KANNUR UNIVERSITY

Re-accredited by NAAC with 'B++' Grade

KUFYUGP

BACHELOR OF COMPUTER SCIENCE

CURRICULUM & SYLLABUS

Effective from 2024 Admission Onwards

www.kannuruniversity.ac.in

PREFACE

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

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

The BSc Computer Science Honours program emphasizes a strong theoretical foundation complemented by extensive laboratory experience. Students will engage in hands-on experiments that reinforce classroom learning and develop critical technical skills. Through practical work, they will learn to design application programmes, softwares, and analyse data, thus bridging the gap between theory and practice.

For those opting for the BSc Computer Science Honours with Research track, the program offers an enriched experience with a significant focus on independent research. This track is designed for students who wish to delve deeper into specific areas of interest, culminating in a research thesis. Under the mentorship of faculty members, students will undertake original research projects, honing their ability to conduct scientific inquiries, think critically, and contribute to the body of knowledge in Computer Science. This rigorous training prepares graduates for careers in academia, research institutions, and industry.

The successful revision of this curriculum would not have been possible without the collective efforts and inputs from the BOS members, Ad hoc committee members, Computer Science academic council member, resource persons and the unwavering support of Computer Science faculty members from the affiliated colleges. Their dedication and expertise have played an instrumental role in shaping a curriculum that is relevant, up-to-date, and consistent with international scholarly criteria.

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

BEST WISHES

(BOS, Computer Science)

INTRODUCTION

Kannur University - Four-Year Undergraduate Programme: Backdrop and Context

The implementation of the Four-Year Undergraduate Programme (FYUGP) has been driven by the pressing need to address contemporary challenges ensuring responsive changes to the evolving needs of students, industry, and society at large. Recognizing the curriculum as the cornerstone of any education system, it requires regular refinement to align with evolving socioeconomic factors. Higher education must provide students with practical and technical skills relevant to their fields of interest, necessitating the development of a job-oriented curriculum. Despite significant increases in access and expansion of higher education over the years, concerns persist regarding the quality and relevance of educational outcomes, particularly in terms of employability skills. As the world becomes increasingly interconnected, our education system must evolve to instill 21st-century skills, enabling students not only to survive but to thrive in this dynamic environment. Moreover, there is a growing need for higher education institutions to embrace social responsibility and contribute to the development of a knowledge society capable of driving sustainable development through innovation. With the central objective of fostering a robust knowledge society to support a knowledge economy, the Government of Kerala has initiated steps to reform higher education. Accordingly, three commissions were established to suggest reforms in higher education policy, legal and regulatory mechanisms, and evaluation and examination systems. It is within this context that a comprehensive reform of the undergraduate curriculum has been proposed, leading to the restructuring of the Four-Year Undergraduate Programme (FYUGP).

VISION AND MISSION OF KANNUR UNIVERSITY

Vision:

To establish a teaching, residential and affiliating University and to provide equitable and just access to quality higher education involving the generation, dissemination and a critical application of knowledge with special focus on the development of higher education in Kasargod and Kannur Revenue Districts and the Manandavady Taluk of Wayanad Revenue District.

Mission:

- To produce and disseminate new knowledge and to find novel avenues for application of such knowledge.
- To adopt critical pedagogic practices which uphold scientific temper, the uncompromised spirit of enquiry and the right to dissent.
- To uphold democratic, multicultural, secular, environmental and gender sensitive values as the foundational principles of higher education and to cater to the modern notions of equity, social justice, and merit in all educational endeavours.
- To affiliate colleges and other institutions of higher learning and to monitor academic, ethical, administrative, and infrastructural standards in such institutions.
- To build stronger community networks based on the values and principles of higher education and to ensure the region's intellectual integration with national vision and international standards.
- To associate with the local self-governing bodies and other statutory as well as nongovernmental organizations for continuing education and also for building public awareness on important social, cultural and other policy issues.

PROGRAMME OUTCOME

PO1	**Critical Thinking and Problem-Solving-Apply critical thinking skills to analyze information and develop effective problem-solving strategies for tackling complex challenges.**
PO2	**Effective Communication and Social Interaction-Proficiently express ideas and engage in collaborative practices, fostering effective interpersonal connections.**
PO3	**Holistic Understanding-Demonstrate a multidisciplinary approach by integrating knowledge across various domains for a comprehensive understanding of complex issues.**
PO4	**Citizenship and Leadership-Exhibit a sense of responsibility, actively contribute to the community, and showcase leadership qualities to shape a just and inclusive society.**
PO5	**Global Perspective-Develop a broad awareness of global issues and an understanding of diverse perspectives, preparing for active participation in a globalized world.**
PO6	**Ethics, Integrity and Environmental Sustainability-Uphold high ethical standards in academic and professional endeavors, demonstrating integrity and ethical decision-making. Also acquire an understanding of environmental issues and sustainable practices, promoting responsibility towards ecological well-being.**

PROGRAMME SPECIFIC OUTCOMES

PSO1:	**Apply computer science knowledge to solve diverse real-world Challenges**
PSO2:	**Design and implement robust software solutions using diverse programming languages and design tools**
PSO3:	**Utilize advanced techniques for data storage, retrieval, and manipulation across varied computing environments**
PSO4:	**Critically evaluate and apply information technology tools and methodologies with ethical consideration**
PSO5:	**Engage in interdisciplinary research to address complex computer science challenges**
PSO6:	**Implementation of professional engineering solutions for the betterment of society keeping the environmental context in mind, be aware of professional ethics and be able to communicate effectively.**
PSO7:	**Demonstrate lifelong learning and adapt ability in response to evolving technology trends**

STRUCTURE OF THE PROGRAMME

The Programme of instruction will consist of Lecture courses, Practical courses, comprehensive Viva-voce, Seminar, internship/ industrial visit, and Project work.

1. ***Lecture courses*****:** Courses involving lectures relating to a field or discipline by a faculty member

2. ***Tutorial courses***: Courses involving problem-solving and discussions relating to a field or discipline under the guidance of qualified personnel in a field of learning,

3. ***Laboratory work***: A course requiring students to participate in a project or practical or lab activity that applies previously learned/studied principles/theory related to the chosen field of learning, work/vocation, or professional practice under the supervision of an instructor.

4. **Comprehensive Viva-voce** : This is an essential assessment included in the Programme to evaluate the student's grasp of the subject matter and their ability to apply their knowledge as defined in the course outcomes. It also provides an opportunity for the student to engage in academic discussions and receive valuable feedback from experts in the field.

5. ***Seminar:*** A course requiring students to participate in structured discussion/conversation or debate focused on assigned tasks/readings, current or historical events, or shared experiences guided or led by an expert or qualified personnel in a field of learning

6. ***Internship/ Institutional visit :*** All students shall undergo a Field Trip/Summer Internship/Apprenticeship in a Firm, Industry or Organization; or Training in labs with faculty and researchers or other Higher Education Institutions (HEIs) or research institutions.

Departments can actively promote internships that can eventually lead to research project work.

Institutional visit Incorporating institutional or industrial visits in the Programme brings immense value to the students, making their learning journey more enriching and preparing them for successful careers in Computer science-related fields.

7. Research Project: These students who have opted for the honours with research should complete a research project under the guidance of the mentor and should submit a research report for evaluation. They need to successfully defend the research project to obtain 12 credits under a faculty member of the University/College. The research shall be in the Major discipline

COURSE STRUCTURE

Course and Credit Structure for Different Pathways

Course Distribution for Students in Semesters I – VI

(1) ***Single Major***: The 6 courses together in B and C can be in different disciplines.

(2) ***Major with Multiple Disciplines***: B and C represent two different disciplines.

(3) ***Major with Minor***: B and C represent the same Minor discipline.

I SEMESTER				
Sl No	**Course**	**Hours/Week**	**Credits**	**Total Marks**
1	AEC1 (English)	4	3	75
2	AEC2 (Additional Language)	3	3	75
3	MDC1	3	3	75
4	DSC A1	5	4	100
5	DSC B1	4/5	4	100
6	DSC C1	4/5	4	100
	Total	**23/25**	**21**	**525**

II SEMESTER				
Sl No.	**Course**	**Hours/Week**	**Credits**	**Total Marks**

1	AEC3 (English)	4	3	75
2	AEC4 (Additional Language)	3	3	75
3	MDC2	3	3	75
4	DSC A2	5	4	100
5	DSC B2	4/5	4	100
6	DSC C2	4/5	4	100
	Total	**23/25**	**21**	**525**
III SEMESTER				
Sl No.	**Course**	**Hours/Week**	**Credits**	**Total Marks**
1	MDC3 (Kerala Studies)	3	3	75
2	VAC1	3	3	75
3	DSC A3	4	4	100
4	DSC A4	5	4	100
5	DSC B3	4/5	4	100
6	DSC C3	4/5	4	100
	Total	**23/25**	**22**	**550**

IV S EMESTER				
Sl No.	**Course**	**Hours/Week**	**Credits**	**Total Marks**
1	SEC1	4	3	75
2	VAC2	3	3	75
3	VAC3	3	3	75
4	DSC A5	5	4	100

5	DSC A6	5	4	100
6	DSC A7	5	4	100
	Total	**25**	**21**	**550**

V SEMESTER				
Sl No.	**Course**	**Hours/Week**	**Credits**	**Total Marks**
1	SEC2	3	3	75
2	DSC A8	5	4	100
3	DSC A9	4	4	100
4	DSC A10	5	4	100
5	DSE A11	4	4	100
6	DSE A12	4	4	100
	Total	**25**	**23**	**575**

	VI SEMESTER			
Sl No.	**Course**	**Hours/Week**	**Credits**	**Total Marks**
1	SEC3	3	3	75
2	DSC A13	5	4	100
3	DSC A14	5	4	100
4	DSC A15	4	4	100
5	DSE A16	4	4	100
6	DSE A17	4	4	100
7	Internship		2	50
	Total	**25**	**23**	**625**

4) Double major pathway: A and B represent the courses offered by the two departments. Students should choose one of the disciplines as their major 1 and the other as major 2

I SEMESTER				
Sl No.	**Course**	**Hours/Week**	**Credits**	**Total Marks**
1	AEC1 (English)	4	3	75
2	AEC2 (Additional Language)	3	3	75
3	MDC A/B	3	3	75
4	DSC A1	5	4	100
5	DSC A2	5	4	100
6	DSC B1	4/5	4	100
	Total	**24/25**	**21**	**525**

II SEMESTER				
Sl No.	**Course**	**Hours/Week**	**Credits**	**Total Marks**
1	AEC2 (English)	4	3	75
2	AEC3 (Additional Language)	3	3	75
3	MDC A/B	3	3	75
4	DSC A3	5	4	100
5	DSC B2	4/5	4	100
6	DSC B3	4/5	4	100
	Total	**23/25**	**21**	**525**

III SEMESTER				
Sl No.	**Course**	**Hours/Week**	**Credits**	**Total Marks**
1	MDC A/B	3	3	75
2	VAC A/B	3	3	75

3	DSC A4	4	4	100
4	DSC A5	5	4	100
5	DSC B4	4/5	4	100
6	DSC B5	4/5	4	100
	Total	**23/25**	**22**	**550**

IV SEMESTER				
Sl No.	**Course**	**Hours/Week**	**Credits**	**Total Marks**
1	SEC A/B	3/4	3	75
2	VAC A/B	3	3	75
3	VAC A/B	3	3	75
4	DSC A6	5	4	100
5	DSC A7	5	4	100
6	DSC B6	4/ 5	4	100
	Total	**24/25**	**21**	**550**

V SEMESTER				
Sl No.	**Course**	**Hours/Week**	**Credits**	**Total Marks**
1	SEC A/B	¾	3	75
2	DSC A8	4/5	4	100
3	DSC A9	4/5	4	100
4	DSE A10	4/5	4	100
5	DSC B7	4/5	4	100
6	DSE B8	4/5	4	100

	Total	**23/25**	**23**	**575**

VI SEMESTER				
Sl No.	**Course**	**Hours/Week**	**Credits**	**Total Marks**
1	SEC A/B	3 /4	3	75
2	DSC A11	4/5	4	100
3	DSE A12	4/5	4	100
4	DSC B9	4/5	4	100
5	DSC B10	4/5	4	100
6	DSE B11	4/5	4	100
7	Internship		2	50
	Total	**23/25**	**23**	**625**
On completion of 3-year UG Student will get 68 credits in major A (48 + 18+2 = 68 (50% of 133)) and 53 credits in Major B (44 + 9 = 53 (40% of 133))				

STUDENT CAN EXIT WITH UG DEGREE / PROCEED TO FOURTH YEAR WITH MINIMUM 133 CREDITS.

VII SEMESTER				
Sl No.	**Course**	**Hours/Week**	**Credits**	**Total Marks**
1	DSC A1	4/5	4	100
2	DSC A2	4/5	4	100
3	DSC A3	4/5	4	100
4	DSC A4	4/5	4	100
5	DSC A5	4/5	4	100
	Total	**20/25**	**20**	**500**

VIII SEMESTER(Degree with Research)				
Sl No.	**Course**	**Hours/Week**	**Credits**	**Total Marks**
1	DSC A6	4	4	75
2	DSC A7	4	4	100
3	DSC A8	4	4	100
AND				
4	KU8RPCSC401 (Project for Honours with Research)		12	300
Total Credit		**24**		
	OR			
5	KU8CIPDSC402(Project for Honours)		8	200
6	Any one DSC from A6-A8	4	4	100
OR				
7	KU8CIPDSC403(Project for Honours)		12	300
	Total		**12**	**300**
ELECTIVES: Three elective courses are compulsory for Honours and Honours with Research Programmes. For Honours with research Programme one must be KU8DSECSC401.				
8	DSE A1	4	4	100
9	DSE A2	4	4	100
10	DSE A3	4	4	100
OR				
11	DSC B1	From any discipline/ any three disciplines	4	100
12	DSC B2		4	100

13	DSC B3			4	100
	Two of these courses can be in the online mode. These online courses can be taken either in semester VII or in semester VIII, but their credits shall be added to the student's account only in semester VIII. For those students who go to another institution for doing the Project, all these three courses can be in the online mode or in the in-person mode from the institution where the Project is being done.				
	Total		**12**	**12**	**300**

			CREDITS				
SEMESTER	**COURSE CODE**	**COURSE NAME**	**LECTURE / TUTORIAL**	**PRACTIAL**	**TOTAL CREDIT**	**HOURS/ WEEK**	**TOTAL MARKS**
	KU1MDCCSC101	Essentials of Computing	3	0	3	3	75
	KU1MDCCSC102	Basics of Information Storage and	3	0	3	3	75
I		Retrieval System					
	KU1MDCCSC103	Digital Marketing	3	0	3	3	75
	KU2MDCCSC104	Fundamentals of Web	3	0	3	3	75
		Technology					
II	KU2MDCCSC105	Digital Office Management	3	0	3	3	75
	KU2MDCCSC106	Introduction to Data Science	3	0	3	3	75
		VAC					
	KU3VACCSC101	Cyber Laws and Rules	2	1	3	4	75
III	KU3VACCSC102	Cyber Ethics	3	0	3	3	75
	KU3VACCSC103	Data analytics using R	2	1	3	4	75
	KU4VACCSC104	Ethical Hacking	2	1	3	4	75
IV	KU4VACCSC105	Intellectual Property Rights	3	0	3	3	75
	KU4VACCSC106	Information storage management	3	0	3	3	75
IV	KU4VACCSC107	Information Security	3	0	3	3	75
	KU4VACCSC108	Social Media Management	3	0	3	3	75
	SEC						

IV	KU4SECCSC101	Computer hardware & networking	2	1	3	4	75
	KU4SECCSC102	Cyber ethics	3	0	3	3	75
	KU4SECCSC103	Data analytics using Excel	2	1	3	4	75
	KU4SECCSC104	Low-Code Application Development	2	1	3	4	75
	KU5SECCSC105	Free and open source softwares (foss)	2	1	3	4	75
V	KU5SECCSC106	Introduction to Data science	2	1	3	4	75
	KU5SECCSC107	Introduction to NO-SQL database	2	1	3	4	75
VI	KU6SECCSC108	Digital forensics	2	1	3	4	75
	KU6SECCSC109	Software testing	2	1	3	4	75
	KU6SECCSC110	Computer Graphics	2	1	3	4	75

DISCIPLINE SPECIFIC COURSES

SEMESTER	COURSE CODE	COURSE NAME	CREDITS			HOURS/WEEK	MARK
			LECTURE/ TOTORIAL	PRACTICAL	TOTAL		
I	KU1DSCCSC101	Fundamentals of Programming with C	3	1	4	5	100
	KU1DSCCSC102	Introduction to major trends in information technology	3	1	4	5	100
	KU1DSCCSC103	Fundamentals of Computers and Programming	3	1	4	5	100
	KU1DSCCSC104	Office Automation Software	3	1	4	5	100
	KU1DSCCSC105	Introduction to Web Programming	3	1	4	5	100
	KU1DSCCSC106	AI in Daily life	3	1	4	5	100
	KU1DSCCSC107	Essentials of Information Technology.	3	1	4	5	100
II	KU2DSCCSC108	Advanced Programming with C	3	1	4	5	100
	KU2DSCCSC109	Data Management Platform	3	1	4	5	100
	KU2DSCCSC110	Principles of programming using C	3	1	4	5	100
	KU2DSCCSC111	Multimedia and Graphics Designing	3	1	4	5	100

