✓	✓
CO4	✓	✓	✓	✓

UK4DSECAP201- PYTHON FOR DATA ANALYTICS

Discipline	COMPUTER APPLICATION				
Course Code	UK4DSECAP201				
Course Title	PYTHON FOR DATA ANALYTICS				
Type of Course	DSE				
Semester	IV				
Academic Level	2				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	3 hours	-	2 hours	5 hours
Pre-requisites	-				
Course Summary	This course is designed to enable students to get familiar with the features of python, its libraries, module creation, implementing various data structures and data visualization .				

Detailed Syllabus:

Module	Unit	Content	Hrs (L + P)
I		**Introduction**	**15**
	1	Data Analytics Lifecycle overview – Discovery,Data Preparation,Model Planning, Model Building,communicate results, operationalize.	
	2	Features of Python, Variables, output, input in Python, Operators ,Control flow statements: Decision making structures, Loops, Nesting of conditional statements and loops, abnormal loop termination	
	3	Functions: uses, syntax, Types – built in and user-defined functions, String functions in python. Recursive function	
	4	Errors and Exception handling	

II	**Data Structures**		**15**
	3	Data Types in Python- Numeric, Dictionary,Boolean, Set,Sequence type	
	4	Modules: In-built modules and user defined modules, import statement, from .... import statement.	
	5	Numpy library for arrays: One-dimensional and multi-dimensional	
III	**Data Processing**		**15**
	6	Pandas library for data processing	
	7	Basics of data frame, import of data, functions of data frame	
	8	Data extraction, Group by functionality	
	9	Creating charts for dataframe, missing values	
IV	**Data Visualization**		**15**
	10	Matplotlib library for visualization: Visualization for categorical variable, visualization of continuous variable.	
	11	Seaborn library for visualization: Visualization for categorical variable, visualization of continuous variable.	
V	**Additional Core Libraries (Not for end semester Examination)**		**15**
	12	SciPy Library for Statistics	
	13	SQLAlchemy Library for SQL	
	14	StatsModels Library for time series models - Introduction	

TEXT BOOK

1. Bharti Motwani, Data Analytics using Python,Wiley,2022
2. Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data,EMC Education services Wiley Publication

REFERENCES

1. Joel Grus,Data Science from Scratch: First Principles with Python,O'Reilly Media,2015
2. Wes McKinney,Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython,O'Reilly Media,2017

3. Jake VanderPlas,Python Data Science Handbook: Essential Tools for Working with Data,O'Reilly Media,2016
4. Aurélien Géron,Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow,O'Reilly Media,2019
5. Python for Data Analysis: 3rd Edition, Wes McKinney ,Publisher(s): O'Reilly Media, Inc.

LAB EXERCISES

1. Programs using Python strings, lists, tuples, and dictionaries.
2. Read and write data from/to files in Python.
3. Programs to demonstrate creating and handling of modules and packages
4. Programs involving regular expressions
5. Programs to draw simple bar chart, pie chart, histogram and scatter plot
6. Create a python program to draw a Histogram, Column Chart, Box plot chart, Pie Chart, and Scatter plot using pandas and mat plot lib.
7. Create a python program to export data (store Data Frame in CSV Format)
8. Create a python program to handle the missing data from a dataset using numpy and pandas.
9. Create a python program to import data from any .csv file and analyze using the statistical functions of pandas tools
10. Programs using Python strings, lists, tuples, and dictionaries.
11. Read and write data from/to files in Python.
12. Programs to demonstrate creating and handling of modules and packages
13. Programs involving regular expressions
14. Programs to draw simple bar chart, pie chart, histogram and scatter plot
15. Create a python program to draw a Histogram, Column Chart, Box plot chart, Pie Chart, and Scatter plot using pandas and mat plot lib.
16. Create a python program to export data (store Data Frame in CSV Format)
17. Create a python program to handle the missing data from a dataset using numpy and pandas.
18. Create a python program to import data from any .csv file and analyze using the statistical functions of pandas tools

    (a) Create a python program to draw a Histogram, Column Chart, Box plot chart, Pie Chart, and Scatter plot using pandas and mat plot lib for the following data. The categorical data on 1997 U.S. Health Care Expenditures. The data are in file healthexpendituresdata.csv.

    (b) The monthly data on the total return from the Standard and Poor 500 stock index (with reinvestment of dividends) from 1970 to 2018. The data are in file SandP500stockpricedata.csv. Create a python program to import data from any .csv file and analyze using the statistical functions of pandas tools. Also create a python program to draw different charts.

    (c)If at the end of each month, a saver deposited $100 into a savings account that paid 6% compounded monthly, h o w much would he have at the end of 10 years? Create a python program to calculate it?

	A	B
1	Category	Expenditures
2	Hospital	371
3	Physician	218
4	Drugs and Supplies	109
5	Other Personal	92
6	Nursing Home	83
7	Dental	51
8	Admin & Insurance	50
9	Public Health	39
10	Home Health	32
11	Research	18
12	Construction	17
13	Eye and Equipment	14

(d)Draw a pie chart and other charts that shows the amount of subscription generated for Indian Bonds from different categories of Investors. Create a python program for the above problem Use pandas and mat plot lib to draw charts

(e)The share holding pattern of a company WIPRO is given. Create a python program for the above problem. Use pandas and matplotlib to draw charts

Course Outcomes

No.	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO-1	Familiarize Data Analytics Lifecycle and Python basics	U,Ap	PSO-1,PSO-2,PSO-3
CO-2	Comprehend various Python Data Structures and Modules	U,Ap	PSO-1, PSO-2,PS0-3

CO-3	Effectively handle data processing using Pandas library, data frames, and data extraction methods.	U,Ap,C	PSO-1, PSO-2, PSO-3
CO-4	Experiment with Python libraries Matplotlib and Seaborn for data visualization of both categorical and continuous variables.	U,Ap,C	PSO-1, PSO-2, PSO-3

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: PYTHON FOR DATA ANALYTICS

Credits: 3:0:1 (Lecture:Tutorial:Practical)

CO No.	CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L)/Tutorial (T)	Practical (P)
1	CO-1	PSO-1 PSO-2,PSO-3	U,Ap	F, C	T	P
2	CO-2	PSO-1, PSO-2,PSO-3	U,Ap	F,C,P	L	P
3	CO-3	PSO-1, PSO-2, PSO-3	U,Ap,C	F,C,P	L	P
4	CO-4	PSO-1, PSO-2, PSO-3	U,Ap,C	F,C,P	L	P

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs :

	PO1	PO2	PO3	PO4	PO 5	PO6	PO7	PO8	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	2	2	2	2	-	-	2		2			
CO 2	2	2	2	2	-	2	2		2	2		

CO 3	2	2	2	-	2	2	2		2	2	2	
CO 4	2	2	2	-	2	2	2		2	2	2	

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate /
3	Substantial /

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Quiz	Seminar	End Semester Examinations
CO-1	✓	✓	✓	✓	✓
CO-2	✓	✓	✓	✓	✓
CO-3	✓		✓		✓
CO-4	✓		✓		✓

UK4DSECAP202-KNOWLEDGE REPRESENTATION AND INTELLIGENT AGENTS

Discipline	COMPUTER APPLICATION
Course Code	UK4DSECAP202
Course Title	Knowledge Representation and Intelligent Agents
Type of Course	DSE
Semester	IV

Academic Level	2				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	3 hours	-	2 hour	5 hours
Pre-requisites	Nil				
Course Summary	The course help students o represent knowledge effectively and design intelligent agents for problem-solving in artificial intelligence.				

Detailed Syllabus:

Module	Unit	Content	Hrs
I	**Algorithm Analysis and Techniques**		**15**
	1	Concepts in algorithm analysis – the efficiency of algorithms, average and worst – case analysis, Asymptotic notation, time and space complexity.	
	2	Techniques - brute force, divide and conquer, decrease and conquer, dynamic programming, shortest paths, backtracking	
II	**Heuristic Search Techniques**		**15**
	3	Heuristic search techniques - Generate and test, Hill climbing, Simulated annealing, Problem reduction, AO* algorithm, Constraints satisfaction, Means - Ends analysis. Search Techniques- Graph search, Depth First Search, Breadth First Search, Best first search, A* algorithm.	
III	**Knowledge Representation**		**15**
	4	Knowledge Management; Types of Knowledge; Knowledge Representation; Knowledgebase	
	5	Knowledge Representation structures: First order Logic, Frames, Conceptual Dependency, Scripts, Semantic Network	
IV	**Intelligent Agents**		**15**

	6	Intelligent agents - structure, types of agents, environment, autonomous agents. Nature inspired agents, Planning Agent, PEAS Representation	
V	**Flexi module:- Not included for End Semester Examinations**		**15**
	7	Reasoning: Abductive, Deductive, Inductive, Analogical, Cause-and-Effect, comparative, Conditional and Exemplar Reasoning	

References

Core

1. Vinod Chandra S S, Anand H S, Artificial Intelligence: Principles and Applications, Prentice Hall of India, New Delhi, 2020

Additional

2. Kevin Knight, Elaine Rich, Artificial Intelligence, 3rd Edn, Pearson, Chennai
3. Stuart Russell and Peter Norvig, Artificial Intelligence: A Modern Approach, 3rd Edition Prentice Hall of India, New Delhi, 2009

LAB EXERCISES

1. Implementation of brute force algorithm
2. Implementation of divide and conquer algorithm
3. Implementation of decrease and conquer algorithm
4. Implementation of shortest paths algorithm
5. Implementation of Heuristic search techniques
6. Implementation of AO* algorithm
7. Implementation of Depth First Search method
8. Implementation of Breadth First Search method
9. Implementation of Best first search method
10. Implementation of A* algorithm.

Course Outcomes

No.	Upon completion of the course the graduate will be able to	Cognitive	PSO addressed
CO1	Interpret the efficiency of different algorithm design methods	U	PSO- 1
CO2	Apply heuristic search techniques	Ap	PSO- 1, 2, 3
CO3	Represent and manage knowledge effectively using various structures, enhancing problem-solving skills	Ap	PSO- 1, 2

CO4	Distingush between the types of intelligent agents	U	PSO- 1, 2

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Credits: 3:0:1 (Lecture: Tutorial: Practical)

CO No.	CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L)/Tutorial (T)	Practical (P)
CO1	Interpret the efficiency of different algorithm design methods	PO-1, 6,7 PSO-1	U	F, C	L	
CO2	Apply heuristic search techniques	PO-1, 6, 7 PSO-1, 2, 3	Ap	F, C, P	L	P
CO3	Represent and manage knowledge effectively using various structures, enhancing problem-solving skills	PO-1, 6, 7 PSO-1,2	Ap	F, C, P	L	
CO4	Distingush between the types of intelligent agents	PO-1, 6, 7 PSO 1, 2	U	F, C, P	L	

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs :

	PO 1	PO2	PO3	PO4	PO 5	PO6	PO7	PO8	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	1	-	-	-	-	3	3	-	2	-	-	-
CO 2	1	-	-	-	-	3	3	-	2	1	2	-
CO 3	1	-	-	-	-	3	3	-	2	1	-	-
CO 4	1	-	-	-	-	3	3	-	2	1	-	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Lab Assessment	End Semester Examinations
CO 1	✓			✓
CO 2	✓	✓	✓	✓
CO 3	✓			✓

CO 4	✓	✓		✓

UK4DSECAP203-WEB SCRIPTING USING JAVASCRIPT

Discipline	COMPUTER APPLICATION				
Course Code	UK4DSECAP203				
Course Title	Web Scripting- Using JavaScript				
Type of Course	**DSE**				
Semester	IV				
Academic Level	2				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	3 hours	-	2 hours	5 hours
Pre-requisites	Basics of Web Design (HTML and CSS)				
Course Summary	This course offers a thorough initiation into web scripting through JavaScript, emphasizing the creation of dynamic and engaging web applications using the React JS library. Students will grasp fundamental JavaScript programming concepts, covering variables, data types, control structures, functions, and objects. Additionally, they will be familier with the principles of component-based UI development with React JS, encompassing state management, props, event handling, and component lifecycle methods. Through hands-on projects and exercises, students will acquire practical skills in constructing contemporary web applications using JavaScript and React JS.				

Detailed Syllabus:

Module	Unit	Content	Hrs (L+ P)
I	**JavaScript : Introduction**		**15**
	1	Introduction to JavaScript, JavaScript Basics: Variables and data types,	
	2	Operators and expressions	

	3	Control Structures: Conditional statements, Loop statements	
	5	Functions: Declaring functions, Parameters and arguments, Returning values	
	6	Dialog boxes: Prompt, Confirm, Alert boxes.	
II	**JavaScript : Arrays, Objects, Events, Form and Exception Handling**		**15 hrs**
	5	Arrays and Objects: Working with arrays, Working with objects, Iterating through arrays and objects	
	6	Events: click event, mouse events, key events	
	7	Forms and Form Validation: Working with forms, Client-side form validation	
	8	Exception Handling	
III	**React JS: Introduction**		**15 hrs**
	9	Introduction to React JS, Need, Applications, Features, Architecture, Virtual DOM	
	10	Installation: Setting up a React development environment (Node.js, npm, create-react-app)	
	11	JSX**:** JSX syntax, Conditional rendering with if/else and element variables, Ternary operators and logical && in JSX, Expressions in JSX	
	12	Creating and rendering React Components	
	13	Components and Props: Components vs Elements**,** Built in components, Attributes vs props, Types of Components: Function components, Passing and using props	
IV	**React JS: Events, Styles, Forms in React JS**		**15 hrs**
	14	Understanding component state, managing state using setState(), Component Life Cycle methods , React Hooks	
	15	Handling Events: Event handling in React, Event Handler Functions, Binding event handlers Functions	
	16	Forms: Controlled vs uncontrolled inputs, Handling form submission and user input	
	17	Styling in React.js CSS in React, Different approaches for styling (CSS, CSS-in-JS, CSS Modules), Inline styles, Styling Libraries, Popular CSS frameworks (Bootstrap, Material-UI)	

V		**Flexi Module: Not included for End Semester Exams**	15 hrs
	18	Cookies in JavaScript, Introduction to React Router: Setting up routes in React applications, Navigating between routes, Passing parameters to routes	

Text books

1. The Complete Reference JavaScript by Fritz Schneider and Thomas A Powell, Second Edition
2. BEGINNING React JS Foundations Building User Interfaces with React JS An Approachable Guide by Chris Minnick

References

- Eloquent JavaScript: A Modern Introduction to Programming by Marijn Haverbeke, Fourth Edition
- Learning React: A Hands-On Guide to Building Web. Applications Using React and Redux by Kirupa Chinnathambi, Addison Wesley
- React.js Essentials by Artemij Fedosejev
- Fullstack React: The Complete Guide to ReactJS and Friends by Anthony Accomazzo, Nate Murray, and Ari Lerner

Web Resources

1. https://www.tutorialsteacher.com/javascript
2. https://www.guru99.com/reactjs-tutorial.html

Lab Experiments

Part A (JavaScript)

1. Experiments based on Operators
2. Experiments based on Control Statements
3. Experiments based on Loop statements
4. Experiments based on Functions
5. Experiments based on Dialog boxes
6. Experiments based on Arrays
7. Experiments based on Objects
8. Experiments based on Form validation
9. Experiments based on Events
10. Experiments based on Exception Handling

Part B (React JS)

Develop a simple application using React by integrating concepts learned throughout the course.

Course Outcomes

No.	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO-1	Illustrate the basic skills in JavaScript	Ap	PSO-1,2,3
CO-2	Develop the client-side scripts using JavaScript	Ap	PSO-1,2,3
CO-3	Illustrate the main ideas behind React JS	Ap	PSO-1,2,3
CO-4	develop interactive user interfaces using React JS	Ap	PSO-1,2,3

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Credits: 3:0:1 (Lecture:Tutorial:Practical)

CO No.	CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L)/Tutorial	Practical (P)
1	Illustrate the basic skills in JavaScript	PO – 3, 6, 7 PSO – 1, 2, 3	Ap	F, C, P	L	P
2	Develop the client-side scripts using JavaScript	PO – 3,5 6, 7 PSO – 1, 2, 3	Ap	F, C, P	L	P

3	Illustrate the main ideas behind JSX	PO – 3, 6, 7 PSO – 1, 2, 3	Ap	F, C, P	L	P
4	Develop interactive user interfaces using React.js.	PO – 3, 5, 6, 7 PSO – 1, 2, 3	Ap	F, C, P	L	P

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs :

	PO 1	**PO2**	**PO 3**	**PO4**	**PO 5**	**PO6**	**PO 7**	**PO 8**	**PSO 1**	**PSO2**	**PSO 3**	**PSO4**
CO 1	-	-	3	-	-	3	3	-	2	1	3	-
CO 2	-	-	3	-	1	3	3	-	2	1	3	-
CO 3	-	-	3	-	-	3	3	-	2	1	3	-
CO 4	-	-	3	-	1	3	3	-	2	1	3	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate /
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓		✓	✓
CO 2	✓		✓	✓
CO 3	✓	✓	✓	✓
CO 4	✓	✓	✓	✓

Value Added Courses

UK4VACCAP200- ETHICAL HACKING

Discipline	COMPUTER APPLICATION				
Course Code	UK4VACCAP200				
Course Title	**ETHICAL HACKING**				
Type of Course	**VAC**				
Semester	IV				
Academic Level	2				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	3	2 hours	-	2 hours	4 hours
Pre-requisites	Basic Knowledge of Malware, Types of attacks and prevention, and ethical Hacking				
Course Summary	The course aims to familiarize students with ethical hacking and its principles, covering fundamental concepts, tools, techniques, and the ethical and legal aspects of hacking practices. Throughout the course, students will gain an understanding of ethical hacking fundamentals and the associated legal and ethical considerations. associated with hacking.				

Detailed Syllabus:

Module	Unit	Content	Hrs (T+P)
I		**Introduction to Ethical Hacking**	12
	1	Define Ethical Hacking? Red Teaming, Blue Teaming ,Purple Teaming, Basic Linux Commands, OSI Layer, Encryption and Encoding, IP address classification, HTTP Methods, TCP Handshake, Cyber Kill Chain(Each step in detail) CIA Triad, AAA-Authentication ,Authorization and Accounting,Worms, viruses, Trojans, Spyware, Root kits	
	2	OWASP Top 10 (2021), MITRE Framework	
	3	Information Disclosure, Insecure Direct Object Reference (IDOR)	
	4	Recently Observed Attacks around the world- Log4j Attack, WannaCry Attack	
II		**Types of Attacks and their Common Prevention Mechanisms**	12
	5	Ransomware Attack, Keystroke Logging, Denial of Service (DoS /DDoS),Social Engineering, Phishing, Vishing, Attack cross-site scripting (XSS), cross site request forgery (CSRF/XSRF) SQL injection, input parameter manipulation, broken authentication,Broken access control, Security Misconfiguration,	
	6	Waterhole attack, brute force, Password Spray, , phishing, Eavesdropping, Man-in-the-Middle.	
	7	Click jacking, Cookie Theft, URL Obfuscation	
	8	DNS poisoning, ARP poisoning, Identity Theft,	
III		**Ethical Hacking**	12
	9	Introduction: Black Hat vs. Gray Hat vs. White Hat (Ethical) hacking, Why is Ethical hacking needed?	

	10	How is Ethical hacking different from security auditing and digital forensics?	
	11	Signing NDA.	
	12	Black box vs. White box vs. Black box	
	13	Vulnerability assessment and Penetration Testing. Difference between Vulnerability Assessment and Penetration Testing	
	14	Planning - Threat Modelling, set up security verification standards	
	15	Set up security testing plan – When, which systems/apps	
	16	understanding functionality, black/gray/white, authenticated vs. Unauthenticated	
IV	**Systems Hacking and Applications Hacking**		**12**
	17	Crawling/Spidering	
	18	**Systems hacking** – Windows and Linux –Key logging, Buffer Overflows.	
	19	Network hacking - ARP Poisoning, Password Cracking(Eg Rainbow table attack)	
	20	Wireless Attacks, MAC Spoofing, MAC Flooding.	
V	**Flexi Module: Not included in End Semester Exams**		**12**
	21	SMTP/Email-based attacks, VOIP vulnerabilities, Directory traversal, Windows Active Directory and common Attacks	
	22	Netcat Trojan, Wrapping definition, Reverse engineering.	

Practical Questions

1.) Use Google and Whois for Reconnaissance
2.) Use CrypTool to encrypt and decrypt passwords using RC4 algorithm
3.) Use Cain and Abel for cracking Windows account password using Dictionary attack and to decode wireless network passwords
4.) Run and Analyze the output of following commands in Linux – ifconfig, ping, netstat,
5.) Perform ARP Poisoning in Windows
6.) Use NMap scanner to perform port scanning of various forms – ACK, SYN, FIN, NULL, XMAS
7.) Use Wireshark (Sniffer) to capture network traffic and analyze
8.) Use Nemesy to launch DoS attack
9.) Simulate persistent cross-site scripting attack

10.)Session impersonation using Firefox and Tamper Data add-on.

Core References

1) Certified Ethical Hacker Study Guide v9, Sean-Philip Oriyano, Sybex; Study Guide Edition,2016

2) CEH official Certified Ethical Hacking Review Guide, Wiley India Edition, 2007

Additional References

1) Certified Ethical Hacker: Michael Gregg, Pearson Education,1st Edition, 2013

2) Certified Ethical Hacker: Matt Walker, TMH,2011

Web Resources

3) http://www.pentest-standard.org/index.php/PTES_Technical_Guidelines

4) https://www.owasp.org/index.php/Category:OWASP_Top_Ten_2017_Project

5) https://www.owasp.org/index.php/Mobile_Top_10_2016-Top_10

6) https://www.owasp.org/index.php/OWASP_Testing_Guide_v4_Table_of_Contents

7)https://www.owasp.org/index.php/OWASP_Secure_Coding_Practices_-_Quick_Reference_ Guide

8) https://cve.mitre.org/

9) https://access.redhat.com/blogs/766093/posts/2914051

Course Outcomes

No.	Upon completion of the course the graduate will be able to	Cognitive	PSO addressed
CO-1	Describe the ethics, legality, methodologies and techniques of hacking	U	PSO-1
CO-2	Explain the types of attacks and their common prevention mechanisms	U	PSO-1
CO-3	Apply various tools for hacking in real time machines	Ap	PSO-3
CO-4	Illustrate Systems Hacking and Applications Hacking.	Ap	PSO-1

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Credits: 2:0:1(Lecture:Tutorial:Practical)

CO No.	CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L) /Tutorial (T)	Practical (P)
CO-1	Describe the ethics, legality, methodologies and techniques of hacking	PO-6,7,8 PSO-1	U	F,C	L	-
CO-2	Explain the types of attacks and their common prevention mechanisms	PO--1,2, 6, 7 PSO-1	U	F,C	L	-
CO-3	Apply various tools for hacking in real time machines	PO-1,2,6,7,8 PSO-3	Ap	F,C,P	L	P
CO-4	Illustrate Systems Hacking and Applications Hacking.	PO-1,2,6,7,8 PSO-1	Ap	F,C	L	-

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs :

	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO 7	PO8	PSO1	PSO2	PSO3	PSO4
CO 1	-	-	-	-	-	2	2	3	2	-	-	-
CO 2	2	1	-	-	-	2	2	3	2	-	-	-

CO 3	2	3	-	-	-	2	2	3	-	-	2	-
CO 4	1	2	-	–	-	2	3	3	1	-	-	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate /
3	Substantial /

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Practical	End Semester Examinations
CO1	✓			✓
CO2	✓	✓		✓
CO3	✓			✓
CO4	✓	✓	✓	✓

UK4VACCAP201- SOFTWARE QUALITY MANAGEMENT

Discipline	Computer Application
Course Code	UK4VACCAP201
Course Title	Software Quality Management
Type of Course	**VAC**

Semester	IV				
Academic Level	2				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	3	3hours	-		3 hours
Pre-requisites	Nil				
Course Summary	In this course, Students will understand the importance of software quality management and implement metrics-driven improvement strategies. They will manage testing activities effectively and deploy continuous improvement processes and tools in software development projects to enhance efficiency and product excellence.				

Detailed Syllabus:

Module	Unit	Content	Hrs
I		***Introduction to Software Quality Management***	**9**
	1	● Definition and importance of software quality ● Quality attributes and characteristics ● Cost of quality ● Quality management principles and practices ● ISO standards for software quality	
II	**Software Metrics and Measurement,Software Inspection and Review**		**9**
	2	**Software Metrics and Measurement:** ● Metrics in software quality management ● Measurement theory and practices ● Inspection, review, and walkthrough processes ● Formal and informal review techniques	
III	**Software Testing Fundamentals & Quality Standards**		**9**

	3.1	**Software Testing Fundamentals** ● Introduction to software testing ● Testing principles and fundamentals ● Testing types and techniques ● Test planning and execution ● Overview of quality standards (e.g., CMMI, IEEE)	
IV	**Continuous Improvement and Tools**		**9**
	4	● Continuous improvement methodologies (e.g., Six Sigma, Lean, etc.) ● Process improvement frameworks (e.g., PDCA, DMAIC, etc.) ● Quality management tools and software	
V	**Flexi Module: Not to be included for end semester exams**		**9**
	5	● Understanding the role of software quality assurance (SQA) in ensuring compliance with quality standards and regulations. ● Implementing quality assurance processes and procedures to maintain compliance with industry standards (e.g., ISO, CMMI).	**9**

Core References

1. Software Engineering: A Practitioner's Approach by Roger S. Pressman
2. Software Testing: Principles and Practices by Srinivasan Desikan and Gopalaswamy Ramesh.
3. Continuous Delivery: Reliable Software Releases through Build, Test, and Deployment Automation, by Jez Humble and David Farley

Additional References

1. Lean Software Development: An Agile Toolkit by Mary Poppendieck and Tom Poppendieck.
2. Software Quality Assurance: Principles and Practice by Nina S. Godbole and Sunita S. Godbole

Web Resources

https://www.sei.cmu.edu/.

Course Outcomes

No.	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO-1	Summarize software quality management concepts, principles.	U	PSO-1
CO-2	Relate knowledge, skills, and tools necessary to implement metrics-driven quality improvement initiatives.	U	PSO-1,2
CO-3	Make use of knowledge, skills, and tools necessary to effectively plan, execute, and manage software testing activities.	Ap	PSO-2
CO4	Identify tools necessary to implement continuous improvement methodologies, process improvement frameworks.	Ap	PSO-2

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Credits: 3:0:0 (Lecture: Tutorial: Practical)

CO No.	CO	PO/PSO addressed	Cognitive Level	Knowledge Category	Lecture (L)/Tutorial (T)/Practical (P)	Practical (P)
CO-1	Summarize software quality management concepts, principles.	PO-6,7,8 PSO-1,2	U	F, C	L	
CO-2	Relate knowledge, skills, and tools necessary to implement metrics-driven quality improvement initiatives.	PO -6, 7, 8 PSO-1,2	U	F, C	L	

CO-3	Make use of knowledge, skills, and tools necessary to effectively plan, execute, and manage software testing activities.	PO -6,7,8 PSO-1,2,3	Ap	F,C,P	L	
CO-4	Identify tools necessary to implement continuous improvement methodologies, process improvement frameworks.	PO-2,6,7,8 PSO-1,2,3	Ap	F,C, P	L	

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4
CO 1	-	1	-	-	-	1	-	-	3	-	-	-
CO 2	-	1	-	-	-	1	-	-	3	1	-	-
CO 3	-	1	-	-	-	2	-	-	-	2	-	-
CO 4	-	1	-	-	-	2	-	-	-	2	-	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics:

	Internal Exam	Assignment	Seminar	End Semester Examinations
CO 1	✓		✓	✓
CO 2	✓		✓	✓
CO 3	✓	✓		✓
CO 4		✓		✓

UK4VACCAP202- ETHICAL AI AND RESPONSIBLE COMPUTING

Discipline	Computer Application				
Course Code	UK4VACCAP202				
Course Title	Ethical AI and Responsible Computing				
Type of Course	VAC				
Semester	IV				
Academic Level	2				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	3	3 hours	-	-	3 hours
Pre-requisites	None				
Course Summary	The course offers a thorough analysis of ethical issues and responsible behaviour related to computing technology and artificial intelligence. Students will study a range of ethical frameworks, rules, and norms pertaining to the creation, application, and management of artificial intelligence systems.				

Detailed Syllabus:

Module	Unit	Content	Hrs

I		**Introduction to Ethical Artificial Intelligence(AI)**	**9**
		Definitions and concepts - Historical context, Importance of ethical considerations in AI and Computing Privacy and Data Ethics - Ethical considerations in data collection, storage, and usage, Legal and regulatory frameworks for data privacy (e.g., GDPR, CCPA).	
II		**Regulation and Policy in AI**	**9**
		Overview of relevant laws and regulations governing AI technologies, Ethical implications of regulatory frameworks for AI. Case studies on legal and ethical dilemmas in AI governance, Privacy-preserving techniques in AI and computing. Ethical leadership in AI organizations, Ethical considerations in AI consulting and entrepreneurship	
III		**Ethical Leadership and Professional Responsibility**	**9**
		Responsible Computing in Practice – Introduction to Responsible Computing, Overview of responsible computing principles, Understanding the importance of responsible AI development and deployment, Corporate responsibility and AI ethics guidelines. Professional codes of conduct, Ethical responsibilities of AI researchers, developers, and practitioners.	
IV		**Emerging Ethical Challenges**	**9**
		Understanding the impact of AI on society and ethics, Privacy concerns in AI-powered surveillance systems, Ethical challenges in using AI for diagnosing and treating medical conditions Ethical implications of AI in healthcare and criminal justice.	
V		**Flexi Module : Not included for End-Semester Exams**	**9**

		International Initiatives and Collaborations in Ethical AI Emerging Standards and Guidelines for Responsible AI Discussion - Ethical challenge or dilemma in AI or computing	

TEXTBOOKS

1. Artificial Intelligence Foundations by Andrew Lowe and Steve Lawless,2021 Publication.
2. Artificial Intelligence and Software Testing by Rex Black ,2022 Publication.
3. "Ethics of Artificial Intelligence and Robotics" by Vincent C. Müller (Ed.)
4. "Artificial Intelligence: A Guide to Ethical and Human-Centred AI" by Nancy Fulda

REFERENCE

1. Eleanor Bird, Jasmin Fox-Skelly, Nicola Jenner, Ruth Larbey, Emma Weitkamp and Alan Winfield," The ethics of artificial intelligence: Issues and initiatives", EPRS | European Parliamentary Research Service Scientific Foresight Unit (STOA) PE 634.452 – March 2020.
2. Patrick Lin, Keith Abney, George A Bekey ," Robot Ethics: The Ethical and Social Implications of Robotics", The MIT Press- January 2014.
3. "Weapons of Math Destruction: How Big Data Increases Inequality and Threatens Democracy" by Cathy O'Neil
4. Relevant academic papers and articles from journals such as Ethics and Information Technology, AI & Society, etc.

WEB RESOURCES

1. https://responsiblecomputing.net
2. https://link.springer.com/journal/43681/volumes-and-issues

Course Outcomes

No.	Upon completion of the course the graduate will be able to	Cognitive	PSO addressed
CO-1	Summarize main concepts of AI with a focus on the ethical implications.	U	PSO – 1
CO-2	Identify AI governance issues and outcomes	Ap	PSO -1, 2, 3
CO-3	Explain professional codes of conduct.	U	PSO - 1,2

CO-4	Identify the ethical issues,and standards used in AI.	U	PSO - 1, 2,3

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Credits: 3:0:0 (Lecture: Tutorial: Practical)

CO No.	CO	PO/PSO	Cognitive Level	Knowledge	Lecture (L)/Tuto	Practical (P)
CO-1	Summarize main concepts of AI with a focus on the ethical	PO-6, 7, 8 /PSO-1	U	F,C	L	-
CO-2	Identify AI governance issues and outcomes	PO-1,5, 6,7, 8	U, Ap	F,C	L	-
CO-3	Apply professional codes of conduct.	PO - 6,7,8/ PSO - 1,2,3	U	F,C	L	-
CO-4	Identify the ethical issues,and standards used in AI.	PO-1, 4, 6, 7,8/	U	F,C	L	-

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs :

	PO1	PO 2	PO3	PO 4	PO5	PO6	PO7	PO8	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	-	-	-	-	-	2	2	3	3	-	-	-
CO 2	1	-	-	-	2	2	2	3	3	2	-	-
CO 3	-	-	-	-	-	2	2-	3	3	2	-	-
CO 4	1	-	-	1	-	2	2	3	3	2	-	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Seminar	End Semester Examinations
CO 1	✓	✓		✓
CO 2			✓	✓
CO 3	✓	✓		✓
CO 4		✓	✓	✓

UK4VACCAP203-PREFACE TO CYBER LAWS

Discipline	Computer Application
Course Code	UK4VACCAP203
Course Title	PREFACE TO CYBER LAWS
Type of Course	**VAC**
Semester	IV
Academic Level	2

Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	3	3 hours	-		3hours
Pre-requisites	None				
Course Summary	This course provides a comprehensive understanding of cyber law, including its scope and importance in the digital age, alongside an exploration of cyberspace and its evolution. Additionally, students gain insights into various cybercrimes, the legal implications, and the role of digital signatures and encryption in ensuring cybersecurity, while also understanding e-contracts, e-governance models, and the legal framework governing e-commerce.				

Detailed Syllabus:

Module	Unit	Content	Hrs
I		**Introduction to Cyber Law**	**9**
	1	**Understanding the Basics of Law** ● Definition of law and its significance in society. ● Different branches of law (e.g., criminal law, civil law, administrative law). ● The role of law in regulating human behavior and resolving disputes. ● Definition of cyber law and its importance in the digital age. ● Scope of cyber law: regulating activities in cyberspace, protecting digital rights, and addressing cybercrimes. ● Relationship between cyber law and traditional legal frameworks **Exploring Cyberspace** ● Definition and characteristics of cyberspace. ● Evolution of cyberspace and its impact on society. ● Key elements of cyberspace (e.g., internet, digital communication, online platforms).	
II		**IT Act.**	**9**

	2	**Understanding Jurisprudence** ● Concept of jurisprudence and its relevance to cyber law. ● Major schools of jurisprudence (e.g., natural law, legal positivism, legal realism) and their influence on legal interpretation. ● Application of jurisprudential theories in the context of cyber law. **Overview of the Indian Legal System** ● Structure of the Indian legal system: legislature, judiciary, and executive. ● Sources of law in India: constitution, statutes, case law, and customary law. ● Role of various legal institutions (e.g., Supreme Court, High Courts, District Courts) in administering justice. **Introduction to the Information Technology Act 2000** ● Background and objectives of the Information Technology Act (IT Act) 2000. ● Key provisions of the IT Act related to electronic transactions, digital signatures, and cybercrimes. ● Impact of the IT Act on India's digital economy and legal landscape. **Amendments in the IT Act** ● Evolution of the IT Act through subsequent amendments. ● Rationale behind amendments and their implications for addressing emerging challenges in cyberspace. ● Recent amendments to the IT Act and their significance in enhancing cybersecurity and protecting digital rights.	
III	**Introduction to Cyber Crimes & Offenses and Punishments**		**9**

	3	**Introduction to Cyber Crimes** ● Types of Cyber Crimes ● Overview of cybercrimes targeting individuals, institutions, and states. ● Common forms of cybercrimes: hacking, identity theft, cyberbullying, phishing, malware attacks, etc. ● Impact of cybercrimes on individuals, organizations, and national security. **Offenses and Punishments:-** ● Classification of cybercrimes based on severity and intent. ● Legal consequences for perpetrators of cybercrimes under the IT Act and other relevant statutes. ● Challenges in investigating and prosecuting cybercrimes, including jurisdictional issues and the need for international cooperation.	
IV		**Digital Signature and Encryption**	**9**
	4	● Introduction to Digital Signature and Encryption ● Concepts of public key and private key cryptography. ● Role of digital signatures in verifying the authenticity and integrity of electronic documents and transactions. ● Certification authorities: their role in issuing digital certificates and ensuring the security of digital signatures..	
V		**Flexi Module: Not included in End Semester Exams**	**9**
	5	**E-Contracting** ● Salient features of e-contracts and their advantages over traditional contracts. ● Formation of e-contracts: offer, acceptance, consideration, and legal enforceability. ● Types of e-contracts (e.g., click-wrap agreements, browse-wrap agreements) and their validity under the law. **E-Governance Models** ● Definition and objectives of e-governance. ● Different models of e-governance: G2C (government-to-citizen), G2B (government-to-business), G2G (government-to-government), and G2E (government-to-employee). **E-Commerce** ● Salient features of e-commerce and its benefits for businesses and consumers. ● Key components of an e-commerce transaction: online shopping platforms, electronic payments, and digital marketing. ● Legal and regulatory framework for e-commerce, including consumer protection laws and taxation policies.	

Course Outcomes

No.	Upon completion of the course the graduate will be able to	Cognitive	PSO addressed
CO-1	Summarize the concepts of cyberlaws and cyberspace.	U	PSO-1
CO-2	Outline Information Technology Act 2000, including its amendments,	U	PSO- 1
CO-3	Illustrate various types of cybercrimes, their legal implications.	U	PSO-1
CO4	Explain the concepts of digital signatures.	U	PSO-1

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Credits: 3:0:0 (Lecture: Tutorial: Practical)

CO No.	CO	PO/PSO addressed	Cognitive Level	Knowledge Category	Lecture (L)/Tutorial (T)/Practical (P)	Practical (P)
CO-1	Summarize the concepts of cyberlaws and cyberspace.	PSO-1 PO-6,7,8	U	F, C	L	-
CO-2	Outline Information Technology Act 2000, including its amendments,	PSO-1 PO-6,7,8	, U	F,C	L	-
CO-3	Illustrate various types of cybercrimes, their legal implications.	PSO-1 PO-6,7, 8	U	F,C	L	-

CO-4	Explain the concepts of digital signatures.	PSO-1 PO-6,7,8	U	F,C,P	L	-

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs :

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO 1	-	-	-	-	-	2	1	3-	2	-	-	-
CO 2	-	-	-	-	-	2	1	3	2	-	-	-
CO 3	-	-	-	-	-	2	1	3	2	-	-	-
CO 4	-	-	-	-	-	2	1	3	2	-	-	-

Correlation Levels:

Level	**Correlation**
-	Nil
1	Slightly / Low
2	Moderate /
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Seminar	End Semester Examinations
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓	✓		✓
CO 4	✓	✓		✓

Skill Enhancement Courses

UK4SECCAP200- Content Management

Discipline	Computer Application				
Course Code	UK4SECCAP200				
Course Title	Content Management				
Type of Course	SEC				
Semester	IV				
Academic Level	2 -				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	3	2 hours	-	2 hours	4 hours
Pre-requisites	Basic knowledge of web development, HTML, and CSS.				
Course Summary	This course provides an introduction to Content Management Systems (CMS), with WordPress as the primary focus due to its widespread usage in website development and content management. Students will gain knowledge in essential concepts, methods, and effective practices for crafting, tailoring, and overseeing content within the WordPress platform. Through practical exercises and projects, students will acquire the expertise needed to design, construct, and sustain dynamic websites tailored to diverse objectives..				

Detailed Syllabus:

Module	Unit	Content	Hrs
I		**Introduction to Content Management Systems**	12
	1	Overview of Content Management Systems (CMS)	
	2	Importance and benefits of using CMS	
	3	Types of CMS platforms: Open-source vs. Proprietary	
	4	Comparison of popular CMS platforms: WordPress, Joomla, Drupal	
II		**WordPress Fundamentals**	12
	5	Installation and setup of WordPress	
	6	Exploring the WordPress dashboard and interface	
	7	Understanding WordPress themes and templates	
	8	Customizing WordPress themes using HTML and CSS	
	9	Working with WordPress plugins for added functionality	
	10	Creating and managing user accounts and permissions	
III		**Content Creation and Management**	12
	11	Creating and publishing different types of content (posts, pages, media)	
	12	Organizing content with categories and tags	
	13	Utilizing WordPress editor for content creation and formatting	
	14	Incorporating multimedia elements (images, videos, audio) into content	
	15	Managing comments and discussions on WordPress site	
IV		**Advanced WordPress Techniques**	12
	16	Implementing custom post types and taxonomies	
	17	Introduction to theme development with WordPress	
	18	Utilizing child themes for customization without affecting core themes	
	19	Introduction to WordPress APIs for extending functionality	

	20	Optimizing WordPress site for performance and security	
V	**Flexi Module**		**12**
	21	Case Studies in WordPress Implementation	
	22	Analyzing real-world examples of websites built with WordPress	
	23	Discussing challenges faced and solutions implemented	
	24	Identifying best practices and lessons learned	
	25	Comparing WordPress with other popular CMS platforms such as Joomla and Drupal	
	26	Evaluating features, ease of use, flexibility, and scalability	
	27	Discussing use cases for different CMS platforms	

References:

1. "Professional WordPress: Design and Development" by Brad Williams, David Damstra, and Hal Stern
2. "WordPress For Dummies" by Lisa Sabin-Wilson
3. "WordPress: The Missing Manual" by Matthew MacDonald
4. "Learning WordPress: A Step by Step Tutorial to Build Your WordPress Website" by John Richards
5. WordPress Codex: https://codex.wordpress.org/
6. https://deanebarker.net/books/squirrel/

List of Experiments

1. **Installation of WordPress**
   - Installation and setup of WordPress
   - Exploring the WordPress dashboard and interface
2. **Adding a New Page:**
   - Experiment with creating a new page in WordPress.
   - Explore different page templates and formats.
3. **Customizing Themes:**
   - Experiment with changing themes in WordPress.
   - Customize colors, fonts, and layout using built-in customization options or CSS.
4. **Installing Plugins:**
   - Experiment with installing and activating different plugins.
   - Test plugins for functionality, such as SEO optimization, contact forms, or image galleries.
5. **Creating Custom Menus:**
   - Experiment with creating custom menus in WordPress.
   - Add, remove, and rearrange menu items to see how it affects site navigation.
6. **Adding Media:**

- Experiment with adding images, videos, and audio files to your WordPress site.
- Test different file formats and sizes for optimization.