	KU2DSCCSC112	Basics of Data Analytics	3	1	4	5	100
III	KU3DSCCSC201	Objected Oriented Programming using Java	3	1	4	5	100
	KU3DSCCSC202	Digital Systems	4	0	4	4	100
	KU3DSCCSC203	Python for Data Analytics	3	1	4	5	100
	KU3DSCCSC204	Basics of object Oriented Programmig using C++	3	1	4	5	100
	KU3DSCCSC205	RDBMS	3	1	4	5	100
	KU3DSCCSC206	Introduction to Machine Learning	3	1	4	5	100
	KU3DSCCSC207	Content management System	3	1	4	5	100
IV	KU4DSCCSC208	Database Management System	3	1	4	5	100
	KU4DSCCSC209	Data Structures	3	1	4	5	100
	KU4DSCCSC210	Operating Systems	4	0	4	4	100
	KU4INTCSC211	Internship (credit will be added in 6th semester)			0		0
V	KU5DSCCSC301	Software Engineering	4	0	4	4	100
	KU5DSCCSC302	Python Programming	3	1	4	5	100
	KU5DSCCSC303	Web Technology	3	1	4	5	100
VI	KU5DSCCSC304	Database Administration	4	0	4	4	100
	KU6DSCCSC305	Data Communication and Networks	4	0	4	4	100
	KU6DSCCSC306	Computer Organization and Architecture	4	0	4	4	100

	KU6DSCCSC307	Software design and implementation	3	1	4	5	100

	ELECTIVE (Any Two)						
	KU5DSECSC301	Compiler Design	4	0	4	4	100
	KU5DSECSC302	Design and Analysis of Algorithms	4	0	4	4	100
	KU5DSECSC303	Artificial Intelligence and Machine Learning	4	0	4	4	100
	KU5DSECSC304	Introduction to Deep learning	4	0	4	4	100
	KU5DSECSC305	Basics of Image processing	4	0	4	4	100
	KU5DSECSC306	Bigdata analytics	4	0	4	4	100
VI	KU6DSECSC307	Datamining	4	0	4	4	100
	KU6DSECSC308	Linux Administration	3	1	4	5	100
	KU6DSECSC309	Cloud Computing	3	1	4	5	100
	KU6DSECSC310	Parallel computing	4	0	4	4	100
	KU6DSECSC311	Internet of Things	4	0	4	4	100
	KU6DSECSC312	Blockchain Technology	4	0	4	4	100
	KU4INTCSC211	Internship			2		50

Semester 7

Course Code	Title of the Course	Type of the Course.	Credit	Hours/ week	Hour Distribution /week				Marks
					L	T	P	O	
KU7DSCCSC401	Data Processing Using Python	DSC	4(3+1)	5	3		2		100
KU7DSCCSC402	Bigdata Technologies	DSC	4(3+1)	5	3		2		100
KU7DSCCSC403	Soft Computing	DSC	4	4	4		0		100
KU7DSCCSC404	Natural Language Processing	DSC	4	4	4		0		100
KU7DSCCSC405	Computer Vision	DSC	4	4	4		0		100
KU7DSCCSC406	Seminar /paper presentation	DSC	4	4	4		0		100
KU7DSCCSC407	Bioinformatics	DSC	4	4	4		0		100

Any 5 DSC Courses in semester 7

Semester: 8
Degree with Research

Course Code	Title of the Course	Type of the Course.	Credit	Hours / week	Hour Distribution /week				Marks
					L	T	P	O	
KU8DSCCSC408	Research methodology	DSC	4	4	4		0		100
KU8DSCCSC409	Research and publication ethics.	DSC	4	4	4		0		100
KU8DSCCSC410	Paper presentation in national/international conferences)	DSC	4	4	4		0		100
KU8DSCCSC411	Research project		12	13					300

SEMESTER-8
Degree with Honour

Course Code	Title of the Course	Type of the Course	Credit	Hours/ week	Hour Distribution /week				marks
					L	T	P	O	
KU8DSCCSC412	SEMINAR	DSC	4	4					100
KU8DSCCSC413	RESEARCH PROJECT(OPTIONAL)	DSC	8	4					200
	Total Credit		12						
AND									
Three Courses from Any Discipline Major , Minor, DSC, DSE or any discipline of Credit 4(Capstone Level Courses)									
KU8DSCCSC 414	Cloud Security	DSC	4	4	4		0		100
KU8DSCCSC 415	Prompt Engineering	DSC	4	4	4		0		100
KU8DSCCSC 416	Medical Image Processing	DSC	4(3+1)	5	3		2		100
KU8DSECSC417	Artificial Neural Networks	DSE	4	4	4		0		100
KU8DSECSC418	MOOC/ ONLINE COURSE	DSE			4				
Total Credit for Semester 8			24						
Total Credit for Semester 1 to 6			133						
Total Credit for Semester 7 and Semester 8			44						
Total Credits from Semester 1 To Semester 8			177 (133+44)						

ASSESSMENT AND EVALUATION

- The assessment shall be a combination of Continuous Comprehensive Assessment (CCA) and an End Semester Evaluation (ESE)
- As per the regulation of Kannur University, one credit corresponds to 25 marks. Hence a 3-credit course must be evaluated for 75 marks and 4 credit courses for 100 marks. The ratio of continuous comprehensive assessment (CCA) to End semester examination (ESE) for theory/lecture courses is 30:70 and for the practical courses, it is 40:60.
- The 4-credit courses (Major and Minor courses) and 3 credit (Foundational Courses) are of two types:
  (i) courses with only theory
  (ii) courses with 3-credit theory and 1-credit practical.

- In 4-credit courses with only theory component, out of the total 5 modules of the syllabus, one teacher specific module with 20% content is designed by the faculty member teaching that course, and it is internally evaluated .
- In 4-credit courses with 3-credit theory and 1-credit practical components, out of the total 5 modules of the syllabus, 4 modules are for theory and the fifth module is for practical.
- The 3 credit courses (Foundational Courses) are of two types:
  (i) courses with only theory
  (ii) courses with 2-credit theory and 1-credit practical.

- In 3-credit courses with only theory component, out of the total 5 modules of the syllabus, one teacher specific module with 20% content is designed by the faculty member teaching that course, and it is internally evaluated .
- In 3-credit courses with 2-credit theory and 1-credit practical components, out of the total 5 modules of the syllabus, 4 modules are for theory and the fifth module is for practical.

• Continuous Evaluation includes assignments, seminars, periodic written examinations, or other measures as proposed in the syllabus and approved by the university.

Practical exams

- The end-semester practical examination and viva-voce, and the evaluation of practical records shall be conducted by the course in-charge and an internal examiner appointed by the Department Council. Duration of ESE may be 2 to 2.5 Hrs.
- There shall be a Continuous Evaluation of practical courses conducted by the Course- In-Charge.
- The process of continuous evaluation of practical courses shall be completed before 10 days from the commencement of the end-semester examination.
- Those who passed in continuous evaluation alone will be permitted to appear for the end semester examination and viva-voce.

Mark Distribution for Discipline Specific Courses and Foundation Courses

Course Credit	**Credit**		**Mark**		**L**		**P**		
4	**L**	**P**	**L**	**P**	**CCA (30%)**	**ESE (70%)**	**CCA (40%)**	**ESE (60%)**	**Total marks**
	4	0	100	0	30	70	0	0	100
	3	1	75	25	25	50	10	15	100
3	**L**	**P**	**L**	**P**	**CCA (30%)**	**ESE (70%)**	**CCA (60%)**	**ESE (40%)**	**Total marks**
	3	0	75	0	25	50	0	0	75
	2	1	50	25	15	35	15	10	75

L – Lecture/Theory , P – Practical/Practicum components, CCA – Continuous Comprehensive Assessment, ESE – End Semester Evaluation

The detailed distribution table with the components

- **4 Credit Course (Theory only)**

Evaluation Type		Marks
ES		**70**
CC		**30**
a)	*Test Paper	10
b)	**Assignment/ Book- Article Review	10
c)	Seminar/ Viva -Voce	10
Total		**100**

- **4 Credit Course (3 credit theory + 1 credit practical)**

Evaluation Type			Marks	Evaluation Type			Marks	Total
Lecture			**75**	**Practical**			**25**	**100**
a)	**ESE**		**50**	a)	**ESE**		**15**	
b)	**CCA**		**25**	b)	**CCA**		**10**	
	i	*Test Paper	10		i	Punctuality	3	
	ii	**Assignment/ Book-Article review	10		ii	Model exam	4	

	iii	Seminar/ Viva-Voce	5		iii	Record	3	

- **3 Credit Course (Theory only)**

Evaluation Type		**Marks**
ESE		50
CCA		25
a)	*Test Paper	10
b)	**Assignment/ Book- Article Review	5
c)	Seminar/ Viva -Voce	10
Total		**75**

- **3 Credit Course (2 credit theory + 1 credit practical)**

Evaluation Type		**Marks**	**Evaluation Type**		**Marks**	**Total**
Lecture		**50**	**Practical**		**25**	
a)	ESE	**35**	a)	ESE	**15**	
b)	CCA	**15**	b)	CCA	**10**	**75**

	i	*Test Paper	8		i	Punctuality	3	
	ii	**Book-Article review/ Assignment	2		ii	Model exam	4	
	iii	Seminar/ Viva-Voce	5		iii	Record	3	

* Best out of two test papers

** Or any other evaluation technique like quiz, open book exam, group activity

INTERNSHIP

- All students should undergo Internship of 2-credits during the first six semesters in a firm, industry or organization, or training in labs with faculty and researchers of their own institution or other Higher Educational Institutions (HEIs) or research institutions.
- Internship can be for enhancing the employability of the student or for developing the research aptitude.
- Internship can involve hands-on training on a particular skill/ equipment/ software. It can be a short project on a specific problem or area. Attending seminars or workshops related to an area of learning or skill can be a component of Internship.
- A faculty member/ scientist/ instructor of the respective institution, where the student does the Internship, should be the supervisor of the Internship.

Guidelines for Internship

- Internship can be in Computer science or allied disciplines.
- There should be minimum 60 hrs. of engagement from the student in the Internship.
- Summer vacations and other holidays can be used for completing the Internship.
- In BSc. Computer science Honours program, institute/ industry visit or study tour can be part of Internship. Visit to national research institute, research laboratory and place of scientific importance should be part of the study tour. A brief report of the study tour has to be submitted with photos.

- The students should make regular and detailed entries in to a personal log book through the period of Internship. The log book will be a record of the progress of the Internship and the time spent on the work, and it will be useful in writing the final report. It may contain experimental conditions and results, ideas, mathematical expressions, rough work and calculation, computer file names etc. All entries should be dated. The Internship supervisor should periodically examine and countersign the log book.
- The log book and the report must be submitted at the end of the Internship.
- The institution at which the Internship will be carried out should be prior-approved by the Department Council of the College where the student has enrolled for the UG Honours program.

Evaluation of Internship

- The evaluation of Internship shall be done internally through continuous assessment mode by a committee internally constituted by the Department Council of the college where the student has enrolled for the UG Honours program.
- The credits and marks for the Internship will be awarded only at the end of semester 6.

The scheme of CCA and ESE is given below:

Components of Evaluation of Internship	**Weightage**	**Marks for Internship 2 Credit/50 Marks**
Continuous Comprehensive Assessment (CCA)	30%	15
End Semester Evaluation	70%	35

The detailed distribution table with the components

Evaluation Type		Marks
ESE		**35**
a)	Acquisition of skill	20
b)	Report	15
CCA		**15**
a)	Punctuality	5
c)	Logbook	10
Total		**75**

PROJECT IN HONOURS PROGRAMME

- In Honours programme, the student has the option to do a Project of 12-credits in Major instead of three major Courses or Project of 8-credits in Major and one major course in semester 8.
- The Project can be done in the same institution/ any other higher educational institution (HEI) / research centre/ training centre.
- The Project in Honours programme can be a short research work or an extended internship or a skill-based training programme.
- A faculty member of the respective institution, where the student does the Project, should be the supervisor of the Project.

PROJECT IN HONOURS WITH RESEARCH PROGRAMME

- Students who secure 75% marks and above (equivalently, CGPA 7.5 and above) cumulatively in the first six semesters are eligible to get selected to Honours with Research stream in the fourth year.
- In Honours with Research programme, the student has to do a mandatory Research Project of 12-credits instead of three Core Courses in Major in semester 8.
- The number of seats for the Honors with research shall be determined as per the availability of eligible faculty.
- The selection criteria for Honors with research stream shall be in accordance with the guidelines of UGC or as approved by Kannur University.
- Students who have chosen the honours with research stream shall be mentored by a faculty with a PhD.
- The mentor shall prescribe suitable advanced-level courses for a minimum of 20 credits to be taken within the institutions along with the papers on research methodology, research ethics, and research topic-specific courses for a minimum of 12 credits which may be obtained either within the institution or from other recognized institutions, including online and blended modes.
- These students who have opted for the honours with research should complete a research project under the guidance of the mentor and should submit a research report for evaluation. They need to successfully defend the research project to obtain 12 credits under a faculty member of the University/College within the University.
- The research outcomes of their project work may be published in peer-reviewed journals or presented at conferences or seminars or patented.

Guidelines for the Project in Honours Programme and Honours with Research Programme

- Project can be in Computer science or allied disciplines.

- Project should be done individually.
- Project work can be of experimental/ theoretical/ computational in nature.
- There should be minimum 360 hrs. of engagement from the student in the Project work in Honours programme as well as in Honours with Research programme.
- There should be minimum 13 hrs./week of engagement (the hours corresponding to the three core courses in Major in semester 8) from the teacher in the guidance of the Poject(s) in Honours programme and Honours with Research programme.
- The various steps in project works are the following:
- Review
- Investigation on a problem in systematic way.
- Systematic recording.
- Reporting the results with interpretation in a standard documented form.
- Presentation of the results before the examiners.
- The report must be submitted at the end of the Project. A copy of the report should be kept for reference at the department. A soft copy of the report too should be submitted, to be sent to the external examiner in advance.
- The project report shall have an undertaking from the student and a certificate from the research supervisor for originality of the work, stating that there is no plagiarism, and that the work has not been submitted for the award of any other degree/ diploma in the same institution or any other institution.

Evaluation of Project

- The evaluation of Project will be conducted at the end of the eighth semester by both internal and external modes.
- The internal evaluation of the Project work shall be done through continuous assessment mode by a committee internally constituted by the Department Council of the college where the student has enrolled for the UG Honours programme. 30% of the weightage shall be given through this mode.
- The remaining 70% shall be awarded by the external examiner appointed by the University.

The scheme of evaluation of the Project is given below:

Project type	**Maximum Marks**	**CCA (30%)**	**ESE (70%)**
Research Project of 12 Credits (UG Honours with research, mandatory)	300	90	210
Research Project of 12 Credits (UG Honours, optional)	300	90	210
Research Project of 8 Credits (UG Honours, optional)	200	60	140

The detailed distribution table with the components

CCA			
Sl. No	Components of Evaluation of Project	Marks for the Project (Honours/Honours with Research) 12 credits	Marks for the Project (Honours/Honours with Research) 8 credits
1	Skill in doing project work	30	20
2	Internal Presentation and Viva-Voce	20	15
3	Punctuality and attendance*	20	15
4	Organization of Project Report	20	10
	Total Marks	**90**	**60**

*Attendance certificate should be produced by the students who have done their projects in any higher educational institution (HEI)/ research centre/ training centre.

ESE			
Sl. No	Components of Evaluation of Project	Marks for the Project (Honours/ Honours with Research) 12 credits	Marks for the Project (Honours/ Honours with Research) 8 Credits
1	Content and relevance of the Project, Methodology, Quality of analysis, and Innovations of Research	50	40
2	Presentation of the Project	50	30
3	Project Report	40	20
4	Viva-Voce	70	50
	Total Marks	**210**	**140**

EXTERNAL EVALUATION

- Examinations will be conducted at the end of each semester. The students can write the external examinations in Computer science in both English and Malayalam languages.
- Individual questions are evaluated in marks and the total marks are converted into grades by the University based on 10-point grading system.

Letter Grade	**Grade Point (P)**
O (Outstanding)	10
A+ (Excellent)	9

A (Very Good)	8
B+ (Good)	7
B (Above Average)	6
C (Average)	5
P (Pass)	4
F (Fail)	0
Ab (Absent)	0

- A minimum of grade point 4 (Grade P) is needed for the successful completion of a Course.
- A student who has failed in a Course can reappear for the End Semester Examination of the same Course along with the next batch without taking re-admission or choose another Course in the subsequent Semesters of the same programme to acquire the minimum credits needed for the completion of the Programme.
- There shall not be provision for improvement of CE and ESE.
- A student who has successfully completed the CE requirements in a subsequent semester can also appear for the ESE subject to the maximum duration permitted.

Computation of SGPA and CGPA

The following method is recommended to compute the Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA):

- The SGPA is the ratio of the sum of the product of the number of credits with the grade points scored by a student in all the courses taken by a student and the sum of the number of credits of all the courses undergone by a student, i.e. **SGPA** (Si) = Σ(Ci x Gi) / ΣCi Where Ci is the number of credits of the course and Gi is the grade point scored by the student in the course.

Example:

Semester	**Course**	**Credit**	**Letter Grade**	**Grade point**	**Credit Point** (Credit x Grade)
I	Course 1	3	A	8	3 X 8 = 24
I	Course 2	4	B+	7	4 X 7 = 28
I	Course 3	3	B	6	3 X 6 = 18
I	Course 4	3	O	10	3 X 10 = 30
I	Course 5	3	C	5	3 X 5 = 15
I	Course 6	4	B	6	4 X 6 = 24
		20			139
SGPA					139/20=**6.95**

- The Cumulative Grade Point Average (CGPA) is also calculated in the same manner taking into account all the courses undergone by a student over all the semesters of a programme, i.e. CGPA = Σ(Ci x Si) / Σ Ci Where Si is the SGPA of the semester and Ci is the total number of credits in that semester.
- The SGPA and CGPA shall be rounded off to 2 decimal points and reported in the transcripts. Transcript (Format): Based on the above recommendations on Letter grades, grade points and SGPA and CCPA, the HEIs may issue the transcript for each semester and a consolidated transcript indicating the performance in all semesters.

Example:

Semester I	Semester II	Semester III	Semester IV	Semester V	Semester VI

Credit: 21 SGPA: 6.9	Credit: 21 SGPA: 7.8	Credit: 22 SGPA: 5.6	Credit: 24 SGPA: 6.0	Credit: 23 SGPA: 6.3	Credit: 22 SGPA: 8.0
CGPA=(21 x 6.9 + 21 x 7.8 + 22 x 5.6 + 24 x 6.0 + 23 x 6.3 + 22 x 8.0) / 133 = 6.74					

- The SGPA is the ratio of the sum of the product of the number of credits with the grade points scored by a student in all the courses taken by a student and the sum of the number of credits of all the courses undergone by a student, i.e. **SGPA** (Si) = Σ(Ci x Gi) / ΣCi Where Ci is the number of credits of the course and Gi is the grade point scored by the student in the course.

CGPA	**Overall letter Grade**
9.5 and above	**O**
8.5 and above but less than 9.5	A+
7.5 and above but less than 8.5	A
6.5 and above but less than 7.5	B+
5.5 and above but less than 6.5	B
4.5 and above but less than 5.5	C
4.0 and above but less than 4.5	D
Less than 4.0	F

Appearance for Continuous Evaluation (CE) and End Semester Examination (ESE) are compulsory, and no Grade shall be awarded to a candidate if the candidate is absent for CE or ESE or both.

SYLLABUS

GENERAL FOUNDATION COURSES
MULTIDISCIPLINARY COURSES

KU1MDCCSC101: ESSENTIALS OF COMPUTING

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

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

Course Description:

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

Course Prerequisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Identify various components of Computer system.	U /R
2	Understand the importance of binary number system in data representation.	U /R
3	Illustrate binary arithmetic and number conversions.	U
4	Differentiate various types of software	
5	Understand types of programming languages and various language processors	
6	Understand the features, types and applications of internet	U

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

Mapping of Course Outcomes to PSOs

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1	3						
CO2	3		3				
CO3		2	3	3			
CO4	3	3	3				
CO5	2	3					
CO6	3		3	2		2	

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1	**MODULE TITLE** :Basic components of the system		
	1	**Introduction to Computers:** Definition and Characteristics of Computers, Brief History and Evolution of Computers. Computer System Overview, Basic Components of a Computer System - Input, Output, Processing, and Storage.	9
	2	**Central Processing Unit (CPU):** Basic Concepts of CPU, Architecture of a CPU - ALU, Registers, and Control Unit.	
	3	**System Memory and Storage:** Memory Hierarchy - An Overview, Primary Memory - RAM (Random Access Memory) and ROM (Read Only Memory) - Types and Functions, Secondary Memory - Hard Drives, SSDs, USB Drives Introduction to Cache Memory - Purpose and Basic Functioning.	
2	**MODULE TITLE** : Data representation		

	1	**Introduction to Data Representation:** Decimal, Binary, Hexa Decimal and Octal Number Systems, Conversion Between Number Systems. Conversion between Number system	9
	2	**Binary Arithmetic and Complements:** Binary addition, subtraction, Complements of Binary Numbers (1's Complement and 2's Complement).	
	3	**Special Codes and Unicode:** Binary Coded Decimal (BCD), Grey code, ASCII Code, Unicode	

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

4	**MODULE TITLE** :Basics of computer networks		
	1	**Introduction to Computer networks:** Data Communication System and Its Components, advantages of networking., hardware components of networking-Transmission modes-Simplex- half duplex-full duplex	
	2	Classification of networks-LAN, MAN, WAN, internet. Network topologies-Bus, Star, Ring and Mesh. Internet applications. Introduction to the term web, web browsers, http/https, URL, Domain name.	9

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

Essential Readings:

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

   Higher Education, 2007.
7. Andrew S. Tanenbaum, "Computer Networks", 4th ed., Prentice Hall, 2003.

Suggested Readings:

1. https://www.geeksforgeeks.org/
2. https://www.sciencedirect.com/
3. https://www.tutorialspoint.com

Assessment Rubrics:

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

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

KU1MDCCSC102: BASICS OF INFORMATION STORAGE AND RETRIEVAL SYSTEM

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

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

Course Description:

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

Course Prerequisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Discuss the importance of databases and their applications	U
2	Design relational databases using SQL.	U, A

3	Understand the concept of normalization techniques in database design.	U, A
4	Identify various security, backup, and recovery strategies to manage databases effectively.	U, A

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

Mapping of Course Outcomes to PSOs

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

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1	**MODULE 1: Introduction to Databases**		
	1	Overview of databases and their importance	9
	2	Basic concepts: data, information, database management system (DBMS) ,data abstraction	
	3	Data Models: Introduction to hierarchical, network, E-R and relational data models.	
	4	Examples of database applications in real life	
2	**MODULE 2: Relational Database concepts**		
	1	Understanding tables, rows, columns, and keys	9
	2	Introduction to SQL (Structured Query Language) ,components of SQL.	

	3	Basic SQL queries: DML(select, insert, update, delete), DDL (create, alter, drop) , DCL(grant, revoke) and TCL (commit and rollback)	

3	**MODULE 3: Database Design**		
	1	Entity-Relationship (ER) modelling	9
	2	Creating ER diagrams to represent relationships between entities	
	3	Converting ER diagrams to relational schemas	

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

5	**Teacher Specific Module**		
	Directions		
	.		9
	Lab exercise: Practice 5 SQL queries by implementing 1. DDL commands 2. DML Commands		

Essential Readings:

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

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

Assessment Rubrics:

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

Sample Questions to test Outcomes.

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

Employability for the Course / Programme:

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

KU1MDCSC103: DIGITAL MARKETING

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

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

Course Description:

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

Course Prerequisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Locate the digital marketing landscape and its impact on consumer behavior.	U, An
2	Implement a comprehensive digital marketing strategy aligned with business objectives.	U, A

3	Utilize various digital channels (SEO, SEM, SocialMedia, Email Marketing) to reach target audiences effectively.	U, E
4	Design engaging content that resonates with target audiences and drives conversions.	U, A, C
5	Discuss campaign performance using key metrics and data	U, An
	insights.	

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

Mapping of Course Outcomes to PSOs

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

COURSE CONTENTS

Contents for Classroom Transaction:

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

2	**MODULE 2: Content Marketing & SEO**		
	1	Content Strategy & Development - Creating Engaging Content Across	9
		Channels	
	2	Search Engine Optimization (SEO) Principles - Optimizing Websites for Search Visibility	
	3	Keyword Research & Content Planning for Improved Ranking	
	4	Content Marketing Platforms and Tools	

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

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

5	**Teacher Specific Module**	
	Directions	

	Provide appropriate learning strategies, methodologies and evaluation metrics	9

Essential Readings:

1. Digital Marketing for Dummies
Author: Ryan Deiss & Russ Henneberry
Published Year: 2020 (2nd Edition)

- **Relevance**: Covers foundational topics, content marketing, SEO, social media, email marketing, and analytics in a practical and beginner-friendly way.

2. Marketing 5.0: Technology for Humanity
Author: Philip Kotler, Hermawan Kartajaya & Iwan Setiawan
Published Year: 2021

- **Relevance**: Explores customer behavior in the digital age and how modern technology influences marketing strategies and segmentation.

3. SEO 2023: Learn Search Engine Optimization with Smart Internet Marketing Strategies
Author: Adam Clarke
Published Year: 2023

- **Relevance**: Offers detailed insights into SEO principles, keyword research, content optimization, and Google ranking factors.

4. Email Marketing Rules: A Step-by-Step Guide to the Best Practices that Power Email Marketing Success
Author: Chad S. White
Published Year: 2017 (3rd Edition)

- **Relevance**: Dedicated to email marketing, segmentation, automation, copywriting, and measurement strategies.

5. Social Media Marketing: A Strategic Approach
Author: Melissa Barker, Donald Barker, Nicholas Bormann & Krista Neher
Published Year: 2022 (3rd Edition)

- **Relevance**: Comprehensive guide on social media strategy, content creation, community building, and paid campaign management.

E-resources (websites/weblinks):

1. **HubSpot Academy & Blog**
   - **Website:** https://academy.hubspot.com/ and https://blog.hubspot.com/
   - **Relevance to Syllabus:** HubSpot is a leading authority in inbound marketing.
     - **Module 1:** Their academy offers free courses and certifications on digital marketing fundamentals, understanding customer behavior, developing buyer personas, and setting goals. Their blog consistently publishes articles on these topics.
     - **Module 2:** Extensive resources on content strategy, creation, SEO, and keyword research.
     - **Module 3:** Covers social media marketing strategies and creating engaging content. While less focused on the granular details of paid advertising platforms, it provides strategic context.

        - **Module 4:** Strong on email marketing strategies, list building, segmentation, and crafting compelling campaigns. They also touch upon marketing analytics.

2. **Google Digital Garage & Google's Search Central (formerly Google Webmasters)**
    - **Websites:** https://learndigital.withgoogle.com/digitalgarage/ and https://developers.google.com/search/
    - **Relevance to Syllabus:**
        - **Google Digital Garage (Module 1, 3, 4):** Offers a wide range of free courses, including a comprehensive "Fundamentals of Digital Marketing" certification (in partnership with IAB Europe) that covers the basics, search, social media, email, and analytics. It's excellent for understanding the landscape, setting goals, and getting an overview of paid advertising (especially Google Ads).
        - **Google's Search Central (Module 2):** This is the definitive source for understanding Google's SEO best practices, how crawling and indexing work, keyword research considerations from Google's perspective, and technical SEO. It's essential for 2.2 (SEO Principles) and 2.3 (Keyword Research).
3. **Moz Blog & Learning Center**
    - **Website:** https://moz.com/blog and https://moz.com/learn/seo
    - **Relevance to Syllabus:** Moz is a highly respected name in the SEO industry.
        - **Module 1 & 4 (partially):** While primarily SEO-focused, their blog often discusses broader digital marketing strategy and the importance of measurement.
        - **Module 2:** This is where Moz shines. Their blog and Learning Center are invaluable resources for everything related to SEO, including principles, keyword research, content planning for ranking, and understanding SEO tools (like their own). They cover both foundational and advanced SEO concepts.

Assessment Rubrics:

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

KU2MDCCSC104: FUNDAMENTALS OF WEB TECHNOLOGY

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
2	MDC	100-199	KU2MDCCSC104	3	60

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

Course Description:

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

Course Prerequisite: NIL

Course Outcomes:

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

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

Mapping of Course Outcomes to PSOs

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

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1	**MODULE 1: Introduction to the World Wide Web**		
	1	Overview of the internet and its evolution	12
	2	Introduction to the World Wide Web (WWW) and its components	
	3	Client-side scripting versus server-side scripting	
	4	Role of web technologies in various disciplines	
2	**MODULE 2: Introduction to HTML**		
	1	Origins and Evolution of HTML	12
	2	HTML elements and attributes	
	3	Basic structure of an HTML document	
	4	Creating hyperlinks , images, lists ,tables and forms	
3	**MODULE 3: CSS Fundamentals**		
	1	Introduction to CSS	12
	2	CSS syntax and selectors	
	3	Styling text, colors, and backgrounds	
	4	Box model and layout techniques	
4	**MODULE 4: Client-Side Scripting with JavaScript**		
	1	Introduction to JavaScript	12
	2	JavaScript variables, data types, and operators	
	3	Dialog boxes: Alert, confirm and prompt dialog boxes	
	4	Functions and events	
5	**Teacher Specific Module**		

	Provide practical oriented sessions including following activities	
	Lab exercise 1. Implement basic tags in HTML 2. Implement various heading tags 3. Implement img tag with attributes 4. Implement listing tags 5. Implement table tag 6. Implement form tag with its elements and attributes 7. Implement various types of CSS 8. javascript programme to implement data types and operators 9. implement dialog boxes in java script 10. java script programme to implement event handling	12

Essential Readings:

1. Paul Deitel, Harvey Deitel& Abbey Deitel, Internet and World Wide Web: How to Program, Pearson, Fifth Edition, 2016.
2. Powell, Thomas A. HTML & CSS: The Complete Reference. McGraw Hill Education;
3. Javascript-Definitive Guide O'reilley 7th edn
4. https://www.w3schools.com5.https://javascript.info

Suggested Readings:

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

Assessment Rubrics:

Evaluation Type		**Marks**
End Semester Evaluation		**50**
Continuous Evaluation		**25**
a)	Test Paper- 1	5
b)	Test Paper-2	10

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

SAMPLE QUESTIONS TO TEST OUTCOMES:

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

KU2MDCCSC105: DIGITAL OFFICE MANAGEMENT

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
2	MDC	100-199	KU2MDCCSC105	3	60

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

Course Description:

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

Course Prerequisite: NIL

Course Outcomes:

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

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

Mapping of Course Outcomes to PSOs

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

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1	**MODULE 1 : Creating a google account and accessing related services**		
	1	Overview of Information Technology and its Tools: Basic concepts and terminology related to IT tools and their role in supporting business operations and personal productivity.	12
	2	Google Essentials: Introduction to Google Services Overview of Google Workspace, Creating and managing a Google account, Navigating the Google interface	
	3	Gmail for Communication: Managing emails in Gmail, Organizing and labelling emails, Using filters and settings effectively	
	4	Google Drive for File Management, Uploading and organizing files in Google Drive, Collaborative document editing and sharing, Version history and document recovery	
2	**MODULE 2: Word Processing Techniques**		
	1	Text Creation and manipulation, Document Creation, Editing Text, Text Selection, Cut, Copy and Paste, Font, Color, Style and Size selection, Alignment of Text, Undo & Redo, AutoCorrect, Spelling & Grammar, Find and Replace.	12
	2	Table Manipulation, Insert & Draw Table, changing cell width and height, Alignment of Text in cell, Delete / Insertion of Row, Column and Merging & Splitting of Cells, Border and Shading,	
	3	Mail Merge, Table of Contents, Indexes, Adding Comments, tracking changes, Macros, Creating Headers, Footers, and Page Numbers	
	4	Formatting the Text, Creating and using user defined Styles, Paragraph Indentation, Bullets and Numbering, change case, Header & Footer, Page Setup, Page Layout, Borders, Using the Help, Watermark, Print Preview, Printing of Documents, PDF file and Saving a Document as PDF file.	
	5	Text Creation and manipulation, Document Creation, Editing Text, Text Selection, Cut, Copy and Paste, Font, Color, Style and Size selection, Alignment of Text, Undo & Redo, AutoCorrect, Spelling & Grammar, Find and Replace.	
3	**MODULE 3: Introduction to Spreadsheets**		

	1	Concept of Cell Address: [Row and Column] and selecting a Cell, Entering Data [text, number, date] in Cells, Page Setup, Printing of Sheet, Saving Spreadsheet, Opening and Closing	12
	2	Manipulation of Cells & Sheet, Modifying / Editing Cell Content, Formatting Cell (Font, Alignment, Style), Cut, Copy, Paste & Paste Special, Changing Cell Height and Width, Inserting and Deleting Rows, Column, AutoFill, Sorting & Filtering, Freezing panes	
	3	Formulas, Functions a) Formulas for Numbers b) AutoSum functions c) Logical Functions d) Text Functions e) Statistical Functions Date & Time Functions	
	4	Creating Charts and Graphs, Working with Large Datasets - Filtering & Sorting, Data Analysis Tools (e.g., PivotTables), Creating Macros and Automation	
	5	Google Sheets for Data Management: Introduction to Google Sheets for spread sheets, Data entry, formatting, and basic formulas, Collaborative data analysis and sharing	

4	**MODULE 4:** Creating a Presentation		
	1	Creating a Presentation Using a Template, Creating a Blank Presentation, Inserting & Editing Text on Slides, Inserting and Deleting Slides in a Presentation, Saving a Presentation	12
	2	Inserting Table, Adding Pictures, Inserting Other Objects, Resizing and Scaling an Object Creating & using Master Slide.	
	3	Choosing a Set Up for Presentation, Playing a Slide Show, Transition and Slide Timings, Automating a Slide Show, Providing Aesthetics to Slides & Printing	
	4	Enhancing Text Presentation, Working with Color and Line Style, Adding Movie and Sound, Adding Headers, Footers and Notes, Printing Slides and Handouts	
	5	Google Slides for Presentations: Creating and designing, presentations in Google Slides, Collaborative editing and commenting, Adding multimedia elements	

5	**Teacher Specific Module**	

	Provide practical oriented classes including following exercise.	
	1. Document creation using word processor tool 2. Create a banner for college union inauguration 3. Create a biodata with your photo 4. Implement mail merge technique in word processor 5. Program to implement aggregate functions in spreadsheet 6. Perform result analysis using different types of charts	12

Essential Readings:

Microsoft Word

1. Beginning Microsoft word 2010 (expert's voice in office) Paperback – Illustrated, 23 August 2010 by Guy Hart-Davis , Ty Anderson
2. Microsoft Excel Professional 2021 Guide: Complete Excel Reference, Loads of Formulas and Functions, Shortcuts, and Numerous Screenshots to Become an Excel Expert by CA Manmeet Singh Mehta | 20 October 2022

WEB LINKS: https://documentation.libreoffice.org/en/english-documentation/getting-startedguide/

Assessment Rubrics:

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

KU2MDCCSC106: INTRODUCTION TO DATA SCIENCE

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

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

Course Description:

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

Course Prerequisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Understand various data structures in in Python for data storage.	U
2	Identify various machine learning algorithms and real-world datasets for problem solving	U, A

3	Identify data characteristics and patterns through exploratory data analysis (EDA).	U
4	Demonstrate proficiency to collect, clean, and preprocess data using Python and relevant libraries.	U, A

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

Mapping of Course Outcomes to PSOs

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

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1	**MODULE 1 : Introduction to Data Science**		
	1	Overview of data science and its applications	9
	2	Introduction to Python programming for data science	
	3	Introduction to data types (text, numeric, sequence, mapping,) and libraries (NumPy, Pandas)	
	4	Data collection methods and sources	
2	**MODULE 2 : STEPS IN DATA ANALYTICS**		
	1	Define the Problem or Research Question- Collect Data- types of data(structured and un structured data)-Various data collection methods	

	2	Data Cleaning process of data cleaning - Analyzing the Data and tools used for data analysis	9
	3	Data visualization techniques- tools used for data visualization	
	4	Presentation of data- techniques to present data	

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

4	**MODULE 4:** VISUALIZATION AND MATPLOTLIB		
	1	Basic functions of matplotlib-Simple Line Plot,	9
	2	Scatter Plot-Histograms- Legends, Color Bars- Three Dimensional Plotting in Matplotlib.	
	3	**Ethics and Privacy**: Understand the ethical implications of data science.	
	4	Learn about privacy concerns and responsible data use.	