7. **Managing Users:**
   - Experiment with user roles and permissions in WordPress.
   - Create new user accounts with different roles and test their capabilities.
8. **Setting up Widgets:**
   - Experiment with adding widgets to your WordPress site.
   - Test different widgets for sidebar content, footers, or custom widget areas.
9. **Creating and Managing Posts:**
   - Experiment with creating blog posts in WordPress.
   - Test different post formats, categories, and tags.
10. **SEO Optimization:**
    - Experiment with SEO plugins and techniques in WordPress.
    - Test optimizing meta titles, descriptions, and content for better search engine visibility.

Course Outcomes

No.	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO-1	Understand the fundamental concepts of Content Management Systems (CMS) and their importance in web development.	R, U	PSO 1
CO-2	Demonstrate proficiency in installing, configuring, and customizing WordPress for different website requirements.	Ap	PSO 2, 3
CO-3	Create and manage various types of content such as posts, pages, media, and menus using WordPress.	C	PSO 2, 3
CO-4	Utilize themes and plugins to enhance the functionality and design of WordPress websites.	E, C	PSO 2, 3

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Credits: 2:0:1 (Lecture:Tutorial:Practical)

CO No.	CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L)/ Tutorial (T)	Practical (P)

1	Understand the fundamental concepts of Content Management Systems (CMS) and their importance in web development.	PO 3,6.7 PSO 1	R, U	F,C	L	-
2	Demonstrate proficiency in installing, configuring, and customizing WordPress for different website requirements.	PO 3,5,6.7 PSO 2,3	Ap	F, C, M	L	P
3	Create and manage various types of content such as posts, pages, media, and menus using WordPress.	PO 3,5,6.7 PSO 2,3	C	F, C, M	L	P
4	Utilize themes and plugins to enhance the functionality and design of WordPress websites.	PO 3,5,6.7 PSO 2,3	E, C	F, C, M	L	P

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs :

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO 1	-	-	3	-	-	3	3	-	3	1	-	-
CO 2	-	-	3	-	2	3	3	-	3	2	3	-
CO 3	-	-	3	-	3	3	3	-	3	2	3	-
CO 4	-	-	3	-	3	3	3	-	3	2	3	-

Correlation Levels:

Level	**Correlation**
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓	✓		✓
CO 2	✓		✓	✓
CO 3	✓	✓	✓	✓
CO 4	✓		✓	✓

UK4SECCAP201- COMPUTER HARDWARE MAINTENANCE

Discipline	COMPUTER APPLICATION				
Course Code	UK4SECCAP201				
Course Title	Computer Hardware Maintenance				
Type of Course	SEC				
Semester	IV				
Academic Level	2				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	3	2 hours	-	2 hours	4 hours
Pre-requisites	Basic understanding of computer systems and familiarity with operating systems.				

Course Summary	The Computer Hardware Maintenance course aims to equip students with the necessary expertise to upkeep, diagnose, and rectify issues with computer hardware components. It encompasses various subjects such as hardware installation, upgrades, troubleshooting typical hardware problems, preventive maintenance methods, and safety protocols.

Detailed Syllabus:

Module	Unit	Content	Hrs
I		**Introduction to Computer Hardware**	12
	1	Overview of computer hardware components	
	2	Understanding motherboard, CPU, RAM, storage devices, network cards and peripherals for maintenance and troubleshooting	
	3	Basics of hardware architecture and compatibility	
	4	Safety precautions and best practices in handling hardware components	
II		**Hardware Installation and Upgrading**	12
	5	Installing and configuring hardware components (CPU, RAM, hard drives, optical drives and similar components)	
	6	Upgrading hardware components for performance enhancement	
	7	BIOS/UEFI settings and firmware updates	
	8	Compatibility considerations and hardware compatibility lists	
III		**Troubleshooting Hardware Issues**	12
	9	Common hardware problems and symptoms	
	10	Diagnostic tools and techniques	
	11	Hardware troubleshooting methodologies	
	12	Repair and replacement of faulty hardware components	
IV		**Preventive Maintenance and Safety**	12
	13	Importance of preventive maintenance for hardware longevity	
	14	Cleaning procedures and maintenance schedules	

	15	Thermal management and cooling solutions	
	16	Electrical safety precautions and handling electrostatic discharge	
V	**Flexi Module: Not included for End Semester Exams**		**12**
	17	Overview of emerging trends and technologies in hardware maintenance	
	18	Case studies highlighting innovative approaches to hardware troubleshooting and maintenance	
	19	Discussion on cutting-edge tools, techniques, and methodologies in the field	
	20	Practical demonstrations and hands-on exercises exploring new hardware maintenance solutions	

Reference:

1. Minas, The Complete Pc Upgrade And Maintenance Guide, Wiley India
2. C. Campbell, Computer Hardware Complete Hardware Guide | Troubleshooting | Maintenance
3. Michael Meyers, Mike Meyers, Scott Jernigan, Guide to Managing and Troubleshooting PCs, Sixth Edition, McGraw Hill Education
4. Stephen Bigelow, Troubleshooting, Maintaining & Repairing PCs, McGraw-Hill
5. https://pnsset.ac.in/public/uploads/lres-55.pdf

Assignments:

1. Research and report on the latest advancements in CPU technology.
2. Conduct a hardware compatibility test for a given set of components and prepare a compatibility report.
3. Troubleshoot and document the resolution of a hardware problem encountered in a simulated environment.
4. Create a preventive maintenance schedule for a specific type of computer hardware and justify its importance.

List of Experiments:

1. Disassembly and reassembly of a desktop computer
2. Memory module installation and troubleshooting
3. Hard drive installation and partitioning
4. CPU installation and thermal paste application
5. BIOS/UEFI configuration and firmware update
6. Peripheral device installation and configuration (e.g., printer, scanner)
7. Troubleshooting boot problems
8. Diagnosing and replacing a faulty power supply unit
9. Network card installation and configuration

10. Advanced troubleshooting of motherboard issues

Course Outcomes

No.	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO-1	Understand the fundamental principles of computer hardware components.	U	PSO 1
CO-2	Learn techniques for hardware installation, upgrading, and configuration.	R, U, Ap	PSO 2,3
CO-3	Develop skills to diagnose and troubleshoot common hardware problems.	Ap, An	PSO 2,3
CO-4	Implement preventive maintenance strategies to prolong the lifespan and optimize performance of computer	C	PSO 2,3

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Credits: 2:0:1 (Lecture:Tutorial:Practical)

CO No.	CO	PO/ PSO	Cognitive Level	Knowledge Category	Lecture (L)/Tutorial (T)	Practical (P)
CO-1	Understand the fundamental principles of computer hardware components.	PO 7 PSO 1	U	F,C	L	P
CO-2	Learn techniques for hardware installation, upgrading, and configuration.	PO 3,6,7 PSO 1,2,3	R, U, Ap	F, C, M	L	P
CO-3	Develop skills to diagnose and troubleshoot common hardware problems.	PO 3,6,7 PSO 1,2,3	Ap, An	F, C, M	L	P

CO-4	Implement preventive maintenance strategies to prolong the lifespan and optimize performance of computer hardware.	PO 3,6,7 PSO 1,2,3	C	F, C, M	L	P

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs :

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO 1	-	-	-	-	-	-	3	-	3	-	-	-
CO 2	-	-	3	-	-	3	3	-	3	2	3	-
CO 3	-	-	3	-	-	3	3	-	3	2	3	-
CO 4	-	-	3	-	-	3	3	-	3	2	3	-

Correlation Levels:

Level	**Correlation**
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Assignment/ Seminar
- Midterm Exam
- Lab Assignments
- Final Exam

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓	✓		✓

CO 2	✓		✓	✓
CO 3	✓	✓	✓	✓
CO 4	✓		✓	✓

UK4SECCAP202 - ANDROID PROGRAMMING USING KOTLIN

Discipline	COMPUTER APPLICATION				
Course Code	UK4SECCAP202				
Course Title	Android Programming Using Kotlin				
Type of Course	SEC				
Semester	IV				
Academic Level	2				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/ Week
	3	3 hours	-		3
Pre-requisites	Basic Computer Knowledge				

Course Summary	This course will help to start from scratch and to become a medium level android app developer using Kotlin

Module	Kotlin Overview	Hrs
1	otlin overview, Android Eco system, Basic Programming terms: Package, lass, Object, Object Oriented Programming, Function or Method, rgument/Parameter; Environment setup in Android studio Kotlin: stalling JDK, Installing Android Studio, Creating new project in android udio, Android studio interface	15

Module	Content	Hrs
2	Fundamentals of Kotlin: First Kotlin Program, Variables, Data ypes, Type Conversions, Arrays , Array list,Set,Map; Operators in Kotlin:Arithmetic, Assignment, Unary, Equality and Relational Operators, Conditional Operators Operator precedence in Kotlin, the rangeTo() function and in operator, Console input;Control low Statements in Kotlin: If ..Else, If Else….If Ladder ,Nested If ;Loops in Kotlin: For and For Each Loop,Do-While Loop	15

Module	Content	Hrs

3	Functions in Kotlin: Declarations and Calling of Functions, Function Types, Function Return types ; Object Oriented Programming: Object and Class in Kotlin,Access Modifiers, Constructor, Encapsulation, Inheritance, Function Overriding, Abstract Classes,Interfaces	15

Module	Introduction to Android App Development	Hrs
4	ıtroduction to Android App Development: Installing Android Virtual Device, Enabling Virtualization, Installing Genymotion Emulator , General Information about Gradle Build system, Manifest File in Android app development , Introduction to Resources(Strings ,Drawables); Android Components: Layouts, Constraint Layouts, Text view, Image view…;User teractions in Android app development: Toast Messages, Snackbar Message, Dialog Message;Lists and views; Intent and Life Cycles, Shared Preferences and Data Saving	15

Module	Content	Hrs
5	Device Compatibility in android app development,Publishing the app on Google Play, Project: Android app development	15

Reference Texts

1. Kotlin in-Depth, Aleksei Sedunov, bpb Publications 2-nd Ed
2. Android Application Development with Kotlin
3. Hardik Trivedi, bpb Publications
4. Head First Kotlin: A Brain-Friendly Guide
5. Dawn Griffiths O′Reilly Publications

Course Outcomes

No	Upon Completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO-1	Understand and set up the Android Eco system through Android Studio and Kotlin,	U	1
CO-2	Master the basics of Kotlin with emphasis on control structures, data types and	Ap	1
CO-3	Demonstrate comprehensive knowledge of Functions and Object Oriented Programming	Ap	1,3
CO-4	Design and develop Android applications, understanding components like layouts, user	Ap	1.3
CO-5	Publish a fully-fledged Android application on Google Play, demonstrating real-world	Ap	2.3

Name of the Course: Credits: 2:0:1(Lecture:Tutorial:Practical)

CO No.	CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L)/Tutorial (T)	Practical (P)
1	CO-1	PO - 6,7 PSO - 1	U	F	L	-

2	CO-2	PO – 6,7,8 PSO - 1	Ap	F, C,P	L	-
3	CO-3	PO – 6,7,8 PSO-1,3	U	**F,C**	**L**	**-**
4	CO-4	PO - 6,7,8 PSO-1,3	An	**F**	**L**	**-**
5	CO-5	PO-7,8 PSO-2,3	Ap,C			

Correlation Level

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

§ Quiz / Assignment/Discussion / Seminar

§ Midterm Exam

§ Final Exam

Mapping of COs to Assessment Rubrics

	Internal Exam	Assignment	Discussion / Seminar	End Semester Examinations
CO 1	✓	✓		✓

CO 2	✓		✓	✓
CO 3	✓	✓	✓	✓
CO 4	✓		✓	✓

UK4INTCAP200	SUMMER INTERNSHIP	CREDITS : 2

Student can start doing a Minor Project along with the summer internship, for which he can gain additional 2 credits . The students submit a project report as per the regulations of the University.

SEMESTER 5

Discipline Specific Core			
UK5DSCCAP300	PHP and MySQL	**4**	**3T+2P**
UK5DSCCAP301	Computer Network	**4**	**3T+2P**
UK5DSCCAP302	Artificial Intelligence	**4**	**3T+2P**
UK5DSCCAP303	Operating system	**4**	**3T+2P**
UK5DSCCAP304	Software Project Management	**4**	**3T+2P**
UK5DSCCAP305	Java Programming	**4**	**3T+2P**
Discipline Specific Elective (Can Select Two)			
UK5DSECAP300	Cryptography and Network Security	**4**	**4T**
UK5DSECAP301	Cyber Forensics	**4**	**4T**
UK5DSECAP302	Data Mining	**4**	**3T+2P**
UK5DSECAP303	Data Visualisation	**4**	**4T**
UK5DSECAP304	Introduction to Machine Learning Using Python	**4**	**3T+2P**
UK5DSECAP305	Artificial Neural Networks	**4**	**3T+2P**
UK5DSECAP306	PHP And MySQL	**4**	**3T+2P**
UK5DSECAP307	Web Application Development using Django	**4**	**3T+2P**
Skill Enhancement Course (Can Select One)			
UK5SECCAP300	Data Analysis Using Excel	**3**	**2T+2P**
UK5SECCAP301	Software Testing	**3**	**2T+2P**
UK5SECCAP302	Web Application Development	**3**	**2T+2P**
UK5SECCAP303	Object Oriented Analysis and Design	**3**	**2T+2P**

Discipline Specific Core Courses

UK5DSCCAP300-PHP AND MYSQL

Discipline	COMPUTER APPLICATION				
Course Code	UK5DSCCAP300				
Course Title	PHP AND MYSQL				
Type of Course	**DSC**				
Semester	V				
Academic Level	3				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	3 hours	-	2 hours	5 hours
Pre-requisites	Basic awareness of concepts on database, data storage, retrieval as well as OOPS concepts				
Course Summary	This course on PHP and MySQL typically covers the fundamentals of web development using PHP programming language for server-side scripting and MySQL for database management.				

Detailed Syllabus:

Module	Unit	Content	Hrs(L+P)
I	**INTRODUCTION TO PHP**		**15 hrs**
	1	Overview of PHP, Benefits, and drawbacks of running PHP as a Server-Side Script. PHP Language Basics: The building blocks of PHP: variables, global & super global.	
	2	Data types: Set type, typecasting, test type, Operators & Expressions,	

		and Flow control functions in PHP.	
	3	Functions: Defining a function, variable scope, calling a function returning values, setting default values for arguments, passing variable reference, built-in functions.	
II		**ARRAYS AND OOP**	**15 hrs**
	5	Arrays: Creating arrays (associative & multidimensional), Array related functions. Working with string functions: Formatting strings, Using Date and Time functions. working with files and directories.	
III		**FORMS**	**15 hrs**
	9	Creating a Simple Input Form, Accessing Form Input with User-Defined Arrays, and Combining HTML and PHP Code on a Single Page, Using Hidden Fields to Save State, Redirecting the User, Sending Mail on Form Submission, Creating the Form. Creating the Script to Send the Mail, Concepts File Uploads	
	10	Cookies: Introduction, different types of cookies, setting a cookie with PHP, deleting a cookie, session function overview: starting a session, working with session variables, passing session IDs in the query string, destroying sessions & un-setting variables, Working with images.	
IV		**MYSQL**	**15 hrs**
	18	Database concepts: Open-source database software: MySQL features MySQL data types: Numeric, date & time, string Table creation in MySQL: insert, select, where clause, ordering the result, like operator Selecting Multiple tables: using join, using queries Modifying records: update command, replace command, delete command date & time functions in MySQL.	
	19	Interacting with MySQL using PHP: Connecting to MYSQL, executing queries, retrieving error messages, inserting data with PHP, retrieving data with PHP.	
V		**Flexi Module: Not included for end semester exams**	**15 hrs**
	23	Design a website using HTML and PHP	

	24	Super global variables and its usage	

LAB WORK(30 Hours)

Setup WAMP/XAMPP Server or Setup Apache, MySQL, and PHP separately in your PHP Lab. The
laboratory work will consist of 15-20 Experiments.

PART A

- Write, test, and debug simple PHP programs.
- Familiarize the use of Conditional Statements.
- Programs with Loops.
- Programs to handle Strings.

PART B

- Implement programs with Functions, Arrays & Images.
- Read and write data from/to files in PHP.
- Programs to demonstrate OOP concepts.
- Programs to handle forms in PHP.
- Programs to interact with MySQL using PHP.

Textbook

Meloni, J. C. *Sams teach yourself PHP, MySQL and Apache all in one*.

References books

Holzner, S. *Complete Reference PHP*.
Vaswani, V. *MySQL (LM): The complete reference*. McGraw-Hill Education, Indian Edition

Web resources

W3schools.com
https://www.w3schools.com/php/php_oop_what_is.asp.
NPTEL COURSE
https://onlinecourses.swayam2.ac.in/aic20_sp32/preview

Course Outcomes

No.	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO1	Discuss features, Basics and building blocks of PHP	U	PSO-1,2
CO2	Restate object object-oriented paradigm	U	PSO-1,2

CO3	Employ web designing and integrate it with PHP	Ap	PSO-1,2,3
CO4	Develop skills to manage front end and back end.	Ap	PSO-1,2,3

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Credits: 3:0:1 (Lecture:Tutorial:Practical)

CO No.	**CO**	**PO/PSO**	**Cognitive Level**	**Knowledge Category**	**Lecture (L)/Tutorial (T)**	**Practical (P)**
1	Discuss features, Basics and building blocks of PHP	PO-2,6,7 PSO-1,2	U	F, C,P	L	P
2	Restate object object-oriented paradigm	PO-2,6 PSO-1,2	U	F,C,P	L	P
3	Employ web designing and integrate it with PHP	PO-1,2,3,5,6,7 PSO-1,2,3	Ap	F,C,P	L	P
4	Develop skills to manage front end and back end.	PO-1,2,3,5,6,7 PSO-1,2,3	Ap	F,C,P	L	P

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs :

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO 1	-	1	-	-	-	2	2	-	3	2	-	-

CO 2	-	2	-	-	-	2	-	-	3	2	-	-
CO 3	2	2	3	-	2	2	2	-	3	2	3	-
CO 4	2	2	3	-	2	2	2	-	3	2	3	

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics :

	Internal	**Assignment**	**Lab work evaluation**	**End Semester**
CO 1	✓		✓	✓
CO 2	✓		✓	✓
CO 3	✓	✓	✓	✓
CO 4	✓	✓	✓	✓

UK5DSCCAP301- COMPUTER NETWORKS

Discipline	COMPUTER APPLICATION
Course Code	UK5DSCCAP301

Course Title	Computer Networks				
Type of Course	**DSC**				
Semester	V				
Academic Level	3				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	3 hours	-	2	5 hours
Pre-requisites	Basic knowledge of computers				
Course Summary	The course introduces main concepts of networking; application areas; classification, transmission environment; OSI and TCP/IP models, network technologies; network architecture, data transmission techniques, network devices, IP addressing, routing protocols, TCP, UDP and application layer protocols.				

Detailed Syllabus:

Module	Unit	Content	Hrs (L)
I	**Reference Models**		**15**
	1	Definition, Network Criteria, Network topologies, Types of connection: point-to-point and multipoint, Categories of Networks, Internet.	
	2	Reference Models : The OSI Reference Model, TCP/IP Reference Model.	
	3	The Physical Layer : Guided Transmission Media, Wireless Transmission, Communication Satellites.	
	4	Multiplexing : FDM, TDM, WDM.	
II	**Data Link Layer**		**15**
	5	Data Link Layer Design Issues : Framing, Flow Control, Error Control. Error Detection and Correction : LRC, VRC, CRC, Checksum and Hamming Code.	

	6	Stop-and-Wait Protocol, Sliding Window Protocol : Go-Back- N and Selective Repeat.	
	7	Multiple Access : ALOHA, CSMA, CSMA/CD. LAN Standards: Ethernet, Token bus, Token ring.	
	8	Network Devices : Repeater, Bridge, Hub, Switch, Router, Gateway.	
III	**Network and Transport Layer**		**15**
	9	Routing, Types of Routing, Routing Algorithms : Shortest Path Algorithm, Flooding, Distance Vector Routing, Link State Routing, Hierarchical Routing.	
	10	Elements of Transport Protocols, Congestion Control : Leaky Bucket Algorithm and Token Bucket Algorithm.	
	11	Transport Layer Protocols : TCP and UDP, Comparison of TCP and UDP.	
	12	Switching Techniques - Circuit, Packet, Message Switching.	
IV	**Application Layer**		**15**
	13	Content Delivery : Content and Internet Traffic, Server Farms and Web Proxies, Content Delivery Networks.	
	14	Streaming Audio and Video : Digital Audio, Digital Video, Streaming Stored Media, Streaming Live Media.	
	15	Application Layer Protocols- HTTP, HTTPS, DNS, File Transfer Protocol (FTP)	
V		**Flexi Module : Not Included for End Semester Exams**	**15**
	16	Session Layer : Functions of Session Layer, Session Management. Presentation Layer : Encryption, Decryption, Compression and Decompression.	
	17	Routing Protocols : OSPF and BGP.	
	18	Delay Tolerant Networking : DTN Architecture, The Bundle Protocol.	

Lab Experiments:

1. Understand the network settings of a computer.
2. Understand the function ipoconfig.
3. Understand basic network connectivity using the ping utility.

4. Configure IP address of a system.
5. Measure the bandwidth between two computers on a network.
6. Set up a simple HTTP server and access web pages over the network.
7. Configure and test DHCP (Dynamic Host Configuration Protocol).
8. Set up and configure a simple wireless network.

References

1. Andrew S Tanenbaum and David J Wetherall, "Computer Networks", Fifth Edition, Pearson.
2. Behrouz A Forouzan, "Data Communications and Networking", Fourth Edition, McGraw Hill.
3. Achyut S Godbole, "Data communications and networks", Second Edition, McGrawHill.

Course Outcomes

No.	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO-1	Infer basics of Computer Networks and the role of network reference models.	U	PSO-1
CO-2	Demonstrate error detection, error control and flow control in the data link layer.	U	PSO-1, 2
CO-3	Explore the different protocols used in network and transport layer	U	PSO-1, 2
CO-4	Summarize the features and operations of various application layer protocols.	U	PSO-1,2,3

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Credits: 4:0:0 (Lecture:Tutorial:Practical)

CO No.	CO	PO/ PSO	Cognitive Level	Knowledge Category	Lecture (L)/ Tutorial (T)	Practical (P)

CO-1	Infer basics of Computer Networks and the role of network reference models.	PO-6, 7 PSO-1	U	F, C	L	-
CO-2	Demonstrate error detection, error control and flow control in the data link layer.	PO-1, 2, 6, 7 PSO-1, 2	U	F, C	L	-
CO-3	Explore the different protocols used in network and transport layer	PO-1, 2, 5, 6, 7 PSO-1, 2	U	F, C	L	-
CO-4	Summarize the features and operations of various application layer protocols.	PO-1, 5, 6, 7 PSO-1, 2	U	F, C	L	-

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO 7	PO8	PSO1	PSO2	PSO3	PSO4
CO 1	-	-	-	-	-	1	1	-	3	-	-	-
CO 2	1	1	-	-	-	1	1	-	3	1	-	-
CO 3	1	2	-	-	2	1	1	-	3	1	-	-
CO 4	1	-	-	-	2	1	1	-	3	1	-	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Final Exam

Mapping of COs to Assessment Rubrics:

	Internal Exam	Assignment	Seminar	End Semester Examination
CO 1	✓			✓
CO 2	✓	✓		✓
CO 3	✓		✓	✓
CO 4	✓	✓	✓	✓

UK5DSCCAP302- ARTIFICIAL INTELLIGENCE

Discipline	COMPUTER APPLICATION				
Course Code	UK5DSCCAP302				
Course Title	ARTIFICIAL INTELLIGENCE				
Type of Course	**DSC**				
Semester	V				
Academic Level	3				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	4 hours	-	-	4 hours
Pre-requisites	Awareness in Knowledge representation and reasoning is desirable				
Course Summary	This course aims to give students a brief idea about Artificial Intelligence and its associated concepts and applications.				

Detailed Syllabus:

Module	Unit	Content	Hrs (L)

I	**Introduction to Artificial Intelligence**		**12**
	1	What is Artificial Intelligence	
	2	Foundations and History of Artificial Intelligence	
	3	Applications of Artificial Intelligence	
	4	Intelligent Agents	
	5	Structure of Intelligent Agents	
	Search Strategies		
	6	Introduction to Search	
	7	Searching for solutions	
	8	Uninformed search strategies (Breadth First Search, Depth First Search, Depth Limited Search, Uniform Cost Search)	
	9	Informed search strategies (Best First Search, A*, Hill Climbing)	
	10	Local search algorithms and optimistic problems (Travelling Salesman Problem)	
	11	Adversarial Search (Algorithms not needed)	
	12	Current-best-hypothesis search (only basic concept & list of applications)	
II	**Knowledge Representation & Reasoning**		**12**
	13	Overview of Inference, Propositional & Predicate Logic	
	14	Logical Reasoning	
	15	Forward & Backward Chaining	
	16	Resolution	
	17	AI languages and tools – CLIPS	
III	**Problem Solving**		**12**
	18	Formulating problems	
	19	Problem Types	
	20	Solving Problems by Searching	
	21	Heuristic search techniques	
	22	Constraint satisfaction problems (Only basic concepts)	

	23	Stochastic search methods (Simulated Annealing, Genetic Algorithms)	
IV	**Learning**		**12**
	24	Overview of different forms of learning	
	25	Decision trees	
	26	Rule-based learning	
	27	Neural networks	
	28	Reinforcement learning	
V		**Flexi Module: Not include in End Semester Exams**	**12**
	29	Comparative study of various searching strategies, Introduction to latest AI Tools, Some recent applications of Learning Techniques and its uses	

Text Books

- Stuart Russell, Peter Norvig, "Artificial Intelligence – A Modern Approach", Fourth Edition, Pearson Education

References

- Elaine Rich and Kevin Knight, "Artificial Intelligence", McGraw-Hill
- E Charniak and D McDermott, "Introduction to Artificial Intelligence", Pearson

Course Outcomes

No.	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO1	Infer basic ideas about Artificial Intelligence (AI) and Intelligent Agents	U	PSO – 1
CO2	Demonstrate the different searching techniques practised in AI	Ap	PSO - 1, 2, 3
CO3	Use concepts of knowledge representation and reasoning in the context of AI	Ap	PSO - 1, 2
CO4	Illustrate AI Problems and different ways of problem solving	Ap	PSO - 1, 2
CO5	List major learning techniques used in AI	Ap	PSO - 1, 2

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Credits: 4:0:0 (Lecture:Tutorial:Practical)

CO No.	CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture(L)/ Tutorial(T)	Practical (P)
1	Infer basic ideas about Artificial Intelligence (AI) and Intelligent Agents	PO - 6, 7 PSO – 1	U	F, C	L	-
2	Demonstrate the different searching techniques practised in AI	PO - 1, 2, 4, 5, 6, 7 PSO - 1, 2, 3	Ap	F, C, P	L	-
3	Use concepts of knowledge representation and reasoning in the context of AI	PO - 1, 2, 6, 7 PSO - 1, 2	Ap	F, C, P, M	L	-
4	Illustrate AI Problems and different ways of problem solving	PO - 1, 2, 6, 7 PSO - 1, 2	Ap	F, C, P, M	L	-
5	List major learning techniques used in AI	PO - 1, 2, 6, 7 PSO - 1, 2	Ap	F, C, P	L	-

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4
CO1	-	-	-	-	-	2	2	-	3	-	-	-
CO2	2	1	-	2	1	2	2	-	3	2	1	-
CO3	3	2	-	-	-	2	3	-	3	2	-	-
CO4	2	3	-	-	-	2	2	-	3	2	-	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics:

	Internal Exam	Assignment	Seminar *	Quiz	End Semester Examinations
CO1	✓				✓
CO2	✓		✓		✓
CO3	✓			✓	✓
CO4	✓	✓			✓
CO5	✓	✓			✓

UK5DSCCAP303-OPERATING SYSTEM

Discipline	**COMPUTER APPLICATION**				
Course Code	UK5DSCCAP303				
Course Title	Operating System				
Type of Course	**DSC**				
Semester	V				
Academic Level	3				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	4 hours	-		4 hours
Pre-requisites	Basic Knowledge in Computer Science				
Course Summary	Provides a comprehensive exploration of fundamental concepts and practices governing modern computer operating systems. Topics include process management, memory allocation, file systems, concurrency, and deadlock handling. Through theoretical study and practical application, students gain insights into OS design principles and algorithms.				

Detailed Syllabus: OPERATING SYSTEM

Module	Unit	Content	Hrs
I		**Introduction**	**12**
	1	Introduction: What Operating System Do, Computer System Organization, Computer System Architecture.	
	2	Operating System Structure, Distributed Systems.	
	3	Operating System Services, User Operating System Interface, System Calls.	
	4	The Process, Process states, Process Control Block, Threads.	
II		**Process Management**	**12**
	5	Process Scheduling, Operations on Processes, Interprocess Communication, CPU Scheduler, Preemptive and Non-Preemptive Scheduling, Dispatcher, Scheduling Criteria.	
	6	Scheduling Algorithms: FCFS, SJF, Priority Scheduling and Round-Robin Scheduling.	
	7	Synchronization: The Critical-Section Problem, Semaphores, Monitors.	
	8	Deadlocks: Deadlock Charecterization, Methods for Handling Deadlocks, Deadlock Prevention, Avoidance, Detection and Recovery from Deadlock.	
III		**Memory Management**	**12**
	9	Memory Management Strategies: Background, Swapping,	

		Contiguous Memory Allocation.	
	10	Paging and Segmentation.	
	11	Virtual Memory Management: Background, Demand Paging, Thrashing.	
	12	Page Replacement: FIFO, LRU and Optimal Page Replacement.	
IV	**Storage Management**		**12**
	13	File System Structure, File System Implementation, File Allocation Methods.	
	14	Disk Scheduling: FCFS, SSTF, SCAN, C-SCAN and LOOK Scheduling.	
V	**Flexi Module (Not included for End Semester Examination)**		**12**
	17	Distributed Operating System: Motivation, Types of Distributed Operating Systems.	
	18	Distributed File Systems: Naming and Transparency, Remote File Access.	
	19	Real Time Systems: System Characteristics, Features of Real-Time Kernels.	

References

1. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, "Operating Systems Principles", Wiley India Edition, 2018.
2. Gary Nutt, NabenduChaki, SarmisthaNeogy, "Operating Systems", Third Edition,Pearson.
3. Andrew S Tanenbaum, Albert S Woodhull, "Operating Systems Design and Implementation", Eastern Economy Edition, PHI.

Course Outcomes

No.	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO-1	Summarize the basic functions and services of operating system.	U	PSO-1
CO-2	Compare various process scheduling methods and to demonstrate deadlock handling.	Ap	PSO-1,2
CO-3	Demonstrate the memory management techniques and page replacement algorithms	Ap	PSO-1,2
CO-4	Sketch file allocation methods and disk scheduling.	Ap	PSO-1,2

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Credits: 4:0:0 (Lecture:Tutorial:Practical)

CO No.	CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L)/Tutorial (T)	Practical (P)
CO-1	Summarize the basic functions and services of operating system.	PO-1,6,,7 PSO-1	U	F, C	L	-
CO-2	Compare various process scheduling methods and to demonstrate deadlock handling.	PO-1,6,7 PSO-1,2	Ap	F, C, P	L	-
CO-3	Demonstrate the memory management techniques and page replacement algorithms	PO-1,6,7 PSO-1,2	Ap	F,C,P	L	-
CO-4	Sketch file allocation methods and disk scheduling.	PO-1,6,7 PSO-1,2	Ap	F, C,P	L	-

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4
CO 1	1	-	-	-	-		2	-	1	2	-	-
CO 2	1	-	-	-	-	-	2	-	2	2	-	-
CO 3	1	-	-	-	-	-	2	-	2	2	-	-
CO 4	1	-	-	-	-	-	2	-	2	2	-	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Quiz	End Semester Examinations
CO 1	✓		✓	✓
CO 2	✓	✓		✓
CO 3	✓		✓	✓
CO 4	✓	✓		✓

Discipline	COMPUTER APPLICATION				
Course Code	UK5DSCCAP304				
Course Title	Software Project Management				
Type of Course	**DSC**				
Semester	V				
Academic Level	3				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	3 hours	-	2 hours	5 hours
Pre-requisites	Basic awareness in Software Development Processes is necessary				

Course Summary	This course deals with principles, steps and techniques involved in managing and enhancing success of software projects.

Detailed Syllabus:

Module	Unit	Content	Hrs
I		**Project Management**	**15**
	1	What is project? What is project Management, The role of project Manager, The Project Management profession	
	2	Project life cycle	
	3	A system view of project management- Understanding organizations, Stakeholder management	
	4	Project phases and the project life cycle, the context of information technology projects	
II		**Developing Project Schedules**	**15**
	5	Developing the project schedule- Project management software tools, Developing the project budget, Finalizing the project schedule and budget, Monitoring and controlling the project	
	6	The project communications plan- Project metrics	
	7	Reporting performance and progress	
	8	Information distribution	
III		**Risk management in Projects**	**15**
	9	Risk- Definition,	
	10	Risk management planning	
	11	Common sources of risk on information technology projects	
	12	Risk identification	
	13	Qualitative risk analysis	
	14	Quantitative risk analysis	

	15	Risk response planning	
	16	Risk monitoring and control	
	17	Using software to assist in project risk management- Jira , Asana	
IV	**Project Procurement Management**		**15**
	18	Planning purchase and acquisitions Planning contracting Requesting seller responses	
	19	Selecting sellers	
	20	Administering the contract	
	21	Closing the contract	
	22	Using software to assist in project management Outsourcing	
V	**Change management and Ethics in Projects**		**15**
	23	The nature of change The change management plan Dealing with resistance and conflict	
	24	Project leadership Ethics in projects Multicultural projects	
	25	Project implementation Administrative closure Project evaluation	

References:

1. Kathy Schwalbe, Information Technology Project Management: Thomson Publication, Cengage Learning, 8Th Edition, 2016.

2. Jack Marchewka, Information Technology Project Management providing measurable organizational value Wiley India, 5th edition, 2015.

3. Stellman& Greene, Applied software project management, SPD.

4. Richard Thayer, Edward Yourdon, Software Engineering Project Management by WILEY INDIA

Lab Exercises

- Choose a simple project or problem to solve.
- Use any Project Management Tools to develop project schedules eg, Trello, Jira, Asana, Microsoft Project, Gantt Project ,ProjectLibre etc.
- Use risk management tools to identify risks involved.
- Write a report on any risks identified.
- Develop Gantt Charts for scheduling the project

Course Outcomes

No.	Upon completion of the course the graduate will be able to	Cognitive	PSO addressed
CO-1	Outline the importance of Project Management	U	PSO-1
CO-2	Develop Project Schedules	Ap	PSO-1,3
CO-3	Identify Project risks	U	PSO-1,3
CO-4	Relate with the project procurement process	Ap	POS-1,3

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Credits: 3:0:1 (Lecture:Tutorial:Practical)

CO No.	CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L)/Tutorial (T)	Practical (P)
CO-1	Outline the importance of Project Management	PO – 6,7 PSO-1	U	F, C	L	-
CO-2	Develop Project Schedules	PO- 6,7 PSO-1,3	Ap	F, C, P	L	P

CO-3	Identify Project risks	PO-6,7 PSO-1	U	F, C, P	L	P
CO-4	Relate with the project procurement process	PO-6,7 PSO-1,3	Ap	F, C	L	-

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs :

	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4
CO 1	-	-				3	3		1	-	-	-
CO 2	-	-				3	3		2	3	-	-
CO 3	-	-				3	3		2	3	-	-
CO 4	-	-				3	3		2	2	-	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Lab Assessment	End Semester Examinations
CO 1	✓			✓
CO 2	✓		✓	✓
CO 3	✓			✓
CO 4		✓		✓

UK5DSCCAP305- PROGRAMMING IN JAVA

Discipline	COMPUTER APPLICATION				
Course Code	UK5DSCCAP305				
Course Title	PROGRAMMING IN JAVA				
Type of Course	**DSC**				
Semester	V				
Academic Level	3				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	3 hours	-	2 hours	5 hours
Pre-requisites	Basic programming skills				
Course Summary	This course is designed to provide fundamental concepts and practical applications, equipping students with the skills necessary to develop robust and efficient Java-based applications.				

Detailed Syllabus:

Module	Unit	Content	Hrs (L+P)
		Introduction to Java	

I	1	Introduction to OOPS: Paradigms of Programming Languages – Basic concepts of Object Oriented Programming – Differences between Procedure Oriented Programming and Object Oriented programming - Benefits of OOPs – Application of OOPs	15
	2	Introduction to Java, History and Features of Java, Java Virtual Machine (JVM), JDK, Java Runtime Environment, Java Bytecode	
	3	Types of Java programs, Java architecture, Program Structure, Creating and executing java programs, Comments	
	4	Java Tokens - Keywords, Identifiers, Literals, Operators; data types, variables, type conversions, expressions	
	5	Control Structures- Decision making and iteration statements, break ,continue and return statements	
	6	Array in Java: Defining an Array, Initializing & Accessing Array, Multi – Dimensional Array	
II		**Classes & Objects**	15
	7	Class and Object in Java: Class fundamentals, creation of objects, instance & static members, defining methods, method overloading, argument passing mechanism, constructors, finalize()	
	8	Inheritance: Defining inheritance –types of inheritance– Overriding methods –,super keyword, Final variables, Final classes, Final method, Abstract methods and classes – Visibility Control	
	9	Interfaces: Defining interface – Extending interface - Implementing Interface - Accessing interface variables	
	10	Strings- String class and methods	
	11	I/O Streams: File – Streams – Advantages - The stream classes – Byte streams –Character streams	
III		**Packages, Exception handling & Multithreading**	15
	12	Packages: Java API Packages , User defined packages, Creating & Accessing a Package – Adding Class to a Package – Hiding Classes	
	13	Exception Handling: Advantages of Exception Handling - Types of Errors – Basics of Exception Handling – try blocks – throwing an exception – catching an exception – finally statement	
	14	Multithreading: Creating Threads – Life cycle of a Thread – Defining &	

		Running Thread – Thread Methods – Thread Priority – Synchronization – Implementing Runnable interface	
IV	**Applets & Event Handlers**		**15**
	15	Applets: Introduction – Applet Life cycle – Creating & Executing an Applet –Applet tags in HTML – Parameter tag – Aligning the display - Graphics Class: Drawing and filling lines, Rectangles, Polygon, Circles & Arcs	
	16	AWT Components and Event Handlers: Abstract window tool kit – Event Handlers – Event Listeners – AWT Controls and Event Handling: Labels, Text Component, Buttons, Check Boxes, Layout Managers	
V	**Flexi Module: Not included for End Semester Exams**		
	17	Swing Controls - JLabel, JTextField, JTextArea, JButton,JRadioButton Java Database Connectivity - JDBC Drivers, Connectivity with MySQL	**15**

CORE TEXTS

1. E Balagurusamy, "Programming with Java – A Primer", McGraw Hill, 2017
2. Sagayaraj, Denis, Karthick and Gajalakshmi, "Java Programming for Core and advanced learners", Universities Press (INDIA) Private Limited 2018

ADDITIONAL REFERENCES

1. Herbert Schildt, "The complete reference Java", TataMc-Graw Hill, 7 th Edition.
2. Dr. K. Somasundaram, Programming in Java 2, Jaico publishing House.
3. Deitel, Java: How to Program, Pearson Education .
4. John Hubbard,Programming with Java, Schaum Outline Series, Second Edition.

PROGRAMMING IN JAVA LAB

The laboratory work will consist of 10-15 experiments

Part A

1. Testing out and interpreting a variety of simple programs to demonstrate the syntax and use of the following features of the language:
    - basic data types
    - operators & expressions

- selection and iteration statements
- jump statements
- arrays

2. **Pro**gram to demonstrate String Class and methods.

3. Programs to demonstrate Classes &Objects,Constructors.
4. Programs to demonstrate various types of Inheritances.
5. Programs to demonstrate method overloading and overriding.
6. Program to demonstrate abstract class and method.

PART B

7. Program to demonstrate Interface.
8. Program to demonstrate creation and handling of packages, their imports and Class Path.
9. Programs involving a variety of Exception Handling situations.
10. Program involving creating and handling threads.
11. Program to demonstrate File handling.
12. Programs to demonstrate Java applets.
13. Programs to demonstrate AWT controls.
14. Programs to demonstrate Event handling.
15. Programs to demonstrate Layout Managers.