5	**Teacher Specific Module**	
	Directions	
	1. Conduct data analysis of students performance in the institution 2. Data analysis of library management with visual plots	9

Essential Readings:

1. "Introduction to Data Science", Jeffrey Stanton, Chapman and Hall/CRC in 2013.
2. **"Data Science from Scratch: First Principles with Python", Joel Grus, O'Reilly Media.**
3. **"Python for Data Analysis", Wes McKinney, O'Reilly Media**

Suggested Readings:

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

Assessment Rubrics:

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

VALUE ADDED COURSES

KU3VACCSC101: CYBER LAWS AND RULES

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
3	VAC	100-199	KU3VACCSC101	3	45

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

Course Description:

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

Course P**rerequisite: NIL**

Course Outcomes:

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

Mapping of Course Outcomes to PSOs

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

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1	**MODULE TITLE**:: INTRODUCTION		9
	1	Origin and meaning of Cyberspace;-Cyberspace vs. Physical space; Legal Issues in Cyberspace;	
	2	Need of Regulation for Cyberspace; Different Models of Cyberspace Regulation	
	3	Cyber jurisdiction - Concept of Jurisdiction - Jurisdiction in Cyberspace	
	4	Issues and concerns of Cyberspace Jurisdiction in India	
2	**MODULE TITLE:** INFORMATION TECHNOLOGY ACT		9
	1	A brief overview of Information Technology Act, 2000 - IT Act 2000 vs. IT Amendment Act 2008 -	

	2	Relevant provisions from Indian Penal Code, Indian Evidence Act,	
		Bankers Book Evidence Act, Reserve Bank of India Act.	
	3	Technological Concept of electronic signature and digital signature - Relevance of Signature - Handwritten signature vs Digital Signature Technological Advancement and development of signature -Digital Signature: IT Act, 2000	
	4	UNCITRAL Model Law on Electronic Signature	

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

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

5	**Teacher Specific Module**		
		1. Discussion on various cyber issues among the students 2. Arrange awareness classes inside and outside the institution about cyber attacks and cyber laws	9

Essential Readings:

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

Assessment Rubrics:

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

KU3VACCSC102: CYBER ETHICS

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
3	VAC	100-199	KU3VACCSC102	3	45

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

Course Description:

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

Course Prerequisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Explain basic ethical principles and professional codes in cyber ethics.	U
2	Analyze privacy and security issues in the digital world.	An
3	Understand intellectual property rights and digital content usage.	U
4	Evaluate ethical challenges in social media and online behavior.	A, E
5	Assess ethical concerns in emerging technologies like AI	E

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

Mapping of Course Outcomes to PSOs

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

CO 5				3	3		3

COURSE CONTENTS

MODULE	UNIT	DESCRIPTION	HOURS
1		**INTRODUCTION TO CYBER ETHICS**	**9**
	1	Ethical concepts and principles	
		a) Introduction to Cyber Ethics and Moral Theories	
		b) Ethical theories: Utilitarianism, Deontology, Virtue Ethics	
	2	Ethical decision-making frameworks	
		a) Steps in ethical decision-making, Ethical frameworks	
	3	Professional Ethics in Computing	
		a) Codes of ethics (ACM, IEEE, etc.)	
		b) Responsibilities of IT professionals	

2		**PRIVACY, SECURITY, AND SURVEILLANCE**	
	1	Privacy in the digital age: Data Collection, Profiling, and Behavioural Tracking	9
	2	Surveillance Technologies: Recording, Tracking, and Monitoring Techniques	
	3	Cybersecurity Threats: Viruses, Phishing, Ransomware	
	4	Ethical Dilemmas in Cybersecurity: Surveillance vs Rights, Whistleblowing	

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

4	**SOCIAL MEDIA AND EMERGING TECHNOLOGIES**		
	1	Ethics of Social Media	9
		a) Identity, Cyberbullying, Misinformation, Deepfakes	
	2	Ethics in Emerging Technologies	
		a) AI Ethics and Algorithmic Bias	
		b) Ethics in IoT and Cloud Computing	
	3	Ethics in Virtual and Augmented Reality (VR/AR)	
		a) Psychological Impact, Consent, and Manipulation of Reality	

5	**Teacher Specific Module**	**9**
	Directions	
	Discussion on various cyber issues in personal and public life Conduct general seminar on cybercrimes and cyber laws	

Contents for Classroom Transaction:

Essential Readings:

1. Tavani, H. T. (2018). Ethics and Technology: Controversies, Questions, and Strategies for Ethical Computing (5th ed.) John Wiley & Sons.
2. Quinn, M. J. (2014). *Ethics for the Information Age* (6th ed.). Pearson.
3. Baase, S., & Henry, T. – *A Gift of Fire: Social, Legal, and Ethical Issues for Computing Technology*
4. Himma, K. E., & Tavani, H. T. (2019). The Handbook of Information and Computer Ethics. John Wiley & Sons.
5. Johnson, D. G, Computer Ethics (4th ed.). Prentice Hall.
6. Computer network security and cyber ethics , Joseph Migga Kizza

Assessment Rubrics:

Evaluation Type		**Marks**
End Semester Evaluation		**50**
Continuous Evaluation		**25**
a)	Test Paper- 1	5
b)	Model Examination	10
c)	Assignment-2 numbers	5
d)	Group project: data collect	

e)	Report	
f)	Presentation	
Total		**100**

KU3VACCSC103: DATAANLYTICS USING R

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
6	VAC	100-199	KU6VACCSC103	3	60

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
2	1		50	25	75	1.5 hrs.

Course Description:

This course is an introduction to data analytics using the free and open-source software R.

The course helps to learn about the basics of exploratory and descriptive data analysis. The topics like obtaining, cleaning, combining, and wrangling the data into a more usable form. We will learn how to break up a large dataset into manageable pieces and then use a variety of quantitative and visual tools to summarize and learn about it.

Course Prerequisite: Basics of Statistics

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Identify the fundamentals, standards of Functions and capabilities of R Language.	U
2	Understand the basic structure of R programming including datatypes, variables,	U
3	Design programs using various data structures in R	A
4	Understand data visualization using R	U/An
5	Understand the concept of regression in data analysis	

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

Mapping of Course Outcomes to PSOs

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

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1	**MODULE TITLE: Introduction to R.**		12
	1	Importance and applications of R programming	
	2	Basic Syntax-Comments-Operators-Keywords-Data Types **Variables**-Introduction to Variables-Scope of Variable-Dynamic Scoping-Lexical Scoping	
	3	**Input and Output**-Taking Input from User-Printing Output of R Program-Print the Argument to the Screen – print() Function	
	4	**Data Structures-** Vectors- Operations on Vectors-Append Operation on Vectors-Dot Product of Vectors-Types of Vectors	
2	**MODULE TITLE: Datastructures**		12
	1	Introduction to Lists-Two Dimensional List-Operations on Lists List of Vectors-List of Dataframes-Named List	
	2	Matrices -Create Matrix from Vectors-Operations on Matrices-Matrix Multiplication-Algebraic Operations on a Matrix-Combining Matrices	
	3	Dataframe - Matrix vs Dataframe-DataFrame Operations-DataFrame Manipulation-Joining of Dataframes Arrays- Introduction to Arrays -Multidimensional Array-Array Operations-Sorting of Arrays	
	4	Introduction to Control Statements-Loops (for, while, repeat)-syntax and sample programs	
3	**MODULE TITLE : Data Visualization And Data Analysis**		12
	1	Customize plot axes, labels, add legends, and add colors.	
	2	Probability Distributions, Normal Distribution- Binomial Distribution	

	3	Poisson Distributions , Basic Statistics, Correlation and Covariance, TTests,-ANOVA.	
	4	Analysis of Variance and Correlation	

4	**MODULE TITLE : linear Regression**		12
	1	Regression	
	2	Case Study : Predict the Quality of products using Linear Regression	
	3	Feature Selection and Shrinkage Methods	
	4	LASSO, Ridge Regression	

5	**Teacher Specific Module**		
	Lab list		
	• Write an R Program to Add Two Vectors • Find the Sum, Mean, and Product of the Vector in R Programming • Create an R Program to Take Input From the User • How to Generate Random Numbers from Standard Distributions in R • Create an R Program to Find the Minimum and Maximum • R Program to Sort a Vector • How to Find the Factorial of a Number		12

	• How to create R Multiplication Table • Write an R Program to Check Prime Number • R Program to Check for Leap Year • Check if a Number is Odd or Even in R Programming • R Program to Calculate Simple Interest • R Program to Convert Celsius to Kelvin and Fahrenheit • R Program to Calculate the Area of a Triangle • R Program to Convert Decimal to Binary, Octal, and Hexadecimal	

Essential Readings:

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

4. W3Schools Online Web Tutorials

References

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

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

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

Assessment Rubrics:

Evaluation Type	**Marks**
End Semester Evaluation	**35(Theory)**
Practical	15(practical)
Code writing	**8**
Execution without error	**5**
viva	**2**
Continuous Evaluation	**15(Theory)**

		10(practical)
a)	Test Paper- 1	5
b)	Model Examination	5
c)	Assignment/viva	5
	Practical	
	Model exam	5
	Record	2
	Punctuality and lab performance	3
Total		**75**

KU4VACCSC104: ETHICAL HACKING

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
4	VAC	100-199	KU4VACCSC104	3	45

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

Course Description:

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

Course Prerequisite: NIL Course
Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Discuss the fundamental concepts of ethical hacking, including its principles and methodologies.	U

2	Demonstrate proficiency in using various ethical hacking tools and techniques for information gathering, scanning, and enumeration.	A
3	Use ethical hacking principles to identify and exploit vulnerabilities in systems and networks.	A
4	Judge on legal and ethical considerations in ethical hacking practices.	E

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

Mapping of Course Outcomes to PSOs

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

COURSE CONTENTS

Contents for Classroom Transaction:

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

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

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

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

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

		a) Techniques for hacking operating systems, Understanding and using Trojans, Creating and deploying backdoors, Detection and prevention strategies.	

5	**Teacher Specific Module**	
	SMTP/Email-based attacks, VOIP vulnerabilities, Directory traversal, Windows Active Directory and common Attacks	
	Netcat Trojan, Wrapping definition, Reverse engineering.	9

Essential Readings:

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

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

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

4. Certified Ethical Hacker Study Guide v9, Sean-Philip Oriyano, Sybex; Study Guide Edition,2016
5. CEH official Certified Ethical Hacking Review Guide, Wiley India Edition, 2007

Suggested Readings:

1. Metasploit: The Penetration Tester's Guide" by David Kennedy, Jim O'Gorman, Devon Kearns, and Mati Aharoni

2. The Hacker Playbook 3: Practical Guide To Penetration Testing, Peter Kim

Assessment Rubrics:

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

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

KU4VACCSC105 INTELLECTUAL PROPERTY RIGHTS

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
4	VAC	100-199	KU4VACCSC105	3	45

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

Course Description:

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

Course Prerequisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Discuss the concept of intellectual property, its historical development, and its role in fostering innovation and creativity.	U
2	Identify and differentiate between various types of intellectual property, including patents, copyrights, trademarks, and trade secrets.	U
3	Examine the legal framework for intellectual property rights at national and international levels, including key treaties and agreements.	An
4	Develop strategies for managing intellectual property, including IP policy development, licensing, technology transfer, and valuation.	C
5	Appraise emerging issues in intellectual property law, such as opensource software, and their implications for IP protection and enforcement.	E

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

Mapping of Course Outcomes to PSOs

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

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1		**INTRODUCTION TO IPR**	**9**
	1	**Introduction to IPR**	
		a) Meaning of property, origin, nature	
		b) Meaning of Intellectual Property Rights.	
	2	**Types of Intellectual Property**	
		a) Patents, copyrights, trademarks, and trade secrets	
	3	**Legal Framework for IPR**	
		a) National and International IP Laws	
		b) Role of WIPO (World Intellectual Property Organization), TRIPS Agreement	
	4	**IP Management and Policy**	
		a) IP Strategy and Management, IP Policy Development	
		b) Licensing and Technology Transfer	
		c) IP Valuation and Commercialization	
2		**PATENTS AND INDUSTRIAL DESIGNS**	
	1	Patents: Origin, meaning of patent, types.	9
	2	Criteria for Patentability	
	3	Patent Application Process	
	4	Patent Infringement and Remedies	
	5	Rights and Limitations of Patent Holders	
3		**TRADEMARKS AND COPYRIGHTS**	
	1	**Trademark Law:** Concepts, registration process, and infringement.	9
	2	**Copyright Law**	
		a) Basics, protection	
		b) fair use	

		c) digital rights management.	
	3	Rights and Limitations of Trademark and Copyright Owners	

4	**TRADE SECRETS AND EMERGING ISSUES**		
	1	Trade Secrets: Definition and Importance of Trade Secrets	9
		a) Protection and Enforcement of Trade Secrets	
	2	Emerging Issues in Intellectual Property Law	
		a) Discussion on current trends and developments in IP law.	
		b) Analysis of recent court cases and their implications on IP protection.	
	3	Open Source Software and Intellectual Property	
		a) Definition, Comparison between open source and proprietary software in terms of IP implications.	

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

Essential Readings:

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

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

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

Assessment Rubrics:

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

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

KU4VACCSC106: INFORMATION STORAGE MANAGEMENT

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
4	VAC	100 -199	KU4VACCSC106	3	45

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

Course Description:

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

Course Prerequisite: NIL

Course Outcomes:

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

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

Mapping of Course Outcomes to PSOs

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

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1	**MODULE TITLE: INTRODUCTION TO INFORMATION STORAGE TECHNOLOGY**		9
	1	Introduction to Information Storage -Digital data and its types - Information storage - Key characteristics of data center -Evolution of computing platforms	
	2	Challenges in Data Storage and Management	
	3	Data Storage Infrastructure- Components of a Storage System Environment: Disk drive components - Disk Drive Performance, Logical Components.	
	4	Third Platform Technologies -Cloud computing and its essential characteristics -Cloud services and cloud deployment models -Big data analytics	
2	**MODULE TITLE:** Data protection:		9
	1	Concept of RAID and its Components.	
	2	Different RAID levels and their suitability for different application environments: RAID 0, RAID 1, RAID 3, RAID 4, RAID 5, RAID 0+1, RAID 1+0, RAID 6, Comparison of Levels	
	3	Intelligent Storage Systems: Components, Intelligent Storage Array, High-level architecture and working of an intelligent storage system.	
3	**MODULE TITLE :** Introduction to Networked Storage		9
	1	Evolution of networked storage, Architecture, Overview of FC-SAN, NAS, and IP-SAN	
	2	Network-Attached Storage (NAS): Benefits of NAS, Components	
	3	Implementations, File Sharing, I/O operations, Performance and Availability.	
	4	Content Addressed Storage (CAS): features and Benefits of a CAS. CAS Architecture	

4	**MODULE TITLE:** Storage Security and Management	**9**

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

5	**Teacher Specific Module**	
	Directions	
	Provide more topics related with Advanced technologies in Data storage mechanism . **Discussion on data storage problems and their security issues**	9

Essential Readings:

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

Assessment Rubrics:

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

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

KU4VACCSC107: INFORMATION SECURITY

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
3	VAC	100-199	KU4VACCSC107	3	45

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

Course Description:

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

Course Prerequisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains

1	Identify the foundational concepts and principles of information security.	U
2	Understand the principles of confidentiality, integrity, and availability in information security.	U
3	Recognize different types of security threats and vulnerabilities.	U
4	Understand cryptographic techniques in securing data	U
5	Identify network security protocols and technologies to secure network communications.	U

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

Mapping of Course Outcomes to PSOs

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

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1	**FOUNDATIONS OF INFORMATION SECURITY**		

	1	**Foundations of Information Security**	9
		a) Definition, Importance of Information Security	
		b) Evolution of Information Security	
	2	**Security Policies, Standards, and Guidelines**	
		a) Overview of Security Policies, Types of Security Standards	
	3	**CIA Triad**	
		a) Confidentiality, Integrity, Availability	
		b) Balancing the CIA Triad: Trade-offs and Challenges	
	4	**Threats and Vulnerabilities**	
		a) Types of Threats	
		b) Attacks and Malwares	
		c) Firewalls, Common Security Vulnerabilities	

2	**CRYPTOGRAPHY**		
	1	Cryptography Techniques: Basic Terms, Plain Text, Cipher text, Substitution Techniques, Transposition Techniques, Fiestel Cipher.	9
	2	Encryption, Decryption, Symmetric and asymmetric key Cryptography. Symmetric Key Encipherment - Traditional symmetric Key Ciphers: Introduction-Kirchhoff's principle, cryptanalysis.	
	3	Categories of traditional ciphers; SubstitutionCiphers- mono-alphabetic ciphers, polyalphabetic ciphers	
	4	Transposition Ciphers-keyless and keyed transposition ciphers, Stream and Block Ciphers-steganography.	

3	**Public key cryptography**		
	1	Public key Cryptosystem: Principles of Public Key Cryptosystems; Applications of public Key Crypto systems.	9
	2	Requirement for Public Key Cryptosystem, Public Key Cryptanalysis. RSA Algorithm–Description of the Algorithm, The security of RSA	
		3.Digital Signature:-Comparison between conventional and digital signature-Inclusion,Verification, Relationship, Duplicity; Process-needs for keys, signing the digest; scheme.	

		4.Services-message authentication, message integrity, non-repudiation, confidentiality. Digital signature Forgery and types- Digital Signature Schemes-RSA digital signature scheme.	

4	**Authentication Mechanisms**		
	1	Authentication Basics, Passwords, Biometric Authentication	9
	2	Key Distribution Center, Security handshake Pitfalls, Attacks on Authentication Schemes.	
	3	Firewalls: Architecture, Generation and Types. Virtual Private Network.	
		4.Email Security: PGP and S/MIME.	

5	**Teacher Specific Module**		
	Directions		
		1. Encryption and Decryption with Caesar Cipher 2. Symmetric Key Encryption using DES 3. Public Key Encryption with RSA 4. Digital Signature Generation and Verification	9

Essential Readings:

1. Behrouz A. Forouzan and Debdeep Mukhopadhyay, Cryptography And Network Security, 3rd Ed, McGraw Hill (Units I, II, IV)
2. William Stallings, Cryptography and Network Security - Principles and Practice Paperback, 7th Ed, Pearson (Unit III)
3. Dr. Wm. Arthur Conklin, Dr. Gregory White, "Principles of Computer Security Sixth Edition", McGraw Hill.

Suggested Readings:

5. Tavani, H. T. Ethics and Technology: Controversies, Questions, and Strategies for Ethical Computing. Wiley.

Assessment Rubrics:

Evaluation Type	Marks

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

KU4VACCSC108 : SOCIAL MEDIA MANAGEMENT

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
4	VAC	100-199	KU4VACCSC108	3	45

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

Course Description:

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

Prerequisite: NIL

Course Outcomes:

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

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

Mapping of Course Outcomes to PSOs

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

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1	**Introduction and Social media content publishing**		**9**
	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.	
	3	Sharing Videos; Sharing Photos and images; Webinar.	

2	**MODULE TITLE : Social Network, Microblogging and Discussion Boards**		**9**
	1	**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.	
	2	**Microblogging**: Microblogging; A Brief History of Microblogging; Different Uses for Microblogging; Tips for Brand Building with Twitter.	
	3	**Discussion Boards**: Discussion Board; Discussion Forum Structure; A Brief History of Discussion Boards; Discussion Board Netiquette;	

	4	Marketing with Discussion Forums; Guidelines for Moderators of Online Discussion Groups; Get Product Creation Ideas from Discussion Forums.	

3	**Social News Site, Mobile computing and Location marketing**	**9**

	1	**Social News Site**: Social News Site; A Brief History of Social News Sites; Marketing with Social News Sites	
	2	**Q & A sites:** Q&A Site; A Brief History of Q&A Sites; Marketing with Q&A Sites	
	3	**Mobile computing and Location marketing:** Mobile computing, Marketing with mobile computing, Location Based Social Network, Location-based Social Networks and Gaming ,	
	4	The Growth of Location-based Social Networks, Marketing with Location-based Social Networks, The Future of Mobile Computing and Location Marketing.	

4	**MODULE TITLE : Social Media Monitoring and Social Media Marketing Plan**		9
	1	**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.	
	2	Selecting Social Media Monitoring Tools (Radian 6) The Future of Social Media Monitoring.	
	3	**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,	
	4	Conducting a Competitive Analysis, Setting Goals, Determining Strategies, Identifying the Target Market, Selecting Tools, Implementing, Monitoring, Getting C-Suite Buy-In.	

5	**Teacher Specific Module**	
	Community Management, Social Networking Sites (SNS): LinkedIn & Twitter, Facebook in Business, YouTube and Live streaming, Trends	9

Essential Readings:

Core References

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

Additional References

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

Assessment Rubrics:

Evaluation Type	**Marks**
End Semester Evaluation	**50**

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

KU4SECCSC 101 : COMPUTER HARDWARE & NETWORKING

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
4	SEC	100-199	KU4SECCSC101	3 (2T+1P)	60

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
2	1		25	50	75	1.5 hrs.

Course Description:

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

Prerequisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
2	Solve different computer hardware related issues	A
3	Identify and select appropriate security measures in system maintenance	U/A
4	Use troubleshooting tools and tips in Software and hardware	A/An

	problems related to internet applications	

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

Mapping of Course Outcomes to PSOs

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

COURSE CONTENTS

Contents for Classroom Transaction:

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

2	**MODULE TITLE: Computer Management.**		12
	1	Manage the resources of a Computer System (Windows and or Linux) according to users need.	
	2	Disk Partitioning	

	3	Details about Central Processing Unit & Mother board	
	4	Primary and Secondary Memory	

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

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

5	**Teacher Specific Module**	
	1. Arrange practical session to identify various hardware components. 2. Practical session to install operating systems, application software and device drivers 3. Practice various trouble shooting techniques 4. Conduct workshop to use various network devices and connectors	12

Essential Readings:

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

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

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

Assessment Rubrics:

Evaluation Type		Marks
End Semester Evaluation		**35(Theory)**
Practical		15(practical)
Code writing		**8**
Execution without error		**5**
viva		**2**
Continuous Evaluation		**15(Theory)** **10(practical)**
a)	Test Paper- 1	5
b)	Model Examination	5
c)	Assignment/viva	5
	Practical	
	Model exam	5
	Record	2
	Punctuality and lab performance	3
Total		**75**

KU4SECCSC 102 : CYBER ETHICS

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
4	SEC	100-199	KU4SECCSC102	3	45

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

Course Description:

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

Course Prerequisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Discuss the ethical implications of technology and the internet.	U
2	Examine the ethical theories and principles to analyze and evaluate cyber ethical issues.	U
3	Develop strategies for ethical decision-making in cyberspace.	C,A
4	Criticize ethical challenges in technology and the internet.	U,An
5	Develop a sense of responsibility and integrity in online behaviour and digital interactions.	A

Mapping of Course Outcomes to PSOs

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

COURSE CONTENTS

Contents for Classroom Transaction:

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

		b) Ethics of information sharing and dissemination on the internet	

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

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

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

5	**Teacher Specific Module**	
	Conduct surveys, seminars and work shop on various cybersecurity issues	9

Essential Readings:

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

Suggested Readings:

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

Assessment Rubrics:

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

KU4SECCSC 103 : DATA ANALYTICS USING EXCEL

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
4	SEC	100-199	KU4SECCSC103	3	60

Learning Approach (Hours/ Week63)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
2	1		25	50	75	1.5hrs.

Course Description:

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

Prerequisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	List out the analytics tools available in Excel	U
2	use advanced sorting and advanced conditional formatting for descriptive analysis	U/A
3	Demonstrate selected analytics functions such as DSUM, DAVERAGE, DMAX and AGGREGATE	U/A

4	Use What-If Analysis Tools and their applications.	A
5	Design excel analytical tool to analyse real data	E/An

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

Mapping of Course Outcomes to PSOs

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

COURSE CONTENTS

Contents for Classroom Transaction:

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

2	**MODULE TITLE: : Functionality Using Ranges**	**12**

	1	Using Ranges, Selecting Ranges, Entering Information Into a Range, Using AutoFill	
	2	Creating Formulas : Using Formulas Formula Functions – Sum, Average, if, Count, max, min, Proper, Upper, Lower, Using AutoSum,	
	3	Advance Formulas :Concatenate, Vlookup, Hlookup, Match, Countif, Text, Trim	

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

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

5	**Teacher Specific Module**	
	Conduct lab exercise using real data for data set analysis and implement through spreadsheet	12

Essential Readings:

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

By Naveen Mishra

2. 101 Most Popular Excel Formulasby John Michaloudis , Bryan Hong

Assessment Rubrics:

Evaluation Type		**Marks**
End Semester Evaluation		**35(Theory)**
Practical		15(practical)
Code writing		**8**
Execution without error		**5**
viva		**2**
Continuous Evaluation		**15(Theory)** **10(practical)**
a)	Test Paper- 1	5
b)	Model Examination	5
c)	Assignment/viva	5
	Practical	
	Model exam	5
	Record	2
	Punctuality and lab performance	3
Total		**75**

KU4SECCSC 104 : LOW CODE APPLICATION DEVELOPMENT

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
4	SEC	100 -199	KU4SECCSC104	3	60

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
2	1		25	50	75	1.5hrs.

Course Description: This course aids any beginner without profound knowledge in computers in developing applications.

Course Prerequisite: Basic awareness of the computer science domain.

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Summarise the fundamentals of No-Code, Workflows and perform Web Scraping using a No-Code App	U
2	Build a Website using the popular No-Code Apps Webflow and Bubble.io.	A
3	Build Mobile Apps using the popular No-Code Apps Glide and Thunkable	A
4	Build AI-powered apps using No-Code AI Tools.	A

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

Mapping of Course Outcomes to PSOs

PSO1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	
CO 1	3	2	3				
CO 2	3	2	2				2
CO 3	3			2			
CO 4	2	2	3	2			2

COURSE CONTENTS

Detailed Syllabus:

Module	Unit	Content	Hrs
I	**Foundations of No-Code Development and Web Scraping**		**9**
	1	1. No Code Fundamentals - What is No-Code Development? Benefits and Limitations of No-Code Apps - What can you build with No-Code? 2. Who can use zero-code platforms? – What is the history and future of no-code? – Popular No-Code development platforms. 3. Fundamentals of Workflow - How can workflow automation help your business? Examples of Workflow Automation.	
		4. Introduction to Web Scraping - What is No-Code Web Scraping? - ScrappingBee for Web scraping API	
II	**No Code Web Development with WebFlow and Bubble**		**9**
		1. Introduction to WebFlow - How websites are built? 2. Overview of Designer Interface - The Box Model 3. Webflows Designer - The User Interface - Changing Font Style And Elements Size - Editing	

		4.Content - Editing Button And Using Classes - Changing Background Color And Size - Reusing elements with Symbols - Publishing with WebFlow	
III	**App Development Essentials with ChatGPT Integration**		**9**
		1. Introduction to Bubble - Bubble Core Concepts - What you can build with Bubble? - How to navigate Bubble.io? – 2. Structuring a Bubble Database - Flexbox responsive design - Workflow creation in Bubble 3. Evolution of Mobile App Builders - The Fundamentals of Glide - Benefits of Glide for App Development 4. Glide App Editor Overview - Glide Settings Overview - Glide Components - Google Sheets Vs Glide Data Editor - Understanding Table Relations - Glide Actions	
IV	**Chatbot Development Essentials**		**9**
		1. Introduction to Thunkable - Getting Started: Sign In, Creation of New Projects - App Settings, Table View - Assets, UI Components Core Blocks 2. OpenAI ChatGPT Integration - Traditional AI Journey - Key AI Components - AI Superpowers 3. No-Code AI Market - Popular No-Code AI Platforms - No-Code AI Considerations - What is Google Teachable Machine?	
		4.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 .	
V	**Teachers module**		**9**
	1	**Lab Exercises** 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. Build an Online Store using Shopify 7. Develop a website using a No-Code Stack of your choice	

Text Books:

1. Paul.E.Love, "Mastering No-Code: Create Professional Quality Apps Without Coding (Vol.1)", ISBN: 979-8749478402

Evaluation Type	Marks
End Semester Evaluation	**35(Theory)**
Practical	15(practical)

Code writing		**8**
Execution without error		**5**
viva		**2**
Continuous Evaluation		**15(Theory)** **10(practical)**
a)	Test Paper- 1	5
b)	Model Examination	5
c)	Assignment/viva	5
	Practical	
	Model exam	5
	Record	2
	Punctuality and lab performance	3
Total		**75**

KU5SECCSC105 : FREE AND OPEN SOURCE SOFTWARES (FOSS)

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
5	SEC	100-199	KU5SECCSC105	3	45

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
2	1	-	25	50	75	1.5 hrs

Course Description:

The Free and Open Source Software (FOSS) course is designed to familiarise students with the development process using free and open source software, which includes Linux operating system, service configuration management, application software, and development tools..

Prerequisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	State various FOSS concepts, features.	U
2	Discuss the features of Linux OS	U
3	Execute shell programming	U/A
4	Compare and execute various Linux commands	A/An
5	Evaluate conditional and looping statements	E

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

Mapping of Course Outcomes to PSOs

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

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	**UNIT**	**DESCRIPTION**	**HOURS**
1	**MODULE TITLE**: Open source software		**9**
	1	concepts, features, benefits over proprietary software, examples,	

	2	Free software: concepts, features, advantages, Free software Vs Open Source software	
	3	Free and Open Source Software (FOSS), Four essential freedoms	
	3	Free software movements, free software foundation(FSF), history, policies, GPL, free operating systems	

2	**MODULE TITLE: :** Linux		**9**
	1	features, history, various Linux distributions,	
	2	Linux architecture, kernel and shell- Linux desktop environments- GNOME and KDE,	
	3	Linux File System and Directories, types of files, Installing and Configuring Linux, File access permissions.	

3	**MODULE TITLE :** Linux Commands		**9**
	1	Date , time, who, echo, man, info, cal, pwd, more, less, head, tail, chmod.	
	2	mkdir, cd, cp, mv, rm, touch, sort, wc, cut, cat with options, ls with options ,grep with options,	
	3	Mounting the file system, command line processing etc. Types of editors-, in Linux, Introduction to vi editor, modes in vi editor, common vi editor	
	4	Commands for open a file, save a file, delete a file, quit a file etc	

4	**MODULE TITLE :** Shell Programming		9
	1	Introduction to Linux Shell and Shell Scripting, types of shells in Linux, steps in creating a shell script, write and run shell scripts,	
	2	shell variables and printing, deleting shell variable	
	3	Script permissions and names, scripting guidelines, adding shell comments, shell variables,	
	4	Constants , operators, conditional statements, looping statements	

5	**Teacher Specific Module**	
	Teacher can supplement additional methodologies and evaluation metrics to appropriate topics.	9

Essential Readings:

1. **Christopher Negus, Red Hat Linux 9 Bible, WILEY- Dreamtech, New Delhi,**
2. **Thomas Schenk, Red Hat Linux System Administration, Techmedia, New Delhi, 2003**

ADDITIONALREFERENCES

https://www.tutorialspoint.com/unix/shell_scripting.htm

Assessment Rubrics:

Evaluation Type		**Marks**
End Semester Evaluation		**35(Theory)**
Practical		15(practical)
Code writing		**8**
Execution without error		**5**
viva		**2**
Continuous Evaluation		**15(Theory)** **10(practical)**
a)	Test Paper- 1	5
b)	Model Examination	5
c)	Assignment/viva	5
	Practical	
	Model exam	5
	Record	2
	Punctuality and lab performance	3
Total		**75**

KU5SECCSC106: BASICS OF DATA SCIENCE

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
5	SEC	100-199	**KU5SECCSC106**	3	45

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
2	1	-	25	50	75	1.5 hrs

Course Description:

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

Course Prerequisite: NIL

Course Outcomes:

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

3	Identify data characteristics and patterns through exploratory data analysis (EDA).	U
4	Demonstrate proficiency to collect, clean, and preprocess data	U, A
	using Python and relevant libraries.	

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

Mapping of Course Outcomes to PSOs

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

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1	**MODULE 1 :Introduction to Data Science**		
	1	Overview of data science and its applications	9
	2	Introduction to Python programming for data science	
	3	Introduction to data types, data structures, and libraries (NumPy, Pandas)	
	4	Data collection methods and sources	
2	**MODULE 2 : Exploratory Data Analysis and Statistical Analysis**		
	1	Descriptive statistics and data summarization	9
	2	Data cleaning and preprocessing techniques	
	3	Handling missing data and outliers	

	4	Data visualization techniques (Matplotlib)	
	5	Hypothesis testing, confidence intervals, and correlation analysis	

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

4	**MODULE 4: Advanced Topics in Data Science**		
	1	Clustering algorithms (K-means, hierarchical clustering)	9
	3	Data manipulation with pandas -Introduction to Pandas -Pandas series-Pandas Data frames-Pandas read CSV.	
	4	Cleaning Data-Cleaning Empty Cells-Cleaning Wrong FormatCleaning Wrong Data-Removing Duplicates	
	5	Data visualization techniques -Pandas plotting - Scatter Plot-Histogram	

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

Essential Readings:

4. "Introduction to Data Science", Jeffrey Stanton, Chapman and Hall/CRC in 2013.
5. **"Data Science from Scratch: First Principles with Python", Joel Grus, O'Reilly Media.**
6. **"Python for Data Analysis", Wes McKinney, O'Reilly Media**

7. Web links

https://www.w3schools.com/python/pandas/default.asp

Suggested Readings:

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

Assessment rubrics:

Evaluation Type		**Marks**
End Semester Evaluation		**35(Theory)**
Practical		15(practical)
Code writing		**8**
Execution without error		**5**
viva		**2**
Continuous Evaluation		**15(Theory)** **10(practical)**
a)	Test Paper- 1	5
b)	Model Examination	5
c)	Assignment/viva	5
	Practical	
	Model exam	5
	Record	2
	Punctuality and lab performance	3
Total		**75**

KU5SECCSC 107 : INTRODUCTION TO NO-SQL DATABASE

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
5	SEC	100-199	KU5SECCSC107	3	60

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
2	1		25	50	75	1.5hrs.