Course Outcomes

No.	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO1	Discuss about the core concepts of Java	U	PSO-1,2,3
CO2	Illustrate advanced features of Java in programming context	Ap	PSO-1,2,3,4
CO-3	List Java methods in Packages, Exception Handling & Multithreading	Ap	PSO-1,2,3,4
CO-4	Summarize Applet concepts and its use in event handling	Ap	PSO-1,2,3,4

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Credits: 3:0:1 (Lecture:Tutorial:Practical)

CO No.	CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L)/Tutorial (T)	Practical (P)
1	Discuss about the core concepts of Java Language	PO - 1,2,3,6,7 PSO-1,2,3		F, C, P, M	L	P
2	Illustrate advanced features of Java in programming context	PO - 1,2,3,6,7 PSO-1,2,3,4		F, C, P, M	L	P
3	List Java methods in Packages, Exception Handling & Multithreading	PO - 1,2,3,5,6,7 PSO-1,2,3,4		F, C, P, M	L	P
4	Summarize Applet concepts and its use in event handling	PO - 1,2,3,5,6,7 PSO-1,2,3,4		F, C, P, M	L	P

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs :

	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO	PSO4
CO	2	1	2	-	-	2	2	-	1	2	2	-
CO	2	2	2	-	-	2	2	-	2	2	2	2
CO	2	2	2	-	1	2	2	-	2	2	2	2
CO	2	2	2	-	1	2	2	-	2	3	2	2

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate /
3	Substantial /

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics:

	Internal Exam	Assignment	Lab Program Evaluation	End Semester Examinations
CO 1	✓	✓	✓	✓
CO 2	✓		✓	✓
CO 3	✓		✓	✓
CO 4	✓	✓	✓	✓

Discipline Specific Elective Courses

UK5DSECAP300-CRYPTOGRAPHY AND NETWORK SECURITY

Discipline	Computer Application
Course Code	UK5DSECAP300
Course Title	Cryptography and Network Security
Type of Course	**DSE**

Semester	V				
Academic Level	3				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	4hours	-	-	4 hours
Pre-requisites	Basic knowledge in Computer Networks				
Course Summary	This course equips learners to understand the core principles of cryptography and its significance in ensuring secure communication over networks, gain proficiency in different cryptographic techniques s and to learn the concepts of digital signatures and their role in verifying the authenticity and integrity of digital documents				

Detailed Syllabus:

Module	Unit	Content	Hrs (L)
I		**Concepts of Security**	**12**
	1	Introduction, The Need for Security, Security Approaches and Principles.	
	2	Cryptography Techniques: Basic Terms, Plain Text, Cipher text, Substitution Techniques, Transposition Techniques, Fiestel Cipher.	
	3	Encryption, Decryption, Symmetric and asymmetric key Cryptography.	
	4	Steganography, Possible types of Attacks.	
II		**Cryptography**	**12**
	5	An Overview of Symmetric key Cryptography.	
	6	Data Encryption Standard (DES) and Advanced Encryption Standard(AES).	
	7	History and Overview of Asymmetric Key Cryptography.	
	8	The RSA Algorithm, Digital signatures: Digital Signature Algorithm. ElGamal Algorithm.	

III	**Public Key Infrastructure**		**12**
	9	Digital certificates, Public Key Cryptography Standard.	
	10	The PKIX Model, Transport Layer Security.	
	11	Secure Socket Layer, Crypto Currency and Bitcoin. Message Digest, SHA Algorithm.	
IV	**Authentication Mechanisms**		**12**
	18	Authentication Basics, Passwords, Biometric Authentication	
	19	Key Distribution Center, Security handshake Pitfalls, Attacks on Authentication Schemes.	
	20	Firewalls: Architecture, Generation and Types. Virtual Private Network. Email Security: PGP and S/MIME.	
V		**Flexi Module (Not included for end Semester Examination)**	
	21	**Case Study :** Cryptographic implementations using Java.	

REFERENCE

Core

- Kahate, "Cryptography and Network Security", McGrawHill
- "Cryptography and Network Security", ITL Education Solutions Limited, Pearson.

Additional

- William Stallings, "Cryptography and Network security", Pearson.
- Dr. Wm. Arthur Conklin, Dr. Gregory White, "Principles of Computer Security Sixth Edition", McGraw Hill.

Course Outcomes

No.	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO-1	Summarize the Basic Concepts of Security	U	PSO-1,2

CO-2	Compare the working and use of Cryptographic Algorithms	U	PSO-1,3
CO-3	Infer about public key infrastructure in cryptography	U	PSO-1,3
CO-4	Present the Various Authentication Systems	U	PSO-1,2,3

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Credits: 4:0:0 (Lecture:Tutorial:Practical)

CO No.	CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L)/Tutorial (T)	Practical (P)
CO-1	Summarize the Basic Concepts of Security	PO-1,7 PSO-1,2	U	F, C	L	-
CO-2	Compare the working and use of Cryptographic Algorithms	PO-1,7,8 PSO-1,3	U	F, C, P	L	-
CO-3	Infer about public key infrastructure in cryptography	PO-6,7,8 PSO-1,3	U	F,C,P	L	-
CO-4	Present the Various Authentication Systems	PO-7,8 PSO-1,2,3	U	F,C	L	-

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs :

	PO1	PO2	PO3	PO	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4
CO	1	-	-	-	-	1	2	-	1	1	-	-
CO	1	-	-	-	-	1	2	2	2	-	1	-

CO	-	-	-	-	-	1	2	1	2	-	2	-
CO	-	-	-	-	-	1	2	2	1	2	2	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments /Case Study
- Final Exam

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Quiz	End Semester Examinations
CO 1	✓		✓	✓
CO 2	✓	✓		✓
CO 3	✓		✓	✓
CO 4		✓		✓

UK5DSECAP301-CYBER FORENSICS

Discipline	**COMPUTER APPLICATION**				
Course Code	UK5DSECAP301				
Course Title	**Cyber Forensics**				
Type of Course	DSE				
Semester	V				
Academic Level	3				
Course Details	Credit	Lecture per week	Tutorial	Practical	Total Hours/Week

			per week	per week	
	4	4 hours		0	4 hours
Pre-requisites	Basic awareness of cyber crimes and cybersecurity				
Course Summary	This course in Cyber Forensics introduces the student with the concepts of digital forensics, tools, techniques, crimes and violations involved.				

Detailed Syllabus:

Module	Unit	Content	Hrs
I	**Title of the Module: Introduction**		**12**
	1	Introduction: Forensic Science, Digital Forensics, Uses of Digital Forensics, Locard's Exchange Principle, Scientific Method, Organizations of Note, Role of the Forensic Examiner in the Judicial System.	
	2	Key Technical concepts: Bits, Bytes, and Numbering Schemes; File Extensions and File Signatures; Storage and Memory; Computing Environments; Data Types; File systems.	
	3	Labs and Tools: Forensic Laboratories- Virtual Labs, Lab Security, Evidence Storage; Policies and Procedures; Quality Assurance-Tool Validation, Documentation; Digital Forensic Tools- Tool Selection, Hardware, Software; Accreditation.	
II	**Title of the Module: Network Forensics and Web Attacks**		**12**
	4	Network Forensics: Introduction, Network Forensics, Log files as Evidence	
	5	Investigating web Attacks: Introduction, Indications of web Attack, Types of Web Attacks, Overview of web logs, Investigating a web attack, Tools for web attack investigation	
III	**Title of the Module**: **Investigating Internet crime**		**12**
	6	Introduction, Internet crimes, Internet Forensics, Goals of investigation, Steps for investigating Internet crimes.	
	7	Tracking E-Mails and E-Mail crimes: Introduction, E-Mail Systems, E-mail Crime, Identity Theft, Chain E-Mails, Phishing, E-Mail Spoofing, Investigating E-mail crimes and violations, Using specialized E-mail Forensic Tools	
IV	**Title of the Module: Investigating Sexual Harassment Incidents and Child Pornography**		**12**

	8	Investigating Sexual Harassment Incidents: Case Example, Typesof Sexual Harassment, Consequences, Stalking, Compliant Procedures, Investigation process, Sexual Harassment policy, Preventive steps, Indian Law: Sexual Harassment of Women at workplace.	
	9	Investigating Child Pornography: Key terms, People's motive behind Child Pornography, Role of internet, Effects of Child Pornography on Children, Measures to prevent Dissemination of Child Pornography, Challenges in Controlling Child Pornography, Precautions before investigating Child Pornography, Steps for Investigating Child Pornography, Sources of Digital Evidence, Tools, Child's Internet Protection Act(CIPA), Anti-Child-Pornography Organizations	
V	**Flexi Module- Not included for End Semester Exams**		**12**
	10	Investigating Network Traffic, Router Forensics, Investigating DoS Attacks, Investigating Trademark and Copyright Infringement.	

LAB EXERCISES

1. Analyze file properties and extract metadata.

   Experiment: Write a Python script to extract metadata (e.g., creation date, author, file type) from a given file (e.g., image, document).

   Tools: Use Python libraries like os, exifread, pyPdf, or python-docx to extract metadata from files.

2. Recover deleted or fragmented files from disk images.

   Experiment: Write a Python script to search for file signatures within a disk image and extract recovered files to a separate folder.

   Tools: Use Python libraries like binwalk or custom scripts to perform file carving on disk images.

3. Analyze network traffic and extract relevant information from packet captures.

   Experiment: Write a Python script to read packet capture files (e.g., pcap) and extract details such as source/destination IP addresses, ports, protocols, and payloads.

   Tools: Use Python libraries like pcapy, dpkt, or scapy for reading and parsing packet capture files.

2. Analyze memory dumps for signs of malicious activity.

Experiment: Write a Python script to parse memory dump files (e.g., from volatile memory or hibernation files) and extract information such as running processes, open network connections, and loaded modules.

Tools: Use Python libraries like volatility or pymem for parsing memory dump files and performing memory analysis.

3. Analyze Windows registry hives for evidence of system activity.

Experiment: Write a Python script to parse Windows registry hive files (e.g., SAM, SYSTEM, NTUSER.DAT) and extract information such as user accounts, installed software, and recent activity.

Tools: Use Python libraries like regipy or custom scripts for parsing Windows registry hive files.

4. Extract artifacts from web browser data for forensic analysis.

Experiment: Write a Python script to parse web browser artifacts (e.g., cookies, history, bookmarks) from browser-specific files (e.g., SQLite databases) and extract relevant information.

Tools: Use Python libraries like sqlite3 for database access and custom scripts for parsing browser-specific files.

5. Analyze email messages and extract relevant information for forensic investigation.

Experiment: Write a Python script to parse email message files (e.g., EML, PST) and extract metadata (e.g., sender, recipient, subject), attachments, and content.

Tools: Use Python libraries like email.parser or pyzmail for parsing email message files.

References

1. John Sammons, "The Basics of Digital Forensics-The Primer for Getting Started in Digital Forensics", Elsevier
2. Computer Forensics: Investigating Network Intrusions and Cyber crimes, EC Council Press

Course Outcomes

No.	Upon completion of the course the graduate will be	Cognitive	PSO
CO-1	Outline the key concepts in cyber forensics.	U	PSO-1
CO-2	Summarise network forensics techniques and investigation of cyber attacks	U	PSO-1
CO-3	Explain about various kinds of Internet related crimes	U	PSO-1
CO-4	Identify various types of violations	U	PSO-1

15R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Credits: 4:0:0 (Lecture:Tutorial:Practical)

CO No.	CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L)/Tutorial (T)	Practical (P)
1	Outline the key concepts in cyber forensics.	PO-1,2,3,6,7 PSO-1	U	F, C	L	-
2	Summarise network forensics techniques and investigation of cyber attacks	PO-1,2,3,6,7 PSO-1,2	Ap	F, C	L	-
3	Explain about various kinds of Internet related crimes	PO-1,2,3,6,7 PSO-1	U	F, C	L	-
4	Identify various types of violations	PO-1,2,3,6,7,8 PSO-1	Ap	F, C	L	-

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO	PSO2	PSO3	PSO
CO 1	2	1	1	-	-	2	2	1	1	-	-	-
CO 2	2	2	1	-	-	2	2	1	2	3	-	-
CO 3	2	2	1	-	-	2	2	1	2	-	-	-
CO 4	2	2	1	-	-	2	2	2	-	-	-	3

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Internal Exam
- Final Exam

Mapping of COs to Assessment Rubrics:

	Internal Exam	Assignment	Quiz	End Semester Examinations
CO 1	✓		✓	✓
CO 2	✓		✓	✓
CO 3	✓	✓		✓
CO 4		✓		✓

UK5DSECAP302- DATA MINING

Discipline	Computer Application				
Course Code	UK5DSECAP302				
Course Title	**DATA MINING**				
Type of Course	DSE				
Semester	V				
Academic Level	3 -				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	3 hours	-	2 hours	5 hours
Pre-requisites	Nil				

Course Summary	This course, Data Mining Concepts and Techniques, introduces the student to the world of data the various methods and models used in transforming, Classifying and analysing data.

Detailed Syllabus:

Module	Unit	Content	Hrs
I	**Basics of Data Mining**		**15**
	1	Definition of data, Information and Data analysis	
	2	Fundamentals of Data Mining , Data mining s tages.	
	3	Applications of Data mining, Data Pre –processing.	
	4	Need for Pre-processing the Data, Data Cleaning.	
II	**Data Integration and Transformation**		**15**
	5	Data Reduction	
	6	Introduction to data warehouse;	
	7	Business Intelligence.	
III	**Classification Models**		**15**
	9	Classification and Prediction	
	10	Issues Regarding Classification and Prediction.	
	11	Classification by Decision Tree Induction	
	12	KNN, Bayesian Classification	
	13	Neural networks	
	14	Support VectorMachines.	
IV	**Association Rules Mining**		**15**
	15	Mining Frequent Patterns	
	16	Associations and Correlations	
	17	Efficient and Scalable Frequent Item set Mining Methods	

	18	Mining various kinds of Association Rules	
	19	From Association Mining to Correlation Analysis.	
V		**Introduction to Hadoop**	15
	20	Understanding the Hadoop	
	21	Distributed File System (HDFS) Getting Data into Hadoop	
	22	Understanding Data Processing in Hadoop	

TEXT BOOK

- Han, J., Pei, J., &Kamber, M. (2011). *Data mining: concepts and techniques*.Elsevier.

REFERECES

- Hall M, Frank E, Holmes G, P.fahringer B. Reutemann P &Witten, I.H(2009), The WEKA data mining software: an update. *ACM SIGKDD explorations newsletter*, *11*(1), 10-18.
- Gupta, G.K (2014) Introduction to Data Mining with Case Studies, 2014, Prentice Hall India.

Hands on experience:

(Using WEKA Tool/ Python)

1. Creating a table using WEKA tool
2. List all the categorical (or nominal) attributes and the real-valued attributes separately
3. Calculate: mean, median, mode
4. Demonstration of data preprocessing on dataset
5. Demonstration of data preprocessing on dataset based on missing values
6. Demonstration of Association rule process on dataset using Apriori Algorithm
7. Demonstration of classification rule process on dataset using decision tree induction
8. Demonstration of classification rule process on dataset using naive bayes algorithm
9. Demonstration of clustering rule process on dataset using various clustering methods
10. Practicing outlier detection in clustering on dataset

Course Outcomes

No.	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO1	Cite the fundamentals of data mining	U	PSO- 1,
CO2	Summarize about pre-processing techniques	U	PSO- 1,2
CO3	Illustrate the data integration, transformation and reduction techniques	Ap	PSO- 1,2,3
CO4	Experiment with classification and prediction models.	Ap	PSO- 1,2,3

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Credits: 3:0:1 (Lecture:Tutorial:Practical)

CO No.	CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L)/Tutorial (T)	Practical (P)
1	Cite thefundamentals of data mining	PO-3,6,7 PS0-1,	U	F,C.P	L	P
2	Summarize about pre-processing techniques	PO-3,6,7 PS0-1,2	U	F,C,P	L	P
3	Illustrate the data integration, transformation and reduction techniques	PO-3,5,6,7 PS0-1,2,3	Ap	F,C,P	L	P

4	Experiment with classification and prediction models.	PO-3,5,6,7 PS0-1,2,3	Ap	F,C,P	L	P

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs :

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO 1	-	-	3	-	-	3	3	-	2	1	-	-
CO 2	-	-	3	-	-	3	3	-	2	1	-	-
CO 3	-	-	3	-	1	3	3	-	2	1	2	-
CO 4	-	-	3	-	1	3	3	-	2	1	2	-

Correlation Levels:

Level	**Correlation**
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations

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

UK5DSECAP303- DATA VISUALIZATION

Discipline	COMPUTER APPLICATION				
Course Code	UK5DSECAP303				
Course Title	Data Visualization				
Type of Course	**DSE**				
Semester	VI				
Academic Level	3				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	4 hours	-		4hours
Pre-requisites	Basic Knowledge of visualization, Data and Image Models Design and Data Analysis				
Course Summary	This course helps the student to visualize data using various techniques.				

Detailed Syllabus:

Modul	Uni	Content	Hrs

e	t		
I		**Value of visualization**	**12**
	1	What is visualization? , Why create visualizations?	
	2	Conveying information to others– Telling stories with data – Data checking and verification.	
	3	Data Maps – Time series – Graphical excellence.	
II		**Data and Image Models**	**12**
	4	Visualization reference model – data: physical and abstract types– metadata, semantics.	
	5	Conceptual data – properties of images – conceptual model – relational data model – statistical data model.	
	6	Dimensions and measures – Roll-up and Drill- down	
	7	Visual encoding and sign systems - Multidimensional Data -Large design space.	
III		**Design of Visualization**	**12**
	9	Visual encodings, mapping data to image – Design criteria, expressiveness, effectiveness.	
	10	Data transformation –Presentation, titles, captions, annotations legend and grid lines- Testing designs.	
	11	Graphical integrity– Charting, Bar chart, Line chart, Dot plot, Tables	
	12	Heat-maps - Data-based grids – Multi-functioning labels	
IV		**Exploratory Data Analysis**	**12**
	13	EDA Vs Classical Data analysis – Goals of EDA	
	14	Assumptions– Data diagnostics – Statistical models into graphics	
	15	Confirmatory analysis – Hypothesis formulation	
	16	Testing procedure, significance – Graphical inference.	
V		**Flexi Module: Not Included for End Seemster Exams**	**12**
	17	Text data; documents, SMS, tweets, logs, tags	

	18	Word clouds, word trees and tagclouds	
	19	Theme visualization – Topic modeling –Seriation, Quantification	

Text Books

1. Tufte, E(2005). *Envisioning Information*, E. Tufte. Graphics Press,2005.
2. Tamara Munzner, Visualization Analysis and Design, CRC Press,2014.

References

3. Nathan Yau, Visualize This- The Flowing Data Guide to Design, Visualization, and Statistics, Wiley, 2011.
4. Scott Murray, Interactive Data Visualization for the Web, O'Reilly,2013.
5. Colin Ware, Visual Thinking for Design, Morgan Kaufman,2008.

Course Outcomes

No.	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO-1	Diffentiate between physical and abstract types	U	PSO- 1,2,3
CO-2	Understand Visualization, data maps, time series and text visualization	Ap	PSO- 1,2,3
CO-3	Apply design for visualization	Ap	PSO- 1,2,3
CO-4	Compare different data and image models	Ap	PSO- 1,2,3

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Credits: 4:0:0 (Lecture:Tutorial:Practical)

CO No.	CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L)/Tutorial	Practical (P)

					(T)	
1	Diffentiate between physical and abstract types	PO-3,6,7 PS0-1,2,3	Ap	F,C,P	L	
2	Understand Visualization, data maps, time series and text visualization	PO-3,6,7 PS0-1,2,3	Ap	F,C,P	L	
3	Apply design for visualization	PO-3,5,6,7 PS0-1,2,3	Ap	F,C,P	L	
4	Compare different data and image models	PO-3,5,6,7 PS0-1,2,3	Ap	F,C,P	L	

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs :

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO 1	-	-	3	-	-	3	3	-	2	1	2	-
CO 2	-	-	3	-	-	3	3	-	2	1	2	-
CO 3	-	-	3	-	1	3	3	-	2	1	2	-
CO 4	-	-	3	-	1	3	3	-	2	1	2	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓		✓	✓
CO 2	✓	✓	✓	✓
CO 3	✓		✓	✓
CO 4	✓	✓	✓	✓

UK5DSECAP304-INTRODUCTION TO MACHINE LEARNING USING PYTHON

Discipline	COMPUTER APPLICATION
Course Code	UK5DSECAP304
Course Title	INTRODUCTION TO MACHINE LEARNING USING PYTHON
Type of Course	DSE
Semester	V
Academic Level	3

Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	3 hours	-	2 hours	5 hours
Pre-requisites	PYTHON PROGRAMMING				
Course Summary	This course offers a comprehensive overview of machine learning fundamentals, spanning supervised, unsupervised, and reinforcement learning techniques. Students will gain practical skills in data preprocessing, visualization, and analysis using Python libraries like NumPy, Pandas, and Scikit-learn. Delving into regression and classification algorithms, including linear regression, logistic regression, and decision trees, learners will acquire the ability to interpret and predict data patterns effectively. Advanced topics explore unsupervised learning methods such as clustering and dimensionality reduction, providing students with essential tools for data analysis. Additionally, the flexi module introduces ensemble learning, neural networks, and autoencoders, paving the way for further exploration into artificial intelligence and machine learning applications.				

Detailed Syllabus:

Module	Unit	Content	Hrs (L+ P)
I	**Introduction to Machine Learning**		**15**
	1	Definition and Importance of Machine Learning:	
	2	Applications across Various Domains	
	3	Supervised Learning:-Definition and Examples, Regression vs. Classification	
	4	Unsupervised Learning:- Definition and Examples,Clustering vs. Dimensionality Reduction	
	5	Reinforcement Learning:- Definition and Examples, Agent-Environment Interaction, Exploration vs. Exploitation Tradeoff	
	6	Understanding data:- numeric variables – mean, median, mode, Measuring spread.	
	7	Introduction to NumPy, Pandas, and Scikit-learn:- Overview of their Features and Capabilities	
II	**Data Preprocessing and Visualization**		**15**
	7	Introduction to Data Preprocessing, Handling Missing Data: Imputation Techniques, Removal Strategies	

	8	Outlier Detection and Treatment: Z-score, IQR, Winsorization	
	9	Feature Scaling and Normalization: Min-Max Scaling, Z-score Normalization, Encoding Categorical Variables: One-Hot Encoding, Label Encoding	
	10	Introduction to Data Visualization:-Overview of Matplotlib and Seaborn Libraries	
	11	Basic Plot Types: Line Plot, Scatter Plot, Bar Plot, Histogram	
	12	Advanced Plot Types: Box Plot, Violin Plot, Heatmap,Multiple Subplots and Figures	
III	**Supervised Learning**		**15**
	12	Regression - Introduction, Types of Regression, Linear Regression, Multiple Linear Regression, Non-Linear Regression (Polynomial Regression)	
	13	Classification –Introduction, Logistic Regression, Decision Trees, Naïve Bayes Classification, Support Vector Machines:-Intuition and Optimization, K-Nearest Neighbours, Random Forest.	
IV	**Unsupervised Learning**		**15**
	19	Categorization of Major Clustering Methods - Partitioning Methods - K-means, K-medoids. Hierarchical Methods - Agglomerative Clustering, Density-based Methods – DBSCAN.	
	20	Principal Component Analysis (PCA):Understanding the PCA algorithm,Calculating principal components and eigenvalues,Reducing dimensionality using PCA,Interpretation of principal components,PCA implementation and applications	
	21	t-Distributed Stochastic Neighbor Embedding (t-SNE):Introduction to t-SNE algorithm,Similarities and differences between PCA and t-SNE	
V		**Flexi Module: Not included for end semester exams**	**15**
	26	Ensemble Learning: Understanding ensemble methods like bagging and boosting.	
	27	Introduction to Neural Networks: Basics of artificial neural networks (ANN), deep learning frameworks (e.g., TensorFlow).	
	28	Introduction to autoencoders,Encoding and decoding processes in autoencoders,Training autoencoders with back propagation Denoising auto encoders and variational auto encoders, Applications of autoencoders in unsupervised learning and feature learning	

References

Core:

- Introduction to Machine Learning with Python" by Andreas C. Müller & Sarah Guido
- Python Machine Learning" by Sebastian Raschka and VahidMirjalili
- Pattern Recognition and Machine Learning" by Christopher M. Bishop
- Machine Learning: A Probabilistic Perspective" by Kevin P. Murphy

Lab Exercises

1. Prepare a dataset of customer having the features date, price, product_id, quantity_purchased, serial_no, user_id,user_type, user_class, purchase_week and visualise the data with
    a. Plot diagram for Price Trends for Particular User, Price Trends for Particular User Over Time
    b. Create box plot Quantity and Week value distribution having parameters of quantity_purchased','purchase_week'
2.

3. **Task:** Conduct exploratory data analysis (EDA) on a designated dataset utilizing NumPy and Pandas.

    Description: Select a dataset of choice (e.g., Iris dataset, Titanic dataset, etc.), and load it into a Pandas DataFrame. Leverage NumPy for numerical computations. Compute the mean, median, and mode of numeric variables within the dataset. Assess the data's spread through techniques such as standard deviation, variance, and range calculations. Employ histograms and box plots to visually represent the distribution of numeric variables. Provide insights and interpretations based on the outcomes of the EDA.

4. Task: Utilize Python programming to preprocess the "Titanic" dataset.

    Description:Implement data preprocessing steps to handle missing data by employing imputation techniques or removal strategies. Detects and treats outliers using Z-score, IQR, or Winsorization methods.

5. Task: Utilize Python programming feature scaling and normalization on the "Titanic" dataset.

    Description:Perform feature scaling and normalization on relevant features, and encode categorical variables using one-hot encoding or label encoding schemes. Utilize Matplotlib and Seaborn libraries to visualize the preprocessed dataset, creating basic plots such as Line Plot, Scatter Plot, Bar Plot, and Histogram, as well as advanced plots like Box Plot, Violin Plot, and Heatmap

6. Task: Utilize Python programming visualize on the "Titanic" dataset.

    Description: Utilize Matplotlib and Seaborn libraries to visualize the preprocessed dataset, creating basic plots such as Line Plot, Scatter Plot, Bar Plot, and Histogram, as well as advanced plots like Box Plot, Violin Plot, and Heatmap

7. Task: Train regression models on the "Boston Housing" dataset to predict house prices based on various features.

Description: Utilize the "Boston Housing" dataset available in the scikit-learn library. Train a linear regression model to predict house prices using features such as area, number of bedrooms, and location. Additionally, implement multiple linear regression to predict sales revenue based on advertising spending across different channels. Explore the application of non-linear regression techniques like polynomial regression to capture more complex data patterns in the dataset. Visualize the regression results to understand the relationships between predictors and the target variable.

8. Task: Employ classification techniques on the "Titanic" dataset to predict survival outcomes based on passenger features.

   Description: Use the Titanic dataset to train a logistic regression model to predict survival outcomes based on passenger features.

9. Task: Employ classification techniques on the "MNIST dataset"

   Description: Implement a support vector machine classifier to classify handwritten digits using the MNIST dataset.

10. Task: Employ classification techniques on the "iris dataset"

    Description: Experiment with k-nearest neighbors and random forest classifiers on iris dataset and MNIST dataset and compare their performance.

11. Task: Apply K-means clustering on the "Online Retail" dataset to segment customers based on their purchasing behavior.

    Description: Utilize the "Online Retail" dataset, which contains information about customer transactions, including items purchased and their quantities. Implement K-means clustering to segment customers into distinct groups based on their purchasing patterns. Analyze the characteristics of each cluster to understand the preferences and behaviors of different customer segments. Identify potential marketing strategies tailored to each segment to enhance customer engagement and satisfaction.

    Dataset: The "Online Retail" dataset is available from the UCI Machine Learning Repository (https://archive.ics.uci.edu/ml/datasets/Online+Retail).

12. Task: Employ principal component analysis (PCA) on the "Labeled Faces in the Wild" dataset to reduce the dimensionality of facial images.

    Description: Utilize the "Labeled Faces in the Wild" dataset, which contains a collection of facial images belonging to various individuals. Implement PCA to reduce the high-dimensional feature space of facial images while preserving essential information. Visualize the principal components to gain insights into the underlying structure of the data. Reconstruct the facial images using a reduced number of dimensions to observe the effectiveness of dimensionality reduction. Analyze the reconstructed images to understand the impact of dimensionality reduction on facial image quality and interpretability.

    Dataset: The "Labeled Faces in the Wild" dataset is available from the scikit-learn library (https://scikit-learn.org/stable/modules/generated/sklearn.datasets.fetch_lfw_people.html).

Course Outcomes

No.	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO1	Summarize the definition and significance of machine learning	R	PSO – 1, 3
CO2	Cite the principles underlying supervised and unsupervised learning methods.	U	PSO – 1, 2, 3
CO3	Apply data preprocessing procedures using Python libraries to cleanse and organize datasets efficiently,	Ap	PSO – 1, 2, 3
CO4	Illustratethe effectiveness of machine learning models.	Ap	PSO – 1, 2, 3

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Credits: 3:0:1 (Lecture:Tutorial:Practical)

CO No.	CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture(L)/ Tutorial(T)	Practical (P)
1	Summarize the definition and significance of machine learning	PO- 1, 2, 3, 4, 6 PSO – 1, 3	U	F	L	P
2	Cite the principles underlying supervised and unsupervised learning methods.	PO- 1, 2, 3, 4, 6 PSO – 1, 2, 3	U	C, P	L	P
3	Apply data preprocessing procedures using Python libraries to cleanse and organize datasets efficiently,	PO- 1, 2, 3, 4, 8 PSO – 1, 2, 3,3	Ap	C, P, M	L	P
4	Illustrate the effectiveness of machine learning models.	PO- 1, 2, 3, 4, 6	Ap	P, M	L	P

		PSO – 1, 2, 3				

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4
CO1	2	2	1	1	-	2	3-	-	2	2	2	-
CO2	3	3	2	1	-	3	3-	-	3	3	2	-
CO3	3	3	2	2	-	3	3	3	3	3	2	-
CO4	3	3	2	2	-	2	3	-	3	3	2	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics:

	Internal Exam	Assignment	Lab Assessment	End Semester Examinations
CO1	✓		✓	✓
CO2	✓	✓	✓	✓
CO3	✓		✓	✓
CO4	✓	✓	✓	✓

UK5DSECAP305- ARTIFICIAL NEURAL NETWORK

Discipline	COMPUTER APPLICATION				
Course Code	UK5DSECAP305				
Course Title	ARTIFICIAL NEURAL NETWORK				
Type of Course	DSE				
Semester	V				
Academic Level	3				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	3 hours	-	2 hours	5 hours
Pre-requisites	Knowledge in Artificial Intelligence is desirable.				
Course Summary	This course provides a comprehensive introduction to artificial neural networks (ANNs), a fundamental concept in machine learning inspired by the structure and function of the human brain. Students will learn about the basic principles, architectures, learning algorithms, and applications of ANNs through lectures, hands-on exercises.				

Detailed Syllabus:

Module	Unit	Content	Hrs (L+

			P)
I	**Introduction**		**15**
	1	Introduction,Why neural network?, Research History, Biological Neuron model, Artificial Neuron model, Notations, Neuron equation.	
	2	Model of Artificial Neuron: Artificial neuron - basic elements, Activation functions – Threshold function, Piecewise linear function, Sigmoidal function, Example	
II	**Neural Network Architectures**		**15**
	3	Neural Network Architectures: Single layer Feed-forward network, Multi layer Feed-forward network, Recurrent networks.	
	4	Learning Methods in Neural Networks- Learning algorithms: Unsupervised Learning - Hebbian Learning, Competitive learning; Supervised Learning : Stochastic learning, Grant descent learning; Reinforced Learning.	
III	**Taxonomy Of Neural Network Systems**		**15**
	5	Popular neural network systems; Classification of neural network systems with respect to learning methods and architecture types.	
	6	Single-Layer NN System Single layer perceptron : Learning algorithm for training Perceptron, Linearly separable task, XOR Problem; ADAptiveLINear Element (ADALINE) : Architecture, Training.	
	7	Multilayer Perceptrons: Introduction, Some Preliminaries, Batch Learning and On-Line Learning, The Back-Propagation Algorithm, XOR Problem.	
IV	**Self Organizing Maps**		**15**
	8	Introduction; Two basic feature-mapping models; SOM: Competitive process, Cooperative process, Adaptive process; Summary of SOM Algorithm; Properties of feature map.	
	9	Kohonen Self Organizing Maps: Architecture, Algorithm, Application.	
V		**Flexi Module: Not included for end semester exams**	**15**
	10	Applications of Artificial Neural Networks: Pattern Recognition, Medicine, Speech Production, Speech Recognition, Business.	
	11	Deep Neural Networks (Basic Concepts only)	

References

Core:

1. Simon Haykin, “Neural Networks and Learning Machines” , Pearson Prentice Hall, Third Edition.
2. LaureneFausett, “Fundamentals of Neural Networks Architectures, Algorithms and Applications”, Pearson Education India, 2004.

Lab Exercises

1. Implement AND problem.
2. Implement XOR problem.
3. Single-Layer Perceptron Implementation
    a. Implement a single-layer perceptron in a programming language of choice (Python recommended).
    b. Train the perceptron on a binary classification task using a simple dataset.
    c. Visualize the decision boundary and analyze the perceptron's performance.
4. Multi-Layer Perceptron (MLP) Demonstration:
    a. Develop a multi-layer perceptron (MLP)
    b. Train the MLP on a dataset such as MNIST for handwritten digit classification.
    c. Experiment with different architectures, activation functions, and optimization algorithms to optimize performance.
5. Implement Self organizing maps.
6. Implement applications using Neural Network.

Course Outcomes

No.	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO1	Outline neural network fundamentals.	U	PSO – 1, 3
CO2	Demonstrate neural network architectures.	Ap	PSO – 1, 2, 3
CO3	Experiment various learning methods	Ap	PSO – 1, 2, 3
CO4	Sketch the features and applications of SOM	Ap	PSO – 1, 2, 3

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Credits: 3:0:1 (Lecture:Tutorial:Practical)

CO	CO	PO/PSO	Cognitive	Knowledge	Lecture(L)/	Practical

No.			Level	Category	Tutorial(T)	(P)
1	Outline neural network fundamentals.	PO- 6, 7 PSO – 1, 3	U	F, C	L	P
2	Demonstrate neural network architectures.	PO- 1, 6, 7 PSO – 1, 2, 3	Ap	F, C, P	L	P
3	Experiment various learning methods	PO- 1, 6,7 PSO – 1, 2, 3	Ap	F, C,P	L	P
4	Sketch the features and applications of SOM	PO- 1, 2, 3, 4, 6 PSO – 1, 2, 3	Ap	F, C, P	L	P

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4
CO1	-	-	-	-	-	3	3-	-	2	-	2	
CO2	1	-	-	-	-	3	3-	-	3	3	3	
CO3	1	-	-	-	-	3	3	3	3	3	3	
CO4	1	-	-	-	-	2	3	-	3	3	3	

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics:

	Internal Exam	Assignment	Lab Assessment	End Semester Examinations
CO1	✓		✓	✓
CO2	✓	✓	✓	✓
CO3	✓		✓	✓
CO4	✓	✓	✓	✓

UK5DSECAP306- PHP AND MYSQL

Discipline	COMPUTER APPLICATION
Course Code	UK5DSECAP306
Course Title	PHP AND MYSQL
Type of Course	**DSE**
Semester	V
Academic Level	3

Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	3 hours	-	2 hours	5 hours
Pre-requisites	Basic awareness of concepts on database, data storage, retrieval as well as OOPS concepts				
Course Summary	This course on PHP and MySQL typically covers the fundamentals of web development using PHP programming language for server-side scripting and MySQL for database management.				

Detailed Syllabus:

Module	Unit	Content	Hrs(L+P)
I	**INTRODUCTION TO PHP**		**15 hrs**
	1	Overview of PHP, Benefits, and drawbacks of running PHP as a Server-Side Script. PHP Language Basics: The building blocks of PHP: variables, global & super global.	
	2	Data types: Set type, typecasting, test type, Operators & Expressions, and Flow control functions in PHP.	
	3	Functions: Defining a function, variable scope, calling a function returning values, setting default values for arguments, passing variable reference, built-in functions.	
II	**ARRAYS AND OOP**		**15 hrs**
	5	Arrays: Creating arrays (associative & multidimensional), Array related functions. Working with string functions: Formatting strings, Using Date and Time functions. working with files and directories.	
III	**FORMS**		**15 hrs**

	9	Creating a Simple Input Form, Accessing Form Input with User-Defined Arrays, and Combining HTML and PHP Code on a Single Page, Using Hidden Fields to Save State,Redirecting the User, Sending Mail on Form Submission, Creating the Form. Creating the Script to Send the Mail, Concepts File Uploads	
	10	Cookies: Introduction, different types of cookies, setting a cookie with PHP, deleting a cookie, session function overview: starting a session, working with session variables, passing session IDs in the query string, destroying sessions & un-setting variables, Working with images.	
IV		**MYSQL**	**15 hrs**
	18	Database concepts: Open-source database software: MySQL features MySQL data types: Numeric, date & time, string Table creation in MySQL: insert, select, where clause, ordering the result, like operator Selecting Multiple tables: using join, using queries Modifying records: update command, replace command, delete command date & time functions in MySQL.	
	19	Interacting with MySQL using PHP: Connecting to MYSQL, executing queries, retrieving error messages, inserting data with PHP, retrieving data with PHP.	
V		**Flexi Module: Not included for end semester exams**	**15 hrs**
	23	Design a website using HTML and PHP	
	24	Super global variables and its usage	

LAB WORK(30 Hours)

Setup WAMP/XAMPP Server or Setup Apache, MySQL, and PHP separately in your PHP Lab. The laboratory work will consist of 15-20 Experiments.

PART A

- Write, test, and debug simple PHP programs.
- Familiarize the use of Conditional Statements.
- Programs with Loops.
- Programs to handle Strings.

PART B

- Implement programs with Functions, Arrays & Images.
- Read and write data from/to files in PHP.
- Programs to demonstrate OOP concepts.
- Programs to handle forms in PHP.

● Programs to interact with MySQL using PHP.

Textbook

Meloni, J. C. *Sams teach yourself PHP, MySQL and Apache all in one*.

References books

Holzner, S. *Complete Reference PHP*.

Vaswani, V. *MySQL (LM): The complete reference*. McGraw-Hill Education, Indian Edition

Web resources

W3schools.com

https://www.w3schools.com/php/php_oop_what_is.asp.

NPTEL COURSE

https://onlinecourses.swayam2.ac.in/aic20_sp32/preview

Course Outcomes

No.	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO1	Discuss features, Basics and building blocks of PHP	U	PSO-1,2
CO2	Restate object object-oriented paradigm	U	PSO-1,2
CO3	Employ web designing and integrate it with PHP	Ap	PSO-1,2,3
CO4	Develop skills to manage front end and back end.	Ap	PSO-1,2,3

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Credits: 3:0:1 (Lecture:Tutorial:Practical)

CO No.	CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L)/Tutorial (T)	Practical (P)
1	Discuss features, Basics and building blocks of PHP	PO-2,6,7 PSO-1,2	U	F, C,P	L	P
2	Restate object object-	PO-2,6	U	F,C,P	L	P

	oriented paradigm	PSO-1,2				
3	Employ web designing and integrate it with PHP	PO-1,2,3,5,6,7 PSO-1,2,3	Ap	F,C,P	L	P
4	Develop skills to manage front end and back end.	PO-1,2,3,5,6,7 PSO-1,2,3	Ap	F,C,P	L	P

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs :

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PSO1**	**PSO 2**	**PSO3**	**PSO4**
CO 1	-	1	-	-	-	2	2	-	3	2	-	-
CO 2	-	2	-	-	-	2	-	-	3	2	-	-
CO 3	2	2	3	-	2	2	2	-	3	2	3	-
CO 4	2	2	3	-	2	2	2	-	3	2	3	

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics :

	Internal Exam	**Assignment(**	**Lab work evaluation**	**End Semester Examinations(**
CO 1	✓		✓	✓
CO 2	✓		✓	✓

CO 3	✓	✓	✓	✓
CO 4	✓	✓	✓	✓

UK5DSECAP307- WEB APPLICATION DEVELOPMENT

Discipline	Computer Applications				
Course Code	UK5DSECAP307				
Course Title	Web Application Development Using Django				
Type of Course	DSE				
Semester	V				
Academic Level	3				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	3 hours	-	2 hours	5 hours
Pre-requisites	Basic understanding of programming concepts (variables, data types, control structures) Familiarity with HTML, CSS, and JavaScript				
Course Summary	This course introduces students to the fundamentals of web application development using Django, a high-level Python web framework. Students will learn how to design, develop, and deploy dynamic web applications.				