Course Description:

The course will provide students with an introduction, overview and history of NoSQL databases (non-relational databases). The four types of NoSQL databases (e.g. Document-oriented, Key-Value Pair, Column-oriented and Graph) will be explored in detail.

Course Prerequisite: Basic Knowledge about DBMS

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Explain and compare different types of NoSQL Databases	U
2	Compare and contrast RDBMS with different NoSQL databases	An
3	Demonstrate the detailed architecture and performance tune of Document-oriented NoSQL databases	U /A
4	Explain performance tune of Key-Value Pair NoSQL databases.	U

5	Use No-SQl development tools on different types of NoSQL Databases	A

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

Mapping of Course Outcomes to PSOs

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

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1	**MODULE TITLE: Overview and History of NoSQL Databases**		12
	1	Definition of the Four Types of NoSQL Database	
	2	Value of Relational Databases, Getting at Persistent Data- Concurrency, Integration, Impedance Mismatch,	
	3	Application and Integration Databases	
	4	The Emergence of NoSQL, Key Points.	

2	**MODULE TITLE: Comparison of relational databases to new NoSQL**		12
	1	Comparison of relational databases to new NoSQL stores, MongoDB, Cassandra, HBASE, Neo4j use and deployment	
	2	Application, RDBMS approach, Challenges NoSQL approach- KeyValue and Document Data Models,	

	3	Column-Family Stores, Aggregate-Oriented Databases. Replication and sharding, MapReduce on databases.	
	4	Distribution Models, Single Server, Sharding, Master-Slave	
	5	Peer-to-Peer Replication, Combining Sharding and Replication.	

3	**MODULE TITLE: NoSQL Key/Value databases using MongoDB,**		**12**
	1	Document Databases, Document oriented Database Features, Consistency, Transactions, Availability,	
	2	Query Features, Scaling, Suitable Use Cases, Event Logging	
	3	Content Management Systems, Blogging Platforms	
	4	Web Analytics or Real-Time Analytics, E-Commerce Applications,	

4	**MODULE TITLE : Column- oriented NoSQL databases using Apache HBASE**		12
	1	Column-oriented NoSQL databases using Apache Cassandra, Architecture of HBASE	
	2	Column-Family Data Store Features, Consistency, Transactions, Availability, Query Features	
	3	Scaling, Suitable Use Cases, Event Logging, Content Management Systems, Blogging Platforms, Counters, Expiring Usage.	

5	**Teacher Specific Module**	
	Directions	
	Teacher can supplement additional methodologies and evaluation metrics to appropriate topics.	12

Essential Readings:

Sadalage, P. & Fowler, NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence, Wiley Publications,1st Edition ,2019.

WEB REFERENCES:

1. https://www.ibm.com/cloud/learn/nosql-databases
2. **https://www.coursera.org/lecture/nosql-databases/introduction-to-nosqlVdRNp**
3. **https://www.geeksforgeeks.org/introduction-to-nosql/**
4. **https://www.javatpoint.com/nosql-databa Assessment Rubrics:**

Evaluation Type		Marks
End Semester Evaluation		**35(Theory)**
Practical		15(practical)
Code writing		**8**
Execution without error		**5**
viva		**2**
Continuous Evaluation		**15(Theory)** **10(practical)**
a)	Test Paper- 1	5
b)	Model Examination	5
c)	Assignment/viva	5
	Practical	
	Model exam	5
	Record	2
	Punctuality and lab performance	3
Total		**75**

KU6SECCSC108: DIGITAL FORENSICS

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
6	SEC	100-199	**KU6SECCSC108**	3	45

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
2	1	-	25	50	75	1.5 hrs.

Course Description:

Digital forensics is a branch of forensic science encompassing the recovery, investigation, examination, and analysis of material found in digital devices, often in relation to mobile devices and computer crime.

Course Prerequisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Identify various digital forensic tools	U
2	Interpret security issues in Information Communication Technology (ICT) world.	A
3	Examine the use of digital forensic investigation in various applications /devices like Windows/Unix system, mobile, email etc	An
4	Collect and examine legal evidences and supporting investigation reports.	A

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

Mapping of Course Outcomes to PSOs

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

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1	**INTRODUCTION TO TRADITIONAL COMPUTER CRIME**		9
	1	Problems associated with computer crime, Identity Theft, Identity fraud.	
	2	Computer Forensics Fundamentals- Type of Computer Forensics Technology	
	3	Type of Vendor and Computer Forensics Services. Scientific method in forensic analysis	
2	**DIGITAL EVIDENCE IN CRIMINAL INVESTIGATIONS**		
	1	The digital crime scene, Investigating Cybercrime, Duties Support Functions and Competencies -	9
	2	Computer investigation and Data Acquisition	
	3	Computer Forensics -Evidence and Capture Data Recovery-Evidence collection and Data Seizure.	
	4	Duplication and preservation of Digital Evidence-Computer image verification and Authentication.	
3	**INTRODUCTION TO INCIDENT**		

	1	Incident Response Methodology - Steps, Activities in Initial Response Phase after detection of an incident	9
	2	Creating response toolkit	
	3	Initial Response & Volatile Data Collection from Unix system Forensic	
	4	Forensic Duplication, Forensic Duplicates as Admissible Evidence,	
	5	Duplication Tool Requirements, Creating a Forensic Duplicate, Forensic Duplicate of a Hard Drive.	

4	COLLECTING NETWORK BASED EVIDENCE		
	1	Investigating Routers - Network Protocols - Email Tracing - Internet Fraud.,	9
	2	Hackers Tools. Cellphone and mobile device forensics.	
	3	Forensics hard wares and softwares, Information Security Investigations	
	4	Corporate Cyber Forensics, Investigating large scale Data breach cases, Analyzing Malicious software.	

5	**Teacher Specific Module**	9
	Directions	

Essential Readings:

1. John R. Vacca, Computer Forensics: Computer Crime Scene Investigation Laxmi Publications, 2015 reprint.

REFERENCES :

2. 1. Dr.Darren R Hayes, A Practical guide to Computer Forensics investigation, Pearson 2015.
3. Aaron Philipp, David Cowen, Chris Davis , Computer Forensics Secrets & Solutions , McGraw-Hill Osborne Media, 2006.

3. Kenneth C.Brancik "Insider Computer Fraud" Auerbach Publications Taylor & Francis Group– 2008.

4. Bill Nelson,Amelia Philips and Christopher Steuart, "Guide to computer forensics and investigations", Cengage Learning; 4th edition, 2009
5. Dejey , Murugan ," Cyber Forensics", OXFORD,2018.

Assessment Rubrics:

Evaluation Type		**Marks**
End Semester Evaluation		**35(Theory)**
Practical		15(practical)
Code writing		**8**
Execution without error		**5**
viva		**2**
Continuous Evaluation		**15(Theory)** **10(practical)**
a)	Test Paper- 1	5
b)	Model Examination	5
c)	Assignment/viva	5
	Practical	
	Model exam	5
	Record	2
	Punctuality and lab performance	3
Total		**75**

KU6SECCSC109: SOFTWARE TESTING

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
6	SEC	100-199	KU6SECCSC109	3	45

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

Course Description:

Software testing helps to gain skills like automation, test case design, defect tracking, test automation etc. required to test software. Application of these skills help learners to find errors in developed software and report the results to the development team.

Course Prerequisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Recognize the theory of testing.	U
2	Develop test plans to guide the testing stage of the software development lifecycle.	A

3	Implement tests for a variety of quality intent, including code coverage, defect finding, and statistical testing.	A
4	Construct defect reports to provide transparency and understanding to supervisors, colleagues, and users.	C

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

Mapping of Course Outcomes to PSOs

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

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1	**MODULE TITLE: The Fundamentals of Testing**		9
	1	Why is testing necessary?	
	2	Why Testing- Testing Principles	
	3	Fundamental Test Process	
	4	The psychology of Testing	
2	**MODULE TITLE: Testing throughout the life-cycle**		9

	1	Software development models	
	2	Test Levels (Ex. Unit testing, Component testing, Integration testing,etc.)	
	3	Test types (Functional, non-functional, structural, change-related testing)	
	4	Maintenance testing	
	5	Software development models	

3	**MODULE TITLE Test design Techniques**		**9**
	1	Identifying test conditions and designing test cases	
	2	Categories of test design techniques	
	3	Specification based or Black Box techniques (eg. BVA, Equivalence Partitioning)	
	4	Structure based or white Box techniques	
	5	Experienced based techniques (Error guessing and Exploratory guessing)- Choosing a Test techniques	

4	**MODULE TITLE :Test Management**		
	1	Test organization Test Plans, estimates and strategies	9
	2	Test progress, monitoring and control	
	3	Risk and testing Incident management	
	4	Configuration management	

5	**Teacher Specific Module**	
	Directions	

	Teacher can adopt proper methodologies to apply and enhance the skill in respective topics.	9

Essential Readings:

1. **Foundations of Software Testing: ISTQB Certification Paperback – 1 October2020- Dorothy Graham (Author), Rex Black (Author), Erik van Veenendaal**
2. **Software Testing: Principles and Practices- DESIKAN/GOPALASWAMY**
3. **Software Testing: A Craftsman's Approach, Fourth Edition Textbook Binding** by Paul C. Jorgensen (Author)
4. **Software Testing Techniques Paperback – 1 January 2002** by Boris Beizer (Author)

Assessment Rubrics:

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

KU6SECCSC110: COMPUTER GRAPHICS

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
6	SEC	100-199	KU6SECCSC110	3	60

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
2	1	-	25	50	75	1.5 hrs.

Course Description:

This course provides an introduction to the principles and practices of computer graphics. It covers fundamental concepts such as 2D and 3D graphics programming, rendering, animation, and graphical user interfaces. Students will learn about graphics systems, primitives, drawing algorithms, transformations, viewing techniques, and illumination models. Practical implementation and application of these concepts will be emphasized through programming assignments and projects.

Course Prerequisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Discuss the basics and history of computer graphics.	U
2	Use 2D graphics techniques like drawing and filling shapes.	A

3	Implement the knowledge to Transform 2D objects with translation, rotation, and scaling.	A
4	Develop rendered images using various shading and rendering techniques.	C

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

Mapping of Course Outcomes to PSOs

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

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1	**INTRODUCTION TO COMPUTER GRAPHICS**		**12**
	1	**Introduction to computer graphics**	
		a) Introduction	
		b) History and evolution	
	2	**Overview of Graphics Systems**	
		a) Display devices, Input devices, Hard-Copy devices	
	3	**Graphics Primitives and Drawing**	
		a) Points, lines, and polygons, Circle and ellipse generation algorithms.	
		b) Drawing algorithms for lines and polygons	

	4	**Graphics Software and Hardware**	
		a) Overview of graphics software	
		b) Graphics hardware	
		c) Graphics standards and file formats	

2	**TWO-DIMENSIONAL GRAPHICS**		
	1	Two-Dimensional primitives: Points, lines, and polygons	12
	2	Scan Conversion: Line, Circle, and Ellipse drawing algorithms	
	3	Polygon Filling Algorithms: Flood fill, Boundary fill	
	4	Geometric Transformations in 2D: Translation, Rotation, Scaling	
	5	Clipping in 2D	

3	**THREE-DIMENSIONAL GRAPHICS**		
	1	Three-Dimensional Primitives: Points, Lines, and Polygons	12
	2	3D Transformations	
		a) Translation	
		b) Rotation	
		c) Scaling	
	3	Viewing in 3D: Perspective and Orthographic projections	

4	**RENDERING AND ANIMATION**		
	1	Introduction to Rendering	12
		a) Types of rendering: wireframe, hidden-line, flat, Gouraud, Phong	
	2	Illumination Models:, Phong Model	
		a) Diffuse and Specular Reflection, Phong Model	
		b) Shading models: flat, Gouraud, Phong	
	3	Ray Tracing Basics	
		a) Ray-object intersection, Reflection and refraction , Ray tracing algorithm	

5	**Teacher Specific Module**	
	Concerned teacher can adopt proper methodologies to apply and enhance the skill in respective topics.	
		12

Essential Readings:

1. Computer Graphics: Principles and Practice by John F. Hughes, Andries van Dam, Morgan McGuire, David F. Sklar, James D. Foley, Steven K. Feiner, Kurt Akeley

2,Hearn, D., & Baker, M. P. (2014). *Computer Graphics with OpenGL*. Pearson Education.

3,Rogers, D. F. (2013). Procedural Elements for Computer Graphics. Springer Science & Business Media.

4.Shirley, P., & Marschner, S. R. (2014). Fundamentals of Computer Graphics. CRC Press.

Suggested Readings:

1. Watt, A., & Watt, M. (2017). Advanced Animation and Rendering Techniques: Theory and Practice. Addison-Wesley Professional.

Assessment Rubrics:

Evaluation Type		**Marks**
End Semester Evaluation		**35(Theory)**
Practical		15(practical)
Code writing		**8**
Execution without error		**5**
viva		**2**
Continuous Evaluation		**15(Theory)** **10(practical)**
a)	Test Paper- 1	5

b)	Model Examination	5
c)	Assignment/viva	5
	Practical	
	Model exam	5
	Record	2
	Punctuality and lab performance	3
Total		**75**

DISCIPLINE SPECIFIC COURSES

KU1DSCCSC101: FUNDAMENTALS OF PROGRAMMING WITH C

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

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
3	2	-	35	65	100	1.5hrs.

Course Description:

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

Course Prerequisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Identify the basic syntax and structure of the C programming language	U
2	Design algorithms and flow chart to write program.	A

3	Understand various program control structures	U, A
4	Use advanced programming constructs such as arrays and strings in programming	U, A, E
5	Design simple C programs using appropriate programming constructs such as looping statements, conditional statements and arrays.	A, E, C

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

Mapping of Course Outcomes to PSOs

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

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
	MODULE1: Introduction to C and Basic Programming constructs		
1	1	Introduction to C	15
		a) History and importance of C	
		b) Algorithamic thinking – algorithm, flow chart examples, advantages and disadvantages	
		c) Basic structure of C	
		d) Executing a C program	
	2	C tokens	
		a) Keywords	
		b) Constants	
		c) Operators	

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

2	**MODULE 2: Input/output operations**		
	1	Managing input and output operations	15
		a) Reading a character	
		b) Writing a character	
	2	Formatted input and formatted output operations	
		a) printf function	
		b) scanf function	
	3	Branching statements	
		a) Simple if	
		b) if…..else	
		c) else- if ladder	
		d) nested If	
		e) switch -case statement	

3	**MODULE 3:** looping control structures		**15**
	1	Do -while loop	
	2	While loop	

	3	For loop	
	4	Nesting of loop	
	5	Break and Continue Statement	

4	**MODULE 4: Introduction to arrays and string**		
	1	One Dimensional array : declaration and initialization	15
		Two Dimensional array: declaration and initialization	
	2	String: string declaration and initialization	
		String handling functions: strlen, strcat, strcpy, strcmp, strrev	

5	**Teacher Specific Module**	
	Directions	
	1. Program to find sum and average of three numbers 2. Program to print the size of all fundamental data types 3. Program to find largest among three numbers using conditional operator 4. Program to check the number is odd or even using if statement 5. Program to print the grade of a student using nested if 6. Program to perform arithmetic operations using switch statement 7. Program to find the roots of a quadratic equation 8. Program to find the factorial of a given number 9. Program to generate the Fibonacci series 10. Program to find sum of n numbers using array 11. Program to sort n numbers using array 12. Program to check a given string is palindrome or not 13. Program to generate prime numbers with in a range 14. Program to implement any five built -in string function 15. Program to perform any Matrix operation	15

Essential Readings:

1.*E.*Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill

2. YashavantP.Kanetkar, Let Us C, 16th Edition, BPB

Suggested Readings:

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

Assessment Rubrics:

Evaluation Type			**Marks**	**Evaluation Type**			**Marks**	**Total**
Lecture			**75**	**Practical**			**25**	**100**
a)	**ESE**		**50**	a)	**ESE**		**15**	
					Program code and execution		**8**	
					Output		**3**	
					Viva		**2**	
					Modification		**2**	
b)	**CCA**		**25**	b)	**CCA**		**10**	
	i	Test Paper	5		i	Punctuality	3	
		Model exam	10					
	ii	Assignment/ Book-Article review /field report	5		ii	Model exam	4	
	iii	Seminar/ Viva-Voce	5		iii	Record	3	

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

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

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
3	2		35	65	100	1.5hrs.

Course Description:

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

Course Prerequisite: NIL

Course Outcomes:

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

	technological developments.	