Detailed Syllabus:

Module	Unit	Content	Hrs
I		**Introduction to Web Development**	**15**
	1	Overview of web development concepts	
	2	Introduction to Django framework	
	3	Setting up development environment	
	4	Basic HTML, CSS, and JavaScript concepts	

	5	Role of Django in creating web applications	
II	**Introduction to Django**		**15**
	6	Installing Django	
	7	Creating a Django project	
	8	Understanding Django apps	
	9	URL routing in Django	
	10	Basic views and templates in Django	
III	**Models and Views in Django**		**15**
	11	Introduction to Django models	
	12	Defining models and relationships	
	13	Querying the database with Django ORM	
	14	Class-based views in Django	
	15	Using templates to render dynamic content	
IV	**Development Using Django**		**15**
	16	User authentication and authorization	
	17	Handling forms in Django	
	18	Working with static files and media	
	19	Implementing pagination and search functionality	
	20	Deploying Django applications to production servers	
V	**Flexi Module**		**15**
	21	Exploration of emerging trends and techniques in web development with Django	
	22	Case studies of successful web applications developed using Django	
	23	Comparative analysis of Django with other web development frameworks (e.g., Flask, Ruby on Rails)	
	24	Discussion on advanced topics such as Django REST framework, asynchronous views, and scalability	

References:

1. William S Vincent, "Django for Beginners: Build Websites with Python and Django" 2020
2. "Django for APIs: Build web APIs with Python & Django" by William S. Vincent
3. "Two Scoops of Django: Best Practices for Django 1.11" by Audrey Roy Greenfeld and Daniel Roy Greenfeld
4. Joel Sklar, Principles of Web Design, Cengage Learning, 2008
5. Randy ConnollyRicardo Hoar,Fundamentals of Web Development, Pearson
6. https://docs.djangoproject.com/en/5.0/
7. https://www.youtube.com/watch?v=o0XbHvKxw7Y
8. https://www.youtube.com/watch?v=llbtoQTt4qw

List of experiments

1. Installation of Django
2. Create a simple project
3. Creating a Model
4. Admin Interface
5. Displaying Data.
6. Adding Forms
7. Editing Data
8. Deleting Data
9. User Authentication
10. Static Files

Course Outcomes

No.	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO-1	Summarize the basics of web development and the role of Django in creating web applications.	U	PSO 1
CO-2	Illustrate setting up and configuring Django projects and applications.	Ap	PSO 1, 3
CO-3	Develop models to represent data in Django applications.	Ap	PSO 2, 3
CO-4	Experiment with views and templates in Django and their role in rendering dynamic web pages.	Ap	PSO 1, 3

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Credits: 3:0:1 (Lecture:Tutorial:Practical)

CO No.	CO	PO/ PSO	Cognitive Level	Knowledge Category	Lecture (L)/Tutorial (T)	Practical (P)
CO-1	Summarize the basics of web development and the role of Django in creating web applications.	PO- 6,7 PSO -1	U	F, C	L	P
CO-2	Illustrate setting up and configuring Django projects and applications.	PO- 2,6, 7 PSO -1, 3	Ap	F,C,P	L	P
CO-3	Develop models to represent data in Django applications.	PO- 2,3,6,7 PSO- 2, 3	Ap	F,C, P	L	P
CO-4	Experiment with views and templates in Django and their role in rendering dynamic web pages.	PO- 2, 7 PSO- 1, 3	Ap	F,CC, P	L	P

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4
CO 1	-	-	-	-	-	2	3	-	3	-	-	-
CO 2	-	2	3	-	-	3	3	-	3	-	3	-
CO 3	-	2	-	-	-	3	3	-	-	2	3	-
CO 4	-	2	-	-	-	2	3	-	3	-	3	-

Correlation Levels:

Level	Correlation
-	Nil

1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Programming Assignments	End Semester Examinations
CO 1	✓	✓	✓	✓
CO 2	✓	✓	✓	✓
CO 3	✓		✓	✓
CO 4	✓		✓	✓

Skill Enhancement Course

UK5SECCAP300:DATA ANALYSIS USING EXCEL

Discipline	COMPUTER APPLICATION
Course Code	UK5SECCAP300
Course Title	Data Analysis Using Excel
Type of Course	**SEC**
Semester	V
Academic Level	3

Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	3	2 hours	-	2 hours	4 hours
Pre-requisites	NIL				
Course Summary	This course aims to introduce the student to the main concepts of data science, understand the essential principles and to implement spreadsheet-based data analysis. Through a blend of theoretical understanding and hands-on practice, learners will develop a solid foundation in data preprocessing, data integration, data transformation, data reduction and skills to apply statistical analysis techniques using Spreadsheet.				

Detailed Syllabus:

Module	Unit	Content	Hrs(L+P)
I	**Fundamentals of Data Science**		**15**
	1	Introduction, Why Data Science, Types of Data analysis: Descriptive analysis, Diagnostic analysis, Predictive analysis and Prescriptive analysis.	
	2	Data Analytics life cycle: Data discovery, Data Preparation, Model planning, Model Building, Communicate Results, and Operationalization.	
	3	Data Science tools: Python programming, R programming, SAS, Spreadsheet, Tableau Public, RapidMiner, Knime, Apache Spark.	
	4	Fundamental areas of study in data science: Machine Learning, Deep Learning, NLP, Statistical data analysis, Knowledge discovery and data mining, Text mining, Recommender systems, Data visualization, Computer Vision, and Spatial data management.	
	5	Role of SQL in data science, Pros and Cons of data science	
II	**Data Pre-processing**		**15**
	6	Introduction, data types and forms, possible data error types,	
	7	Various data pre -processing operations: Data Cleaning: Filling missing values, Smoothing noisy data, Detecting and removing outliers.	
	8	Data Integration: Virtual integration, physical data integration, Application based integration, Manual Integration, and middleware data integration.	
	9	Data Transformation: Rescaling data, Normalizing data, Binarizing data, Standardizing data.	

	10	Data Reduction: Dimensionality reduction, Data cube aggregation, Numerosity reduction. Data Discretization: Top-down discretization, Bottom-up discretization.	
III		**Data Analysis with Worksheet**	**15**
	11	Introduction to Worksheet: Creation and Formatting.	
	12	Ranges and Tables-Data Cleaning with Text Functions, Containing Date Values and Containing Time Values	
	13	Conditional Formatting, Sorting and Filtering	
	14	Subtotals with Ranges, Creating Macros, Pivot Table.	
IV		**Data Plotting and Visualization**	**15**
	15	Introduction, Visual encoding, Basic data visualization tools: Histograms, Bar Charts/Graphs, Scatter plots and Area plots. Data visualization types: Temporal data, Hierarchical data, Network data, Multi-dimensional data, Geospatial data and Multivariate data.	
	16	Lookup Functions: LOOKUP and VLOOKUP and HLOOKUP.	
	17	Data Visualization using Band Chart, Thermometer Chart, Gantt chart, Waterfall Chart and Pivot Charts. Types of jobs in data analytics: Data Analyst, Data scientist, Data engineer, Database administrator, Data architect, and Analytics manager.	
V		**Flexi Module (Not Included for End Semester Examination)**	**15**
	18	Advanced data visualization tools	
	19	Visualization of geospatial data	
	20	Statistical Data Analysis : Probability theory	

REFERENCES

Core

- Gypsy Nandi and Rupam Kumar Sharma, Data Science fundamentals and practical approaches, First Edition, BPB Publication, 2020 **.**
- Bernd Held, Excel Functions and Formulas, BPB Publications.

Additional

- V K Jain, Data Science and Analytics, Khanna Publishing.
- Joel Grus, Data Science From Scratch, Second Edition, Oreilly.

Practical Questions

PART A

1. Create a workbook and perform the operations: Selecting range of columns, hiding /show rows and columns and rename the worksheet.
2. Create workbook with student mark details. Include formulas to calculate total, percentage and grade.
3. Create worksheet with student mark details and perform the following operations
   i. Find the number of students having percentage more than 70.
   ii. Find the number of students having percentage between 60 and 80.
   iii. Find the number of students passed in a subject
   iv. Find the student who got highest mark in a subject.
4. Create a worksheet with Employee salary details. Find mean, median, mode, standard deviation and variance.
5. Create a workbook with sales details and use the functions: TRIM and CLEAN.
6. Create worksheet with student mark details. Use sorting and filtering functions.
7. Create a worksheet with employee details. Use date and time values. Calculate salary details and bonus using functions.
8. Create a worksheet with student name as a column. Add three more columns First name, Last name and e-mail. Find the values of First name, Last name and e-mail(Firstname_lastname@gmail.com). Use text functions.
9. Enter your date of birth and today's date in two cells. Find your age in days, months and years.
10. Prepare a worksheet with sales details. Make pivot table having product and category in row label.

PART B

11. Create a worksheet for flower shop with invoiceid, flower name, price, qty and total price. Enter 10 records. Make pivot table and pivot charts.
12. Create a worksheet with Fruits supply details. Apply LOOKUP, VLOOKUP and HLOOUP functions.
13. Assign a macro to a command button to display "welcome" in a cell.
14. Assign a macro to a command button to display "welcome" in a message box.
15. Assign a macro to a command button to find total number of sheets in a workbook.
16. Assign a macro to a command button to add a new worksheet.
17. Assign a macro to a command button to add a new workbook.
18. Prepare a worksheet with wildlife population of different states in India. Display in Pie chart and Bar chart.
19. Prepare a worksheet with total number of primary schools in each district of kerala. Include different charts.
20. Create a worksheet with employee salary details. Include charts.

Course Outcomes

No.	Upon completion of the course the graduate will be able to	Cognitive	PSO addressed
CO-1	Discuss about the fundamentals of Data Science	U	PSO -1
CO-2	Illustrate the usage of Data Pre-processing techniques	Ap	PSO-1,2,3
CO-3	Use data science concepts in real world problems	An	PSO-1,2,3
CO-4	Build Data Analytics and management Skill	Ap	PSO-1,2,3,4

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Credits: 2:0:1(Lecture:Tutorial:Practical)

CO No.	CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L)/Tutorial (T)	Practical (P)
CO-1	Discuss about the fundamentals of Data Science	PO-7 PSO-1,2	U	F, C	L	-
CO-2	Illustrate the usage of Data Pre-processing techniques	PO-7 PSO-1,2,3	Ap	C, P	L	P
CO-3	Use data science concepts in real world problems	PO-7 PSO-1,2,3	An	F, C, P	L	P
CO-4	Build Data Analytics and management Skill	PO-7 PSO-1,2,3,4	Ap	F, C, P	L	P

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs :

	PO1	PO 2	PO 3	PO4	PO5	PO 6	PO7	PO 8	PSO 1	PSO 2	PSO3	PSO 4
CO 1	-	-	-	-	-	-	1	-	1	1	-	-
CO 2	-	-	-	-	-	-	2	-	2	2	2	-
CO 3	-	-	-	-	-	-	2	-	1	2	2	-
CO 4	-	-	-	-	-	-	2	-	2	2	2	2

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics :

	Internal	Assignment	Quiz	End Semester Examinations
CO 1	✓		✓	✓
CO 2	✓		✓	✓
CO 3	✓	✓		✓
CO 4		✓		✓

UK5SECCAP301- SOFTWARE TESTING

Discipline	COMPUTER APPLICATIONS				
Course Code	UK5SECCAP301				
Course Title	Software Testing				
Type of Course	SEC				
Semester	V				
Academic Level	3				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	3	2 hours	-	2 hours	4 hours
Pre-requisites	Basic understanding of programming concepts Familiarity with software development lifecycle Knowledge of basic software engineering principles				
Course Summary	This course provides an introduction to software testing methodologies, techniques, and tools. It covers the fundamentals of testing, including test planning, test case design, and execution. The course also includes an introduction to automation testing using Selenium. Students will learn how to systematically identify, evaluate, and address software defects to ensure the quality and reliability of software applications.				

Detailed Syllabus:

Module	Unit	Content	Hrs
I		**Introduction to Software Testing**	**12**
	1	Overview of software testing	
	2	Testing principles and fundamentals	

	3	Software testing life cycle	
	4	Testing types: Manual, Automation, functional, non-functional, black-box, white-box	
	5	Levels of testing: Unit Testing, Integration Testing, System Testing, User Acceptance Testing	
	6	Testing documentation: test plan, test cases, test reports	
II		**Testing Types and Techniques**	**12**
	7	Types of testing - Regression Testing , Smoke Testing, Database Testing, Usability Testing	
	8	Load Testing, Stress Testing, Performance Testing	
	9	Internationalization Testing, Localization Testing	
	10	Static Testing Techniques : Importance of reviews in STLC, Review Activities, Roles and Responsibilities during Review	
	11	Dynamic Testing Techniques: Specification-based or black-box techniques , Boundary Value Analysis, Decision Table Testing, Equivalence Partitioning	
	12	Experience-based Testing Techniques: Error Guessing, Exploratory Testing	
III		**Test Automation and introduction to Selenium**	**12**
	13	Introduction to test automation	
	14	Overview : major functional and non functional tools, Test management and defect tracking tools	
	15	Overview of Selenium	
	16	Setting up Selenium environment	
	17	Introduction to Selenium Components	
IV		**Testing Using Selenium**	**12**
	19	Create Selenese commands	
	20	Handling different elements : textboxes, radio buttons, check boxes	
	21	Keyboard, mouse actions	

	22	Developing test cases and test suits with Selenium	
	23	Working with a case study	
V	**Flexi Module**		**12**
	24	Introduction to emerging techniques in software testing	
	25	Comparative analysis of different testing tools and frameworks	
	26	Case studies highlighting successful implementation of Selenium in real-world projects	
	27	Exploring advanced topics such as AI-driven testing, machine learning in test automation, and shift-left testing methodologies	
	28	Interactive sessions, discussions, and hands-on exercises based on the latest trends and industry developments	

References:

1. Roger S. Pressman, "Software Engineering: A Practitioner's Approach", McGraw Hill Education.
2. Rex Black, "Foundations of Software Testing", Cengage Learning.
3. Dorothy Graham et al., "Experiences of Test Automation: Case Studies of Software Test Automation", Addison-Wesley Professional.
4. Alan Richardson, "Selenium WebDriver: From Foundations to Framework", Leanpub.
5. "Learn Selenium" ,UnmeshGundech and Carl Cocchiaro
6. https://www.tutorialspoint.com/selenium/index.htm
7. https://greenstechnologys.com/Selenium%20Full%20Material%20Updated%20Greens.pdf

Lab Exercises

1. Installation of Selenium
2. Testing Web Page Loading
3. Form Submission Testing
4. Testing Navigation
5. Testing Element Interactions
6. Testing Element Visibility
7. Testing Error Handling
8. Testing Cross-Browser Compatibility
9. Testing Responsiveness
10. Testing Performance

Course Outcomes

No.	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO-1	Outline the fundamental concepts of software testing and its importance in software development.	U	PSO 1
CO-2	Identify different testing techniques and methodologies and apply them to real-world scenarios.	U	PSO 1, 2
CO-3	Use Selenium environment.	Ap	PSO 1,2,3
CO-4	Utilize automation testing tools, specifically Selenium, to automate test scenarios and enhance testing efficiency.	Ap	PSO 1,2,3

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Credits: 2:0:1 (Lecture:Tutorial:Practical)

CO No.	CO	PO/ PSO	Cognitive Level	Knowledge Category	Lecture (L)/ Tutorial (T)	Practical(P)
CO-1	Outline the fundamental concepts of software testing and its importance in software development.	PO- 6,7 PSO- 1	U	F, C	L	
CO-2	Identify different testing techniques and methodologies and apply them to real-world scenarios.	PO -2,6, 7 PSO -1, 2	U	F, C	L	
CO-3	Use Selenium environment.	PO- 2,3,6,7 PSO -1,2,3	Ap	F,C,P	L	P
CO-4	Utilize automation testing tools, specifically Selenium, to	PO- 2,3,6.7	Ap	F,C,P	L	P

	automate test scenarios and enhance testing efficiency.	PSO -1,2,3				

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4
CO 1	-	-	-	-	-	3	3	-	3	-	-	-
CO 2	-	2	-	-	-	3	3	-	3	3	-	-
CO 3	-	2	3	-	-	2	3	-	3	2	3	-
CO 4	-	2	3	-	-	2	3	-	3	2	3	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Programming Assignments	End Semester Examinations
CO 1	✓	✓		✓

CO 2	✓	✓		✓
CO 3	✓		✓	✓
CO 4	✓		✓	✓

UK5SECCAP302- WEB APPLICATION DEVELOPMENT

Discipline	Computer Applications				
Course Code	UK5SECCAP302				
Course Title	Web Application Development				
Type of Course	SEC				
Semester	V				
Academic Level	3				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	3	2 hours	-	2 hours	4 hours
Pre-requisites	Basic understanding of programming concepts (variables, data types, control structures) Familiarity with HTML, CSS, and JavaScript				
Course Summary	This course introduces students to the fundamentals of web application development using Django, a high-level Python web framework. Students will learn how to design, develop, and deploy dynamic web applications.				

Detailed Syllabus:

Module	Unit	Content	Hrs

I	**Introduction to Web Development**		**12**
	1	Overview of web development concepts	
	2	Introduction to Django framework	
	3	Setting up development environment	
	4	Basic HTML, CSS, and JavaScript concepts	
	5	Role of Django in creating web applications	
II	**Introduction to Django**		**12**
	6	Installing Django	
	7	Creating a Django project	
	8	Understanding Django apps	
	9	URL routing in Django	
	10	Basic views and templates in Django	
III	**Models and Views in Django**		**12**
	11	Introduction to Django models	
	12	Defining models and relationships	
	13	Querying the database with Django ORM	
	14	Class-based views in Django	
	15	Using templates to render dynamic content	
IV	**Development Using Django**		**12**
	16	User authentication and authorization	
	17	Handling forms in Django	
	18	Working with static files and media	
	19	Implementing pagination and search functionality	
	20	Deploying Django applications to production servers	
V	**Flexi Module**		**12**
	21	Exploration of emerging trends and techniques in web development with Django	

	22	Case studies of successful web applications developed using Django	
	23	Comparative analysis of Django with other web development frameworks (e.g., Flask, Ruby on Rails)	
	24	Discussion on advanced topics such as Django REST framework, asynchronous views, and scalability	

References:

1. William S Vincent, "Django for Beginners: Build Websites with Python and Django" 2020
2. "Django for APIs: Build web APIs with Python & Django" by William S. Vincent
3. "Two Scoops of Django: Best Practices for Django 1.11" by Audrey Roy Greenfeld and Daniel Roy Greenfeld
4. Joel Sklar, Principles of Web Design, Cengage Learning, 2008
5. Randy ConnollyRicardo Hoar,Fundamentals of Web Development, Pearson
6. https://docs.djangoproject.com/en/5.0/
7. https://www.youtube.com/watch?v=o0XbHvKxw7Y
8. https://www.youtube.com/watch?v=llbtoQTt4qw

Lab Exercises

1. Installation of Django
2. Create a simple project
3. Creating a Model
4. Admin Interface
5. Displaying Data.
6. Adding Forms
7. Editing Data
8. Deleting Data
9. User Authentication
10. Static Files

Course Outcomes

No.	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO-1	summarize the basics of web development and the role of Django in creating web applications.	U	PSO 1
CO-2	Illustrate setting up and configuring Django projects and applications.	Ap	PSO 1, 3
CO-3	Develop models to represent data in Django applications.	Ap	PSO 2, 3

CO-4	Build views and templates in Django and their role in rendering dynamic web pages.	Ap	PSO 1, 3

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Credits: 2:0:1 (Lecture:Tutorial:Practical)

CO No.	CO	PO/ PSO	Cognitive Level	Knowledge Category	Lecture (L)/Tutorial (T)	Practical (P)
CO-1	summarize the basics of web development and the role of Django in creating web applications.	PO-6,7 PSO -1	U	F, C,P	L	P
CO-2	Illustrate setting up and configuring Django projects and applications.	PO -2,6,7 PSO -1, 3	Ap	F,C,P	L	P
CO-3	Develop models to represent data in Django applications.	PO- 2,3,6,7 PSO -2, 3	Ap	F, C, P	L	P
CO-4	Build views and templates in Django and their role in rendering dynamic web pages.	PO- 2, 6,7 PSO- 1, 3	Ap	F, C, P	L	P

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4
CO 1	-	-	-	-	-	2	3	-	3	-	-	-
CO 2	-	2	3	-	-	3	3	-	3	-	3	-
CO 3	-	2	-	-	-	3	3	-	-	2	3	-
CO 4	-	2	-	-	-	2	3	-	3	-	3	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics :

	Internal	Assignment	Programming	End Semester
CO 1	✓	✓	✓	✓
CO 2	✓	✓	✓	✓
CO 3	✓		✓	✓
CO 4	✓		✓	✓

UK5SECCAP303- OBJECT ORIENTED ANALYSIS AND DESIGN

Discipline	COMPUTER APPLICATION				
Course Code	UK5SECCAP303				
Course Title	Object Oriented Analysis and Design				
Type of Course	SEC				
Semester	V				
Academic Level	3				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	3	2 hours	-	2 hours	4 hours

Pre-requisites	Nil
Course Summary	This course delivers Object-oriented approach for analysis and design of System/Subsystem/Functional units based on the given specifications through UML Diagrams

Detailed Syllabus:

Module	Unit	Content	Hrs(L+P)
I		**INTRODUCTION TO UML**	**15**
	1	Introduction to UML: Importance of modelling, Principles of modelling, Object oriented modelling.	
	2	Conceptual model of the UML, Architecture, Software development life cycle	
	3	Classes, relationships, Common mechanisms and diagrams.	
	4	CASE Tools	
II		**ADVANCED BEHAVIORAL MODELING**	**12**
	5	Advanced classes, Advanced relationships	
	6	Interfaces, types and roles, packages, terms, concepts.	
	7	Class and Object Diagrams: Terms, concepts	
	8	Common modelling techniques for class and object diagrams	
III		**ARCHITECTURAL MODELING**	**12**
	9	Interaction diagrams	
	10	Use cases	
	11	Use case Diagrams	
	12	Activity Diagrams	
IV		**ADVANCED BEHAVIORAL MODELING**	**12**
	13	Events and signals	

	14	State machines, processes and threads	
	15	Tme and space, state chart and state chart diagrams	
	16	Case study: The next gen POS system	
	17	Component diagrams & Deployment diagrams	
V		**Flexi Module: Not included for End Semester Exams**	**12**
		Advanced UML diagrams	

Text Books:

1. Grady Booch, James Rumbaugh, Ivar Jacobson, "The Unified Modeling Language User Guide", Pearson Education, 2nd Edition, 2004.

2. Craig Larman, "Applying UML and Patterns: An Introduction to Object Oriented Analysis and Design and Iterative Development", Pearson Education, 3rd Edition, 2005.

Reference Books:

1. MeilirPage-Jones: Fundamentals of Object Oriented Design in UML, Pearson Education, 1st Edition, 2006.

2. Hans-Erik Eriksson, Magnus Penker, Brian Lyons, David Fado, "UML 2 Toolkit", WILEY-Dreamtech India Pvt. Ltd., Pearson Education, 3rd Edition, 2005.

Web References:

1. https://www.tutorialspoint.com/uml/uml_overview.html

2. https://www.utdallas.edu/~chung/OOAD/M03_1_StructuralDiagrams.ppt 3. https://onedrive.live.com/download?cid=99CBBF765926367

E-Text Books:

1. https://www.utdallas.edu/UML2.0/Rumbaugh 2. https://www.utdallas.edu/~chung/SP/applying-uml-and-patterns.pdf

Lab Exercises

Course Out Come:

To capture the requirements specification for an intended software system·

To draw the UML diagrams for the given specification·

To map the design properly to code·

To test the software system thoroughly for all scenarios·

To improve the design by applying appropriate design patterns.·

Draw standard UML diagrams using an UML modeling tool for a given case study and map design to code and implement a 3 layered architecture.

Test the developed code and validate whether the SRS is satisfied.

1. Identify a software system that needs to be developed.
2. Document the Software Requirements Specification (SRS) for the identified system.
3. Identify use cases and develop the Use Case model.
4. Identify the conceptual classes and develop a Domain Model and also derive a Class Diagram from that.
5. Using the identified scenarios, find the interaction between objects and represent them using UML Sequence and Collaboration Diagrams
6. Draw relevant State Chart and Activity Diagrams for the same system.
7. Implement the system as per the detailed design
8. Test the software system for all the scenarios identified as per the usecase diagram
9. Improve the reusability and maintainability of the software system by applying appropriate design patterns.
10. Implement the modified system and test it for various scenarios

1. Case Tools
2. Passport automation system 3.
3. Book bank
4. .Exam Registration
5. Stock maintenance system
6. Online course reservation system
7. Airline/Railway reservation system
8. Software personnel management system
9. Credit card processing
10. E-book management system
11. Recruitment system
12. Foreign trading system
13. Conference Management System
14. BPO Management System
15. Library management system
16. Student information system

Course Outcomes

No.	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO-1	List the importance and use of basic principles in object oriented modeling for appropriate analysis and design of given scenarios.	U	PSO-1
CO-2	Make use of building blocks and different views for creating conceptual model architectural view of system in Unified Software Development Life cycle.	Ap	PSO-1,2,3
CO-3	Demonstrate static and dynamic aspects of the system through UML diagrams for specifying structure and interaction of objects during runtime.	Ap	PSO-1,2,3
CO-4	Identify basic building blocks for visualizing artifacts of an Object Oriented System.	U	PSO-1

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Credits: 2:0:1 (Lecture:Tutorial:Practical)

CO No.	CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L)/Tutorial (T)	Practical (P)
CO1	List the importance and use of basic principles in object oriented modeling for appropriate analysis and design of given scenarios.	PO-6,7 PSO-1	U	F,C	L	-
CO2	Make use of building blocks and different views for creating conceptual model architectural	PO-6,7 PSO-	Ap	F,C,P	L	P

	view of system in Unified Software Development Life cycle.	1,2,3				
CO3	Demonstrate static and dynamic aspects of the system through UML diagrams for specifying structure and interaction of objects during runtime.	PO-6,7 PSO-1,2,3	Ap	F,C, P	L	P
CO4	Identify basic building blocks for visualizing artifacts of an Object Oriented System.	PO-6,7 PSO-1	U	F,C	L	

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs :

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO 1						2	2		2	-	-	-
CO 2						2	2		2	2	2	-
CO 3						2	2		2	2	2	-
CO 4						2	2		2	-	-	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate /
3	Substantial /

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓			✓
CO 4		✓		✓

SEMESTER VI

SEMESTER VI			
Discipline Specific Core			
UK6DSCCAP300	Machine Learning	**4**	**3T+2P**
UK6DSCCAP301	Visual Programming	**4**	**3T+2P**
UK6DSCCAP302	Internet of Things	**4**	**3T+2P**
UK6DSCCAP303	Software Testing	**4**	**3T+2P**
UK6DSCCAP304	Cloud Computing	**4**	**3T+2P**
As per University regulations	Minor Project (NOT MANDATORY)	**2(additional credits only)**	**0**
UK6DSCCAP306	Operating System Concepts and Techniques	**4**	**3T+2P**
Discipline Specific Elective (Can select Two)			
UK6DSECAP300	Image Processing and Applications	**4**	**3T+2P**
UK6DSECAP301	Mobile & Wireless Security	**4**	**4T**

UK6DSECAP302	Data Analytics with R	**4**	**3T+2P**
UK6DSECAP303	Big Data Technologies using Hadoop	**4**	**3T+2P**
UK6DSECAP304	Recommendation Systems	**4**	**3T+2P**
UK6DSECAP305	Deep Learning	**4**	**3T+2P**
UK6DSECAP306	Mobile Application Development	**4**	**3T+2P**
UK6DSECAP307	Emerging Trends in Web Development	**4**	**3T+2P**
Skill Enhancement Course (Can Select One)			
UK6SECCAP300	Mobile Application Development	**3**	**2T+2P**
UK6SECCAP301	Game Application Development	**3**	**2T+2P**
UK6SECCAP302	Cloud Computing	**3**	**3T**
UK6SECCAP303	Entrepreneurship in IT	**3**	**3T**

DSC

Discipline	COMPUTER APPLICATION				
Course Code	UK6DSCCAP300				
Course Title	MACHINE LEARNING USING PYTHON				
Type of Course	**DSC**				
Semester	VI				
Academic Level	3				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	3 hours	-	2 hours	5 hours
Pre-requisites	Knowledge in Python Programming is essential				
Course Summary	This course offers a comprehensive overview of machine learning fundamentals, spanning supervised, unsupervised, and reinforcement learning techniques. Students will gain practical skills in data preprocessing, visualization, and analysis using Python libraries like NumPy, Pandas, and Scikit-learn. Delving into regression and classification algorithms, including linear regression, logistic regression, and decision trees, learners will acquire the ability to interpret and predict data patterns effectively. Advanced topics explore unsupervised learning methods such as clustering and dimensionality reduction, providing students with essential tools for data analysis. Additionally, the flexi module introduces ensemble learning, neural networks, and autoencoders, paving the way for further exploration into artificial intelligence and machine learning applications.				

Detailed Syllabus:

Module	Unit	Content	Hrs (L+P)

I	**Introduction**		**15**
	1	Definition and Importance of Machine Learning:	
	2	Applications across Various Domains	
	3	Supervised Learning:-Definition and Examples, Regression vs. Classification	
	4	Unsupervised Learning:- Definition and Examples,Clustering vs. Dimensionality Reduction	
	5	Reinforcement Learning:- Definition and Examples, Agent-Environment Interaction, Exploration vs. Exploitation Tradeoff	
	6	Understanding data:- numeric variables – mean, median, mode, Measuring spread.	
	7	Introduction to NumPy, Pandas, and Scikit-learn:- Overview of their Features and Capabilities	
II	**Data Preprocessing and Visualization**		**15**
	7	Introduction to Data Preprocessing, Handling Missing Data: Imputation Techniques, Removal Strategies	
	8	Outlier Detection and Treatment: Z-score, IQR, Winsorization	
	9	Feature Scaling and Normalization: Min-Max Scaling, Z-score Normalization, Encoding Categorical Variables: One-Hot Encoding, Label Encoding	
	10	Introduction to Data Visualization:-Overview of Matplotlib and Seaborn Libraries	
	11	Basic Plot Types: Line Plot, Scatter Plot, Bar Plot, Histogram	
	12	Advanced Plot Types: Box Plot, Violin Plot, Heatmap,Multiple Subplots and Figures	
III	**Supervised Learning**		**15**
	12	Regression - Introduction, Types of Regression, Linear Regression, Multiple Linear Regression, Non-Linear Regression (Polynomial Regression)	
	13	Classification –Introduction, Logistic Regression, Decision Trees, Naïve Bayes Classification, Support Vector Machines:-Intuition and Optimization, K-Nearest Neighbours, Random Forest.	
IV	**Unsupervised Learning**		**15**
	19	Categorization of Major Clustering Methods - Partitioning Methods - K-means, K-medoids. Hierarchical Methods - Agglomerative Clustering, Density-based Methods – DBSCAN.	

	20	Principal Component Analysis (PCA):Understanding the PCA algorithm,Calculating principal components and eigenvalues,Reducing dimensionality using PCA,Interpretation of principal components,PCA implementation and applications	
	21	t-Distributed Stochastic Neighbor Embedding (t-SNE):Introduction to t-SNE algorithm,Similarities and differences between PCA and t-SNE	
V		**Flexi Module: Not included for end semester exams**	**15**
	26	Ensemble Learning: Understanding ensemble methods like bagging and boosting.	
	27	Introduction to Neural Networks: Basics of artificial neural networks (ANN), deep learning frameworks (e.g., TensorFlow).	
	28	Introduction to autoencoders,Encoding and decoding processes in autoencoders,Training autoencoders with backpropagation Denoising autoencoders and variational autoencoders,Applications of autoencoders in unsupervised learning and feature learning	

References

Core:

- Introduction to Machine Learning with Python" by Andreas C. Müller & Sarah Guido
- Python Machine Learning" by Sebastian Raschka and Vahid Mirjalili
- Pattern Recognition and Machine Learning" by Christopher M. Bishop
- Machine Learning: A Probabilistic Perspective" by Kevin P. Murphy

Lab Exercises

1. Prepare a dataset of customer having the features date, price, product_id, quantity_purchased, serial_no, user_id,user_type, user_class, purchase_week and visualise the data with
    a. Plot diagram for Price Trends for Particular User, Price Trends for Particular User Over Time
    b. Create box plot Quantity and Week value distribution having parameters of quantity_purchased','purchase_week'
2. **Task:** Conduct exploratory data analysis (EDA) on a designated dataset utilizing NumPy and Pandas.

    Description: Select a dataset of choice (e.g., Iris dataset, Titanic dataset, etc.), and load it into a Pandas DataFrame. Leverage NumPy for numerical computations. Compute the mean, median, and mode of numeric variables within the dataset. Assess the data's spread through techniques such as standard deviation, variance, and range calculations. Employ histograms and box plots to visually represent the distribution of numeric variables. Provide insights and interpretations based on the outcomes of the EDA.

3. Task: Utilize Python programming to preprocess the "Titanic" dataset.

Description:Implement data preprocessing steps to handle missing data by employing imputation techniques or removal strategies. Detects and treats outliers using Z-score, IQR, or Winsorization methods.

4. Task: Utilize Python programming feature scaling and normalization on the "Titanic" dataset.

   Description:Perform feature scaling and normalization on relevant features, and encode categorical variables using one-hot encoding or label encoding schemes. Utilize Matplotlib and Seaborn libraries to visualize the preprocessed dataset, creating basic plots such as Line Plot, Scatter Plot, Bar Plot, and Histogram, as well as advanced plots like Box Plot, Violin Plot, and Heatmap

5. Task: Utilize Python programming visualize on the "Titanic" dataset.

   Description: Utilize Matplotlib and Seaborn libraries to visualize the preprocessed dataset, creating basic plots such as Line Plot, Scatter Plot, Bar Plot, and Histogram, as well as advanced plots like Box Plot, Violin Plot, and Heatmap

6. Task: Train regression models on the "Boston Housing" dataset to predict house prices based on various features.

   Description: Utilize the "Boston Housing" dataset available in the scikit-learn library. Train a linear regression model to predict house prices using features such as area, number of bedrooms, and location. Additionally, implement multiple linear regression to predict sales revenue based on advertising spending across different channels. Explore the application of non-linear regression techniques like polynomial regression to capture more complex data patterns in the dataset. Visualize the regression results to understand the relationships between predictors and the target variable.

7. Task: Employ classification techniques on the "Titanic" dataset to predict survival outcomes based on passenger features.

   Description: Use the Titanic dataset to train a logistic regression model to predict survival outcomes based on passenger features.

8. Task: Employ classification techniques on the "MNIST dataset"

   Description: Implement a support vector machine classifier to classify handwritten digits using the MNIST dataset.

9. Task: Employ classification techniques on the "iris dataset"

   Description: Experiment with k-nearest neighbors and random forest classifiers on iris dataset and MNIST dataset and compare their performance.

10. Task: Apply K-means clustering on the "Online Retail" dataset to segment customers based on their purchasing behavior.

    Description: Utilize the "Online Retail" dataset, which contains information about customer transactions, including items purchased and their quantities. Implement K-means clustering to segment customers into distinct groups based on their purchasing patterns. Analyze the characteristics of each cluster to understand the preferences and

behaviors of different customer segments. Identify potential marketing strategies tailored to each segment to enhance customer engagement and satisfaction.

Dataset: The "Online Retail" dataset is available from the UCI Machine Learning Repository (https://archive.ics.uci.edu/ml/datasets/Online+Retail).

11. Task: Employ principal component analysis (PCA) on the "Labeled Faces in the Wild" dataset to reduce the dimensionality of facial images.

Description: Utilize the "Labeled Faces in the Wild" dataset, which contains a collection of facial images belonging to various individuals. Implement PCA to reduce the high-dimensional feature space of facial images while preserving essential information. Visualize the principal components to gain insights into the underlying structure of the data. Reconstruct the facial images using a reduced number of dimensions to observe the effectiveness of dimensionality reduction. Analyze the reconstructed images to understand the impact of dimensionality reduction on facial image quality and interpretability.

Dataset: The "Labeled Faces in the Wild" dataset is available from the scikit-learn library (https://scikit-learn.org/stable/modules/generated/sklearn.datasets.fetch_lfw_people.html)

Course Outcomes

No.	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO1	Recall the definition and significance of machine learning	R	PSO – 1, 3
CO2	Understand the principles underlying supervised and unsupervised learning methods.	U	PSO – 1, 2, 3
CO3	Apply data preprocessing procedures using Python libraries to cleanse and organize datasets efficiently, employ regression and classification algorithms to analyze and forecast patterns within datasets accurately, and implement clustering and dimensionality reduction techniques to unravel latent structures within data and mitigate complexity.	Ap	PSO – 1, 2, 3,4
CO4	Analyze the effectiveness of machine learning models through the assessment of performance metrics and result interpretation, assess the comparative advantages of various clustering methods, and evaluate the efficacy of ensemble learning and neural networks in enhancing model precision and predictive capabilities.	An	PSO – 1, 2, 4

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Credits: 2:0:2 (Lecture:Tutorial:Practical)

CO No.	CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture(L)/ Tutorial(T)	Practical (P)
1	Recall the definition and significance of machine learning	PO- 1, 2, 3, 4, 6 PSO – 1, 3	R	F,C	L	P
2	Understand the principles underlying supervised and unsupervised learning methods.	PO- 1, 2, 3, 4, 6 PSO – 1, 2, 3	U	F, C, P	L	P
3	Apply data preprocessing procedures using Python libraries to cleanse and organize datasets efficiently, employ regression and classification algorithms to analyze and forecast patterns within datasets accurately, and implement clustering and dimensionality reduction techniques to unravel latent structures within data and mitigate complexity.	PO- 1, 2, 3, 4, 8 PSO – 1, 2, 3,4	Ap	F, C, P, M	L	P
4	Analyze the effectiveness of machine learning models through the assessment of performance metrics and result interpretation, assess the comparative advantages of various clustering methods, and evaluate the efficacy of ensemble learning and neural networks in enhancing model precision and predictive capabilities.	PO- 1, 2, 3, 4, 6 PSO – 2, 4	An	F,C.P, M	L	P

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4
CO1	**2**	**2**	**1**	**1**	**-**	**2**	**-**	**-**	**2**	**2**	**2**	**2**
CO2	**3**	**3**	**2**	**1**	**-**	**3**	**-**	**-**	**3**	**3**	**2**	**1**
CO3	**3**	**3**	**2**	**2**	**-**	**-**		**3**	**3**	**3**	**2**	**2**
CO4	**3**	**3**	**2**	**2**	**-**	**2**	**-**	**-**	**3**	**3**	**2**	**2**

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics:

	Internal Exam	Assignment	Practical Evaluation	End Semester Examinations
CO1	✓		✓	✓
CO2	✓	✓	✓	✓
CO3	✓		✓	✓
CO4	✓	✓	✓	✓

UK6DSCCAP301 : VISUAL PROGRAMMING

Discipline	Computer Applications				
Course Code	UK6DSCCAP301				
Course Title	Visual Programming				
Type of Course	**DSC**				
Semester	VI				
Academic Level	3				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	3 hours	-	2 hours	5 hours
Pre-requisites	Basic programming skills				
Course Summary	This course aims to make the students capable of developing a web site using client server technology ASP.NET. Through this course, students will learn the basic concepts of client-server technology like CLR, web pages and its different web controls, validation controls and ADO.NET.				

Detailed Syllabus:

Module	Unit	Content	Hrs(L+P)
I		**Introduction to ASP.NET**	**15**
	1	The .Net Platform and the Web- The Pathway to Web Application, The Web Client/Server Model, Components of ASP.NET and the .NET framework, Overview of IIS, Overview of ASP.NET, The .NET Common Language Runtime, Language Independence in the .NET framework. Working with ASP.NET- The Features of ASP.NET, The Anatomy of ASP.NET Pages, Introducing Web Forms, Visual Studio IDE Basics, Code-Behind feature. Application Configuration- Overview of Global.asax file and Web.config file.	
		Web Controls	

II	2	Introduction to server controls- how to work with button controls, text boxes, labels, check boxes, radio button, list controls and other web server controls like image, image map, hyperlink, file upload, and calendar controls, properties of each control of ASP.NET. ASP.NET Page Directives- @Page, @Control, @Import, @Register, @Assembly, @OutputCache	**15**
III	**Validation and Data Controls**		**15**
	3	Introduction to validation controls- basic validation controls- Required Field Validator Control, Compare Validator Control, Range Validator Control, Regular Expression Validator Control, Custom Validator Control, properties of each validation control of ASP.NET. Introduction to Data List Controls- Repeater Control and DataList Control, Introduction of GridView, Introduction of FormView and Detail View Controls Authoring a User Control- Login Control, LoginView Control, LoginStatus- Control, LoginName Control, PasswordRecovery Control	
IV	**State Management and ADO.NET**		**15**
	4	How to manage state – how to use view state, session state and application state. ASP.NET Intrinsic Objects- The HttpRequest Object, The HttpResponse Object, The HttpApplicationState Object, The HttpSessionState Object Introduction to ADO.NET- ADO.NET Programming Objects and Architecture, Displaying Database Data, Working with The Data Set and Data Table Objects	
V		**Flexi Module: Not included for End Semester Exams**	**15**
		Introduction to authentication, how to set up authentication and authorization, how to configure ASP.NET applications, how to deploy an ASP.NET application.	

Core Textbooks

1. Matt J. Crouch, “ASP.NET and VB.NET Web Programming”, Pearson

Reference Books

1. Gerg Buczek, “ASP.NET Developer’s Guide” Publisher: McGraw Hill
2. Imar Spaanjaars, “Beginning ASP.NET 4.0 in C# and VB”, Wiley publishers.

3. Anne Boehm, Murach's ASP.NET 4 web programming with VB 2010, Shroffs publishers and Distributors Pvt. Ltd.

Web Resources

1. https://www.javatpoint.com/asp-net-tutorial
2. https://learn.microsoft.com/en-us/aspnet/tutorials
3. https://www.tutorialspoint.com/asp.net/index.htm

LAB SYLLABUS

The laboratory work will consist of 10-15 experiments.

Part A (1 to 10 programs)

- Programs to demonstrate and use different web server controls in ASP.NET.
- Program to demonstrate working with forms.
- Programs to demonstrate and use of different Validation controls.
- Develop a web form for Email Registration

Part B (11 to 15 programs)

- Program to demonstrate Session Management.
- Design a form that allows the user to enter some simple data and store it in db.
- Design a form to perform delete and update operations in db.
- Design a form to retrieve data from a table and use GridView control.
- Programs to demonstrate Login Control.