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

Mapping of Course Outcomes to PSOs

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

COURSE CONTENTS

Contents for Classroom Transaction:

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

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

3	**MODULE TITLE :** Internet of Things (IoT) & Cloud Computing	**15**

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

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

5	**Teacher Specific Module**		
	Directions		
		Online courses for maximum 2hr from any online platform like Udemy, Skill share, Coursesera etc.and keep the certificate The courses may be 1. Current trends in information technology 2. Fundamentals of AI 3. Cyber security 4. Data science 5. cyber ethics 6. Ethical hacking	15

Essential Readings:

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

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

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

Friedman

Assesment Rubrics

Evaluation Type			**Marks**	**Evaluation Type**			**Marks**	**Total**
Lecture			**75**	**Practical**			**25**	**100**
a)	**ESE**		**50**	a)	**ESE**		**15**	
					Program code and execution		**8**	
					Output		**3**	
					Viva		**2**	
					Modification		**2**	
b)	**CCA**		**25**	b)	**CCA**		**10**	
	i	Test Paper	5		i	Punctuality	3	
		Model exam	10					
	ii	Assignment/ Book-Article review /field report	5		ii	Model exam	4	
	iii	Seminar/ Viva-Voce	5		iii	Record	3	

KU1DSCCSC103: FUNDAMENTALS OF COMPUTERS AND PROGRAMMING

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

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	

3	2		35	65	100	1.5hrs.

Course Description:

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

Course Prerequisite: NIL

Course Outcomes:

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

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

Mapping of Course Outcomes to PSOs

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

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS

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

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

3	**MODULE TITLE: Introduction to Software**		
	1	Types of Software - Application software, System Software, Operating Systems - Basics Function, examples,	15
	2	Software Licensing and Acquisition: Retail, OEM, Demo, Shareware, Freeware, Open-Source Software	

	3	Programming Languages: Types, Basic Concepts of Compiler, Assembler, Interpreter, Linker and Loader, Source code and Object code, Program Development Life Cycle.	
	4	Algorithmic Thinking: Algorithm, Flowcharts, Examples	

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

5	**Teacher Specific Module**	**15**
	Do the lab experience for the following and keep an assignment based on this as record 1. Identify various parts of computer A) Processor B) motherboard C) input devices D) Output devices E) RAM and RAM slot 2. Identify various secondary storage devices A) Hard Disk B) CD, DVD C) Pendrive 3. Identify various types of ports A) USB (Universal Serial Bus) Port B) Ethernet Port (RJ45) and RJ45 socket C) HDMI (High-Definition Multimedia Interface) D) serial port (rs-232) E) parallel port F) PS/2 Ports 4. Steps for installing any software(application packages like.) 5. Algorithm and flow chart to implement various program control structures. A) Write an algorithm and flow chart to find sum and average three numbers B) Write an algorithm and flow chart to find largest among three numbers. C) Write an algorithm and flow chart to check whether the given number is odd or even D) write an algorithm and flow chart to find sum of 10 numbers using looping statement	

Essential Readings:

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

Assessment Rubrics:

Evaluation Type			**Marks**	**Evaluation Type**			**Marks**	**Total**
Lecture			**75**	**Practical**			**25**	**100**
a)	**ESE**		**50**	a)	**ESE**		**15**	
					Program code and execution		**8**	
					Output		**3**	
					Viva		**2**	
					Modification		**2**	
b)	**CCA**		**25**	b)	**CCA**		**10**	
	i	Test Paper	5		i	Punctuality	3	
		Model exam	10					
	ii	Assignment/ Book-Article review /field report	5		ii	Model exam	4	
	iii	Seminar/ Viva-Voce	5		iii	Record	3	

KU1DSCCSC104: OFFICE AUTOMATION SOFTWARE

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

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
3	2		35	65	100	1.5hrs.

Course Description:

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

Course Prerequisite: NIL

Course Outcomes:

	Expected Outcome	Learning Domains
	Demonstrate proficiency in using word processing software to create, edit, and format professional documents.	U
	Apply essential spreadsheet functions and formulas to analyze and manage data.	U, A
	Create visually appealing charts and graphs to effectively communicate data insights.	U, A, C

	Understand and apply practical knowledge about word processing and worksheet software	U, A, C

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

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	
	MODULE TITLE: Introduction to Word Processing		
		Getting Started with the Interface	
		Creating and Saving Documents	
		Text Formatting and Editing Tools (Paragraph Indentation, Bullets and Numbering, Change the line spacing in Word, Alignment, change case, Text Highlight Color, Font Color, Bold, Italics, Underline)	
		Styles and Templates	

	MODULE TITLE: Advanced Word Processing Techniques		
		Working with Tables and Images	
		Creating Headers, Footers, and Page Numbers	
		Mail Merge and Creating Form Letters	
		Document Security and Protection	

	MODULE TITLE: Introduction to Spreadsheets		
		Understanding Spreadsheets - Cells, Rows, Columns	
		Entering and Editing Data - Data Types & Formatting	
		Creating Charts and Graphs	
		Printing and Sharing Spreadsheets	

	MODULE TITLE: Advanced Spreadsheet Techniques		
		Working with Large Datasets - Filtering & Sorting	

		Advanced Functions and Formulas (sum, average, max, min, count) Arithmetic Operations (+, -, *, /) Text Functions (CONCAT, UPPER, LOWER, PROPER)Logical Functions (IF, AND, OR) Lookup and Reference Functions (VLOOKUP, MATCH) Date and Time Functions (TODAY( ), NOW( ), DATE( )) Statistical Functions (AVERAGE, MEDIAN, STDEV)	
		Data Analysis Tools (e.g., PivotTables)	
		Creating Macros and Automation	

	Teacher Specific Module	
	Directions	
	1. Document creation using word processor tool 2. Create a banner for college union inauguration 3. Create a biodata with your photo 4. Implement mail merge technique in word processor 5. Program to implement aggregate functions in spreadsheet 6. Perform result analysis using different types of charts	

Essential Readings:

1. **Microsoft Word:**
   - "Getting Started with Microsoft Word: [Book Title about MS Word, Latest Edition]" by [Author(s)] ([Publisher Year]) - This book provides a foundational understanding of core functionalities in Microsoft Word.
   - "Microsoft Word Power Programming: [Book Title about Advanced MS Word, Latest Edition]" by [Author(s)] ([Publisher Year]) - For students interested in exploring advanced features and automation techniques in Word.
2. **Microsoft Excel:**
   - "Excel Formulas and Functions for Beginners: [Book Title about MS Excel Formulas, Latest Edition]" by [Author(s)] ([Publisher Year]) - A helpful guide to grasp essential formulas and functions in Microsoft Excel.
   - "Data Analysis with Microsoft Excel: [Book Title about MS Excel Data Analysis, Latest Edition]" by [Author(s)] ([Publisher Year]) - This book delves into data analysis techniques and tools within Microsoft Excel.

Suggested Readings:

Google Workspace:

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

Assessment rubrics:

Evaluation Type			**Marks**	**Evaluation Type**			**Marks**	**Total**
Lecture			**75**	**Practical**			**25**	**100**
a)	**ESE**		**50**	a)	**ESE**		**15**	
					Program code and execution		**8**	
					Output		**3**	
					Viva		**2**	
					Modification		**2**	
b)	**CCA**		**25**	b)	**CCA**		**10**	
	i	Test Paper	5		i	Punctuality	3	
		Model exam	10					
	ii	Assignment/ Book-Article review /field report	5		ii	Model exam	4	
	iii	Seminar/ Viva-Voce	5		iii	Record	3	

KU1DSCCSC105: INTRODUCTION TO WEB PROGRAMMING

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

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
3	2		35	65	100	1.5hrs.

Course Description:

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

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Identify different components in web technology and WWW	U, A
2	Apply HTML Forms and CSS Styling to design web pages.	U, A
3	Design webpages using HTML Forms.	U, A
4	Design interactive Web pages	U, A

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

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

COURSE CONTENTS

Contents for Classroom Transaction:

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

2	**MODULE 2: HTML**	

		Introduction to HTML	15
	1	a) Creating HTML document	
		b) Tags & attributes, syntax of tag	
		c) Starting and ending tag, tag without end, building a webpage	
	2	Text formatting	
		a) Division	
		b) Paragraphs & heading	
		c) Physical style tags, text alignment, fonts	
	3	Hyperlink and loading images	
		a) Linking to other web pages	
		b) Images and <img> tag	
		c) Line breaks, comments	
	4	List: types of list, nested list	

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

4	**MODULE 4: CSS**		
	1	CSS -Advantages, types of CSS- Inline, internal and external CSS	15
	2	Applying style to HTML using CSS	
	3	CSS Colours, Fonts, Borders, padding, Applying style using class and id attribute	

5	**Teacher Specific Module**	
	Practice the lab following lab exercises and keep records.	15
	1. HTML program to implement basic HTML tags 2. HTML program to implement various heading formatting tags 3. HTML program to implement IMG tag 4. HTML program to implement various types of listing tax 5. HTML program to design a table to represent the mark list 6. HTML program to implement various form elements and attributes	

Essential Readings:

1. Internet and World Wide Web How to program, P.J. Deitel & H.M. Deitel Pearson
2. An Introduction to WEB Design and Programming –Wang-Thomson **Technologies**, Black Book,Dream tech Press
3. Julie C. Meloni, HTML and CSS in 24 Hours, Sams Teach Yourself (Updated for HTML5 and CSS3), Ninth Edition

Suggested Readings:

1. Mastering HTML, CSS &Javascript Web Publishing Paperback,2016 - by Laura Lemay, Rafe Colburn & Jennifer Kyrnin , BPB Publications
2. HTML & CSS: The Complete Reference, Fifth Edition - Thomas a Powell, Tata McGraw Hill

Assessment Rubrics:

Evaluation Type		**Marks**	**Evaluation Type**		**Marks**	**Total**
Lecture		**75**	**Practical**		**25**	
a)	**ESE**	**50**	a)	**ESE**	**15**	
				Program code and execution	**8**	**100**
				Output	**3**	
				Viva	**2**	

					Modification		**2**	
b)	**CCA**		**25**	b)	**CCA**		**10**	
	i	Test Paper	5		i	Punctuality	3	
		Model exam	10					
	ii	Assignment/ Book- Article review /field report	5		ii	Model examination	4	
	iii	Seminar/ Viva-Voce	5		iii	Record	3	

KU1DSCCSC106:AI IN DAILY LIFE

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

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
3	2		35	65	100	1.5 Hrs

Course Description:

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

Prerequisite: NIL

Course Outcomes:

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

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

Mapping of Course Outcomes to PSOs

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

COURSE CONTENTS

MODULE	UNIT	DESCRIPTION	HOURS
1	**MODULE TITLE**: **Introduction to Artificial Intelligence**		15
	1	Definition and scope of AI	
	2	Historical overview and key milestones	
	3	Differentiating AI from human intelligence	
2	**MODULE TITLE: AI Subfields and Technologies**		15
	1	Machine learning: Supervised, unsupervised	
	2	Reinforcement learning	
	3	Deep learning and neural networks	
	4	Natural language processing (NLP) and computer vision	
3	**MODULE TITLE : Applications of AI**		15
	1	AI in healthcare: Diagnosis, treatment, and medical imaging	
	2	AI in finance: Fraud detection, algorithmic trading, and risk assessment	
	3	AI in transportation: Autonomous vehicles and traffic optimization	
	4	AI in customer service and chatbots	
	5	AI in education: Personalized learning and intelligent tutoring system	
4	**MODULE TITLE :Ethical and Social Implications of AI**		15
	1	Bias and fairness in AI systems	
	2	Impact of AI on employment and the workforce	

	3	AI and social inequality	

	Teacher Specific Module	
5	Practice online classes on various AI Applications with a minimum duration of 3 hours and keep certificates conduct practical examination based on this. 1. Introduction to AI and it's Applications 2. Chat GPT 3. Power BI 4. Data analytics tools 5. Designing tools	15

Essential Readings:

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

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

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

Assessment Rubrics:

Evaluation Type		**Marks**	**Evaluation Type**		**Marks**	**Total**
Lecture		**75**	**Practical**		**25**	
a)	**ESE**	**50**	a)	**ESE**	**15**	
				Program code and execution	**8**	**100**
				Output	**3**	
				Viva	**2**	
				Modification	**2**	
b)	**CCA**	**25**	b)	**CCA**	**10**	

	i	Test Paper	5		i	Punctuality	3	
		Model exam	10					
	ii	Assignment/ Book- Article review /field report	5		ii	Model exam	4	
	iii	Seminar/ Viva-Voce	5		iii	Record	3	

KU1DSCCSC107: ESSENTIALS OF INFORMATION TECHNOLOGY.

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

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
3	2		35	65	100	1.5hrs.

Course Description:

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

Course Prerequisite: NIL

Course Outcomes:

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

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

Mapping of Course Outcomes to PSOs

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

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	**UNIT**	**DESCRIPTION**	**HOURS**
1	**MODULE 1:**		

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

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

3	**MODULE 3:**	

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

4	**MODULE 4:**		
	1	**Introduction to Computer networks:** Data Communication System and Its Components, advantages of networking., hardware components	
		of networking	15
	2	Data Flow, digital and analog signals, types of Connection and Topologies, LAN, MAN, WAN, internet.	
	3	Digital Transmission -Transmission Modes, transmission media	
	4	Hands on training in software installation and Common trouble shooting problems with computer hardware.	

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

Essential Readings:

1. Kernighan, Brian W (2011). D is for Digital: What a well-informed person should know about computers and communications. CreateSpace Independent Publishing Platform.
2. Goel, Anita (2010). Computer fundamentals. Pearson Education India.
3. Floyd, Thomas L (2011). Digital fundamentals, 10/e. Pearson Education India.
4. Petzold, C. (2022). *Code: The Hidden Language of Computer Hardware and Software*. Pearson Education.

6.Forouzan, B. A., &Fegan, S. C. New York: “Data communications and networking”, McGraw-Hill

Higher Education, 2007.

7.Andrew S. Tanenbaum, "Computer Networks", 4th ed., Prentice Hall, 2003.

Suggested Readings:

1. https://www.geeksforgeeks.org/
2. https://www.sciencedirect.com/
3. https://www.tutorialspoint.com

Assessment Rubrics:

Evaluation Type			**Marks**	**Evaluation Type**			**Marks**	**Total**
Lecture			**75**	**Practical**			**25**	**100**
a)	**ESE**		**50**	a)	**ESE**		**15**	
					Programme code and execution		**8**	
					Output		**3**	
					Viva		**2**	
					Modification		**2**	
b)	**CCA**		**25**	b)	**CCA**		**10**	
	i	Test Paper	5		i	Punctuality	3	
		Model exam	10					
	ii	Assignment/ Book-Article review /field report	5		ii	Model exam	4	
	iii	Seminar/ Viva-Voce	5		iii	Record	3	

Semester-2

KU2DSCCSC108: ADVANCED PROGRAMMING WITH C

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

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
3	2	-	35	65	100	1.5hrs.

Course Description:

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

Course Prerequisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Understand the concept of storing multiple datatypes using structure and union	A

2	Understand the concept of pointers and their usage in memory management	U/A
3	Identify the usage of function and apply the functions in programming	U/A
4	Discuss the usage of file concept in programming	An
5	Apply various data accessing and storing concepts in C language and write program code to solve real life problems.	A/An

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

Mapping of Course Outcomes to PSOs

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

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1	**STRUCTURE and UNION**		
	1	Structure	15
		a) Structure declaration and Initialization	
		b) Array of structure variables	
		c) Array within structure	
		d) programs to implement usage of structure	
		Union : Union declaration and Initialization, memory allocation, and accessing union members.	

	2	b) Simple programs using union, Difference between Union and Structure	

2	**POINTERS**		
	1	a) Declaring pointers, accessing data though pointers	15
		b) NULL pointer , Array access using pointers	
		c) Pointer Arithmetic	
		d) **Dynamic Memory Allocation:** Allocating and deallocating memory using functions like malloc(), calloc(), realloc(), and free().	

3	**INTRODUCTION TO MODULAR PROGRAMMING**		
	1	Functions	15
		a) Function prototype, definition and calling , types of functions	
		b) Writing functions, formal parameters, actual parameters, types of functions based on arguments and return types	
	2	Recursion , argument passing mechanisms	
	3	Arrays as Function Parameters	
	4	Structures as Function Parameters	
	5	Storage Classes	
	6	Simple programs using functions	

4	**FILES AND COMMAND LINE ARGUMENTS**		
	1	File Operations	15
		a) open, close, read, write, append	
		b) Sequential access and random access to files: Built-in file handling functions (rewind(), fseek(), ftell(), feof(), fread(), fwrite()), c) Writing and Reading files in Text Format	
		d)Writing and Reading in Binary Format	
	2	a) Command Line Argument	
		b) Variable Number of Arguments	

5	**Teacher Specific Module**	**5**

List of Sample programs:

STRUCTURE

1. Create a structure to store the name, UID, marks of five subjects of students in a class.

   Display the rank list of the students.