Course Outcomes

No.	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO-1	Discuss about the various features of visual studio tools.	Ap	PSO-1,2,3
CO-2	Illustrate the usage of different controls in web development.	Ap	PSO-1,2,3,4
CO-3	Build web pages using validation and data controls in ASP.NET	Ap	PSO-1,2,3,4
CO-4	Develop dynamic websites using visual studio IDE.	Ap	PSO-1,2,3,4

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Credits: 4:0:0 (Lecture:Tutorial:Practical)

CO No.	CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L)/ Tutorial (T)	Practical (P)
1	Discuss about the various features of visual studio tools.	PO-1,2,3,6,7,8 PSO-1,2,3	Ap	F,C,P,M	L	P
2	Illustrate the usage of different controls in web development.	PO-1,2,3,6,7,8 PSO-1,2,3,4	Ap	F,C,P,M	L	P
3	Build web pages using validation and data controls in ASP.NET	PO-1,2,3,5,6,7,8 PSO-1,2,3,4	Ap	F,C,P,M	L	P
4	Develop dynamic websites using visual studio IDE.	PO-1,2,3,5,6,7,8 PSO-1,2,3,4	Ap	F,C,P,M	L	P

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO	PSO	PSO4
CO	2	1	2	-	-	2	2	1	1	2	2	-
CO	2	2	2	-	-	2	2	1	2	3	2	2
CO	2	2	2	-	1	2	2	1	2	3	2	2
CO	2	2	2	-	1	2	2	2	2	3	2	2

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics:

	Internal Exam	Assignment	Lab Program Evaluation	End Semester Examinations
CO 1	✓		✓	✓
CO 2	✓	✓	✓	✓
CO 3	✓		✓	✓
CO 4	✓	✓	✓	✓

UK6DSCCAP302: INTERNET OF THINGS

Discipline	Computer Application				
Course Code	UK6DSCCAP302				
Course Title	Internet of Things				
Type of Course	**DSC**				
Semester	VI				
Academic Level	3				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	3 hours	-	2 hours	5 hours
Pre-requisites	Should posses knowledge on Computer Networks				
Course Summary	This course provides an introduction to the Internet of Things (IoT), covering fundamental concepts, technologies, applications, and challenges associated with interconnected devices.				

Detailed Syllabus:

Module	Unit	Content	Hrs(L+P)
I		**Introduction to IOT**	**15**
	1	IOT Definition, characteristics of IOT, IOT Elements	
	2	Genesis of IOT; Convergence of IT and OT; Challenges	
	3	Engineering IoT Networks: Sensors Actuators and Smart Objects; Sensor Networks, Wireless Sensor Networks.	
II		**IoT Network Architecture and Design**	**15**
	4	Drivers Behind New Network Architectures; One M2M IOT Standardized Architecture; IOT World Forum Standardization Architecture	
	5	A Simplified IoT Architecture; The Core IoT Functional Stack; IoT Data Management and Compute Stack	
III		**IOT Hardware, Software**	**15**
	6	Overview of IoT hardware platforms (Arduino, Raspberry Pi)	
	7	Basics of Arduino, Arduina hardware, Arduino IDE	
	8	Introduction to IoT operating systems (Linux, FreeRTOS)	
	9	Programming languages for IoT development (e.g., Python, C/C++)	
	10	IoT development frameworks and tools (Real Time Innovations, AWS IOT, WATSON IOT platform); Open IOT	
IV		**Domain specific IOT**	**15**
	11	Connected roadways: Vehicle Tracking system based on GPS and GSM	
	12	IOT Applications for Smart home: IOT based Smart Doorbell system	
	13	Smart City: Smart Parking system; Smart street light	
	14	IOT for environment: IOT based Air quality Monitoring system; Smart water management	
	15	IOT for healthcare: Smart walking stick for visually impaired	
V		**Flexi Module- Not Considered forEnd Semester Exams**	**15**

	16	Datalink Layer: IEEE 802.15.4, Bluetooth Low Energy, ZigBee Smart Energy; Network layer: IP- Version 4 and 6, 6LoWPAN,6TiSCH, RPL; Transport layer: TCP, UDP, DCCP; Session Layer: HTTP, CoAP, MQTT; Service Layer - one M2M, ETSI M2M; Security in IoT Protocols - MAC 802.15.4, 6LoWPAN, Application Layer	

Reference Books

Core Books

1. David Hanes, "IoT Fundamentals: Networking Technologies, Protocols and Use Cases for the Internet of Things", Cisco Press, Pearson, 2017.
2. Mayur Ramgir, "Internet of Things: Architecture, Implementation and security"
3. Margolis, Michael. "Arduino Cookbook: Recipes to Begin, Expand, and Enhance Your Projects", O'Reilly Media, Inc.", 2011.

Additional References

1. Raj Kamal, "Internet of Things", 2nd Edition, 2022.
2. Vijay Madisetti and ArshdeepBahga, "Internet of Things (A Hands-on-Approach)", 1st Edition, VPT, 2014.

Lab Exercises

1. Prepare a report of various IOT components
2. Analyse various IOT architectures and prepare the list of protocols used in each layer.
3. Familiarize various IOT hardware, software Operating system.
4. Prepare an IOT architecture for various applications in IOT.

Course Outcomes

No.	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO1	Restate the basic characteristics, elements and challenges faced in IoT (Ap)	U	PSO-1
CO2	Compare different IOT Network Architecture and Design	Ap	PSO-1,2,3
CO3	Illustrate the role of various hardware and Software components in IOT	Ap	PSO-1,2,3
CO4	Outline the role of IOT in major domains through Domain specific IOT applications	U	PSO-1

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Credits: 3:0:1 (Lecture: Tutorial: Practical)

CO No.	CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L)/Tutorial (T)	Practical (P)
CO1	Restate the basic characteristics, elements and challenges faced	PO-2, 6,7 PSO-1, 2, 3	Ap	F, C	L	-
CO2	Compare different IOT Network Architecture and	PO-2,6, 7 PSO-1, 2, 3	Ap	F, C, P	L	-
CO3	Illustrate the role of various hardware and Software	PO-2,6,7 PSO-1,2,3	Ap	F, C, P	L	P
CO4	Outline the role of IOT in major domains through Domain specific	PO-2, 5,6,7 P PSO-1, 2, 3	U	F, C	L	P

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs :

	PO1	PO2	PO3	PO4	PO 5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4
CO 1	-	1	-	-	-	2	3	-	3	-	-	-
CO 2	-	1	-	-	-	2	3	-	3	3	1	-
CO 3	-	2	-	-	-	2	3	-	3	3	1	-
CO 4	-	3	-	-	2	2	3	-	3	-	-	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Discussion / Seminar
- Midterm Exam
- Lab Assignments
- Final Exam

Mapping of COs to Assessment Rubrics:

	Internal	Quiz	Lab	End Semester
CO 1	✓	✓		✓
CO 2	✓		✓	✓
CO 3	✓	✓		✓
CO 4	✓		✓	✓

UK6DSCCAP303: SOFTWARE TESTING

Discipline	Computer Applications				
Course Code	UK6DSCCAP303				
Course Title	Software Testing				
Type of Course	DSC				
Semester	VI				
Academic Level	3				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	3hours	-	2 hours	5 hours

Pre-requisites	Basic understanding of programming concepts Familiarity with software development lifecycle Knowledge of basic software engineering principles
Course Summary	This course provides an introduction to software testing methodologies, techniques, and tools. It covers the fundamentals of testing, including test planning, test case design, and execution. The course also includes an introduction to automation testing using Selenium. Students will learn how to systematically identify, evaluate, and address software defects to ensure the quality and reliability of software applications.

Detailed Syllabus:

Module	Unit	Content	Hrs
I		**Introduction to Software Testing**	15
	1	Overview of software testing	
	2	Testing principles and fundamentals	
	3	Software testing life cycle	
	4	Testing types: Manual, Automation, functional, non-functional, black-box, white-box	
	5	Levels of testing: Unit Testing, Integration Testing, System Testing, User Acceptance Testing	
	6	Testing documentation: test plan, test cases, test reports	
II		**Testing Types and Techniques**	15
	7	Types of testing - Regression Testing , Smoke Testing, Database Testing, Usability Testing	
	8	Load Testing, Stress Testing, Performance Testing	
	9	Internationalization Testing, Localization Testing	
	10	Static Testing Techniques : Importance of reviews in STLC, Review Activities, Roles and Responsibilities during Review	
	11	Dynamic Testing Techniques: Specification-based or black-box techniques , Boundary Value Analysis, Decision Table Testing, Equivalence Partitioning	
	12	Experience-based Testing Techniques: Error Guessing, Exploratory Testing	
III		**Test Automation and introduction to Selenium**	15
	13	Introduction to test automation	

	14	Overview : major functional and non functional tools, Test management and defect tracking tools	
	15	Overview of Selenium	
	16	Setting up Selenium environment	
	17	Introduction to Selenium Components	
IV	**Testing Using Selenium**		**15**
	19	Create Selenese commands	
	20	Handling different elements : textboxes, radio buttons, check boxes	
	21	Keyboard, mouse actions	
	22	Developing test cases and test suits with Selenium	
	23	Working with a case study	
V	**Flexi Module**		**15**
	24	Introduction to emerging techniques in software testing	
	25	Comparative analysis of different testing tools and frameworks	
	26	Case studies highlighting successful implementation of Selenium in real-world projects	
	27	Exploring advanced topics such as AI-driven testing, machine learning in test automation, and shift-left testing methodologies	
	28	Interactive sessions, discussions, and hands-on exercises based on the latest trends and industry developments	

References:

1. Roger S. Pressman, "Software Engineering: A Practitioner's Approach", McGraw Hill Education.
2. Rex Black, "Foundations of Software Testing", Cengage Learning.
3. Dorothy Graham et al., "Experiences of Test Automation: Case Studies of Software Test Automation", Addison-Wesley Professional.
4. Alan Richardson, "Selenium WebDriver: From Foundations to Framework", Leanpub.
5. “Learn Selenium” , Unmesh Gundech and Carl Cocchiaro
6. https://www.tutorialspoint.com/selenium/index.htm
7. https://greenstechnologys.com/Selenium%20Full%20Material%20Updated%20Greens.pdf

Lab Exercises

1. Installation of Selenium
2. Testing Web Page Loading
3. Form Submission Testing
4. Testing Navigation
5. Testing Element Interactions

6. Testing Element Visibility
7. Testing Error Handling
8. Testing Cross-Browser Compatibility
9. Testing Responsiveness
10. Testing Performance

Course Outcomes

No.	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO-1	Outline the fundamental concepts of software testing and its importance in software development.	U	PSO 1
CO-2	Identify different testing techniques and methodologies and apply them to real-world scenarios.	U	PSO 1, 2
CO-3	Use Selenium environment.	Ap	PSO 1,2,3
CO-4	Utilize automation testing tools, specifically Selenium, to automate test scenarios and enhance testing efficiency.	Ap	PSO 1,2,3

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Credits: 2:0:2 (Lecture:Tutorial:Practical)

CO No.	CO	PO/ PSO	Cognitive Level	Knowledge Category	Lecture (L)/ Tutorial (T)	Practical(P)
CO-1	Outline the fundamental concepts of software testing and its importance in software development.	PO- 6,7 PSO- 1	U	F, C	L	
CO-2	Identify different testing techniques and methodologies and apply them to real-world scenarios.	PO -2,6, 7 PSO -1, 2	U	F, C	L	
CO-3	Use Selenium environment.	PO- 2,3,6,7 PSO -1,2,3	Ap	F,C,P	L	P
CO-4	Utilize automation testing tools, specifically Selenium, to automate test scenarios and enhance testing efficiency.	PO- 2,3,6.7 PSO -1,2,3	Ap	F,C,P	L	P

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4
CO 1	-	-	-	-	-	3	3	-	3	-	-	-
CO 2	-	2	-	-	-	3	3	-	3	3	-	-
CO 3	-	2	3	-	-	2	3	-	3	2	3	-
CO 4	-	2	3	-	-	2	3	-	3	2	3	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics :

	Internal	Assignment	Programming	End Semester
CO 1	✓	✓		✓
CO 2	✓	✓		✓
CO 3	✓		✓	✓
CO 4	✓		✓	✓

UK6DSCCAP304: CLOUD COMPUTING

Discipline	COMPUTER APPLICATION				
Course Code	UK6DSCCAP304				
Course Title	**CLOUD COMPUTING**				
Type of Course	DSC				
Semester	VI				
Academic Level	3				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4 Credits	4 Hours	-	-	4 Hours
Pre-requisites	NIL				
Course Summary	This Course provides a comprehensive view on Cloud Computing and provides insights of the key services and players in the industry. The student is acquainted to the Architecture of Clouds, challenges faced in the Cloud, and to various applications and tools available in Cloud Computing for Machine Learning.				

Detailed Syllabus:

Module	Unit	Content	Hrs
I	**Title of the Module: Cloud Computing Foundation**		**12**
	1	Introduction to Cloud Computing- Basics	
	2	History, importance, Characteristics, Pros and Cons of Cloud computing.	
	3	Types of Cloud – Public and Private Cloud. Cloud Computing infrastructure	
II	**Title of the Module: Cloud Architecture- Layers and Models**		**12**
	4	Layers in Cloud Architecture	
	5	Software as a Service (SaaS), features of SaaS and benefits	
	6	Platform as a Service (PaaS), features of PaaS and benefits	

	7	Infrastructure as a Service (IaaS), features of IaaS and benefits	
	8	Cloud Service Providers	
	9	Challenges and risks in cloud adoption	
	10	Cloud deployment model: Public clouds – Private clouds – Community clouds - Hybrid clouds	
	11	Advantages of Cloud computing.	
III	**Title of the Module: Cloud Computing for everyone**		**12**
	12	Centralizing email communications	
	13	Collaborating on schedules	
	14	Cloud computing for community	
	15	Collaborating on group projects and events	
	16	Cloud computing for corporation	
IV	**Title of the Module: Virtualization and Cloud Tools for Machine Learning**		**12**
	17	Definition, Adopting Virtualization, Types	
	18	Virtualization and Software, Virtual Clustering	
	19	Virtualization Application, Pitfalls of Virtualization	
	20	Amazon web components and services, Elastic Compute Cloud (EC2), Amazon Storage System and database services	
	21	Microsoft Cloud Services	
	22	Google Cloud Applications	
	23	Cloud based tools for Machine Learning - AWS SageMaker, Azure Machine Learning, Google Cloud AI Platform Data preprocessing, feature engineering, and model training	
V		**Flexi Module: Not included for End Semester Exams**	12
	24	Future Trends	
	254	Mobile Cloud, Autonomic Cloud Engine, Multimedia Cloud	
	26	Energy Aware Cloud Computing, Jungle Computing	
		Deploying Machine Learning Models on the Cloud- Containerization with Docker and Kubernetes Serverless deployment with AWS Lambda or Azure Functions	

Text books

Cloud Computing, A practical approach for learning and implementation, A.Srinivasan&J.Suresh, Pearson, 2017

Rajkumar Buyya, James Broberg, Andrzej, Cloud Computing: Principles and Paradigms, Wiley India Publications, 2011

Barrie Sosinsky, "Cloud Computing Bible", 1st Edition, Wiley India Pvt. Ltd., New Delhi, 2011.

Course Outcomes

No.	Upon completion of the course the graduate will be able	Cognitive	PSO
CO-1	Outline the basics of cloud computing	U	PSO-1
CO-2	Differentiate between the various technologies of cloud	Ap	PSO-1,2
CO-3	Recognize the applications of Cloud	U	PSO-1
CO-4	Compare various Cloud Services	Ap	PSO-1,2

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Credits: 4:0:0 (Lecture:Tutorial:Practical)

CO No.	CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L)/Tutorial (T)	Practical (P)
CO-1	Outline the basics of cloud computing	PO-2,6,7 PSO-1	U	F, C	L	-
CO-2	Differentiate between the various technologies of cloud computing.	PO-2,4,5,6,7 PSO-1,2	Ap	F, C	L	-
CO-3	Recognize the applications of Cloud	PO-2,6,7 PSO-1	U	F, C	L	-
CO-4	Compare various Cloud Services	PO-2,4,5,6,7	Ap	F, C	L	-

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs:

	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	-	-	-	-	-	2	2		1	-	-	-
CO 2	-	3-	-	1	1	2	2		2	3	-	-
CO 3	-	3	-	-	-	2	2		2	-	-	-
CO 4	-	3	-	1	1	2	2		2	3	-	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics:

	Internal Exam	Assignment	Discussion	End Semester Examinations
CO 1	✓	✓		✓
CO 2	✓		✓	✓
CO 3	✓			✓
CO 4	✓	✓	✓	✓

UK6DSCCAP306-OPERATING SYSTEM CONCEPTS AND TECHNIQUES

Discipline	**COMPUTER APPLICATION**				
Course Code	UK6DSCCAP306				
Course Title	Operating System Concepts and Techniques				
Type of Course	**DSC**				
Semester	VI				
Academic Level	3				
Course Details	Credit	Lecture Per Week	Tutorial Per Week	Practical Per Week	Total Hours/Week
	4	4 hours			4 hours
Pre-requisites	Basic Knowledge in Computer Science				
Course Summary	Provides a comprehensive exploration of fundamental concepts and practices governing modern computer operating systems. Topics include process management, memory allocation, file systems, concurrency, and deadlock handling. Through theoretical study and practical application, students gain insights into OS design principles and algorithms.				

Detailed Syllabus: OPERATING SYSTEM CONCEPTS AND TECHNIQUES

Module	Unit	Content	Hrs
I		**Introduction**	**12**
	1	Introduction: What Operating System Do, Computer System Organization, Computer System Architecture.	
	2	Operating System Structure, Distributed Systems.	
	3	Operating System Services, User Operating System Interface, System Calls.	
	4	The Process, Process states, Process Control Block, Threads.	
II		**Process Management**	**12**
	5	Process Scheduling, Operations on Processes, Interprocess Communication, CPU Scheduler, Preemptive and Non-Preemptive Scheduling, Dispatcher, Scheduling Criteria.	
	6	Scheduling Algorithms: FCFS, SJF, Priority Scheduling and Round-Robin Scheduling.	
	7	Synchronization: The Critical-Section Problem, Semaphores, Monitors.	

	8	Deadlocks: Deadlock Charecterization, Methods for Handling Deadlocks, Deadlock Prevention, Avoidance, Detection and Recovery from Deadlock.	
III	**Memory Management**		**12**
	9	Memory Management Strategies: Background, Swapping, Contiguous Memory Allocation.	
	10	Paging and Segmentation.	
	11	Virtual Memory Management: Background, Demand Paging, Thrashing.	
	12	Page Replacement: FIFO, LRU and Optimal Page Replacement.	
IV	**Storage Management**		**12**
	13	File System Structure, File System Implementation, File Allocation Methods.	
	14	Disk Scheduling: FCFS, SSTF, SCAN, C-SCAN and LOOK Scheduling.	
V	**Flexi Module (Not included for End Semester Examination)**		**12**
	17	Distributed Operating System: Motivation, Types of Distributed Operating Systems.	
	18	Distributed File Systems: Naming and Transparency, Remote File Access.	
	19	Real Time Systems: System Characteristics, Features of Real-Time Kernels.	

References

4. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, "Operating Systems Principles", Wiley India Edition, 2018.
5. Gary Nutt, NabenduChaki, SarmisthaNeogy, "Operating Systems", Third Edition,Pearson.
6. Andrew S Tanenbaum, Albert S Woodhull, "Operating Systems Design and Implementation", Eastern Economy Edition, PHI.

Course Outcomes

No.	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO-1	Summarize the basic functions and services of operating system.	U	PSO-1
CO-2	Compare various process scheduling methods and to demonstrate deadlock handling.	Ap	PSO-1,2

CO-3	Demonstrate the memory management techniques and page replacement algorithms	Ap	PSO-1,2
CO-4	Sketch file allocation methods and disk scheduling.	Ap	PSO-1,2

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Credits: 4:0:0 (Lecture:Tutorial:Practical)

CO No.	CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L)/Tutorial (T)	Practical (P)
CO-1	Summarize the basic functions and services of operating system.	PO-1,6,,7 PSO-1	U	F, C	L	-
CO-2	Compare various process scheduling methods and to demonstrate deadlock handling.	PO-1,6,7 PSO-1,2	Ap	F, C, P	L	-
CO-3	Demonstrate the memory management techniques and page replacement algorithms	PO-1,6,7 PSO-1,2	Ap	F,C,P	L	-
CO-4	Sketch file allocation methods and disk scheduling.	PO-1,6,7 PSO-1,2	Ap	F, C,P	L	-

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4
CO 1	1	-	-	-	-		2	-	1	2	-	-
CO 2	1	-	-	-	-	-	2	-	2	2	-	-

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

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics :

	Internal	Assignment	Quiz	End Semester
CO 1	✓		✓	✓
CO 2	✓	✓		✓
CO 3	✓		✓	✓
CO 4	✓	✓		✓

DSE

UK6DSECAP300: IMAGE PROCESSING AND APPLICATIONS

Discipline	COMPUTER APPLICATION				
Course Code	UK6DSECAP300				
Course Title	IMAGE PROCESSING AND APPLICATIONS				
Type of Course	**DSE**				
Semester	VI				
Academic Level	3				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	3 hours	-	2 hours	5 hours
Pre-requisites	1. Basic Knowledge on images 2. Basic knowledge on Cryptography				
Course Summary	This course aims to introduce the main concepts and techniques of image security and applications.				

Detailed Syllabus:

Module	Unit	Content	Hrs
I		**Introduction**	**15**
	1	Basic concepts: Pixel, Intensity, Types- Binary, Grayscale and color images, Image representation	
	2	Image security tools: GIMP, Image Maick, Exif tool, OpenPuff, Steghide	
	3	Basics of secret sharing: Shamir's secret sharing scheme	
II		**Visual Cryptography**	**15**
	4	Introduction ; Visual Cryptography ; Applications: Trojan-Free Secure Transaction, Authentication, Access Control, Transaction Tracking, Watermarking	

	5	Preliminaries ; Fundamental Principles of Visual secret sharing : Pixels Expansion , Contrast , Basis Matrices, Concept of Black and White Pixels in Visual Cryptography	
	6	Formation of A basis matrix : Observations Related to The Basis Matrix, Creation Approach of Naor and Shamir, Essential Conditions for a Basis Matrix	
III	**Digital Watermarking**		**15**
	7	Introduction :Significance of the Word "Watermark", Importance of Watermarking; Applications: Proof of Ownership, Ownership Identification, Broadcast Monitoring, Content Authentication, Tamper Recovery, Transaction Tracking, Copy Control, Device Control	
	8	Classification of Watermarking Techniques : Based on Visibility- Visible watermarking, Invisible/hidden watermarking, Based on Degree of Resistance to Attacks, Robust watermark, Fragile watermark, Semi-fragile watermark, Dual watermarking; Based on Watermark Detection/Extraction: Non-blind/Non-oblivious watermarking, Semi-blind watermarking, Blind/oblivious watermarking	
	9	Properties of watermarks : Robustness, Fragility, Imperceptibility, Capacity, Security, Computational Cost	
	10	Attacks: Types of Attacks - Intentional attack, Unintentional attack, Example of Attacks in the Watermarking System: Removal attack, Addition attack, Cryptographic attacks, Copy paste attack, Print scan attack, Geometric attack	
IV	**Steganography**		**15**
	11	Introduction: Watermarking vs. Steganography, Need for Steganography; Applications: Positive Applications, Negative Applications Properties: Fidelity, Embedding Capacity, Embedding Effectiveness, Blind Extraction, Statistical Undetectability, Robustness, Security, Computation Cost Addition	

	12	Performance measures; Approaches: Embedding Capacity, Imperceptibility, False Positive and False Negative, Computation Cost Mathematical notation and terminology: Steganalysis- Passive Steganalysis, Active Steganalysis, Malicious Steganalysis Detection : Blind Steganalysis, Targeted Steganalysis	
V	**Flexi module(Not for External Examination)**		**15**
	13	Emerging Technologies: Zero Knowledge proof, Tamper Evident Sensors, Multi factor authentication	
	14	Applications	

References

1. **S**hivendra Shivani, Suneeta Agarwal, Jasjit S. Suri, Handbook of Image-Based Security Techniques, CRC Press
2. Rafael C. Gonzalez, Richard E. Woods, Digital Image Processing, Third Edition

Lab Exercises

1. Demonstrate basic concepts of images
2. Analyse an image security tool.
3. Implement a secret sharing scheme.
4. Implement visual cryptography schemes.
5. Implement digital watermarking methods
6. Demonstrate Stegnography methods.

Course Outcomes

No.	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO-1	Demonstrate the fundamental concepts of images and security.	U	PSO-1
CO-2	Illustrate the concepts of visual cryptography and its applications	Ap	PSO-1, 2, 3

CO-3	Experiment with digital watermarking	Ap	PSO-1,2,3
CO-4	Demonstrate the principles and techniques of steganography	Ap	PSO-1, 2,3

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Credits: 4:0:0 (Lecture:Tutorial:Practical)

CO No.	CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L)/Tutorial (T)	Practical (P)
CO-1	Demonstrate the fundamental concepts of images and security.	PO-6,7 PSO-1, 3	Ap	F, C	L	-
CO-2	Illustrate the concepts of visual cryptography and its applications	PO6, 7 PSO-1,2,3	Ap	F, C	L	-
CO-3	Experiment with digital watermarking	PO6, 7 PSO-1, 2,3	Ap	F, C	L	-
CO-4	Demonstrate the principles and techniques of stegnography	PO6, 7 PSO-1, 2,3	Ap	F, C	L	-

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	-	-	-	-	-	3	3	-	3	-	2	-

CO 2	-	-	-	-	-	3	3	-	3	3	3	-
CO 3	-	-	-	-	-	3	3	-	3	3	3	-
CO 4	-	-	-	-	-	3	3	-	3	3	3	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics :

	Internal	Assignment/	Lab Assessment	End Semester Examinations
CO 1	✓	✓	✓	✓
CO 2	✓	✓	✓	✓
CO 3	✓	✓	✓	✓
CO 4	✓	✓	✓	✓

UK6DSECAP301 : Mobile and Wireless Security

Discipline	Computer Application

Course Code	UK6DSECAP301				
Course Title	Mobile and Wireless Security				
Type of Course	DSE				
Semester	VI				
Academic Level	3				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	4 hours	-	-	4hours
Pre-requisites	Knowledge of Concepts in Computer Networks and Security				
Course Summary	Security has been a concern in Wired and Wireless Networks. In this course an introduction to various security aspects in mobile and wireless networks are given.				

Detailed Syllabus:

Module	Unit	Content	Hrs
I		**Introduction to Mobile and Wireless Security**	**15**
	1	Introduction to Mobile Communication, Security - Wired and Wireless	4
	2	Security issues in Wireless and Mobile Communications. Need for Security in Wireless and Mobile Communications	4
	3	Threats to Wireless and Mobile Devices - Data Theft, Device Control and System Access.	3
	4	Security for Mobile Applications. Advantages and Disadvantages of Application Level Security	4
II		**Security at Device, Network and Server Levels**	**15**
	5	Mobile Devices' Security Requirements	5
	6	Mobile Wireless Network Level Security	5
	7	Server Level Security	5
III		**Application Level Security in Wireless Networks**	**15**
	8	Application of WLANS, Wireless Threats	3
	9	Vulnerabilities and Attack methods over WLANs. Information Security Standards.	4
	10	Security for 1G Wi-Fi and 2G Wi-Fi applications. Recent Security schemes for Wi-Fi applications	4

	11	Recent Security Schemes for Wi-Fi Applications	4
IV	**Security in MANETs and Ubiquitous Computing**		**15**
	12	MANETs - Introduction, Application and Features	3
	13	Security challenges in MANETs. Security attacks on MANETs	4
	14	External and Internal Threats for MANET Applications	4
	15	Some of the Security Attacks on Ubiquitous Computing Networks and its solutions	4
V		**Application Level Security in Heterogeneous Wireless Networks**	**15**
	16	Introduction. Heterogeneous Wireless Network Architecture	4
	17	Heterogeneous Network Application in Disaster Management	3
	18	Security Problems and Attacks in Heterogeneous Wireless Networks	4
	19	Security Solution for Heterogeneous Wireless Networks.	4

Text Books

1. Pallapa Venkataram, Sathish Babu B, "Wireless and Mobile Network Security", TMH 2010

2. Jim Doherty, "Wireless and Mobile Device Security", Jones and Bartlett Publishers, Inc., 2nd Edition.

3. Wolfgang Osterhage, "Wireless Network Security", CRC Press, 2nd Edition.

4. https://www.cisco.com/c/en/us/products/wireless/what-is-wi-fi-security.html

Course Outcomes

No.	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO-1	List the security threats in Mobile and Wireless Networks.	U	PSO-1
CO-2	Explain the different security measures in Mobile and Wireless Networks.	U	PSO-1,2
CO-3	Identify the various advantages and disadvantages of different security measures.	U	PSO-1,2
CO-4	Explain the various types of security issues in wireless networks.	U	PSO-1,2,3

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Note: 1 or 2 COs/module

Name of the Course: Credits: 4:0:0 (Lecture:Tutorial:Practical)

CO No.	CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L)/Tutorial (T)	Practical (P)
1	List the security threats in Mobile and Wireless Networks.		U	F,C	L	
2	Describe the different security measures in Mobile and Wireless Networks.		U	F,C	L	
3	Present the various advantages and disadvantages of different security measures.		U	F ,C	L	
4	Analyse the various types of security issues in wireless networks.		U	F, C	L	

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO 1	2	2	-	-	-	2	2	-	3	-	-
CO 2	1	2	1	-	-	3	2	-	-	3	-

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

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Quiz	End Semester Examinations
CO 1	✓		✓	✓
CO 2	✓		✓	✓
CO 3	✓	✓		✓
CO 4		✓		✓

UK6DSECAP302: DATA ANALYTICS WITH R

Discipline	COMPUTER APPLICATION
Course Code	UK6DSECAP302
Course Title	DATA ANALYTICS WITH R
Type of Course	DSE

Semester	V				
Academic Level	3 -				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	3 hours	-	2 hours	5 hours
Pre-requisites	Basic concepts in Statistics and Probability				
Course Summary	This course provides fundamental concepts of data analytics, R language & data visualization				

Detailed Syllabus:

Module	Unit	Content	Hrs (L + P)
I		**Introduction to R Programming**	**15**
	1	Basic Interaction with R, Using R as a Calculator, functions, Control Structures, factors, data frames	
	2	Using R as a Calculator, functions, Control Structures, factors, data frames	
	3	Data pipelines, coding and naming conventions.	
	4	Data Manipulation: Reading Data, Manipulating and tidying Data with deplorer	
II		**Visualizing Data**	**15**
	5	**Visualizing Data:** Basic Graphics, The Grammar of Graphics and the ggplot2 Package	
	6	Figures with multiple plot	
	7	Working with Large Datasets	
	8	Expressions**,** Basic Data Types, Data Structures, Control Structures, Functions, Recursive Functions	
III		**Advanced R Programming**	**15**
	9	Working with Vectors and Vectorizing Functions	
	10	Advanced Functions, Functional Programming	
	11	Function Operations: Functions as Input and Output, Building an R Package	
	12	Creating an R Package, R oxygen	
IV		**Data analysis using R**	**15**

	13	Exploratory data analysis using R functions –sqrt, range, sort, minimum, maximum, median, average, standard deviation, skewness, variance	
	14	Correlation and covariance between Power tests- Bivariate Analysis-Paired sample t-test, t-test to compare means-one mean and two means	
	15	One factor ANOVA comparing means across several groups, 2-way ANOVA. Simple linear regression.	
V	**Flexi Module (Not included for End semester Examination)**		**15**
	16	Supervised Learning: Machine Learning, Supervised Learning, Regression versus Classification, Inference versus Prediction	
	17	Unsupervised Learning: Clustering, k-Means Clustering, Hierarchical Clustering	
	18	Object Oriented Programming: Immutable Objects and Polymorphic Functions, Data Structures, Classes	

TEXT BOOK

1. Thomas Mailund, Beginning Data Science in R, Data Analysis, Visualization, and Modelling for the Data Scientist, APress
2. Keen, K. J. . Graphics for statistics and data analysis with R. CRC Press, 2010.
3. Tony Fischetti, Data Analysis with R.
4. Joseph Schmuller, Statistical Analysis with R for dummies.

LAB EXERCISES

1) Find roots of a quadratic equation using the R program.
2) Calculate simple interest by creating function in R program
3) Copy spreadsheet data to clipboard and from clipboard transfer to table. Sort the data in ascending order; find average and standard deviation. [Hint dat <- ead.table("clipboard", header=TRUE)].
4) Read the student name and mark from a text file and store it in a table. Find maximum, minimum, average, median and standard deviation of marks. Display histogram and barplot.
5) Read the salesman name and sales amount from a CSV file. Display the average and standard deviation of sales. Visualize using plot and box plot of the sales amount. Inspect the boxplot and comment on the presence of outliers
6) The profit of a company on five products is given. Find the average profit of the company using the R function. Plot the data using plot, hist and pie graphs. Write the screen output to text files [Hint: use the function sink ()]
7) Create dataset of age of 50 students using rnorm() with n=50, mean=3.1 and sd=0.04 and conduct one sample t-test at significance level of 0.05, to check the validity of the statement " the average age of students joining the play school is 3 years". Display this diagram. Interpret the result.
8) A table contains expenditure and profit of a company. Conduct Pearson correlation test using R to find the correlation of expenditure on profit. Display data using line graph using ggplot()

9) A shopkeeper has data on the sales per day of one month. He introduced a new scheme in the next month. He wants to check whether there are any significant differences in average sales of the current month and the previous month. Display boxplot for both the data and interpret the result [Hint create suitable dataset using rnorm() and conduct 2 Sample t-test].
10) Crop yield and quantity of fertilizer used in an agricultural field is given. Conduct one-way ANOVA test to check whether the quantity of fertilizer used has any impact on the crop yield. Interpret the result.

Course Outcomes

No.	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO-1	Demonstrate the basic features used in R Programming	Ap	PSO-1, 3
CO-2	Illustrate the concepts of data visualization and its usage in various scenarios.	Ap	PSO-1, 3
CO-3	Examine different functions used in advanced R Programming	Ap	PSO-1, 3
CO-4	Explore different ways of Data Analysis using R	An	PSO-1, 2, 3

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Credits: 4:0:0 (Lecture:Tutorial:Practical)

CO No.	CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L)/ Tutorial (T)	Practical (P)
CO-1	Demonstrate the basic features used in R Programming	PO-4, 6, 7 PSO-1, 3	Ap	F, C, P	L	P
CO-2	Illustrate the concepts of data visualization and its usage in various scenarios.	PO-4, 6, 7 PSO-1, 3	Ap	F, C, P	L	P

CO-3	Examine different functions used in advanced R Programming	PO-4, 6, 7 PSO-1, 3	Ap	F, C, P	L	P
CO-4	Explore different ways of Data Analysis using R	PO-1, 2, 4, 6, 7 PSO-1, 2, 3	An	F, C, P, M	L	P

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs :

	PO1	**PO2**	**PO 3**	**PO 4**	**PO 5**	**PO6**	**PO 7**	**PO 8**	**PSO1**	**PSO2**	**PSO 3**	**PSO4**
CO 1	-	-	-	1	-	1	1	-	2	-	1	-
CO 2	-	-	-	1	-	1	2	-	2	-	1	-
CO 3	-	-	-	1	-	2	2	-	2	-	1	-
CO 4	1	1	-	1	-	2	2	-	2	1	1	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Lab Assessment	End Semester Examination
CO 1	✓		✓	✓
CO 2	✓		✓	✓
CO 3	✓	✓	✓	✓
CO 4	✓	✓	✓	✓

UK6DSECAP303: Big Data Technologies using Hadoop

Discipline	COMPUTER APPLICATION				
Course Code	UK6DSECAP303				
Course Title	Big Data Technologies using Hadoop				
Type of Course	**DSE**				
Semester	VI				
Academic Level	3				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	3 hours	-	2 hours	5 hours
Pre-requisites	UK3DSECSC201: Data Science Fundamentals				
Course Summary	The Big Data Technologies Using Hadoop course is designed to introduce students to the concepts, tools, and technologies for processing and analyzing large-scale datasets commonly referred to as Big Data. The course focuses on Hadoop, an open-source framework that provides distributed storage and processing capabilities for handling massive volumes of data across clusters of commodity hardware. Students will learn the fundamentals of Hadoop ecosystem components and how to leverage them to solve real-world big data challenges.				

Detailed Syllabus:

Module	Unit	Content	Hrs (L + P)

I	**Introduction**		**15**
	1	Introduction to Hadoop, Understanding the Hadoop Distributed File System (HDFS) Getting Data into Hadoop, Understanding Data Processing in Hadoop	
II	**Advanced Map Reduce Concepts**		**15**
	2	Advanced Map Reduce API Concepts, Introduction to Apache Pig, Advanced Pig Usage, Introduction to Apache Hive, Advanced Hive Usage YARN Administration.	
III	**SQL and Cluster management**		**15**
	3	SQL on Hadoop Overview, The Hadoop Ecosystem, Cluster Management using Apache Ambari, Scaling Hadoop, Advanced Cluster Configuration, the Hadoop User Environment (HUE).	
IV	**Advanced concepts in Hadoop**		**15**
	4	Advanced HDFS, Securing Hadoop, Troubleshooting Hadoop, Integrating Hadoop into the Enterprise, Hadoop in the Cloud, Introduction to NoSQL, Introduction to Apache Spark.	

Lab Exercises Lab Exercises

1. Installation of Hadoop.
2. Implementation of Map reduce in Hadoop.
3. Demonstrate SQL queries in Hadoop.
4. Implement a word count program using map reduce concepts.
5. Implement cluster management in hadoop.
6. Implement NoSQL programs in MongoDB**.**

Course Outcomes

No.	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO1	Summarise map reduce concepts	U	PSO 1
CO2	Implement data processing in Hadoop and apply Hive to YARN administration	Ap	Ps

CO3	Develop cluster management system using Apache Ambari	Ap	
CO4	Restate HDFS, NoSQl and Apache Spark	Ap	

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Credits: 3:0:1 (Lecture: Tutorial: Practical)

CO No.	**CO**	**PO/PSO**	**Cognitive Level**	**Knowledge Category**	**Lecture (L)/Tutorial (T)**	**Practical (P)**
CO1	Remember map reduce concepts		U	F, C	10	3
CO2	Understand data processing in Hadoop and apply Hive to YARN administration		Ap	P	10	3
CO3	Develop cluster management system using Apache Ambari		An	P	15	4
CO4	Restate HDFS, NoSQl and Apache Spark		Ap	P	10	20

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs :

	PO1	**PO2**	**PO3**	**PO4**	**PO 5**	**PO6**	**PO 7**	**PO8**	**PSO 1**	**PSO 2**	**PSO3**	**PSO 4**

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

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Discussion / Seminar
- Midterm Exam
- Lab Assignments
- Final Exam

Mapping of COs to Assessment Rubrics :

	Internal	Quiz/Assignment	Lab Assessment	End Semester Examinations
CO 1	✓	✓		✓
CO 2	✓			✓
CO 3	✓			✓
CO 4	✓	✓		✓

UK6DSECAP304: Recommendation Systems

Discipline	COMPUTER APPLICATION				
Course Code	UK6DSECAP304				
Course Title	Recommendation systems				
Type of Course	DSE				
Semester	VI				
Academic Level	3				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	3 hours	-	2 hours	5 hours
Pre-requisites	Nil				
Course Summary	The course will explore recommendation systems: and various techniques.				

Detailed Syllabus:

Module	Unit	Content	Hrs
I		**Introduction**	**15**
	1	Introduction, Recommender Systems Function, Data and Knowledge Sources, Recommendation Techniques, Application and Evaluation, Recommender Systems and Human Computer Interaction, Recommender Systems as a Multi-Disciplinary Field, Emerging Topics and Challenges.	
II		**Data Mining Methods for Recommender Systems**	**15**
	2	Introduction; Data Preprocessing: Similarity Measures, Sampling, Reducing Dimensionality, Denoising	
	3	Classification: Nearest Neighbors, Decision Trees, Rule-based Classifiers, SVM	

	4	Cluster Analysis : k-Means. Alternatives to k-means; Association Rule Mining	
III	**Content-based Recommender Systems**		**15**
	8	Introduction ; Basics of Content-based Recommender Systems; State of the Art of Content-based Recommender Systems; Trends and Future Research	
IV	**Collaborative Filtering**		**15**
	11	Introduction; Preliminaries; Matrix factorization models: SVD , SVD++, Time-aware factor model	
		Neighborhood models: Similarity measures, Similarity-based interpolation, Jointly derived interpolation weights .	
V	**Flexi module:- Not included for external examination**		**15**
		Evaluating Recommendation Systems: Introduction, Experimental Settings, Recommendation System Properties	
		Applications of Recommendation systems	

References

Core

1. Francesco Ricci · Lior Rokach · Bracha Shapira · Paul B. Kantor, "Recommender system handbook", Springer, Third edition, 2022.

Additional

2. Charu C Aggarwal, Recommender system:The textbook, Springer, 2016 .

Lab Exercises

Programs for implementing different algorithms in the syllabus of recommendation systems

Course Outcomes

No.	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed

CO1	Summarize Recommendation system concepts	U	PSO 1
CO2	Apply data mining methods	Ap	PSO 1, 2, 3
CO3	Make use of skills in Content-based Recommender Systems	Ap	PSO 1, 2
CO4	Explain different techniques for collaborative filtering	U	PSO 1, 2

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Credits: 3:0:1 (Lecture: Tutorial: Practical)

CO No.	**CO**	**PO/PSO**	**Cognitive Level**	**Knowledge Category**	**Lecture (L)/Tutorial (T)**	**Practical (P)**
CO1	Summarize Recommendation system concepts	PO-1, 6,7 PSO1	U	F, C	L	
CO2	Apply data mining methods	PO-1, 6, 7 PSO-1, 2, 3	Ap	F, C, P	L	
CO3	Make use of skills in Content-based Recommender Systems	PO-1, 6, 7 PSO- 1,2	Ap	F, C, P	L	

CO4	Explain different techniques for collaborative filtering	PO-1, 6, 7 PSO 1, 2	U	F, C, P	L	

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs :

	PO 1	**PO2**	**PO3**	**PO4**	**PO 5**	**PO6**	**PO7**	**PO8**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO 1	1	-	-	-	-	3	3	-	2	-	-	-
CO 2	1	-	-	-	-	3	3	-	2	1	2	-
CO 3	1	-	-	-	-	3	3	-	2	1	-	-
CO 4	1	-	-	-	-	3	3	-	2	1	-	-

Correlation Levels:

Leve	**Correlation**
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics :

	Internal	Assignment	Lab	End Semester
CO 1	✓			✓

CO 2	✓	✓		✓
CO 3	✓			✓
CO 4	✓	✓		✓

UK6DSECAP305: Deep Learning

Discipline	Computer Application				
Course Code	UK6DSECAP305				
Course Title	Deep Learning				
Type of Course	**DSE**				
Semester	VI				
Academic Level	3				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	3 hours	-	2 hours	5 hours
Pre-requisites	UK101DSECSC: Introduction to Machine Learning				
Course Summary	This course provides an in-depth exploration of deep learning, a subfield of machine learning focused on algorithms inspired by the structure and function of the brain's neural networks. Students will delve into neural network architectures, training algorithms, optimization techniques, and applications across various domains				

Detailed Syllabus:

Module	Unit	Content	Hrs (L+P)
I		**Introduction**	**15**
	1	Introduction; Applications; Deep Learning Process; Artificial Neural Network: neurons, activation functions, layers, and architectures; Types of Deep Learning Network; Limitations	

II	**Deep Neural Networks**		**15**
	2	Deep Neural Networks: Deep Feedforward Networks, Example: XOR problem; Gradient Based learning: Cost functions, Output Units: Linear, Sigmoid, Softmax; Hidden Units: Rectified Linear Units; Bagging; Boosting ; Optimization strategies: Batch Normalization	
	3	Python packages for Deep Learning: TensorFlow, Keras	
III	**Convolutional Neural Networks**		**15**
	4	Convolutional Neural Networks: Introduction, Convolution operation, Pooling, Batch Normalisation, CNN architecture; Convolutional Networks and the History of Deep Learning	
IV	**Sequence Modeling**		**15**
	5	Recurrent Neural Networks; Bidirectional RNNs; Encoder- Decoder Sequence to sequence architecture; Deep Recurrent Neural Network; Recursive Neural Networks; Long Short-Term Memory; Deep Generative models: Boltzmann Machines	
V		**Flexi Module: Not included for End Semester Exams**	**15**
	6	Computer Vision; Natural Language Processing; Speech Recognition; Medical Data Processing	

Reference Books

Core Books

1. Ian Goodfellow, Yoshua Bengio, and Aaron Courville, Deep Learning, MIT Press 2016

Additional References

1 Aurelien Geron, .Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems, Third Edition, October 2022

2. Adam Gibson and Josh Patterson, “Deep Learning: A Practitioner’s Apprach”, O'Reilly Media, First Edition, 2017

3. Aurélien Géron, “Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow”, O'Reilly Media, Second Edition, 2019

4. Rajalingappaa Shanmugamani, “Deep Learning for Computer Vision", First Edition, 2018.

Practical Components (30 Hours)

1. Implement basic functions in Keras and Tensorflow.
2. Implement a deep neural network using Keras
3. Implement a CNN using Keras.
4. Implement a RNN.
5. Implement LSTM.
6. Implement MNIST handwritten digits classification.
7. Implement object classification.
8. Implement classification in different scenarios.

Course Outcomes

No.	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO1	Understand the concepts of deep learning	U	PSO-1, 2,
CO2	Apply deep neural networks in various real world problems	Ap	PSO-1, 2, 3
CO3	Apply various methods in convolutional neural networks	Ap	PSO- 1, 2, 3
CO4	Illustrate the working various learning methods	Ap	PSO-1, 2, 3

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Credits: 3:0:1 (Lecture: Tutorial: Practical)

CO No.	CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L)/Tutorial (T)	Practical (P)
CO1	Understand the concepts of deep learning	PO 2, 5, 6, 7 PSO 1, 2, 3,	U	F, C, P	L	P

CO2	Apply deep neural networks in various real world problems	PO 2,5, 6, 7 PSO 1, 2, 3,	Ap	F, C, P	L	P
CO3	Apply various methods in convolutional neural networks	PO 2, 5, 6, 7 PSO 1, 2, 3,	Ap	F, C, P	L	P
CO4	Illustrate the working various learning methods	PO2, 5, 6, 7 PSO 1, 2, 3, 4	Ap	F, C, P	L	P

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs :

	PO1	**PO2**	**PO3**	**PO4**	**PO**	**PO6**	**PO7**	**PO8**	**PSO**	**PSO**	**PSO**	**PSO**
CO	-	2	-	-	1	3	3	-	3	2	3	-
CO	-	2	-	-	1	3	3	-	3	2	3	-
CO	-	2	-	-	1	3	3	-	3	2	3	-
CO	-	2	-	-	1	3	3	-	3	2	3	-

Correlation Levels:

Level	**Correlation**
-	Nil
1	Slightly / Low
2	Moderate /
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Discussion / Seminar
- Midterm Exam
- Lab Assignments
- Final Exam
- **Mapping of COs to Assessment Rubrics :**

	Internal	Quiz/Assignment	Lab	End Semester
CO 1	✓	✓	✓	✓
CO 2	✓		✓	✓
CO 3	✓		✓	✓
CO 4	✓	✓	✓	✓

UK6DSECAP306: Mobile Application Development

Discipline	Computer Applications				
Course Code	UK6DSECAP306				
Course Title	Mobile Application Development				
Type of Course	DSE				
Semester	VI				
Academic Level	3				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	3 hours	-	2 hours	5hours
Pre-requisites	Basic knowledge of programming concepts and familiarity with object-oriented programming languages.				
Course Summary	This course provides an introduction to mobile application development using Flutter, a popular open-source UI software development kit created by Google. Students will learn the fundamentals of mobile app development, the process involved in creating mobile applications, and practical implementation through developing a simple mobile app using Flutter.				

Detailed Syllabus:

Module	Unit	Content	Hrs
I		**Introduction to Mobile App Development**	15
	1	Overview of mobile application development	
	2	Types of mobile applications (Native, Web, Hybrid)	
	3	Introduction to Flutter and its advantages	
	4	Basics of UI/UX design for mobile applications	
II		**Mobile App Development Process**	15
	5	Understanding the mobile app development lifecycle	
	6	Understanding user requirements and market analysis	
	7	Wireframing and prototyping	
	8	Development methodologies (Waterfall, Agile)	
	9	Testing and quality assurance	
III		**Introduction to Flutter**	15
	10	Introduction to Dart programming language	
	11	Setting up Flutter environment	
	12	Understanding Flutter architecture and components	
	13	Widgets and their usage in Flutter	
	14	State management in Flutter applications	
IV		**Developing an App in Flutter**	15
	15	Hands-on coding exercises to develop a basic Flutter app	
	16	Implementing UI components, navigation, and state management in Flutter	
	17	Integrating APIs and handling data in Flutter apps	
	18	Debugging and troubleshooting common issues in Flutter development	
	19	Deploying Flutter apps to Android and iOS devices	
V		**Flexi Module**	15
	20	Exploration of emerging trends and techniques in mobile app development	
	21	Case studies of successful mobile apps developed using Flutter	
	22	Comparative analysis of Flutter with other mobile app development frameworks	
	23	Discussion on advanced topics such as performance optimization, responsive design, and accessibility in Flutter apps	

References:

- Erric Windmill, “Flutter in Action”, Manning Publications
- "Learning Flutter: A Hands-On Guide to Building Native iOS and Android Apps with Dart" by Rae Hoyt, Jody Alkema, and Brian E. Long
- Flutter Documentation" - Available online at https://flutter.dev/docs
- "Mobile App Development: 101 Guide" by John Smith
- "Agile Development with Flutter: Building Mobile Apps Using Flutter" by Paul Taylor
- "UI/UX Design for Mobile Developers" by Jessica Brown
- https://digilib.stekom.ac.id/assets/dokumen/ebook/feb_3872ce7467cbdc7beedfcdc12b2b607b0ba36429_1649057575.pdf
- https://www.techaheadcorp.com/wp-content/uploads/2019/10/mobile-application-development-guide-pdf.pdf
- https://www.tutorialspoint.com/flutter/flutter_tutorial.pdf
- https://docs.flutter.dev/cookbook

Sample List of Experiments

1. Hello World App: Create a simple Flutter app that displays "Hello, World!" on the screen.
2. Counter App: Build a Flutter app with a button and a counter displayed. Each button press increases the counter by one.
3. Basic Layouts: Experiment with arranging elements on the screen using Row and Column widgets.
4. Styling Text and Buttons: Explore changing the style of text and buttons in your Flutter app.
5. Simple Navigation: Implement basic navigation between two screens using Flutter's Navigator widget.
6. Creating Lists: Learn to display a list of items in your app using ListView widget.
7. User Input: Allow users to input text through text fields and display the input on the screen.
8. Fetching Data: Fetch data from a public API (e.g., weather forecast) and display it in your app.
9. Managing State: Experiment with updating the UI dynamically using setState.
10. Local Storage: Store and retrieve data locally on the device, like a simple to-do list.

Course Outcomes

No.	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed

CO-1	Outline the fundamentals of mobile applications and their significance in the current digital landscape.	U	PSO 1
CO-2	Summarize mobile app development process from ideation to deployment, including design considerations, development stages, and testing.	U	PSO 1
CO-3	Experiment in Flutter framework, its architecture, widgets, and features.	Ap	PSO 1, 2, 3
CO-4	Develop a basic mobile application using Flutter.	Ap	PSO 2, 3

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Credits: 2:0:2 (Lecture:Tutorial:Practical)

CO No.	CO	PO/ PSO	Cognitive Level	Knowledge Category	Lecture (L)/ Tutorial (T)	Practical (P)
CO-1	Outline the fundamentals of mobile applications and their significance in the current digital landscape.	PO- 6, 7 PSO -1	U	F,C	L	P
CO-2	Summarize mobile app development process from ideation to deployment, including design considerations, development stages, and testing.	PO -6, 7 PSO- 1	U	F, C	L	P
CO-3	Experiment in Flutter framework, its architecture, widgets, and features.	PO- 2, 3, 6, 7 PSO -1, 2, 3	Ap	F,C,P	L	P
CO-4	Develop a basic mobile application using Flutter.	PO -2, 3 6, 7 PSO -1,2, 3	Ap	F,C,P	L	P

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4

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

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics :

	Internal	Assignmen	Programming	End Semester
CO 1	✓	✓	✓	✓
CO 2	✓	✓	✓	✓
CO 3	✓		✓	✓
CO 4	✓		✓	✓

UK6DSECAP307: Emerging Trends in Web Development

Discipline	COMPUTER APPLICATION
Course Code	UK6DSECAP307
Course Title	Emerging Trends in Web development

Type of Course	DSE				
Semester	VI				
Academic Level	3				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	4 hours	-	0	4 hours
Pre-requisites	Nil				
Course Summary	This course cover cutting-edge tools, frameworks, and methodologies that are shaping the future of web development.				

Detailed Syllabus:

Module	Unit	Content	Hrs
I		**Introduction**	**12**
	1	Types of Websites: Static Website, Dynamic Website; Scripting: Server-side scripting, Client side scripting	
	2	Web publishing Fundamentals: Electronic Publishing	
	3	Web Hosting Service: History, Classification: Smaller hosting services, Larger hosting services, Shared Web Hosting Service	
	4	Website Testing: Web Application performance tool, Web security testing, Software testing; Testing Approach	
II		**Progressive Web Apps**	**12**
	5	Progressive Web Apps(PWA): Definition, History, Making a Progressive Web App, PWA Market Impact, PWA and App stores	
	6	Web App Manifest files: Save to Home screen, Making a web App Installable, Anatomy of Web App Manifest files	
	7	Service Workers: Introducing service workers	
III		**Web Assembly**	**12**
	8	Web Assembly; What problems does it solve? How does it work?	
	9	Structure of a WebAssembly module; How is WebAssembly secure? Languages for creating a WebAssembly module	
	10	WebAssembly modules: Known Sections, Custom Sections	
IV		**GraphQL**	**12**
	11	GraphQL; Queries and mutations- Fields, Arguments, Aliases, Fragments	

	12	Using variables inside fragments, Operation name, Variables, Variable Definitions, Default variables, Directives	
	13	Mutations: Multiple fields in mutations, Inline Fragments, Meta fields	
	14		
V	**Flexi module:- Not included for external examination**		**12**
	15	WebVR, WebRTC	
	16	Web Performance Optimization	

References

1. Er. V. K. Jain, "Advanced Programming in Web Designing", Cyber Tech Publications, 2018. (Module 1)
2. John M. Wargo, "Learning Progressive Web Apps: Bring a Native App Experience to the Web" (Module 2)
3. Gerard Gallant, "WebAssembly in Action" (Module 3)
4. Samer Buna, "GraphQL in Action" (Module 4)

Course Outcomes

No.	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO1	Summarize the fundamentals of web hosting and publishing	U	PSO 1
CO2	Develop Progressive Web Apps (PWAs) integrating Web App Manifest and Service Workers effectively.	Ap	PSO 1, 2, 3
CO3	Develop secure WebAssembly modules, comprehending its structure, languages, and known sections	Ap	PSO 1, 2, 3
CO4	Make use of skills in GraphQL effectively.	Ap	PSO 1, 2, 3

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Credits: 4:0:0 (Lecture: Tutorial: Practical)

CO No.	CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L)/Tutorial (T)	Practical (P)

CO1	Summarize the fundamentals of web hosting and publishing	PO-1, 6,7 PSO1	U	F, C	L	
CO2	Develop Progressive Web Apps (PWAs) integrating Web App Manifest and Service Workers effectively.	PO-1, 6, 7 PSO-1, 2, 3	Ap	F, C, P	L	
CO3	develop secure WebAssembly modules, comprehending its structure, languages, and known sections	PO-1, 6, 7 PSO- 1,2, 3	Ap	F, C, P	L	
CO4	Make use of skills in GraphQL querying, mutations, and directives, applying variables, fragments, and meta fields effectively.	PO-1, 6, 7 PSO 1, 2,3	Ap	F, C, P	L	

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs :

	PO1	PO2	PO3	PO4	PO 5	PO6	PO7	PO8	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	1	-	-	-	-	3	3	-	2	-	-	-
CO 2	1	-	-	-	-	3	3	-	2	1	2	-
CO 3	1	-	-	-	-	3	3	-	2	1	2	-
CO 4	1	-	-	-	-	3	3	-	2	1	2	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics :

	Internal	Assignment	Project	End Semester
CO 1	✓			✓
CO 2	✓	✓		✓
CO 3	✓			✓
CO 4	✓	✓		✓

Skill Enhancement Courses

UK6DSECAP300: Mobile Application Development

Discipline	Computer Applications				
Course Code	UK6DSECAP300				
Course Title	Mobile Application Development				
Type of Course	DSE				
Semester	VI				
Academic Level	3				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	3	2 hours	-	2 hours	4 hours
Pre-requisites	Basic knowledge of programming concepts and familiarity with object-oriented programming languages.				
Course Summary	This course provides an introduction to mobile application development using Flutter, a popular open-source UI software development kit created by Google. Students will learn the fundamentals of mobile app development, the process involved in creating mobile applications, and practical implementation through developing a simple mobile app using Flutter.				

Detailed Syllabus:

Module	Unit	Content	Hrs
I		**Introduction to Mobile App Development**	12
	1	Overview of mobile application development	
	2	Types of mobile applications (Native, Web, Hybrid)	
	3	Introduction to Flutter and its advantages	
	4	Basics of UI/UX design for mobile applications	
II		**Mobile App Development Process**	12
	5	Understanding the mobile app development lifecycle	
	6	Understanding user requirements and market analysis	
	7	Wireframing and prototyping	
	8	Development methodologies (Waterfall, Agile)	

	9	Testing and quality assurance	
III	**Introduction to Flutter**		**12**
	10	Introduction to Dart programming language	
	11	Setting up Flutter environment	
	12	Understanding Flutter architecture and components	
	13	Widgets and their usage in Flutter	
	14	State management in Flutter applications	
IV	**Developing an App in Flutter**		**12**
	15	Hands-on coding exercises to develop a basic Flutter app	
	16	Implementing UI components, navigation, and state management in Flutter	
	17	Integrating APIs and handling data in Flutter apps	
	18	Debugging and troubleshooting common issues in Flutter development	
	19	Deploying Flutter apps to Android and iOS devices	
V	**Flexi Module**		**12**
	20	Exploration of emerging trends and techniques in mobile app development	
	21	Case studies of successful mobile apps developed using Flutter	
	22	Comparative analysis of Flutter with other mobile app development frameworks	
	23	Discussion on advanced topics such as performance optimization, responsive design, and accessibility in Flutter apps	

References:

- Erric Windmill, “Flutter in Action”, Manning Publications
- "Learning Flutter: A Hands-On Guide to Building Native iOS and Android Apps with Dart" by Rae Hoyt, Jody Alkema, and Brian E. Long
- Flutter Documentation" - Available online at https://flutter.dev/docs
- "Mobile App Development: 101 Guide" by John Smith
- "Agile Development with Flutter: Building Mobile Apps Using Flutter" by Paul Taylor
- "UI/UX Design for Mobile Developers" by Jessica Brown
- https://digilib.stekom.ac.id/assets/dokumen/ebook/feb_3872ce7467cbdc7beedfcdc12b2b607b0ba36429_1649057575.pdf
- https://www.techaheadcorp.com/wp-content/uploads/2019/10/mobile-application-development-guide-pdf.pdf
- https://www.tutorialspoint.com/flutter/flutter_tutorial.pdf
- https://docs.flutter.dev/cookbook

Sample List of Experiments

1. Hello World App: Create a simple Flutter app that displays "Hello, World!" on the screen.
2. Counter App: Build a Flutter app with a button and a counter displayed. Each button press increases the counter by one.
3. Basic Layouts: Experiment with arranging elements on the screen using Row and Column widgets.
4. Styling Text and Buttons: Explore changing the style of text and buttons in your Flutter app.
5. Simple Navigation: Implement basic navigation between two screens using Flutter's Navigator widget.
6. Creating Lists: Learn to display a list of items in your app using ListView widget.
7. User Input: Allow users to input text through text fields and display the input on the screen.
8. Fetching Data: Fetch data from a public API (e.g., weather forecast) and display it in your app.
9. Managing State: Experiment with updating the UI dynamically using setState.
10. Local Storage: Store and retrieve data locally on the device, like a simple to-do list.

Course Outcomes

No.	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO-1	Outline the fundamentals of mobile applications and their significance in the current digital landscape.	U	PSO 1
CO-2	Summarize mobile app development process from ideation to deployment, including design considerations, development stages, and testing.	U	PSO 1
CO-3	Experiment in Flutter framework, its architecture, widgets, and features.	Ap	PSO 1, 2, 3
CO-4	Develop a basic mobile application using Flutter.	Ap	PSO 2, 3

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Credits: 2:0:2 (Lecture:Tutorial:Practical)

CO No.	CO	PO/ PSO	Cognitive Level	Knowledge Category	Lecture (L)/ Tutorial (T)	Practical (P)
CO-1	Outline the fundamentals of mobile applications and their significance in the current digital landscape.	PO- 6, 7 PSO -1	U	F,C	L	P
CO-2	Summarize mobile app development process from ideation to deployment, including design considerations, development stages, and testing.	PO -6, 7 PSO- 1	U	F, C	L	P
CO-3	Experiment in Flutter framework, its architecture, widgets, and features.	PO- 2, 3, 6, 7 PSO -1, 2, 3	Ap	F,C,P	L	P
CO-4	Develop a basic mobile application using Flutter.	PO -2, 3 6, 7 PSO -1,2, 3	Ap	F,C,P	L	P

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4
CO 1	-	-	-	-	-	2	3	-	3	-	-	-
CO 2	-	-	-	-	-	3	3	-	3	-	-	-
CO 3	-	3	3	-	-	3	3	-	2	3	3	-
CO 4	-	3	3	-	-	3	3	-	1	3	3	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics :

	Internal	Assignmen	Programming	End Semester
CO 1	✓	✓	✓	✓
CO 2	✓	✓	✓	✓
CO 3	✓		✓	✓
CO 4	✓		✓	✓

UK6SECCAP301: Game Application Development

Discipline	Computer Application				
Course Code	UK6SECCAP301				
Course Title	Game Application Development				
Type of Course	SEC				
Semester	VI				
Academic Level	3				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	3	2 hours	-	2 hours	4 hours
Pre-requisites	Basic understanding of programming concepts Familiarity with computer systems and software usage				
Course Summary	This course introduces students to the fundamentals of game design and development using Unity as the primary tool. It covers various aspects of game creation, from conceptualization to implementation, focusing on both theoretical and practical elements.				

Detailed Syllabus:

Module	Unit	Content	Hrs
I		**Introduction to Game Design**	12
	1	Understanding the concept of game design	
	2	History and evolution of game design	
	3	Elements of game design: mechanics, dynamics, aesthetics	
	4	Principles of game design: immersion, balance, feedback	
	5	Tools used in game design	
II		**Fundamentals of Game Design**	12
	6	Game genres and classifications	
	7	Gameplay mechanics and dynamics	
	8	Storytelling in games	
	9	Player psychology and engagement	
III		**Stages of Game Development Process**	12

	10	Conceptualization and idea creation	
	11	Pre-production: game design documents, prototyping	
	12	Production: asset creation, coding, testing	
	13	Post-production: debugging, polishing, release	
IV	**Game Development using Unity**		**12**
	14	Overview of Unity interface and workspace	
	15	Basic game development concepts in Unity	
	16	Creating scenes, game objects, and scripts	
	17	Implementing basic gameplay mechanics in Unity	
V	**Flexi Module**		**12**
		Exploration of emerging trends and techniques in game development	
		Case studies of innovative games and development processes	
		Comparison of different game engines and development tools	
		Introduction to virtual reality (VR) and augmented reality (AR) in game development	

References:

1. Game Development : Gaming Design & Programming Paperback – 1 January 2021 byK.Patinson
2. Hands-On Unity 2022 Game Development - Third Edition Paperback – Import, 31 October 2022by Nicolas Alejandro Borromeo
3. Schell, J. (2019). The Art of Game Design: A Book of Lenses. CRC Press.
4. Fullerton, T., Swain, C., & Hoffman, S. (2014). Game Design Workshop: A Playcentric Approach to Creating Innovative Games. CRC Press.
5. https://www.coursera.org/specializations/game-design-and-development
6. Unity Technologies. (n.d.). Unity Documentation. Retrieved from https://docs.unity3d.com/Documentation/

List of Experiments

Experiment 1: Installation and Familiarization

- Installation: Download and install Unity Hub and the latest version of Unity. Follow the instructions provided on the Unity website.
- Project Creation: Create a new 2D/3D project in Unity Hub.
- Interface Tour: Familiarize yourself with the Unity interface by exploring different panels such as Hierarchy, Scene, Game, Inspector, Project, and Console.

Experiment 2: Creating Objects and Manipulating Transformations

- Create Objects: Create primitive objects like cubes, spheres, and cylinders in the scene.

- Transformations: Experiment with moving, rotating, and scaling objects using the Transform component in the Inspector panel.

Experiment 3: Applying Materials and Textures

- Materials: Create basic materials and apply them to objects to change their appearance.
- Textures: Import textures and apply them to materials to add details to objects.

Experiment 4: Lighting and Shadows

- Directional Light: Add a directional light to the scene and observe how it affects the lighting and shadows.
- Point Light: Experiment with point lights and their effects on the scene.

Experiment 5: Scripting Basics

- Basic Scripting: Write a simple script to move an object based on user input (e.g., arrow keys or mouse input).
- Script Attachments: Attach the script to an object and observe the behavior in the game.

Experiment 6: Physics and Colliders

- Rigidbody: Add a Rigidbody component to an object and observe how it interacts with physics.
- Colliders: Experiment with different types of colliders (e.g., BoxCollider, SphereCollider) and their interactions.

Experiment 7: User Interface (UI) Elements

- Canvas Creation: Create a UI Canvas and add UI elements like buttons, text, and images.
- Button Interaction: Write scripts to handle button clicks and perform actions in the game.

Experiment 8: Particle Effects

- Particle System: Create a simple particle system (e.g., fire, smoke, sparks) and adjust its properties like emission rate and color.

Experiment 9: Audio Integration

- Audio Sources: Add audio sources to objects and play sounds (e.g., background music, footsteps) using scripts.

Experiment 10: Building and Deployment

- Building the Game: Build the game for different platforms (e.g., PC, mobile) using Unity's build settings.
- Testing: Test the built game on various devices and platforms to ensure compatibility and functionality.

Course Outcomes

No.	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO-1	Understand the principles of game design and development.	U	PSO 1
CO-2	Learn the fundamentals of designing interactive and engaging gameplay experiences.	R, U	PSO 1
CO-3	Explore the stages of the game development process.	U, An	PSO 2. 3
CO-4	Gain proficiency in using Unity for game creation and development.	Ap, E	PSO 2. 3

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Credits: 3:0:0 (Lecture:Tutorial:Practical)

CO No.	CO	PO/ PSO	Cognitive Level	Knowledge Category	Lecture (L)/ Tutorial (T)	Practical (P)
CO-1	Understand the principles of game design and development.	PO 2, 7 PSO 1	U	F, C	L	P
CO-2	Learn the fundamentals of designing interactive and engaging gameplay experiences.	PO 2, 7 PSO 1	R, U	C, P	L	P
CO-3	Explore the stages of the game development process.	PO 3, 6, 7 PSO 2. 3	U, An	P	L	P
CO-4	Gain proficiency in using Unity for game creation and development.	PO 2, 3, 5, 7 PSO 2. 3	Ap, E	M	L	P

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4
CO 1	-	2	-	-	-	-	3	-	3	-	-	-
CO 2	-	2	-	-	-	-	3	-	3	3	-	-
CO 3	-	-	3	-	-	2	3	-	1	2	3	-
CO 4	-	2	3	-	2	-	3	-	1	3	3	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics :

	Internal	Assignmen	Programming	End Semester
CO 1	✓	✓		✓
CO 2	✓	✓	✓	✓
CO 3	✓		✓	✓
CO 4	✓		✓	✓

UK6SECCAP302: CLOUD COMPUTING

Discipline	COMPUTER APPLICATION				
Course Code	UK6SECCAP302				
Course Title	**CLOUD COMPUTING**				
Type of Course	SEC				
Semester	VII				
Academic Level	4				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	3 Credits	3 Hours	-	-	3 Hours
Pre-requisites	NIL				
Course Summary	This Course provides a comprehensive view on Cloud Computing and provides insights of the key services and players in the industry. The student is acquainted to the Architecture of Clouds, challenges faced in the Cloud, and to various applications and tools available in Cloud Computing for Machine Learning.				

Detailed Syllabus:

Module	Unit	Content	Hrs
		Cloud Computing Foundation	**12**
	1	Introduction to Cloud Computing- Basics	
	2	History, importance, Characteristics, Pros and Cons of Cloud computing.	
	3	Types of Cloud – Public and Private Cloud. Cloud Computing infrastructure	
II		**Cloud Architecture- Layers and Models**	**12**
	4	Layers in Cloud Architecture	
	5	Software as a Service (SaaS), features of SaaS and benefits	
	6	Platform as a Service (PaaS), features of PaaS and benefits	
	7	Infrastructure as a Service (IaaS), features of IaaS and benefits	

	8	Cloud Service Providers	
	9	Challenges and risks in cloud adoption	
	10	Cloud deployment model: Public clouds – Private clouds – Community clouds - Hybrid clouds	
	11	Advantages of Cloud computing.	
III	**Cloud Computing for everyone**		**12**
	12	Centralizing email communications	
	13	Collaborating on schedules	
	14	Cloud computing for community	
	15	Collaborating on group projects and events	
	16	Cloud computing for corporation	
IV	**Virtualization and Cloud Tools for Machine Learning**		**12**
	17	Definition, Adopting Virtualization, Types	
	18	Virtualization and Software, Virtual Clustering	
	19	Virtualization Application, Pitfalls of Virtualization	
	20	Amazon web components and services, Elastic Compute Cloud (EC2), Amazon Storage System and database services	
	21	Microsoft Cloud Services	
	22	Google Cloud Applications	
	23	Cloud based tools for Machine Learning - AWS SageMaker, Azure Machine Learning, Google Cloud AI Platform Data preprocessing, feature engineering, and model training	
V		**Not included for End Semester Exams**	12
	24	Future Trends	
	254	Mobile Cloud, Autonomic Cloud Engine, Multimedia Cloud	
	26	Energy Aware Cloud Computing, Jungle Computing	
		Deploying Machine Learning Models on the Cloud- Containerization with Docker and Kubernetes Serverless deployment with AWS Lambda or Azure Functions	

Text books

Cloud Computing, A practical approach for learning and implementation, A.Srinivasan&J.Suresh, Pearson, 2017

Rajkumar Buyya, James Broberg, Andrzej, Cloud Computing: Principles and Paradigms, Wiley India Publications, 2011

Barrie Sosinsky, "Cloud Computing Bible", 1st Edition, Wiley India Pvt. Ltd., New Delhi, 2011.

Course Outcomes

No.	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO-1	Outline the basics of cloud computing	U	PSO-1
CO-2	Differentiate between the various technologies of cloud computing.	Ap	PSO-1,2
CO-3	Recognize the applications of Cloud	U	PSO-1
CO-4	Compare various Cloud Services	Ap	PSO-1,2

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Credits: 4:0:0 (Lecture:Tutorial:Practical)

CO No.	CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L)/Tutorial (T)	Practical (P)
CO-1	Outline the basics of cloud computing	PO-2,6,7 PSO-1	U	F, C	L	-
CO-2	Differentiate between the various technologies of cloud computing.	PO-2,4,5,6,7 PSO-1,2	Ap	F, C	L	-
CO-3	Recognize the applications of Cloud	PO-2,6,7 PSO-1	U	F, C	L	-

CO-4	Compare various Cloud Services	PO-2,4,5,6,7 PSO-1,2	Ap	F, C	L	-

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs:

	PO 1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO 1	-	-	-	-	-	2	2		1	-	-	-
CO 2	-	3-	-	1	1	2	2		2	3	-	-
CO 3	-	3	-	-	-	2	2		2	-	-	-
CO 4	-	3	-	1	1	2	2		2	3	-	-

Correlation Levels:

Level	**Correlation**
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics:

	Internal Exam	Assignment	Discussion	End Semester Examinations
CO 1	✓	✓		✓
CO 2	✓		✓	✓
CO 3	✓			✓
CO 4	✓	✓	✓	✓

UK6SECCAP303: Entrepreneurship in IT

Discipline	COMPUTER APPLICATION				
Course Code	UK6SECCAP303				
Course Title	Entrepreneurship in IT				
Type of Course	SEC				
Semester	VI				
Academic Level	3				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	3	3 hours	-		3 hours
Pre-requisites	General foundations in computer science.				
Course Summary	This course is a launchpad for aspiring entrepreneurs. It equips the student with the principles, concepts and emerging IT trends supporting Entrepreneurship.				

Detailed Syllabus:

Module	Unit	Content	Hrs
I		**Introduction to Entrepreneurship**	12
	1	Understanding Entrepreneurship- Concept, Relevance, Role of Entrepreneurship in growth of economy- economic growth, job creation, new Industry formation	

	2	Nature of Entrepreneurship startups- Risks and Entrepreneurship venture, Characteristics of Entrepreneurship	
	3	History of Entrepreneurship Revolution, Emergence of Entrepreneurship Class in India- Ancient Period, Early Pre-Independence period, Late Pre - Independence period, Post-Independence Entrepreneurship period,	
	4	Role of IT in business development- Tools used – Asana, Jira, Trello Current Entrepreneurial Trends -Digital anonymity, Return on domestic manufacturing and crafts, Data Analysis, Big Data, Mobile Computing and Commerce, IT virtualization, Social Media, Cloud Computing, IOT, AI, Role of SaaS, Principles, Data driven Decision making, Remote work and Collaboration Tools, Lean startup Movement, Minimum Viable Product, Lean vs DevOps vs Agile, Examples of Lean Startup Companies.	
II	**Paths to Entrepreneurship**		**12**
	5	Categories of Entrepreneurs-Pure and Non pure Entrepreneurs, Home based Entrepreneur, Serial or portfolio Entrepreneur, Nonprofit Entrepreneur, Corporate Entrepreneur, Qualities of an Entrepreneur	
	6	Qualities of an Entrepreneur	
	7	What is an Enterprise? Features of an Enterprise, Challenges and Opportunities of Entrepreneurship, Problems faced- Economic, Non-Economic and barriers	
	8	Theories of Entrepreneurship- Schumpter's Theory of innovation, Peter Drucker Theory of Entrepreneurship	
III	**Preparing for Entrepreneurship**		**12**
	9	Preparing to become and Entrepreneur- Find a mentor, Build a Professional Network, Learn about Entrepreneurs, Understand Personal and Business preferences, Improve or acquire critical skills, Study an Industry,	
	10	Understanding Business Environment, Creativity, Innovation and value Creation	
	11	Process of setting up a new business, Problems of a new venture- Marketing Problems, Production problems, Financial problems, Managerial and Administerial problems, selection of a viable project- strengths and weaknesses	
	12	New venture Action Plan- Significance of writing a business plan	
	13	Role of IT in Entrepreneurship-Entrepreneurial Opportunities in IT -E-commerce, Graphics designing, 3D animaton, Web designer, Medical Transcription, Enabled Services Call Centres, Geographical Information systems, Networking, Data Mining & Warehousing, System software Companies, e-Education	
	14	Indian Start Up Ecosystem	
	15	Starup India Initiative	

	16	Raising Funds for startups- Means and sources of Finances	
	17	Venture Capital- meaning, Role, Significance	
IV	**Protecting Startup Assets**		**12**
	18	Intellectual Property Rights, Trademarks, Trade secrets, Copyrights	
	19	The Digital Millenium Copyright Act, Obtaining Copyright Protection	
	20	Patents, Inventions and patents, Patent types, Patent Process, Patent infringement	
	21	Intellectual Property Strategy	
	22	Relevant case studies	
V	**Flexi Module: Not included for End Semester Exams**		**12**
	23	Lean Startup Methodology Case Study- e.g. Dropbox, Uber, Spotify, Airbnb, General Electric, Qualcomm, Intuit	
	24	Business Incubators- Types- Academic Institutions, Non-Profit development corporations, For profit property development ventures, , Venture Capital Firms, Regional Incubators, Business Incubators vs Business Acclerators.	
	25	Contemporary Role Models- E.g.-Case 1-Flipkart Online Services Case 2- Absolute Sports Pvt Ltd Case 3- Narayana Hrudayalaya Pvt Ltd Case 4- MittiCool Clay Creations	

References

Kathleen R Allen, Launching New Ventures, An Entrepreneurial Approach, CengageLearning, 2016.

Sangeeta Sharma, Entrepreneurship Development, PHI Learning Pvt. Ltd, 2021.

Robert D. Hisrich, Michael P. Peters, Dean A. Shepherd, Sabyasachi Sinha, Entrepreneurship, 11th Edition, 2020, McGraw Hill

Ramesh Parihar, Chandra Sharma, Entrepreneurships and Start ups, Shree Ram Publications, 2023

Peter Thiel and Blake Masters, Zero to One: Notes on Startups, or How to Build the Future, Crown Currency, 1!e, 2014

Eric Ries, The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses, Crown publisher, 2011

Web Resources
https://www.startupindia.gov.in/
https://www.makeinindia.com/
https://skillindia.gov.in/
htt https://msme.gov.in/ps://www.india.gov.in/website-ministrycommerce-and-industry

Course Outcomes

No.	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO-1	Summarize basic concepts of Entrepreneurship	U	PSO-1
CO-2	Categorize entrepreneurs and features of enterprises	U	PSO-1
CO-3	Explain the principles and tools that support building a startup	U	PSO-1
CO-4	Identify concepts that provide legal protection to startups and enterprises	U	PSO-1

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Credits: 4:0:0 (Lecture:Tutorial:Practical)

CO No.	CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L)/Tutorial (T)	Practical (P)
CO-1	Summarize basic concepts of Entrepreneurship	PO-6,7 PSO-1	U	F, C	L	-
CO-2	Categorize entrepreneurs and features of enterprises	PO-6,7 PSO-1	U	F, C	L	
CO-3	Explain the principles and tools that support building a startup	PO-6,7 PSO-1	U	F, C	L	--

CO-4	Identify concepts that provide legal protection to startups and enterprises	PO-6,7 PSO-1	U	F, C	L	-

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4
CO 1	-	-	-	-	-	2	2	-	2	-	-	-
CO 2	-	-	-	-	-	2	2	-	2	-	-	-
CO 3	-	-		-	-	2	2	-	2	-	-	-
CO 4	-	-	--	-	-	2	2	-	-2	-	-	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics :

	Internal	Assignmen	Semina	End Semester
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓	✓	✓	✓
CO 4	✓	✓		✓

SEMESTER 7

Discipline Specific Core			
UK7DSCCAP400	Cloud Architecture	**4**	**4T**
UK7DSCCAP401	Mobile and wireless security	**4**	**4T**
UK7DSCCAP402	DevOps	**4**	**3T+2P**
UK7DSCCAP403	Full Stack Development	**4**	**3T+2P**
UK7DSCCAP404	Network Administration	**4**	**3T+2P**
UK7DSCCAP405	Augmented Reality	**4**	**4T**
UK7DSCCAP406	Man- Machine interface	**4**	**4T**
UK7DSCCAP407	Research Methodology	**4**	**4T**
UK7DSCCAP408	Haskell Programming	**4**	**3T+2P**
UK7DSCCAP409	Academic Writing using Latex	**4**	**3T+2P**
UK7DSCCAP410	Big Data Analytics	**4**	**3T+2P**
UK7DSCCAP411	E-governance	**4**	**4T**
UK7DSCCAP412	Prompt Engineering	**4**	**3T+2P**
Discipline Specific Elective (Can select One)			
UK7DSECAP400	Cloud Computing and Security	**4**	**4T**
UK7DSECAP401	Social Media Analytics	**4**	**4T**
UK7DSECAP402	Computer Vision	**4**	**4T**
UK7DSECAP403	Full Stack Development	**4**	**3T+2P**

UK7DSCCAP400: Cloud Architecture

Discipline	COMPUTER APPLICATION
Course Code	UK7DSCCAP400
Course Title	Cloud Architecture
Type of Course	**DSC**
Semester	VII

Academic Level	4 -				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	4 hours	-		4 hours
Pre-requisites	Basic knowledge in Cloud Computing				
Course Summary	This course provides the student knowledge on cloud architectures				

Detailed Syllabus:

Module	Unit	Content	Hrs
I		**Application Architecture**	**12**
	1	Monolithic, Layered, Client Server, Master-Slave, Peer to Peer	
	2	Broker, Event-bus, MVC (Model View Controller), MVP (Model View Presenter), MVVM (Model View View Model), MVT (Model View Template),	
	3	Service Oriented Architecture (SOA), Web Services, SOAP, RESTful, Micro-Services, Server Less.	
	4	Cloud Reference Model (NIST Architecture)	
II		**Virtualization**	**12**
	5	Virtualization-Definition, Benefits, Challenges.	
	6	Implementation levels of virtualization-ISA level, HAL level, OS level, Library level, Application level,	
	7	Types of Virtualizations- Server Virtualization, Network Virtualization, Storage Virtualization, Desktop Virtualization, Application Virtualization, Management Virtualization	

	8	Frameworks for virtualization, Virtualization Providers, Containers, Dockers. VMs vs Containers	
III	**Cloud Services and Security**		**12**
	9	AWS, Azure, Google Cloud, [Platform services, Data analytics services, Big Data services, Ware housing services, Streaming services, Elastic search.	
	10	Analytics services, ETL, AI/ML services, Database Services (SQL and NOSQL)	
	11	Data lake, Data Storage Services, Authentication Services, Business applications	
	12	IoT Services, Communication Services, Server less services, containers, developer tools, monitoring tools]	
	13	Risks in Cloud Computing, Types-Internal Security Risks, External Security Risks, Data Protection Risk, Data Loss,	
	14	Security Issues and challenges.	
	15	Security Advantages in cloud environment- Data centralization, Incident response, Logging.	
	16	Disadvantages in cloud environment- Investigation, Data Segregation, Long term viability, compromised servers.	
	17	Disaster Recovery in Clouds.	
IV	**Cloud Lifecycle**		**12**
	18	Role of Cloud Modelling and Architecture, Reference Model for Cloud Computing, Cloud Industry Standards.	
	19	Cloud Application Architecture, Cloud Computing and Logical Architecture. Networking in Cloud.	
	20	Key Principles of Cloud Computing - Abstraction, Automation, Elasticity,	
	21	Cloud Federation, Two-layer connectivity for cloud federation.	
	22	Cloud ecosystem model- Cloud Ecosystem, Cloud Broker/ Cloud Agent, Cloud Outlook, Cloud Unified Process.	
V	**Native and Emergent Cloud Trends**		**12**
	23	Hybrid-Cloud, Multi-Cloud, Configuration Management, Server less computing,	
	24	Micro services, Service Mesh, Cloud Native	

	25	DevOps, Application Modernization, Security Policy	

References:

Ricardo Puttini, Thomas Erl, and Zaigham Mahmood, Cloud Computing: Concepts, Technology & Architecture, Prentice Hall, 1 ED, 2013

Tom Laszewski, Piyum Zonooz, Erik Farr Kamal Arora, Cloud Native Architectures: Design high availability and cost-effective applications for the cloud, Packt Publisher, August 2018

Thomas Erl, Cloud Computing Design Patterns, Service Tech Press, Pearson, 1 Edition, 2015

Brett McLaughin, Cloud Migration for Dummies, Virtana Special Edition

Rajkumar Buya, Christian Vecchiola, S Thamarai Selvi, Mastering Cloud Computing, Mc Graw Hill, 1 ED, 2017

Course Outcomes

No.	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO-1	**Summarize on cloud computing architecture and infrastructure**	U	PSO-1
CO-2	**Infer about various cloud computing solutions.**	U	PSO-1
CO-3	**Relate with the core issues of cloud computing such as risks, security, privacy, and disaster recovery**	Ap	PSO-1,2
CO-4	**Explain about new trends in cloud computing**	U	PSO-1

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Credits: 4:0:0 (Lecture:Tutorial:Practical)

CO No.	CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L)/Tutorial (T)	Practical (P)

CO-1	**Summarize on cloud computing architecture and infrastructure**	PO-6,7 PSO-1	U	F, C	L	-
CO-2	**Explain about various cloud computing solutions.**	PO-6,7 PSO-1	U	F, C	L	-
CO-3	**Relate with the core issues of cloud computing such as risks, security, privacy, and disaster recovery**	PO-6,7 PSO-1,2	Ap	F, C	L	-
CO-4	**Explain about new trends in cloud computing**	PO6,7 PSO-1	U	F, C	L	-

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs :

	PO 1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO 1	-	-	-	--	-	2	2	--	2	-	-	-
CO 2	-	-	-	-	-	2	2		2	-	-	-
CO 3	-	-	-	-	--	2	2	-	2	2	-	-
CO 4	-	-	-	-	-	2	2	-	2	-	-	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Quiz/ Seminar	End Semester Examinations
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓		✓	✓
CO 4		✓		✓

UK7DSCCAP401: Mobile and Wireless Security

Discipline	Computer Application
Course Code	UK7DSCCAP401
Course Title	Mobile and Wireless Security
Type of Course	DSC
Semester	VII
Academic Level	4

Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	4 hours	-	-	4 hours
Pre-requisites	Knowledge of Concepts in Computer Networks and Security				
Course Summary	Security has been a concern in Wired and Wireless Networks. In this course an introduction to various security aspects in mobile and wireless networks are given.				

Detailed Syllabus:

Module	Unit	Content	Hrs
I		**Introduction to Mobile and Wireless Security**	**12**
	1	Introduction to Mobile Communication, Security - Wired and Wireless	
	2	Security issues in Wireless and Mobile Communications. Need for Security in Wireless and Mobile Communications	
	3	Threats to Wireless and Mobile Devices - Data Theft, Device Control and System Access.	
	4	Security for Mobile Applications. Advantages and Disadvantages of Application Level Security	
II		**Security at Device, Network and Server Levels**	**12**
	5	Mobile Devices' Security Requirements	
	6	Mobile Wireless Network Level Security	
	7	Server Level Security	
III		**Application Level Security in Wireless Networks**	**12**
	8	Application of WLANS, Wireless Threats	
	9	Vulnerabilities and Attack methods over WLANs. Information Security Standards.	
	10	Security for 1G Wi-Fi and 2G Wi-Fi applications. Recent Security schemes for Wi-Fi applications	
	11	Recent Security Schemes for Wi-Fi Applications	
IV		**Security in MANETs and Ubiquitous Computing**	**12**
	12	MANETs - Introduction, Application and Features	
	13	Security challenges in MANETs. Security attacks on MANETs	
	14	External and Internal Threats for MANET Applications	
	15	Some of the Security Attacks on Ubiquitous Computing Networks and its solutions	
V		**Application Level Security in Heterogeneous Wireless Networks**	**12**
	16	Introduction. Heterogeneous Wireless Network Architecture	
	17	Heterogeneous Network Application in Disaster Management	
	18	Security Problems and Attacks in Heterogeneous Wireless Networks	4
	19	Security Solution for Heterogeneous Wireless Networks.	4

Text Books

1. Pallapa Venkataram, Sathish Babu B, "Wireless and Mobile Network Security", TMH 2010

2. Jim Doherty, “Wireless and Mobile Device Security”, Jones and Bartlett Publishers, Inc., 2nd Edition.

3. Wolfgang Osterhage, “Wireless Network Security”, CRC Press, 2nd Edition.

4. https://www.cisco.com/c/en/us/products/wireless/what-is-wi-fi-security.html

Course Outcomes

No.	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO-1	List the security threats in Mobile and Wireless Networks.	U	PSO-1
CO-2	Explain the different security measures in Mobile and Wireless Networks.	U	PSO-1,2
CO-3	Identify the various advantages and disadvantages of different security measures.	U	PSO-1,2
CO-4	Explain the various types of security issues in wireless networks.	U	PSO-1,2,3

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Credits: 4:0:0 (Lecture:Tutorial:Practical)

CO No.	CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L)/Tutorial (T)	Practical (P)
1	List the security threats in Mobile and Wireless Networks.		U	F,C	L	

2	Describe the different security measures in Mobile and Wireless Networks.		U	F,C	L	
3	Present the various advantages and disadvantages of different security measures.		U	F ,C	L	
4	Analyse the various types of security issues in wireless networks.		U	F, C	L	

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO 1	2	2	-	-	-	2	2	-	3	-	-
CO 2	1	2	1	-	-	3	2	-	-	3	-
CO 3	-	2	-	-	-	2	3	-	-	2	-
CO 4	1	-	2	-	-	2	2	-	-	-	2

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignmen	Quiz	End Semester Examinations
CO 1	✓		✓	✓
CO 2	✓		✓	✓
CO 3	✓	✓		✓
CO 4		✓		✓

UK7DSCCAP402: DevOps

Discipline	COMPUTER APPLICATION				
Course Code	UK7DSCCAP402				
Course Title	**DevOps**				
Type of Course	**DSC**				
Semester	VII				
Academic Level	3				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week

	4	3 hours	-	2 hours	5 hours
Pre-requisites	1.Basic Programming Skills: Familiarity with programming fundamentals in languages such as Python, JavaScript, or Java is beneficial.				
Course Summary	This course provides students with a comprehensive understanding of DevOps principles, practices, and tools essential for modern software development and deployment.				

Detailed Syllabus:

Module	Unit	Content	Hrs
I		**Introduction to DevOps**	**15**
	1	Understanding DevOps: Definition, principles, and benefits.	
	2	Key components of DevOps: collaboration, automation, monitoring.	
	3	Introduction to common DevOps tools: Artifactory, Git, Jenkins, Docker.	
II		**Version Control with Git**	**15**
	4	Fundamentals of version control systems	
	5	Git basics- various commands in GIT, repositories, branches, commits, merges	
	6	Collaborative development workflows with Git.	
III		**Continuous Integration and Deployment**	**15**
	7	Introduction to Continuous Integration (CI) and Continuous Deployment (CD)	
	8	Setting up CI/CD pipelines with Jenkins	
	9	Automating software builds, testing, and deployment	
IV		**Containerization with Docker**	**15**
	10	Introduction to containerization and Docker	
	11	Docker basics: containers, images, Dockerfile, Docker Compose	
	12	Container orchestration with Docker Swarm	
		Flexi Module- Not included in End Semester Exams	**15**

V	13	Introduction to Kubernetes Kubernetes Cluster Architecture — An overview Understanding concepts of Pods, Replica sets, deployments and namespaces, Understanding the concepts of services and networking.	

Text Books

1. The Phoenix Project: A Novel about IT, DevOps, and Helping Your Business Win" by Gene Kim, Kevin Behr, and George Spafford.
2. Effective DevOps: Building a Culture of Collaboration, Affinity, and Tooling at Scale" by Jennifer Davis and Ryn Daniels.

References

1. Continuous Delivery: Reliable Software Releases through Build, Test, and Deployment Automation" by Jez Humble and David Farley.

LAB

Hands-on exercises:

- Setting up Git, working with branches, GitHub collaboration
- Configuring Jenkins jobs, creating CI/CD pipelines
- Dockerizing applications, managing containers with Docker Swarm.

No.	**Upon completion of the course the graduate will be able to**	**Cognitive Level**	**PSO addressed**
CO-1	Understand the fundamentals of DevOps culture, principles, and practices.	U	PSO-1,3
CO-2	Learn about key DevOps tools and technologies for automation, configuration management, and monitoring.	Ap	PSO-1,2,3
CO-3	Students will gain proficiency in using DevOps tools and technologies such as Git, Jenkins, Docker.	AP	PSO-1,2,3

CO-4	Students will have acquired the knowledge, skills, and abilities to effectively implement DevOps practices in software development environments.	An	PSO-1,2,3

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Credits: 4:0:0 (Lecture:Tutorial:Practical)

CO	CO	PO/PSO	Cognitiv	Knowledg	Lecture	Practical
1	Understand the fundamentals of DevOps culture, principles, and practices	PO- 2,3, 6,7 PSO-1, 2,	Ap	F, C, P	L	P
2	Learn about key DevOps tools and technologies for automation, configuration management, and monitoring	PO- 2,3, 6,7 PSO-1, 2,	Ap	F, C, P	L	P
3	Students will gain proficiency in using DevOps tools and technologies such as Git, Jenkins, Docker.	PO- 2,3, 6,7 PSO-1, 2,	Ap	F, C, P	L	P
4	Students will have acquired the knowledge, skills, and abilities to effectively implement DevOps practices in software development environments.	PO- 2,3, 6,7 PSO-1, 2,	Ap	F, C, P	L	P

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4
CO 1		1	2			2	2		2	2		

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

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate /
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics :

	Internal Exam	**Assignment**	**Project Evaluation**	**End Semester**
CO 1	✓		✓	✓
CO 2	✓	✓	✓	✓
CO 3	✓		✓	✓
CO 4	✓	✓	✓	✓

Discipline	COMPUTER APPLICATION
Course Code	UK7DSCCAP403
Course Title	Full Stack Development

Type of Course	DSC				
Semester	VII				
Academic Level	4				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	3 hours	-	2 hours	5 hours
Pre-requisites	Should have knowledge in HTML 5, CSS 3, JavaScript and node.js				
Course Summary	The course provides a comprehensive overview of full stack web development, covering both front-end and back-end technologies. Students will learn how to design, develop, and deploy dynamic web applications using industry-standard tools and frameworks				

Detailed Syllabus:

Module	Unit	Content	Hrs(L+P)
I	**Basics of Full Stack Development**		**15**
	1	Understanding the Basic Web Development Structure, Structure of Web Applications, Components- User, Browser, Web Server, Backend Services	
	2	What are Software Stacks, Types of Stacks	
	3	Who is a Full Stack Developer	
	4	Tools for Full Stack Developers- Editors, Development Editors, Browsers	
	5	Familiarizing Nodej.s,	
II	**Familiarizing MongoDB**		**15**
	6	Understanding NoSQL and MongoDB- NoSQL, MOngoDB	

	7	Building MongoDB Environment	
	8	User Accounts- Listing Users,Create User Accounts, Remove Users	
	9	Access Control- Creating User Administrator Account Creating Databsae Administrator Account	
	10	Data types in MongoDB	
	11	Administering Databases	
	12	Managing Collections	
	13	Connecting to MongoDB from node.js	
	14	Understanding the Objects used in MongoDB Node.js driver	
	15	Simple applications	
	16	Advanced MongoDB- Indexing, Aggregation, Map Reduce	
III	**Express and Angular**		**15**
	17	Implementing Express in node.js- installing Express, configuring routes	
	18	Using Request and Response objects, Introduction to Typescript	
	19	Type Annotations, Variables and Constants, understanding Interfaces	
	20	Implementing Classes, Modules, Functions	
	21	Basics of Angular, Angular CLI, Creating First Application in Angular, Angular Lifecycle	
	22	Understanding and using rigModule	
	23	Angular Architecture, Angular Components	
	24	Expressions-Pipes,Data Binding, Built in Directives- Structural Directives-ngif, ngfor,ngSwitch, Attribute Directives	
IV	**React**		**15**
	25	Concept of MEAN Stack, MERN Stack	
	26	Basic React Applications, React Components	
	27	Inter Component Communication, The Props, React State	
	28	Express REST APIs	

	29	Modularization and Webpack, Routing with React Router, Server-side Rendering	
V	**Flexi Module: Not included for End Semester Exams**		**15**
	30	Data Formats- CSV, XWL, JSON, Image Formats- Photographs in IPC Format, Graphs and animations in GIF format, Graphics in png format Vector Graphics in Svc format, Video Formats, Audio formats	
	31	Implementing Mobile Applications, Types of Mobile applications, Native applications, Mobile web applications, Hybrid applications, Comparison of approaches	
	32	Using Web Protocols, Using Web APIs	
	33	Responsive Design- Introduction, Viewports, Media queries, Flexible layouts	

References

1. A A Puntambekar, Full Stack Web Development, Technical Publications, First Edition, June 2023

2. Philip Ackermann, Full Stack Web Development The Comprehensive Guide, Rheinwerk Publishing Inc, First Edition, 2023

Lab Exercises

- Creating web pages using HTML,
- Designing web pages using CSS,
- Making Web pages interactive with Javascript,
- Making Webpages dynamic using server-side logic

Course Outcomes

No.	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO-1	Summarize basic concepts of full stack development	Ap	PSO-1, 2,
CO-2	Develop Applications using Express and Angular	Ap	PSO-1, 2,
CO-3	Build Applications with REACT	Ap	PSO-1,2,
CO-4	Construct a MERN Stack	Ap	PSO-1, 2,

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Credits: 4:0:0 (Lecture:Tutorial:Practical)

CO No.	CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L)/Tutorial (T)	Practical (P)
CO-1	Summarize basic concepts of full stack development	PO- 2,3, 6,7 PSO-1, 2,	Ap	F, C, P	L	P
CO-2	Develop Applications using Express and Angular	PO- 2,3, 6,7 PSO-1, 2,	Ap	F, C, P	L	P
CO-3	Build Applications with REACT	PO- 2,3, 6,7 PSO-1,2,	Ap	F, C, P	L	P
CO-4	Construct a MERN Stack	PO- 2,3, 6,7 PSO-1, 2,	Ap	F, C, P	L	P

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4
CO 1	-	2	2	-	-	3	3	-	2	2		-
CO 2	-	2	2	-	-	3	3	--	2	2		-
CO 3	-	2	2	-	-	3	3	-	2	2		--
CO 4	-	2	2	-	-	3	3	-	2	2		-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Lab Assessment	End Semester Examinations
CO 1	✓	✓	✓	✓
CO 2	✓		✓	✓
CO 3	✓		✓	✓
CO 4	✓	✓		✓

UK7DSCCAP404: NETWORK ADMINISTRATION

Discipline	Computer Application				
Course Code	UK7DSCCAP404				
Course Title	NETWORK ADMINISTRATION				
Type of Course	**DSC**				
Semester	VII				
Academic Level	4				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	3hours		2hours	5 hours
Pre-requisites	Knowledge in Computer Networking Concepts				
Course Summary	This course provides a comprehensive idea on network administration				

Detailed Syllabus:

Module	Unit	Content	Hrs
I	**Fundamentals of Networking & Ethernet Specification and Features**		**15**
	1	● Basic concepts of networking ● Types of networks (LAN, WAN, MAN, PAN) ● Network topologies (Bus, Star, Ring, Mesh) ● Network Elements ● OSI reference Model ● TCP/IP Protocol suite ● TCP/IP Security. ● **Ethernet Specification and Features** ○ Ethernet at Physical Layer ○ Ethernet at Data Link Layer ○ Ethernet Standards and Features	
II	**Transmission Media and Network Addressing**		**15**

	2	• Introduction to transmission media (copper, fibre optics, wireless)
		• Data transmission concepts, Modulation and Multiplexing techniques
		
		• Network Addressing
		  • Types of Logical Addresses
		  • Network Layer Protocols
		  • Calculation of Network Addresses
		  • Subnetting
		  • Subnetting of Class A
		  • Subnetting of Class B
		  • IPv4 and IPv6
		  • Transition from IPv4 to IPv6	

III	Switching, VLANs, and DNS, Wireless Technology and Network Design		**15**

	3	• Switching
		  ○ Spanning Tree Protocol (STP)
		• VLANs
		• DNS (Domain Name System)
		• Wireless Technology and Network Design
		  • IEEE 802.11 Standards
		  • Wireless Standards
		  • WLAN (Wireless Local Area Network)
		  • WiFi Security
		  • Installing and Troubleshooting WiFi
		  • Basic Network Designing	

IV	**Routing and Routing protocol**		**15**

	4	• Introduction to Routing
		• **Routing Protocols**
		  • Distance Vector Routing Protocol
		  • Link State Routing Protocol
		  • Hybrid Routing Protocol	

V	**Network Security, Monitoring Network & Troubleshooting Network.**		

	5	• **Network Security:**
		  ◦ Basics of cryptography
		  ◦ Authentication and authorization
		  ◦ Firewalls and intrusion detection systems
		  ◦ Virtual Private Networks (VPNs)
		• Monitoring Network
		  ◦ SNMP (Simple Network Management Protocol)
		  ◦ SIEM (Security Information and Event Management)
		  ◦ Monitoring Tools
		• Troubleshooting Network
		  ◦ Hardware Tools
		  ◦ Software Tools
		  ◦ Network Issues
		  ◦ Internet of Things (IoT)
		  ◦ Network Troubleshooting Commands (Windows)	

References

- Computer Networks" by Andrew S. Tanenbaum and David J. Wetherall.
- "Computer Networking: A Top-Down Approach" by James F. Kurose and Keith W. Ross.
- "TCP/IP Illustrated, Volume 1: The Protocols" by W. Richard Stevens.
- "CCNA Routing and Switching Complete Study Guide: Exam 100-105, Exam 200-105, Exam 200-125" by Todd Lammle.
- "Network Security Essentials: Applications and Standards" by William Stallings.

Lab Exercises

Hands on experience of implementing, monitoring and trouble shooting networks

Course Outcomes

No.	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed

CO-1	Outine on the network components, OSI model, TCP/IP suite, Ethernet standards, and security principles	U	PSO-1,2
CO-2	Differentiate wired and wireless media, install cables, configure network addresses, and perform subnetting for IPv4 and IPv6.	U	PSO-1,2
CO-3	Configure switching, VLANs, DNS, and wireless networks, adhering to IEEE 802.11 standards while ensuring security and basic network design principles.	Ap	PSO-1,2
CO-4	Experiment with routing concepts, and configure them for efficient data transmission.	Ap	PSO-1, 2

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Credits: 4:0:0 (Lecture:Tutorial:Practical)

CO No.	CO	PSO addressed	Cognitive Level	Knowledge Category	Lecture (L)/Tutorial (T)/Practical (P)	Practical(p)
CO-1	Outine on the network components, OSI model, TCP/IP suite, Ethernet standards, and security principles	PSO-1, PSO-2	U	F, C	L	-
CO-2	Differentiate wired and wireless media, install cables, configure network addresses, and perform subnetting for IPv4 and IPv6.	PSO-1, PSO-2	U	F, C	L	-

CO-3	Configure switching, VLANs, DNS, and wireless networks, adhering to IEEE 802.11 standards while ensuring security and basic network design principles.	PSO-1, PSO-2	Ap	F, C,P	L,	P
CO-4	Experiment with routing concepts, and configure them for efficient data transmission.	PSO-1, PSO-2	Ap	F, C,P	L,	P
CO-5	Identify network threats, implement security measures, monitor networks using SNMP and SIEM, and troubleshoot network issues utilizing hardware and software tools, including IoT devices and Windows commands.	PSO-1, PSO-2	Ap, An, E	Theory / Practical	L, P	P

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs :

CO-1	3	3	2	1	1	-	3	3	2	1	1	-
CO-2	3	3	2	1	1	-	3	3	2	1	1	-
CO-3	3	3	2	1	1	-	3	3	2	1	1	-
CO-4	3	3	2	1	1	-	3	3	2	1	1	-
CO-5	3	3	2	1	1	-	3	3	2	1	1	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Lab	End Semester
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓			✓
CO 4		✓		✓

UKDSCCAP405: AUGMENTED REALITY

Discipline	COMPUTER SCIENCE
Course Code	UK7DSCCAP405
Course Title	AUGMENTED REALITY
Type of Course	**DSC**
Semester	VII

Academic Level	4				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	4 hours	--	--	4 hours
Pre-requisites	Knowledge in Programming and Problem Solving as well as in Artificial Intelligence & Machine Learning				
Course Summary	This Course offers a comprehensive introduction to rapidly evolving fields of Virtual Reality (VR) and Augmented Reality (AR). Students will explore foundational concepts, techniques, and technologies essential for understanding, designing, and developing immersive VR/AR experiences.				

Detailed Syllabus:

Module	Unit	Content	Hrs
I	**Introduction to Augmented Reality**		**12**
	1	Augmented reality characteristics	
	2	Difference between Augmented Reality and Virtual Reality	
	3	AR technological components	
	4	Technologies used in AR-Feature Extraction -Hardware components	
	5	AR devices -Importance of AR -Real world uses of AR	
	6	AR types -Software tools available for AR	
II	**Need of technologies for Augmented Reality**		**12**
	7	Hardware technology– virtual scenes– 3D objects– AR components	
	8	Display – HMD – Eyeglasses–Contact Lenses	
	9	AR powered devices– AR application development drawbacks– Compatibility – Performance	
	10	AR libraries – Motion tracking – Environmental understanding – Anchors.	

III	**Technology Integration and Implementation of AR**		**12**
	11	Technology use and integration in industrial settings	
	12	Assistive training to faculty members	
	13	Planning and administration for implementation– AR implications– Practical data – AR labs	
	14	Platforms to form AR content- Coordinated utilization of AR applications – Hands on preparation	
IV	**Augmented Reality and Virtual Reality for Micro Learning**		**12**
	15	Micro learning techniques– Utilizing VR for learning – VR for Practical online assessment	
	16	VR info graphics – Virtual case considerations	
	17	VR technology – Components of VR – VR Hardware – VR applications	
	18	VR in Education-Virtual Laboratory – Factory Planning	
V	**Tools and Applications of Augmented Reality**		**12**
	19	Software Tools – Software approaches – recognition types – native software solutions	
	20	ARKit – ARCore – software development kit - Cloud services	
	21	AR business applications– smart cities– Crime and Security – Games – IoT – Use cases – Social Media – Gaming	

TEXTBOOK

1. Kaliraj P, Devi T, (2021). Innovating with Augmented Reality: Applications in Education and Industry (P. Kaliraj, Ed.) (1st ed.). Auerbach Publications. https://doi.org/10.1201/9781003175896.

REFERENCE

1. George Mather, Foundations of Sensation and Perception: Psychology Press; 2 edition, 2009.
2. The VR Book: Human-Cantered Design for Virtual Reality, by Jason Jerald
3. Learning Virtual Reality by Tony Parisi, O' Reilly
4. Burdea, G. C. and P. Coffet. Virtual Reality Technology, Second Edition. Wiley-IEEE Press, 2003/2006.
5. Alan B. Craig, Understanding Augmented Reality, Concepts and Applications, Morgan Kaufmann, 2013.
6. Alan Craig, William Sherman and Jeffrey Will, Developing Virtual Reality Applications, Foundations of Effective Design, Morgan Kaufmann, 2009.
7. John Vince, "Virtual Reality Systems ", Pearson Education Asia, 2007.
8. Anand R., "Augmented and Virtual Reality", Khanna Publishing House, Delhi.
9. Grigore C. Burdea, Philippe Coiffet , Virtual Reality Technology, Wiley 2016

10. Dieter Schmalstieg and Tobias Höllerer, Augmented Reality: Principles & Practice, Pearson Education India, 2016
11. Kent Norman (Ed), Wiley Handbook of Human Computer Interaction, Wiley 2017

WEB REFERENCE

1. Manivannan, M., (2018), "Virtual Reality Engineering," IIT Madras, https://nptel.ac.in/courses/121106013
2. Misra, S., (2019), "Industry 4.0: Augmented Reality and Virtual Reality," IIT Kharagpur, https://www.youtube.com/watch?v=zLMgdYI82IE
3. Dube, A., (2020), "Augmented Reality - Fundamentals and Development," NPTEL Special Lecture Series, https://www.youtube.com/watch?v=MGuSTAqlZ9Q
4. http://cambum.net/course-2.htm
5. http://msl.cs.uiuc.edu/vr/

Course Outcomes

No.	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO-1	Identify, examine, and develop software that reflects fundamental techniques for the design and deployment of VR and AR experiences.	U	PSO-1
CO-2	Describe how VR and AR systems work.	U	PSO-1,3
CO-3	Explain the use of designs for AR and VR experiences.	U	PSO-1
CO-4	Illustrate the benefits and drawbacks of specific AR and VR techniques on the human body.	Ap	PSO-1,3

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Credits: 4:0:0 (Lecture:Tutorial:Practical)

CO No.	CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L)/Tutorial (T)	Practical (P)

CO-1	Identify, examine, and develop software that reflects fundamental techniques for the design and deployment of VR and AR experiences.	PSO-1	U	F, C	L	-
CO-2	Describe how VR and AR systems work.	PSO-1,3	U	F,C,P	L	-
CO-3	Explain the use of designs for AR and VR experiences.	PSO-1	U	F,C	L	-
CO-4	Illustrate the benefits and drawbacks of specific AR and VR techniques on the human body.	PSO-1,3	Ap	F,C	L	-

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs :

	PO 1	**PO2**	**PO 3**	**PO 4**	**PO 5**	**PO6**	**PO 7**	**PO 8**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO 1	-	-	-	-	-	2	2	-	1	-	-	-
CO 2	-	-	-	-	-	2	2	-	2	-	1-	-
CO 3	-	-	-	-	-	2	2	-	2	-	1	-

CO 4	-	-	-	-	-	2	2	-	2	-	2	

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics :

	Internal	Assignment	Seminar	End Semester
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓		✓	✓
CO 4		✓		✓

UK7DSCCAP406: MAN MACHINE INTERFACE

DISCIPLINE	COMPUTER APPLICATIONS
Course Code	UK7DSCCAP406
Course Title	MAN MACHINE INTERFACE
Type of Course	**DSC**

Semester	VII				
Academic Level	4				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	4 hours	--	--	4 hours
Pre-requisites	Knowledge in Computer Graphics and UI Programming is desirable.				
Course Summary	This course provides an in-depth exploration of Man-Machine Interface (MMI), covering topics such as the importance of user interface design, graphical user interfaces, web interfaces, human-computer interaction, screen designing, interface components, usability engineering, evaluation techniques, cognitive models, and emerging technologies like ubiquitous computing and augmented reality. Through lectures and practical exercises, students gain valuable insights into designing intuitive interfaces and understanding the social and ethical implications of technology.				

Detailed Syllabus:

Module	Unit	Content	Hrs
I	**Introduction to Man-Machine Interface (12 Hours)**		**12**
	1	Importance of User Interface- Definition and significance in system design	
	2	Benefits of good design- Brief history of screen design evolution	
	3	Graphical User Interface (GUI)-Popularity of graphics in interface design-Concept of direct manipulation	
	4	Characteristics and principles of graphical systems	
	5	Web User Interface-Popularity and characteristics of web interfaces	
	6	Principles of user interface design for the web	

II	**Design Process and Screen Designing**		**12**
	7	Human Interaction with Computers-Understanding human characteristics in interface design	
	8	Importance of considering human factors-Human interaction speeds and business implications	
	9	Screen Design Goals and Planning -Purpose and organization of screen elements- Ordering of screen data and content-Screen navigation and flow	
	10	Visual Composition in Interface Design-Creating visually pleasing compositions	
	11	Emphasizing focus and presenting information meaningfully-Technological considerations in interface design	
III	**Windows and Interface Components (12 Hours)**		**12**
	12	Windows and Navigation Schemes- Selection of window and navigation schemes	
	13	Selection of devices and screen-based controls	
	14	Interface Components-Text and message presentation-Icons and multimedia elements	
	15	Considerations for colour usage and selection	
IV	• **MMI in Software Process**		**12**
	16	Usability Engineering and Prototyping-The software life cycle and iterative design	
	17	Prototyping practices and design rationale-Principles to support usability and standards	
	18	Evaluation Techniques-Expert analysis and user participation in evaluation	
	19	Choosing appropriate evaluation methods	
	20	Introduction to MMI patterns and universal design principles	
V	**Cognitive Models and Emerging Technologies**		**12**

	21	Cognitive Models in Interface Design- Goal and task hierarchies	
	22	Linguistic and physical models- Cognitive architectures and implications for interface design	
	23	Ubiquitous Computing and Augmented Reality- Applications and challenges in interface design	
	24	Information and Data Visualization-Techniques for effective visualization	
	25	Design considerations for data representation and display optimization	

Course Outcomes

No.	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO-1	Summarize the fundamental concepts and principles of of good man-machine interface design	U	PSO-1
CO-2	Explain design goals and principles to plan, organize, order and design screen elements effectively.	U	PSO-1,2
CO-3	Illustrate integration of various interface components in interface designs based on various considerations.	Ap	PSO-1,2,3
CO-4	Use interactive interface designs for software applications.	Ap	PSO-1,2,3

R-Remember, U-Understand, Ap-Apply**, An-Analyse, E-Evaluate, C-Create**

Textbooks:

1. Galitz, Wilbert O. *The Essential Guide to User Interface Design.* Wiley Dream Tech.
   - Modules Covered: 1, 2, 3
2. Dix, Alan, et al. *Human–Computer Interaction.* Pearson Education.
   - Modules Covered: 4, 5

Reference Books:

1. Shneiderman, Ben. *Designing the User Interface. 3rd Edition.* Pearson Education Asia.
2. Preece, Jennifer, et al. *Interaction Design.* Wiley Dreamtech.
3. Lauesen, Soren. *User Interface Design.* Pearson Education.
4. Olsen, D. R. *Human–Computer Interaction.* Cengage Learning.
5. Smith, Andrew, and Atakan, M. C. *Human–Computer Interaction.* Cengage Learning.

Name of the Course: Credits: 4:0:0 (Lecture:Tutorial:Practical)

CO No.	**CO**	**PSO**	**Cognitive Level**	**Knowledge Category**	**Lecture (L)/Tutorial (T)**	**Practical (P)**
CO 1	Summarize the fundamental concepts and principles of of good man-machine interface design	PO-6,7 PSO-1	U	F, C	L	
CO 2	Explain design goals and principles to plan, organize, order and design screen elements effectively.	PO-6,7 PSO-1,2	U	F, C	L	
CO 3	Illustrate integration of various interface components in interface designs based on various considerations.	PO-6,7 PSO-1,2,3	Ap	F,C,P	L	
CO 4	Use interactive interface designs for software applications.	PO-6,7 PSO-1,2,3	Ap	F,C,P	L	

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO	PSO	PSO	PSO
CO 1	-	-	-	-	-	3	3	-	3	-	-	-
CO 2	-	-	-	-	-	3	3	-	3	2	-	-
CO 3	-	-	-	-	-	3	3	-	3	2	-	-
CO 4	-	-	-	-	-	3	3	-	3	2	2	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics :

	Internal	Assignment	Lab	End Semester Examinations
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓		✓	✓
CO 4		✓	✓	✓

UK7DSCCAP407: RESEARCH METHODOLOGY

Discipline	COMPUTER APPLICATION
Course Code	UK7DSCCAP407
Course Title	RESEARCH METHODOLOGY
Type of Course	**DSC**
Semester	VII

Academic Level	4				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	4 hours	-	0	4 hours
Pre-requisites	Nil				
Course Summary	Objectives, Design and methods of research ,Data pre processing hypothesis, reporting and thesis writing				

Detailed Syllabus:

Module	Unit	Content	Hrs
I		**Objectives and types of research**	**12**
	1	Motivation, objectives – Research Methods vs Methodology	
	2	Types of Research – Descriptive vs Analytical, Applied vs Fundamental, Quantitative vs Qualitative, Conceptual vs Empirical	
	3	Research Formulation – Defining and formulating the research problem, Selecting the problem, Necessity of defining the problem, Importance of literature review in defining a problem	
	4	Literature review, Critical literature review, Identifying gap areas from literature review	
II		**Research Design and methods**	**12**
	5	Research Design-Basic principles, need of research design, Features of good design, Important concepts relating to research design	
	6	Developing a research plan – Exploration, Description, Diagnosis, Experimentation	
	7	Data collection and analysis- Sources of data-primary, secondary, tertiary	
	8	Methods of data collection – Observation, Interview, Questionnaires, Schedule and some other methods, Sampling methods – Probability, non-probability samples	
III		**Data Processing Strategies and Hypothesis**	**12**

	9	Editing, Coding, Classification tabulation, Graphical representation	
	10	Hypothesis – meaning and importance of hypothesis, sources of hypothesis, Types of hypotheses, Development of working hypothesis	
IV	**Reporting and thesis writing**		**12**
	11	Structure and components of scientific reports, Types of report, technical reports and thesis	
	12	Different steps in the preparation – Layout, structure and language of typical reports	
	13	Illustrations and tables, Bibliography, referencing and footnotes	
	14	Oral presentation, Planning, Preparation, Practice, Making presentation, Use of visual aids	
V	**Application of results and ethics**		**12**
	15	Environmental impacts – Ethical issues, Ethical committees	
	16	Commercialisation, copy right, royalty, intellectual property rights and patent law	
	17	plagiarism, citations and acknowledgement.	

References

1. Bhanwar Lal Garg, Renu Kavdia, Sulochana Agarwal, and Umesh Kumar Agarwal, An Introduction to Research Methodology, RBSA Publishers, 2015.
2. C R Kothari, Research Methodology: Methods and Techniques, New Age International (P) Ltd. Publishers, Second Edition 2004.
3. Anil K Dhiman, and Suresh C Sinha, Research Methodology, Ess Ess Publications, 2008
4. Arlene Fink, Conducting Research Literature Reviews: From the Internet to Paper, Fifth Edition, Sage Publications, 2019.
5. Barbara Gastel, and Robert A. Day, How to Write and Publish a Scientific Paper, Eighth Edition, Santa Barbara, California: Greenwood, 2016.

Course Outcomes

No.	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO-1	Understand the distinction between research methods and methodology and apply them effectively in their research projects.	U	PSO-1,2,
CO-2	Demonstrate competency in various methods of data collection, such as observation, interviews, questionnaires, schedules, and others, and apply them according to the research objectives.	Ap	PSO-1,2, 3
CO-3	Demonstrate proficiency in editing raw data, coding variables, classifying data into meaningful categories, and tabulating data for analysis.	Ap	PSO-1,2,3
CO-4	Develop skills in the various steps involved in preparing scientific reports, including layout, structure, and language considerations.	Ap	PSO-1,2,3

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Credits: 4:0:0 (Lecture: Tutorial: Practical)

CO No.	CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L)/Tutorial (T)	Practical (P)

CO1	Understand the distinction between research methods and methodology and apply them effectively in their research projects.	PO-1,6,7 PSO-1,2,	U	F, C	L	-
CO2	Demonstrate competency in various methods of data collection, such as observation, interviews, questionnaires, schedules, and others, and apply them according to the research objectives.	PO-1,6, 7 PSO-1,2, 3	Ap	F, C	L	-
CO3	Demonstrate proficiency in editing raw data, coding variables, classifying data into meaningful categories, and tabulating data for analysis.	PO-1,6,7 PSO-1, 2,3	Ap	F, C	L	-

CO4	Develop skills in the various steps involved in preparing scientific reports, including layout, structure, and language considerations.	PO-1,6,7 PSO-1, 2, 3	Ap	F, C	L	-

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs :

	PO1	**PO2**	**PO3**	**PO4**	**PO 5**	**PO6**	**PO7**	**PO8**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO 1	3	-	-	-	-	3	-	-	2	3	-	2
CO 2	3	-	-	-	-	3	-	-	2	3	-	2
CO 3	3	-	-	-	-	3	-	-	2	3	-	2
CO 4	3	-	-	-	-	3	-	-	2	3	-	2

Correlation Levels:

Level	**Correlation**
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics :

	Internal	Assignment	Seminar	End Semester Examinations
CO 1	✓			✓
CO 2	✓	✓		✓
CO 3	✓		✓	✓
CO 4	✓	✓		✓

UK7DSCCAP408: HASKELL PROGRAMMING

Discipline	Computer Science				
Course Code	UK7DSCCAP408				
Course Title	Haskell Programming				
Type of Course	**DSC**				
Semester	VII				
Academic Level	4				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	3 hours	-	2 hours	5 hours
Pre-requisites	Basic knowledge in Mathematics and Artificial Intelligence is desirable.				

Course Summary	This course introduces students to functional programming concepts and languages, emphasizing the benefits of immutability, higher-order functions, and declarative programming. Students will learn to write concise, elegant, and scalable code using functional programming techniques.

Detailed Syllabus:

Module	Unit	Content	Hrs (L+P)	CO
I		**Introduction to Functional programming**	**15 hrs**	**CO1**
	1	Functional programming: Functions and types; Functional composition		
	2	The Haskell Platform, Environment setup		
	3	Expressions, types and values: A session with GHCi, Names and Operators-sections and lambda expressions-Evaluation; Types and type classes, Printing values, Modules, Haskell layout		
II		**Numbers and Lists**	**15 hrs**	**CO2**
	4	**Numbers**: The type class Num, Other numeric type classes, Computing floors, Binary Search, Natural Numbers,		
	5	**List**: Notation; Enumerations; List Comprehensions; Some basic operations; Concatenation; concat, map and filter; zip and zipWith; Common words		
III		**Proofs and Efficiency**	**15 hrs**	**CO3**
	6	**Proofs**: Induction over Natural Numbers; Induction over lists- Induction over partial lists, Induction over infinite lists; The function foldr-Fusion, Variant; The function foldl; The function scanl; The maximum segment sum		
	7	**Efficiency**: Lazy evaluation; Controlling space- Two more application operators; Controlling time; Analysing Time; Accumulating parameters; Sorting-Merge sort, Quick sort		
IV		**Imperative Functional Programming**	**15 hrs**	**CO4**
	8	**IO monad**: IO Monad-do-notation; Monad Laws; The state Monad; The ST Monad; Mutable arrays- Hash table; Immutable Arrays		

V		**Flexi Module: Not included in End Semester Exams**	**15 hrs**	
	9	**A simple Equational calculator-**Basic considerations; Expressions; Laws; Calculations; Rewrites; Matchings; Substitutions; Testing the calculator		

References

Core

1. Richard Bird, "Thinking functionally with Haskell"

Additional

2. Graham Hutton, Programming in Haskell, 1e, Cambridge University Press, 2007.
3. KeesDoets and Jan van Eijck, The Haskell Road to Logic, Maths and Programming, 2e, College Publications, 2004.
4. Greg Michaelson, an Introduction to Functional Programming through Lambda Calculus, 1e, Dover Publications, 2011
5. Chris Okasaki, Purely Functional Data Structures, 1e, Cambridge University Press, 1999.

Lab

List of Programs:

1. Program to find common words in a text.
2. Program to write numbers as words.
3. Program to calculate values of regular expression.
4. Implement Numbers.
5. Implement List.
6. Implement induction over natural numbers.
7. Implement induction over infinite lists.
8. Implement the functions foldr, foldl and scanl.
9. Implement maximum segment sum.
10. Implement Merge sort.
11. Implement Quick sort.
12. Implement IO Monad.
13. Implement Mutable arrays.
14. Implement immutable arrays.
15. Develop A simple Equational calculator.

Course Outcomes

No.	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO1	Discuss the foundational concepts in Functional Programming	U	PSO-1
CO2	Explain about Numbers and Lists in Functional Programming	U	PSO-1,3
CO3	Predict the relevance of proofs and efficiency through various methods	U	PSO-1,3
CO4	Summarize the concepts in Imperative Functional Programming	U	PSO-1, 2, 3,

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Credits: 3:0:1 (Lecture: Tutorial: Practical)

CO No.	CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L)/Tutorial (T)	Practical (P)
CO1	Discuss the foundational concepts in Functional Programming	PO6, PO7, PSO1, 3	U	F, C, P	L	P
CO2	Explain about Numbers and Lists in Functional Programming	PO6, PO7, PSO1, PSO3	U	F, C, P	L	P

CO3	Predict the relevance of proofs and efficiency through various methods	PO3, PO6, PO7, PSO1, PSO3	U	F, C, P	L	P
CO4	Summarize the concepts in Imperative Functional Programming	PO2, PO3, PO4, PO5, PO6, PO7, PSO1, PSO2, PSO3, PSO4	U	F, C, P	L	P

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs :

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO 1	-	-	-	-	-	3	3	-	3	-	3	-
CO 2	-	-	-	-	-	3	3	-	3	-	3	-
CO 3	-	-	1	-	-	3	3	-	3	-	3	-
CO 4	-	2	2	3	1	3	3	-	3	3	3	2

Correlation Levels:

Level	**Correlation**

-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Lab Assignments
- Final Exam

Mapping of COs to Assessment Rubrics :

	Internal Exam	Quiz/Seminar/Assignment	Lab Assignments	End Semester Examinations
CO 1	✓	✓	✓	✓
CO 2	✓		✓	✓
CO 3	✓		✓	✓
CO 4	✓	✓	✓	✓

UK7DSCCAP409: ACADEMIC WRITING AND PUBLISHING

Discipline	COMPUTER APPLICATION
Course Code	UK7DSCCAP409
Course Title	**ACADEMIC WRITING AND PUBLISHING**
Type of Course	**DSC**
Semester	VII
Academic Level	4

Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	3 hours	-	2 hours	5 hours
Pre-requisites	**Nil**				
Course Summary	The course introduces philosophy of science and ethics, research integrity, publication ethics, Indexing and citation in databases, open access publications, research metrics, plagiarism tools, LaTeX software for creating presentations and academic writings and typesetting.				

Detailed Syllabus:

Module	Unit	Content	Hrs (L+P)
I		**Ethics with respect to research and publications**	**15 hrs**
	1	**Ethics with respect to science and research**-Intellectual honesty and research integrity	
	2	Publication Ethics-Definition, introduction and importance, Intellectual Property Right, Principles of Transparency and Best Practice in Scholarly Publishing: COPE, WAME	
	3	Scientific misconducts: Falsification, Fabrication and Plagiarism (FFP)- types	
	4	Redundant publications: Duplicate and overlapping publications, salami slicing, Selective reporting and misrepresentation of data	
	5	Publication misconduct: Definition, concept, problems that lead to unethical behaviour and vice versa, types, Violation of publication ethics, authorship and contributorship, Identification of publication misconduct, complaints and appeals, Predatory publishers and journals	
II		**Open access publication initiatives, software tools, Research metrics**	**15 hrs**

	6	**Open access publications and initiatives-** SHERPA/RoMEO online resource to check publisher copyright & self-archiving policies,	
	7	UGC-CARE list of journals, Journal finder/journal suggestion tools - JANE, Elsevier Journal Finder, Springer Journal Suggester.	
	8	**Software tools-** Use of reference management software (Mendeley, Zotero) and anti-plagiarism software (Turnitin, Urkund) Databases - indexing databases, Citation databases: Web of Science, Scopus.	
	9	Research Metrics -Impact factor of journal as per Journal Citation Report, SNIP, SJR, IPP, Cite Score Metrics: h-index, g-index, i-10 index, altmetrics, Eigenfactor score	
III	**LaTeX for Academic Writing**		**15 hrs**
	10	Latex Editors, Online latex editors, Commands to basic layout of a latex file, preamble, Simple typesetting – spaces, quotes, dashes, special symbols, text positioning ,type style Sections.	
	11	Document Class - Font Size, paper size, Page Formats, Page Style, Page Numbering, formatting length, Parts of a document- Title, abstract, header and footer	
	14	Sectioning commands-\Part, \chapter, \section, \subsection, \susbsubsection, \paragraph, \subparagraph	
	15	Emphasizing words with \emph, \texttt, \textsl, \textit, \underline ,	
	16	Basic environments like enumerate, itemize, description, flushleft, flusuright	
	17	Adding footnotes, Table of Contents, Simple equations and adding reference	
	18	Tables : preparing a table and floating it, the longtable environment	

	19	Figures : Including graphics with graphicx package, controlling width, height etc, adding captions typesetting mathematics : basic symbols, equations, operators, the equation environment and reference to it.	
IV		Advanced features of LaTeX	**15 hrs**
	20	Creating Simple charts	
	20	Bibliography and citation commands, Bibliographic database commands, table of content, Index and Glossary commands, List of tables and figures	
	21	Creating slides with slide layouts, colors, fonts, and animations for presentation using document class beamer	
	22	Creating posters	
V		**Flexi Module_ Not included for End Semester Exams**	**15 hrs**
		Creating Bibliography file- types of bibliographic entries, URLs and DOIs in citations, TikZ package for drawing diagram	

Textbooks

1. Kerry Lynn Macintosh, Ethics and Integrity in Research: A Primer ,Oxford University Press
2. Rafael Ball,An Introduction to Bibliometrics- New Development and Trends , Chandos Publishing
3. Adil E. Shamoo and David B. Resnik, Responsible Conduct of Research **,**Oxford University Press
4. Charles Lipson,Doing Honest Work In College – How to Prepare Citations, Avoid Plagiarism, and Achieve Real Academic Success, Chicago Guides to Academic Life
5. Tobias Oetiker, Hubert Partl, Irene Hyna and Elisabeth Schlegl Short, Introduction to LATEX 2e, Samurai Media Limited (or available online at https://mirror.niser.ac.in/ctan/info/lshort/english/lshort.pdf)
6. Leslie Lamport. LATEX: A Document Preparation System, Addison-Wesley, Reading, Massachusetts, second edition, 1994

Web Resources:

1. www:clarivate.com
2. TeXstudio : user manual, http://texstudio.sourceforge.net/manual/current/usermanual_en.html
3. Han Lin Shang,Writing posters with beamerposter package in LATEX (https://tug.org/pracjourn/2012-1/shang/shang.pdf)
4. The beamer class User Guide for version 3.71. (https://tug.ctan.org/macros/latex/contrib/beamer/doc/beameruserguide.pdf)

References

1. Measuring Scholarly Impact: Methods and Practice edited by Ying Ding, Ronald Rousseau, and Dietmar Wolfram, Springer

Lab Exercises

1. Design and typeset a books incorporating chapters, sections, figures and referencing
2. Design and typeset a books incorporating Table of Content,chapters, sections, figures and referencing
3. Design and typeset two column article incorporating Abstract, sections, tables, and citations. Include list of tables and Table of contents.
4. Design and typeset two column article with formatting requirements such as double-spacing, graph, and citation.
5. Design and typeset a books using LaTeX and customize chapter headings, header and footer page layouts, and typography.
6. Design and typeset books using LaTeX and customize chapter headings, sections subsection, page layouts, and typography.
7. Design and typeset books using LaTeX and customize chapter headings, sections subsection and figure. Include list of figures
8. Design a professional resume or curriculum vitae (CV) using LaTeX.
9. Design and typeset professional letters using LaTeX.
10. Design scientific posters for a conference or presentation using LaTeX.
11. Design and typeset question papers in your field of study using LaTeX
12. Design and type set a two column research papers in your field of study, including sections such as abstract, introduction, methodology, results, discussion, and references.

13. Design and type set a dummy project report in your field of study, including sections such as abstract, introduction, methodology, results, discussion, and references.

Course Outcomes

No.	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO-1	Identify ethical considerations in research including matters of falsification, fabrication, plagiarism and the principles of transparency in scholarly publishing.	U	PSO-1
CO-2	Explain open access initiatives, familiarise with software tools for reference management and anti-plagiarism.	U	PSO-1,2
CO-3	Prepare academic documents using latex editors using document class, sectioning, environment ,basic type setting commands, tables and figure	Ap	PSO-1,2
CO-4	Produce documents having charts, index, bibliography & citation, presentation slides and posters	Ap	PSO-1,2

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Credits: 4:0:0 (Lecture:Tutorial:Practical)

CO No.	CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L)/Tutorial (T)	Practical (P)
1	Identify ethical considerations in research including matters of falsification, fabrication, plagiarism and the principles of transparency in scholarly publishing,	PO-3, 4,6,7, 8 PSO-1	U	F, C	L	

2	Explain open access initiatives, familiarise with software tools for reference management and anti-plagiarism.	PO-3, 4, 6,7, 8 PSO-1, 2	U	F, C	L	
3	Prepare academic documents using latex editors using document class, sectioning, environment ,basic type setting commands, tables and figure	PO-3, 4, 6,7 PSO-1, 2	Ap	F<C,P	L	P
4	Produce documents having charts, index, bibliography & citation, presentation slides and posters	PO-3, 4, 6,7 PSO-1, 2	Ap	F,C, P	L	P

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4
CO 1	**2**	**1**	**1**	**-**	**-**	**2**	**2**	**1**	**1**	**-**	**-**	**-**
CO 2	**2**	**2**	**1**	**-**	**-**	**2**	**2**	**1**	**2**	**3**	**-**	**-**
CO 3	**2**	**2**	**1**	**-**	**-**	**2**	**2**	**1**	**2**	**-**	**-**	**-**
CO 4	**2**	**2**	**1**	**-**	**-**	**2**	**2**	**2**	**-**	**-**	**-**	**3**

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate /
3	Substantial /

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics :

	Internal	Assignment	Lab Assessment	End Semester Examinations
CO 1	✓	✓		✓
CO 2	✓	✓		✓
CO 3	✓		✓	✓
CO 4	✓		✓	✓

UK7DSCCAP410: BIG DATA ANALYTICS

Discipline	COMPUTER APPLICATION				
Course Code	UK7DSCCAP410				
Course Title	Big Data Analytics				
Type of Course	**DSC**				
Semester	VII				
Academic Level	4				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	3 hours	-	2 hours	5 hours

Pre-requisites	UK3DSECSC201: Data Science Fundamentals
Course Sumary	The Big Data Technologies Using Hadoop course is designed to introduce students to the concepts, tools, and technologies for processing and analyzing large-scale datasets commonly referred to as Big Data. The course focuses on Hadoop, an open-source framework that provides distributed storage and processing capabilities for handling massive volumes of data across clusters of commodity hardware. Students will learn the fundamentals of Hadoop ecosystem components and how to leverage them to solve real-world big data challenges.

Detailed Syllabus:

Module	Unit	Content	Hrs (L + P)
I	**Introduction**		**15**
	1	Introduction to Hadoop, Understanding the Hadoop Distributed File System (HDFS) Getting Data into Hadoop, Understanding Data Processing in Hadoop	
II	**Advanced Map Reduce Concepts**		**15**
	2	Advanced Map Reduce API Concepts, Introduction to Apache Pig, Advanced Pig Usage, Introduction to Apache Hive, Advanced Hive Usage YARN Administration.	
III	**SQL and Cluster management**		**15**
	3	SQL on Hadoop Overview, The Hadoop Ecosystem, Cluster Management using Apache Ambari, Scaling Hadoop, Advanced Cluster Configuration, the Hadoop User Environment (HUE).	
IV	**Advanced concepts in Hadoop**		**15**
	4	Advanced HDFS, Securing Hadoop, Troubleshooting Hadoop, Integrating Hadoop into the Enterprise, Hadoop in the Cloud, Introduction to NoSQL, Introduction to Apache Spark.	

References

1. **Jeffrey Aven, Hadoop In 24 Hours Sams Teach Yourself, 2018.**

Web: Resources:

1. Apache Hadoop official website**: https://hadoop.apache.org/**
2. Hortonworks Community Connection**: https://community.cloudera.com/t5/Hortonworks-Community/ct-p/hortonworks-community**

Lab Exercises

1. Installation of Hadoop.
2. Implementation of Map reduce in Hadoop.
3. Demonstrate SQL queries in Hadoop.
4. Implement a word count program using map reduce concepts.
5. Implement cluster management in hadoop.
6. Implement NoSQL programs in MongoDB.

Course Outcomes

No.	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO1	Summarise map reduce concepts	U	PSO- 1
CO2	Implement data processing in Hadoop and apply Hive to YARN administration	Ap	PSO- 1,3
CO3	Develop cluster management system using Apache Ambari	Ap	PSO-1,3
CO4	Restate HDFS, NoSQl and Apache Spark	Ap	PSO-1,3

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Credits: 3:0:1 (Lecture: Tutorial: Practical)

CO No.	CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L)/Tutorial (T)	Practical (P)
CO1	Summarise map reduce concepts	PO-6,7 PSO- 1	U	F, C	T	P
CO2	Implement data processing in Hadoop and apply Hive to YARN administration	PO-6,7 PSO- 1,3	Ap	P	T	P
CO3	Develop cluster management system using Apache Ambari	PO-6,7 PSO-1,3	An	P	T	P
CO4	Restate HDFS, NoSQl and Apache Spark	PO-6,7 PSO-1,3	Ap	P	T	P

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs :

	PO1	PO2	PO3	PO4	PO 5	PO6	PO 7	PO8	PSO 1	PSO 2	PSO3	PSO 4
CO 1	-	-	-	-	-	3	3	-	1	-	-	-
CO 2	-	-	-	-	-	3	3	-	2	-	3	-
CO 3	-	-	-	-	-	3	3	-	2	-	1	-
CO 4	-	-	-	-	-	3	3	-	2	-	2	3

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Discussion / Seminar
- Midterm Exam
- Lab Assignments
- Final Exam

Mapping of COs to Assessment Rubrics :

	Internal	Quiz/Assignment	Lab Assessment	End Semester Examinations
CO 1	✓	✓		✓
CO 2	✓			✓
CO 3	✓			✓
CO 4	✓	✓		✓

UK7DSCCAP411: E-GOVERNANACE

Iscipline	COMPUTER APPLICATION
Course Code	UK7DSCCAP411
Course Title	E-Governance
Type of Course	**DSC**
Semester	VII

Academic Level	4				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	4 hours	-	-	4 hours
Pre-requisites	Awareness in basics of Information Technology concepts is desirable.				
Course Summary	This course on E-Governance provides a comprehensive understanding of digital governance and its potential in transforming the functioning of governments, services they provide and modes of interaction with citizens.				

Detailed Syllabus:

Module	Unit	Content	Hrs
I	**Concepts of E-Governance**		**12 hrs**
	1	Meaning, Concept of E-Governance, Objectives of E-Governance.	
	2	Types of Interactions of E- Governance-Government to Customer, Government to Employees, Government to Government, Government to Business.	
	3	Advantages, Disadvantages, Importance of E-Governance.	
	4	Components-Pillars of E-Governance, Goals of E-Governance, Some E-governance Initiatives in India	
II	**Evolution of E-Governance**		**12**
	5	Phases of E- Government in India-Informatics based E- Government	
	6	Personal Computer based E-Government	
	7	World Wide Web based E-Government	

	8	History and Evolution of E-Governance in India	
III	**E-Governance Technologies and Principles**		**12**
	9	Role of Technologies in E-Governance-Block Chain Technologies and E-Governance	
	10	Information Technology and E-Governance	
	11	Smart E-Government Platform through Technologies	
	12	Cloud Computing in E-Governance	
	13	Core Principles of E-Governance	
	14	E-Government is about Government than Online Presence	
	15	Promotion of E-citizens and E-democracy	
	16	Accessibility, use of Open Source over proprietary software	
	17	E-Business Plan, Strategies for Implementation of E-Governance, National E-Governance Plan	
IV	**E-Governance Architecture**		**12**
	18	E-Governance Architecture- India Enterprise Architecture (INDEA)- Vision, Purpose, Scope of INDEA	
	19	Structure, Principles, Reference Models of INDEA.	
	20	Opportunities, Challenges for E-Governance, Environmental and Social Challenges	
	21	Economic Challenges, Technical Challenges, Challenges of Implementation, Other Challenges, Security Drawbacks	
	22	Role of DeitY in good Governance	
V	**Flexi Module**		**12**

	23	Empowering India through E-Governance- MyGov Platform, Pahal, Paygov India, Aadhar Enabled Payment System, Smart Cities	
	24	Nine Pillars of Digital India	
	25	UMANG, Digital Locker, National Centre of Geo-Informatics, Rapid Assessment System, State Wide Area Network, e-Kranti, e-Taal, e_District, e-Sampark, e-Pramaan- Digital Life Certificate, e-Office, Open Forge Platform	

References

M Sumathy, A handbook of E-governance in India, Abhijeet Publishers, September 2021

M P Gupta, Prabhat Kumar, Jaijit Bhattacharya, Government Online Opportunities and Challenges, Tata McGraw Hill, 2003

Prabhu C S R, E-GOVERNANCE: CONCEPTS AND CASE STUDIES, PHI, (Second Edition) 2022

Course Outcomes

No.	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO-1	Summarize concepts of E-Governance	U	PSO-1,2
CO-2	Relate with the various phases of E-Government	Ap	PSO-1,2
CO-3	Interpret E-Governance Principles	Ap	PSO-1,2
CO-4	Identify E-Governance Architecture and challenges faced.	Ap	PSO-1,2

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Credits: 4:0:0 (Lecture: Tutorial: Practical)

CO No.	CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L)/Tutorial (T)	Practical (P)
CO-1	Summarize concepts of E-Governance	PSO-1,2	U	F, C	L	-
CO-2	Relate with the various phases of E-Government	PSO-1,2	Ap	F, C	L	-
CO-3	Interpret E-Governance Principles	PSO-1,2	Ap	F, C	L	-
CO-4	Identify E-Governance Architecture and challenges faced.	PSO-1,2	Ap	F, C	L	-

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	-	-	-	-	-	2	2		2	2	-	-
CO 2	-	-	-	-	-	2	2		2	2	-	-
CO 3	-	-	-	-	-	2	2		2	2	-	-
CO 4	-	-	-	-	-	2	2		2	2	-	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate /
3	Substantial /

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics:

	Internal Exam	Assignment	Discussion/Seminar	End Semester Examinations
CO 1	✓		✓	✓
CO 2	✓		✓	✓
CO 3	✓			✓
CO 4	✓	✓		✓

UK7DSCCAP412: PROMPT ENGINEERING

Discipline	COMPUTER APPLICATION
Course Code	UK7DSCCAP412
Course Title	**PROMPT ENGINEERING**
Type of Course	**DSC**

Semester	**VII**				
Academic Level	4				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	3 hours	-	2 hours	5 hours
Pre-requisites	Should possess analytical skills. Prior knowledge in engineering principles and practices will be desirable				
Course Summary	Prompt Engineering is a course that delves into the creation, optimization and evaluation of prompts used for various categories of AI systems. The course covers techniques for designing prompts to elicit desired responses from language models. The course explores the various strategies for fine tuning prompts through experimentation and iteration to obtain specific outcome. On an overall the prompt engineering course equips students with skills to harness the power of language models through strategic prompt design				

Detailed Syllabus:

Module	Unit	Content	Hrs-(L+P)
I		**Introduction to Prompt Engineering**	**15**
	1	Prompt Engineering- Definition, Importance of Prompt Engineering, Role of Prompt Engineers, Application domains- Education, Engineering, Entertainment	
	2	Principles of Prompt Engineering- Understanding User Prompts-Types of Prompts- Information Prompts, Confirmation Prompts, Suggestion Prompts, Social Influence Prompts. Factors influencing prompt effectiveness- clarity, timing, relevance, language and tone, personalization.	
	3	Foundation of Language Models- Definition, tasks- Text generation, Translation, Question Answering, Summarization, Natural Language Inference, other capabilities- chatbots, virtual assistants, Examples of Language Models- Gemini, BERT, GPT based Models, GPT-3, GPT4, LaMDA, PaLM, Parti.	
	4	Processing text in Language Models- Tokenization, Generation of text in Language Models- Beam Search	
II		**Crafting Prompts**	**15**

	5	Types of Prompts. Visual Prompts, Auditory Prompts, Tactile Prompts, Open ended Prompts, closed ended prompts, Instructional prompts, Contextual prompts.	
	6	Factors influencing Model responses- Context, Length, Structure, Complexity, Fine tuning. Conciseness and specificity in prompt design	
	7	Query Formulation Techniques, importance of context in prompt formulation, Techniques for crafting clear and effective instructions, tailoring prompts to specific tasks or domains	
	8	Structuring Prompts for Unambiguous understanding- Clear Communication, Contextual Cues- images, code. Best practices to be followed for designing user prompts –- designing effective prompt systems - understanding user perspective, clear and concise prompts, providing context, considering user input, feedback and validation, iterative design process. Strategies for iteratively improving prompts based on feedback and performance analysis, Feedback Mechanism- Quantitative analysis, qualitative analysis, iterative prompt design, A/B testing,	
	9	Approaches for adjusting prompt language, structure and complexity, Fine tuning, techniques used – Supervised learning, Reinforcement learning	
	10	Prompt generation Tools- Prompt Studio, Prompt Bard, PromptInsight, Prompt evaluation tools- PromptEvaluator, PromptRanker, PromptTuning	
III	**Prompt Engineering Strategies and Applications**		**15**
	11	Pillars of Prompting- Providing Examples, Giving Direction, Formatting Responses, Evaluating Quality, Chaining AIs	
	12	Debiasing techniques, Context Manipulation, Controlled Generation, Iterative Prompting	
	13	Prompt strategies for tasks – summarization, translation, Q & A, creative writing, other tasks	
	14	Role of Prompt Engineering in various applications- Search and Recommendation, Natural Language Processing, Creative AI, AT Safety	
	15	Examples of applications using prompt engineering- Google AI, Microsoft AI, Salesforce AI, Open AI	
IV	**Prompt Engineering Technologies & Ethical issues**		**15**
	16	Machine Learning Models for personalized prompts- Rule based Models, Collaborative filtering Models, Content based Models, Hybrid Models	

	17	Emerging Technologies in Prompting- Natural Language Processing, Machine Learning, Augmented Reality, Virtual Reality, Sustainable Prompting Strategies- Energy efficient hardware, optimizing prompt frequency and timing	
	18	Ethical considerations in Prompt Engineering- Privacy and Consent, Manipulative prompting practices, Ensuring Prompt conformity to Ethical standards	
	19	Handling Constraints, Addressing Biases in prompts and response, Interpreting Model Output, tools used for auditing bias and fairness example- Google Text to Text Transfer Model, Metrics for assessing quality and effectiveness of prompts	
V	**Flexi Module: Not included for End Semester Exams**		**15**
	20	Advanced Techniques-Meta Prompting, Multimodal prompt engineering, prompt embedding, conditional generation.	
	21	Prompt techniques- Zero-shot Prompting, Auto-prompting, Few shots prompting, Chain of Thought Prompting, Self-consistency prompting, General Knowledge Prompting, Tree of Thoughts prompting	

References

Utkarsh Pal, Mastering Prompt Engineering: A Guide to Effective Communication with language Models, December 2023

Alan Weston, Prompt Engineering for Beginners, February 2024

A Scholtens, Course book Prompt Engineering, January 2023, SAS155,

Naween Balani, Prompt Engineering: Unlocking Generative AI, April 2023, ISBN -13-979-8390487082

Yaswanth Sai Palghat, The Art of Asking prompt Engineering, Notion Press Media Pvt Ltd, August 2023, ISBN 13979-8890673169

Nathan Hunter, The Art of Prompt Engineering with ChatGPT: A Hands On Guide, Shroff/Hunter, First edition, June 2023

Author's Name, Name of Book, Publisher, Publication Year, volume, edition, ISBN

Lab Exercises

Familiarization of any one Language Model /application /GPT

- Select a prompt generation tool or framework (e.g., GPT-3, Prompt Studio).
- Create effective prompts for generation of text, creative writing, content generation, resume writing., poetry, fiction, non fiction or any other genre

- Design prompts for different scenarios (e.g., recommendation prompts for an e-commerce website, feedback prompts for a survey).
- Evaluate the generated prompts based on clarity, relevance, and user engagement.
- Discuss strategies for improving prompt effectiveness and iterate on the design process
- Compare various prompt generation tools (e.g., GPT-3, OpenAI Codex, DialoGPT).
- Case Studies in Prompt Engineering- Successful prompting campaigns, Failures in Prompt Engineering
- Case Studies demonstrating effective prompt engineering strategies

Course Outcomes

No.	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO-1	Summarize prompt engineering principles	U	PSO-1
CO-2	Develop effective prompts	Ap	PSO-1,2,3
C0 -3	Illustrate prompt engineering strategies:	Ap	PSO-1,2,3
CO -4	Make use of prompt engineering technologies	Ap	PSO-1,2

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Credits: 4:0:0 (Lecture: Tutorial: Practical)

CO No.	CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L)/Tutorial (T)	Practical (P)
1	Summarize prompt engineering principles	PO-6,7 PSO-1	U	F, C	L	-

2	Developing effective prompts	PO-6,7 PSO-1,2,3	Ap	F, C, P	L	P
3	Illustrate prompt engineering strategies:	PO-6,7 PSO-1,2,3	Ap	F, C,P	L	P
4	Make use of prompt engineering technologies	PO-6,7 PSO-1,3	Ap	F, C	L	-

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs:

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO6**	**PO 7**	**PO8**	**PSO 1**	**PSO2**	**PSO3**	**PSO4**
CO 1	-	-	--	-	-	2	2	-	2	-	-	-
CO 2	-	1	1	-	-	2	2	-	2	2	2	-
CO 3	-	-		--	-	2	2	-	2	1	2	-
CO 4	-	-	-	-	-	2	2	1	2	-	2	

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium

3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics:

	Internal	Assignment/	Lab	End Semester
CO 1	✓	✓		✓
CO 2	✓		✓	✓
CO 3	✓		✓	✓
CO 4	✓	✓		✓

UK7DSECAP400: CLOUD COMPUTING AND SECURITY

Discipline	COMPUTER SCIENCE
Course Code	UK7DSECAP400
Course Title	Cloud Computing And Security
Type of Course	DSE

Semester	VII				
Academic Level	4				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	4 hours	-		4
Pre-requisites	Awareness of basic concepts regarding Cloud Computing				
Course Summary	This course provides an in-depth awareness on the principles, technologies, and best practices involved, for securing Cloud Computing environments. The topics covered include risk management, data protection, identity and access management, network security, and compliance.				

Detailed Syllabus:

Module	Unit	Content	Hrs
I	**Risks in Cloud Computing**		**12**
	1	Cloud Computing Risks, Risk Management in Cloud Computing	
	2	Cloud's Impact on IT Operations	
	3	Risk Management Process in Enterprise-wide Risk Management	
	4	Types of Risks in Cloud Computing- Internal Security Risk, External Security Risk, Data Protection Risk, Data Loss	
II	**Data Security in Cloud**		**12**
	5	Current State, Security issues and challenges	
	6	Security advantages and disadvantages in Cloud environment	
	7	Cloud, Digital Persona and Data Security,	
	8	Content Level Security	
III	**Cloud Security Services**		**12**
	9	CIA triad- Data Confidentiality, Data Integrity and Data Availability	

	10	Security Authorization Challenges in the Cloud- Auditing, Risk Administration	
	11	Secure Cloud Software Requirements- Monitoring a constantly changing environment	
	12	Secure Cloud Software Testing- Reducing Testing Costs. Software Testing Tools to test Cloud Computing	
IV	**Cloud Security Architecture**		**12**
	13	Introduction, (CSA) Cloud Security Architecture	
	14	Authentication- Single Sign on	
	15	Authorization	
	16	Identity and Access Management	
	17	Securing Data in Rest, Securing Data in Motion	
		Key Management	
V	**Flexi Module: Not included for End Semester Exams**		**12**
	18	Virtual private clouds (VPCs) and network segmentation, Secure connectivity options (VPN, Direct Connect), Distributed denial of service (DDoS) protection	
	19	Compliance and Legal Considerations, Regulatory compliance requirements (GDPR, HIPAA, etc.)	
	20	Cloud Security standards and frameworks (ISO27001, NIST, etc)	
	21	Legal aspects of cloud security (contracts, data jurisdiction)	

References

A Srinivasan, j Suresh, Cloud Computing- A Practical Approach for Learning and implementation, Pearson Education, 2022

Arshdeep Bahga, Vijay Madisetti, Cloud Computing- A Hands on Approach, Universities Press (India) Private Limited, 2023

Tim Mather, Subra Kumaraswamy, Shaheed Latif, Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance, O'Reilly, 2009

Course Outcomes

No.	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO-1	Outline risks in Cloud Computing	U	PSO-1,2
CO-2	Analyze issues in Cloud Security	Ap	PSO-1,2
CO-3	Plan appropriate Cloud security services	Ap	PSO-1,2,3
CO-4	Identify an effective Secure Cloud architecture	Ap	PSO-1,2,3

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Credits: 4:0:0 (Lecture:Tutorial:Practical)

CO No.	CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L)/Tutorial (T)	Practical (P)
CO-1	Outline risks in Cloud Computing	PSO-1,2	U	F, C	L	-
CO-2	Analyze issues in Cloud Security	PSO-1,2	Ap	F, C	L	-
CO-3	Plan appropriate Cloud security services	PSO-1,2,3	Ap	F, C	L	-
CO-4	Identify and effective Secure Cloud architecture	PSO-1,2,3	Ap	F, C	L	-

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4
CO 1	-	-	-	-	-	2	2		2	2	-	-
CO 2	2	-	-	-	-	2	2		2	2	-	-
CO 3	2	-	1	1	-	2	2		2-	2	1	-
CO 4	2	-	1	1	-	2	2		2	2	1	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Final Exam

Mapping of COs to Assessment Rubrics :

	Internal	Assignment	Discussion	End Semester
CO 1	✓			✓
CO 2	✓	✓		✓
CO 3	✓		✓	✓
CO 4	✓	✓		✓

UK7DSECAP401: SOCIAL MEDIA ANALYTICS

Discipline	Computer Science				
Course Code	UK7DSECAP401				
Course Title	**Social Media Analytics**				
Type of Course	DSE				
Semester	VII				
Academic Level	4				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	4 hours	-	-	4 hours
Pre-requisites	Basic knowledge about Data Science				
Course Summary	This course provides an in-depth exploration of social media analytics focusing on understanding, analysing, and leveraging data generated through various social media platforms.				

Detailed Syllabus:

Module	Unit	Content	Hrs
I		**Social Media Data**	**12**
	1	Basics of data Analytics, fundamentals of social media data.	
	2	Data Evaluation : Learning to evaluate the quality and relevance of data	
	3	Data Sources: Recognizing different sources of social media data, both online and offline, Data Sources in Social Media Channels	
	4	Data Gathering Techniques: Exploring methods such as APIs and web crawling for collecting data efficiently	

II	**From Data to Insights**		**12**
	5	From Data to Insights: Key - Actionable, metric	
	6	Creating a plan to shape data	
	7	Choosing a good Analytical Tool, Data Aggregation, Calculation and Display	
	8	Social media and Big Data (Concepts)	
III	**Types of Analytics Tools**		**12**
	9	Types of Analytics: Various types of analytics in social media, including listening, advertising, CMS and CRM analytics	
	10	Social Media Listening: Exploring methods for analysing keywords, Mention based Analysis, Interest and sentiment.	
	11	Advertising Analytics: Focusing on measuring the effectiveness of paid social media campaigns.	
	12	CMS and CRM Analytics: Understanding how to measure content performance and customer interactions.	
IV	**Dedicated vs Hybrid Tools**		**12**
	13	Advantages and Disadvantages of Dedicated vs Hybrid Tools	
	14	Data Integration Tools – Advantages and Disadvantages.	
	15	Differences of Social Media Networks, Interactivity	
	16	The Analytics Process - Investigation Beyond Social Analytics Metrics, Dashboards, and Reports	
V	**Flexi Module - Not included for End Semester Examination**		**12**
	17	Case study on any social media network	
	18	Comparison of some recent media analytic tools	
	19	Metrics used in CMS and CRM Analytics	

TEXT BOOK

1. Alex Goncalves, “Social Media Analytics strategy using data to optimize Business performance”, Apress
2. Matthew Ganis, “Social Media Analytics: Techniques and Insights for Extracting Business Value Out of Social Media", Pearson, 2018

Course Outcomes

No.	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO-1	Acquire knowledge on the fundamentals of social media data	U	PSO-1
CO-2	Articulate data aggregation, key metrics, and usage of proper analytical tools for discerning insights.	U	PSO-1, 2
CO-3	Illustrate the methods to analyze keywords, sentiments and campaigns in social media.	Ap	PSO-1, 2
CO-4	Compare the use of dedicated and hybrid tools in social media analytics	Ap	PSO-1, 2

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Credits: 4:0:0 (Lecture:Tutorial:Practical)

CO No.	CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L)/ Tutorial (T)	Practical (P)
CO-1	Acquire knowledge on the fundamentals of social media data	PO-6, 7 PSO-1	U	F, C	L	-
CO-2	Articulate data aggregation, key metrics, and usage of proper analytical tools for discerning insights.	PO-6, 7 PSO-1	U	F, C	L	-

CO-3	Illustrate the methods to analyze keywords, sentiments and campaigns in social media.	PO-1, 6, 7 PSO-1, 2	Ap	F, C	L	-
CO-4	Compare the use of dedicated and hybrid tools in social media analytics	PO-1, 6, 7 PSO-1, 2	Ap	F, C	L	-

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4
CO 1	-	-	-	-	-	1	1	-	2	-	-	-
CO 2	-	-	-	-	-	2	3	-	2	-	-	-
CO 3	2	-	-	-	-	2	3	-	2	2	-	-
CO 4	2	-	-	-	-	2	3	-	2	2	-	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	End Semester
CO 1	✓		✓

CO 2	✓		✓
CO 3	✓	✓	✓
CO 4	✓	✓	✓

UK7DSECAP402: COMPUTER VISION

Discipline	COMPUTER SCIENCE				
Course Code	UK7DSECAP402				
Course Title	COMPUTER VISION				
Type of Course	**DSC**				
Semester	VII				
Academic Level	4				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	4 hours	-	-	4 hours
Pre-requisites	1. Basic Knowledge about computer images and computer Graphics 2. Basic Knowledge about machine learning				
Course Summary	This course aims to introduce the main concepts of computer vision, understand some essential principles and to implement computer vision techniques in projects or other related works.				

Detailed Syllabus:

Module	Unit	Content	Hrs
I		**Introduction**	**12**
	1	Computer Vision	
	2	Image formation, 2D transformation, 3D transformations 3D to 2D projections	
	3	Photometric image formations: Lighting, Reflectance and shading, optics	
	4	Digital camera: Sampling and aliasing, colour, compression	
II		**Filtering and Fitting**	**12**
	5	Point operators: Pixel transforms, Colour transforms	
	6	Linear filtering: Non-linear filtering, Bilateral filtering,	
	7	Model fitting and optimization: Scattered data interpolation. Variational methods and regularization, Markov random fields.	
III		**Recognition and Feature Detection**	**12**
	8	Recognition: Instance recognition.	
	9	Image classification, Feature-based methods, Deep networks.	
	10	Object detection, video understanding.	
	11	Feature detection and matching: feature detectors, feature descriptors, feature matching, edge detection	
IV		**Image Alignment and Stitching**	**12**
	12	Image alignment and stitching: pair wise alignment.	
	13	Image stitching, Motion estimation: translational alignment, parametric motion.	
V		**Computational Photography**	**12**
	14	Photometric calibration, High dynamic range imaging	
	15	Image matting and compositing: blue screen matting, natural image matting, optimization-based matting	

	16	smoke, shadow, and flash matting	

References:

1. Richard Szeliski, 2020. Computer Vision: Algorithms and Applications. Springer, 2nd Edn,
2. Linda F. Shapiro, George C. Stockman, 2001. Computer Vision. Prentice Hall, 1st Edn.
3. David. A. Forsyth, Jean Ponce, 2011. Computer Vision: A Modern Approach, 2nd Edn.

Course Outcomes

No.	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO-1	Summarize the fundamental concepts and principles of computer vision, including image formation, transformations, and photometric image formations.	U	PSO-1
CO-2	Illustrate the concepts of linear and non-linear filtering techniques, their role in image enhancement and noise reduction, model fitting and optimization methods	Ap	PSO-1, 2, 3
CO-3	Experiment with feature detection and matching algorithms, including feature detectors, descriptors, matching techniques, and edge detection.	Ap	PSO-1,2,3
CO-4	Demonstrate the principles and techniques of image alignment and stitching in computer vision and image processing.	Ap	PSO-1, 2,3

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Credits: 4:0:0 (Lecture:Tutorial:Practical)

CO No.	CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L)/Tutorial (T)	Practical (P)
CO-1	Summarize the fundamental concepts and principles of computer vision, including image formation, transformations, and photometric image formations.	PO-6,7 PSO-1	U	F, C	L	-
CO-2	Illustrate the concepts of linear and non-linear filtering techniques, their role in image enhancement and noise reduction, model fitting and optimization methods	PO6, 7 PSO-1,2,3	Ap	F, C	L	-

CO-3	Experiment with feature detection and matching algorithms, including feature detectors, descriptors, matching techniques, and edge detection.	PO6, 7 PSO-1, 2,3	Ap	F, C	L	-
CO-4	Demonstrate the principles and techniques of image alignment and stitching in computer vision and image processing.	PO6, 7 PSO-1, 2,3	Ap	F, C	L	-

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs :

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO 1	-	-	-	-	-	3	3	-	3	3	3	3
CO 2	-	-	-	-	-	3	3	-	3	3	3	3
CO 3	-	-	-	-	-	3	3	-	3	3	3	3
CO 4	-	-	-	-	-	3	3	-	3	3	3	3

Correlation Levels:

Level	**Correlation**
-	Nil
1	Slightly / Low

2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO 1	✓			✓
CO 2	✓	✓		✓
CO 3	✓			✓
CO 4	✓	✓		✓

Discipline	COMPUTER APPLICATION				
Course Code	UK7DSECAP403				
Course Title	Full Stack Development				
Type of Course	DSE				
Semester	VII				
Academic Level	4				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	3 hours	-	2 hours	5 hours

Pre-requisites	Should have knowledge in HTML 5, CSS 3, JavaScript and node.js
Course Summary	The course provides a comprehensive overview of full stack web development, covering both front-end and back-end technologies. Students will learn how to design, develop, and deploy dynamic web applications using industry-standard tools and frameworks

Detailed Syllabus:

Module	Unit	Content	Hrs(L+P)
I	**Basics of Full Stack Development**		**15**
	1	Understanding the Basic Web Development Structure, Structure of Web Applications, Components- User, Browser, Web Server, Backend Services	
	2	What are Software Stacks, Types of Stacks	
	3	Who is a Full Stack Developer	
	4	Tools for Full Stack Developers- Editors, Development Editors, Browsers	
	5	Familiarizing Nodejs,	
II	**Familiarizing MongoDB**		**15**
	6	Understanding NoSQL and MongoDB- NoSQL, MOngoDB	
	7	Building MongoDB Environment	
	8	User Accounts- Listing Users, Create User Accounts, Remove Users	
	9	Access Control- Creating User Administrator Account Creating Databsae Administrator Account	
	10	Data types in MongoDB	

	11	Administering Databases	
	12	Managing Collections	
	13	Connecting to MongoDB from node.js	
	14	Understanding the Objects used in MongoDB Node.js driver	
	15	Simple applications	
	16	Advanced MongoDB- Indexing, Aggregation, Map Reduce	
III	**Express and Angular**		**15**
	17	Implementing Express in node.js- installing Express, configuring routes	
	18	Using Request and Response objects, Introduction to Typescript	
	19	Type Annotations, Variables and Constants, understanding Interfaces	
	20	Implementing Classes, Modules, Functions	
	21	Basics of Angular, Angular CLI, Creating First Application in Angular, Angular Lifecycle	
	22	Understanding and using rigModule	
	23	Angular Architecture, Angular Components	
	24	Expressions-Pipes,Data Binding, Built in Directives- Structural Directives-ngif, ngfor,ngSwitch, Attribute Directives	
IV	**React**		**15**
	25	Concept of MEAN Stack, MERN Stack	
	26	Basic React Applications, React Components	
	27	Inter Component Communication, The Props, React State	
	28	Express REST APIs	
	29	Modularization and Webpack, Routing with React Router, Server-side Rendering	
V	**Flexi Module: Not included for End Semester Exams**		**15**

	30	Data Formats- CSV, XWL, JSON, Image Formats- Photpgraphs in IPC Format, Graphs and animations in GIF format, Graphics in png formatVector Graphics in Svc format, Video Formats, Audio formats	
	31	Implementing Mobile Applications, Types of Mobile applications, Native applications, Mobile web applications, Hybrid applications, Comparison of approaches	
	32	Using Web Protocols, Using Web APIs	
	33	Responsive Design- Introduction, Viewports, Media queries, Flexible layouts	
	34		

References

1. A A Puntambekar, Full Stack Web Development, Technical Publications, First Edition, June 2023

2. Philip Ackermann, Full Stack Web Development The Comprehensive Guide, Rheinwerk Publishing Inc, First Edition, 2023

Lab Exercises

- Creating web pages using HTML,
- Designing web pages using CSS,
- Making Web pages interactive with Javascript,
- Making Webpages dynamic using server-side logic

Course Outcomes

No.	Upon completion of the course the graduate will be able	Cognitive	PSO
CO-1	Summarize basic concepts of full stack development	Ap	PSO-1, 2, 3
CO-2	Develop Applications using Express and Angular	Ap	PSO-1, 2, 3
CO-3	Build Applications with REACT	Ap	PSO-1,2, 3
CO-4	Construct a MERN Stack	Ap	PSO-1, 2, 3

R-Remember, U-Understand, Ap-Apply, An-Analyse, E-Evaluate, C-Create

Name of the Course: Credits: 4:0:0 (Lecture:Tutorial:Practical)

CO No.	CO	PO/PSO	Cognitive Level	Knowledge Category	Lecture (L)/Tutorial (T)	Practical (P)
CO-1	Summarize basic concepts of full stack development	PO- 2,3, 6,7 PSO-1, 2, 3	Ap	F, C, P	L	P
CO-2	Develop Applications using Express and Angular	PO- 2,3, 6,7 PSO-1, 2, 3	Ap	F, C, P	L	P
CO-3	Build Applications with REACT	PO- 2,3, 6,7 PSO-1,2, 3	Ap	F, C, P	L	P
CO-4	Construct a MERN Stack	PO- 2,3, 6,7 PSO-1, 2, 3	Ap	F, C, P	L	P

F-Factual, C- Conceptual, P-Procedural, M-Metacognitive

Mapping of COs with PSOs and POs :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4
CO 1	-	2	2	-	-	3	3	-	2	2	2	-
CO 2	-	2	2	-	-	3	3	--	2	2	2	-
CO 3	-	2	2	-	-	3	3	-	2	2	2	--
CO 4	-	2	2	-	-	3	3	-	2	2	2	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Quiz / Assignment/ Quiz/ Discussion / Seminar
- Midterm Exam
- Programming Assignments
- Final Exam

Mapping of COs to Assessment Rubrics :

	Internal Exam	Assignment	Lab Assessment	End Semester Examinations
CO 1	✓	✓	✓	✓
CO 2	✓		✓	✓
CO 3	✓		✓	✓
CO 4	✓	✓		✓

SEMESTER 8

Online Course 1		
Online Course 2		
1. UG Honors with Research- Research Project Mandatory	**12**	
2. UG Honors - Internship Project	**12**	

UK8CIPCAP400 Internship project (For UG Honours) :12 credits

------As per the regulations of the University

UK8RPHCAP400 Research Project (For UG honours with research) :12 credits

------As per the regulations of the University

Online Course 1 :As per the regulations of the University

Online course 2 : As per the regulations of the University

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