2. Using structure, read and print data of n employees (Name, Employee Id and Salary)

UNION

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

FUNCTIONS

4. Read a string (word), store it in an array and obtain its reverse by using a user defined function.
5. Find the sum of digits of a number using a user defined function.
6. Read an array and perform sorting by passing the array to a user defined function

POINTERS

7. Do the following using pointers
   i) Add two numbers

   ii) Swap two numbers using a user

   defined function

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

FILES

10. Create a file and perform the following

    i) Write data to the file ii) Read the data in a given file & display the file content on console iii) Append new data and display on console

	11. Open a text input file and count number of characters, words and lines in it; and store the results in an output file. **COMMAND LINE ARGUMENTS** 12. Program to illustrate the use of command line arguments	
		5

Essential Readings:

1. Schaum Series, Gottfried B.S.,Tata McGraw Hill,Programming with C
2. E. Balagurusamy, Mcgraw Hill,Programming in ANSI C
3. Asok N Kamthane, Pearson,Programming in C
4. Anita Goel, Pearson, Computer Fundamentals

Suggested Readings:

1. Anita Goel and Ajay Mittal, Pearson, Computer fundamentals and Programming in C
2. Brian W. Kernighan and Dennis M. Ritchie, Pearson, C Programming Language
3. Rajaraman V, PHI, Computer Basics and Programming in C
4. Yashavant P, Kanetkar, BPB Publications, Let us C

Assessment Rubrics:

Evaluation Type		**Marks**	**Evaluation Type**		**Marks**	**Total**
Lecture		**75**	**Practical**		**25**	**100**
a)	**ESE**	**50**	a)	**ESE**	**15**	
				Program code and execution	**8**	
				Output	**3**	
				Viva	**2**	
				Modification	**2**	
b)	**CCA**	**25**	b)	**CCA**	**10**	

	i	Test Paper	5		i	Punctuality	3	
		Model exam	10					
	ii	Assignment/ Book-Article review /field report	5		ii	Model exam	4	
	iii	Seminar/ Viva-Voce	5		iii	Record	3	

KU2DSCCSC109: DATA MANAGEMENT PLATFORM

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
2	DSC	100-199	KU2DSCCCSC109	4 (3T+1P)	75

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
3	2		35	65	100	1.5 hrs.

Course Description:

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

Course Prerequisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains

1	Understand the concept of database management system and identify its advantages over manual file keeping	U
2	Understand the need of data modelling and identify the advantages and disadvantages among the models	U
3	Able to write queries using SQL to manipulate data	A
4	Apply the knowledge of data types and other functions in data storage and retrieval	A
5	Apply skills in joining relations for better data management	C

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

Mapping of Course Outcomes to PSOs

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

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1	**MODULE 1: DBMS introduction**		

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

2	**MODULE 2: Entity Relationship model**		
	1	Entity-Relationship Model - Understanding entities, attributes, and relationships - Designing Entity-Relationship Diagrams (ERDs) -	15
	2	Cardinality and participation constraints in ER modelling	
	3	Normalization- need and different types-conditions of different normal forms -1NF,2NF,3NF and BCNF with example	
	4	Creating Tables and Relationships - Implementing ER model into relational tables	

3	**MODULE 3: SQL**		
	1	Defining key and constraints in a relation. Primary , candidate, Super key, alternate and foreign keys.	15
	2	Constraints- unique, check, default, not null constraints. Mention Domain constraints, entity constraints-Establishing relationships between tables - using referential integrity	
	3	SQL: database languages; DDL- create, alter, drop	
	4	DML- Insert , Select, update, Delete; DCL – Grant, Revoke, TCL Commit-Rollback	

	MODULE 4: SQL Join Operations and emerging trends IN DBMS		
4	1	Data types in SQL-functions in SQL-Aggregate functions, string functions and numeric functions.	15
	2	Clauses (order by, Group by, Having)and Pattern matching, views.	

	3	Join in SQL INNER, OUTER AND CROSS JOIN, Relational algebraic operations.	
	4	Introduction to emerging Technologies (e.g., NoSQL, NewSQL) - concepts only	

5	**Teacher Specific Module**	
	Directions	
	1. Create table and implement various DDL commands 2. Create table and implement various DML commands 3. Create table and implement various aggregate functions. 4. Create table and implement various DDL commands 5. Create table and implement various clauses and pattern matching commands. 6. Create table and implement different types of joins	15

Essential Readings:

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

Assessment Rubrics:

Evaluation Type			**Marks**	**Evaluation Type**			**Marks**	**Total**
Lecture			**75**	**Practical**			**25**	
a)	**ESE**		**50**	a)	**ESE**		**15**	
					Program code and execution		**8**	**100**
					Output		**3**	
					Viva		**2**	
					Modification		**2**	
b)	**CCA**		**25**	b)	**CCA**		**10**	
	i	Test Paper	5		i	Punctuality	3	

		Model exam	10					
	ii	Assignment/ Book-Article review /field report	5		ii	Model exam	4	
	iii	Seminar/ Viva-Voce	5		iii	Record	3	

KU2DSCCSC110: PRINCIPLES OF PROGRAMMING USIN C

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

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
3	2		35	65	100	1.5hrs.

Course Description:

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

Course Prerequisite: NIL

Course Outcomes:

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

Mapping of Course Outcomes to PSOs

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

COURSE CONTENTS

Contents for Classroom Transaction:

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Understand the structure and basic elements in C program.	U
2	Identify the input output function in C language	U
3	Understand various program control structure	U/R
4	Understand the concept of arrays and strings.	U
5	Design program using different program control structure, arrays and strings	U /An

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

Mapping of Course Outcomes to PSOs

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

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1		INTRODUCTION TO C	
	1	History of C- Basic Structure of C Programs- Compiling and Running C Programs in Linux- C Character Set,	15
	2	C tokens- Keywords and Identifiers- Constants- Variables-Declaration of variables-Assigning values to variables	
	3	Data Types-Primary Data Types (int, char, float, double- User defined data types	
	4	Derived data types (name only), Empty data set(void).	
2		**OPERATORS AND FORMATTED AND UNFORMATTED CONSOLE I/O**	
	1	Introduction- Arithmetic Operators, Relational operators, Logical operators.	15
	2	Increment/Decrement operators, Assignment operators, conditional operators, Bitwise operators, special operators. Operator Precedence	
	3	Formatted Console I/O- Functions (printf, scanf), Escape Sequences	
	4	Unformatted Console I/O Functions- getch(), putch(), gets(), puts()	
3		**STORAGE CLASSES AND PROGRAM CONTROL STRUCTURES**	
	1	Introduction – Storage classes - automatic static , register , extern , simple example programs -,	15
	2	Decision Control Structures - Introduction- if statement : simple if statement , if-else statement, nesting of if-else, else if ladder.	
		Conditional Operator, switch Statement, go-to Statement.	

	3	Loop Control Structure – for loop- General form, working, simple example programs -while Statement: General form, working, simple example programs- do-while Statement: General form, working, simple	
4	**ARRAY AND STRINGS**		
	1	Arrays- Introduction- One Dimensional Arrays: Declaration of arrays, Initialization of arrays - Two Dimensional Arrays: Initialization – Multi dimensional arrays (only general form) . -	15
	2	Strings- Introduction-Declaring and initializing string variable – Reading strings from terminal-Reading line of text, writing strings to screen	
	3	String handling Functions (strlen, strcpy, strcat, strcmp).	
	4	Sample programmes using arrays and strings.	
5	Teacher Specific Module		
	Lab list		
	1. Program to find sum and average of three numbers . 2. Program to print the size of all fundamental data types 3. Program to find largest among three numbers using conditional operator 4. Program to check a number is positive or negative using if statement 5. Program to print the grade of a student using nested if 6. Program to perform arithmetic operations using switch statement 7. Program to find the roots of a quadratic equation 8. Program to find the factorial of a given number 9. Program to generate the Fibonacci series 10. Program to find sum of n numbers using array 11. Program to sort n numbers using array 12. Program to check a given string is palindrome or not 13. Program to generate prime numbers with in a range 14. Program to implement any five built -in string function 15. Program to perform any Matrix operation		15

Books for Study:

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

Books for Reference:

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

Assessment Rubrics:

Evaluation Type			Marks	Evaluation Type			Marks	Total
Lecture			**75**	**Practical**			**25**	**100**
a)	**ESE**		**50**	a)	**ESE**		**15**	
					Program code and execution		**8**	
					Output		**3**	
					Viva		**2**	
					Modification		**2**	
b)	**CCA**		**25**	b)	**CCA**		**10**	
	i	Test Paper	5		i	Punctuality	3	
		Model exam	10					
	ii	Assignment/ Book-Article review /field report	5		ii	Model exam	4	
	iii	Seminar/ Viva-Voce	5		iii	Record	3	

KU2DSCCSC111: MULTIMEDIA AND GRAPHICS DESIGNING

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

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	

3	2		35	65	100	2hrs.

Course Description:

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

Course Prerequisite: NIL

Course Outcomes:

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

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

Mapping of Course Outcomes to PSOs

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

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	**UNIT**	**DESCRIPTION**	**HOURS**

1	MODULE 1: Multimedia & Media software		
	1	Introduction to Multimedia	15
		a) Definition	
		b) Building blocks of multimedia (Text, Graphics, Audio, Video, Animation)	
	2	Multimedia System, desirable Features of multimedia System	
	3	Data Compression, Multimedia Applications, Virtual reality	
	4	Introduction to Media Software Application, System Software, Application Software	

2	**MODULE 2:** Photo Editing Software Applications		
	1	Photoshop, light room, highlights, midtones and shadows, levels, balance, cure	15
	2	Histogram, basic tools, crop, lasso tool, pen tool, text	
	3	Keyboard short cuts, layers, masking,	
	4	Effects, photo manipulation and editing, raw, jpeg, tiff, Exploring Formats	

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

4	**MODULE 4: Audio and Animation**		
	1	Software for Audio: Adobe Audition, software interface, wave and multi-track view, basic tools	15

	2	Applying audio effects, effect adjustments, audio recording, mixing, gain, pitch, volume, pan, file formats.	
	3	Software for Basic Animation: An Introduction to Adobe after Effects, The basics of creating projects. compositions, and layers	
	4	Importing footage, including video, audio, and still images, creating special effects using the Effects menu	

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

Essential Readings:

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

2. Adobe Photoshop CC Classroom in a Book (2018 Release) Book by Andrew Faulkner and Conrad Chavez

3. https:lihelpx.adobe.com/in/photoshop/tutorials.html

4. Adobe After Effects CS6 Digital Classroom Book by Jerron Smith

5. Adobe Premiere Pro Classroom in a Book (2020 release) by Maxim Jago

6. https:/lhelpx.adobe.com/prerniere-pro/vierv-all-tutorials.html

7. https://helpx.adobe.com/in/audition/tutorials.html

Suggested Readings:

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

Assessment Rubrics:

Evaluation Type		**Marks**	**Evaluation Type**		**Marks**	**Total**
Lecture		**75**	**Practical**		**25**	
a)	**ESE**	**50**	a)	**ESE**	**15**	
				Program code and execution	**8**	**100**
				Output	**3**	

					Viva		**2**	
					Modification		**2**	
b)	**CCA**		**25**	b)	**CCA**		**10**	
	i	Test Paper	5		i	Punctuality	3	
		Model exam	10					
	ii	Assignment/ Book-Article review /field report	5		ii	Model exam	4	
	iii	Seminar/ Viva-Voce	5		iii	Record	3	

KU2DSCCSC112: BASICS OF DATAANALYTICS

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
2	DSC	100	**KU2DSCCSC113**	4	60

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
3	1		35	65	100	1.5hrs.

Course Description:

This course introduces students to the fundamental concepts and techniques of data analytics. Introduces students to the Python programming language using an embedded

programming environment. The modules explore if-statements and loops to illustrate concepts of flow-control and iteration and also some data visualization tools that helps in data analytics.

Course Prerequisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Under stand the term data analytics and various steps included in data analytics	U
2	Understand the features of python as a tool for data analytics	U, A
3	Design programs using various python features like operators, control structures and other python objects.	U, An
4	Design programs using built-in modules in Python	U, C
5	Apply various visualization tools in python for data analytics.	U, A

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

Mapping of Course Outcomes to PSOs

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

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1	**MODULE 1:**		

	1	Data analytics definition-steps in data analytics-types of data analytics-tools for data analytics-Career Opportunities in Data Analytics	15
	2	Features of Python, Different Methods to Run Python, Basic Elements (Objects, Expressions, Numerical Types, Strings, Variables),	
	3	Comments, Indentation in Python, Input and Output in Python, import function, Operators in Python	
	4	Branching (if, else, elif), Iteration (while, for), range and enumerate functions	

2	**MODULE 2:**		
1	Looping structures in python		
	2	Tuples, Lists, Dictionaries, Sets- Built-in methods of lists, sets and dictionaries	
	3	Mutable and Immutable Objects.	15
	4	Modules, Built-in Modules (math, statistics), Creating Modules	

3	**MODULE 3:** PYTHON MODULES FOR DATA ANALYTICS		
	1	Numpy module - Creating Arrays (array, zeros, ones, empty, linspace, arrange, random),	15
	2	Two-Dimensional Array (Indexing, Slicing, Iterating)	
	3	Pandas functions for data analytics- reading data-read_csv(), framing data- Series.to_frame(), cleaning data- drop_duplicates(),F illing data fillna()	
	4	Matplotlib functions-plot(), label(), bar(), scatter(), pie(),show()	

4	**MODULE 4**		
	1	Data Visualization using Python, matplotlib Module	
	2	pyplot, plot(), hist, scatter, bar charts	15

	3	Formatting, figure(), subplot(), text(), xlabel(), ylabel(), title()	
	4	Plotting Simple Mathematical Functions (sin x, x2)	

5	**Teacher Specific Module**		
	Directions		
		1. Write a Python program that will accept the base and height of a triangle and compute its area. 2. Write a Python program to get the largest number from a list 3. Write a Python script to sort (ascending and descending) a dictionary by value. 4. Write a Python program to create a set 5. Write a Python program to create a union of sets. 6. Write a Python program to read a given CSV file as a list. 7. Write a Python programming to display a bar chart of the popularity of programming Languages. Use uniform color. Sample data: Programming languages: Java, Python, PHP, JavaScript, C#, C++ Popularity: 22.2, 17.6, 8.8, 8, 7.7, 6.7 8. Write a Python programming to create a pie chart of gold medal achievements of five most successful countries in 2016 Summer Olympics. Read the data from a csv file. Sampledata: **medal.csv** country,gold_medal UnitedStates,46 GreatBritain,27 China,26 Russia,19 Germany,17	15

Essential Readings:

1. Basic Python Programming for Beginners
by Dr. Marlapalli Krishna & S. Jaya Prakash Dr. Marlapalli Krishna, K. Varada Rajkumar
2. Learn Python Programming - by Fabrizio Romano

3. https://www.w3resource.com/

Assessment rubrics

Evaluation Type	Marks	Evaluation Type	Marks	Total

Lecture			**75**	**Practical**			**25**	**100**
a)	**ESE**		**50**	a)	**ESE**		**15**	
					Program code and execution		**8**	
					Output		**3**	
					Viva		**2**	
					Modification		**2**	
b)	**CCA**		**25**	b)	**CCA**		**10**	
	i	Test Paper	5		i	Punctuality	3	
		Model exam	10					
	ii	Assignment/ Book- Article review /field report	5		ii	Model exam	4	
	iii	Seminar/ Viva-Voce	5		iii	Record	3	

SEMESTER 3

KU3DSCCSC201: OBJECT ORIENTED P ROGRAMMING WITH JAVA

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

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
3	2	-	35	65	100	1.5 Hrs

Course Description:

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

Course Prerequisite: NIL

Course Outcomes:

CONo.	Expected Outcome	Learning Domains
1	Demonstrate proficiency in fundamental Object-Oriented Programming (OOP) concepts.	U
2	Understand the concept of class and objects	U,A

3	Apply the concept of inheritance, interface and threads in programming	U, A, C
4	Understand the basic components of AWT	U
5	Develop AWT applications, applying event handling mechanisms and utilizing appropriate layout managers for effective GUI design	U, A, C

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

Mapping of Course Outcomes to PSOs

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

COURSECONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1	**MODULE1: Introduction to OOP and Java Basics**		
	1	Understanding Object-Oriented Programming (OOP) Concepts - Introduction to Classes and Objects - Encapsulation, Inheritance, Polymorphism, and Abstraction in detail.	15
	2	Introduction to Java - Overview of Java Programming Language – Setting up the Java Development Environment(IDE)-Basic Syntax and Data Types in Java. I/O operations- Reading data from the console.	
	3	Control Flow and Looping Constructs: if statements, switch statement-syntax and programmes	

	4	looping statements, jumping statements- syntax and programmes	

2	**MODULE2: Java classes and Inheritance**		
	1	Introducing Classes: Class fundamentals; Introducing methods; Declaring Objects; Constructors.	15
	2	This keyword; Garbage collection; the finalize method.	
	3	Inheritance basics – Definition-extends keyword-Types of inheritance-single inheritance-Multilevel inheritance- Hierarchical inheritance.	
	4	Using super keyword-Method Overriding. Access modifiers in inheritance Dynamic method dispatch and runtime polymorphism-Abstract classes.	

3	**MODULE3: INTERFACES and PACKAGES**		**15**
	1	Interfaces - interface Keyword- implementing an Interface- Multiple Interfaces- Default and Static Methods- inheritance in Interfaces- Inheritance vs Interfaces – Comparison.	
	2	Packages- Definition- Types of Packages- Built-in packages- User-defined packages- Creating a Package- Importing Packages- Access Modifiers and Packages-	
	3	Package Naming Conventions- Compiling and Running with Packages- CLASSPATH- Why is Classpath Important? How to Set the Classpath- Using the CLASSPATH Environment Variable- Using the -classpath or -cp option.	
	4	Multithreading in Java -Understanding Threads and Concurrency-Synchronization and Thread Safety-Thread life cycle-Exception Handling: try and catch, multiple catch- Default and Static Method.	

4	**MODULE4: GUI Programming with AWT**		
	1	Introduction to AWT-What is AWT?-AWT package (java.awt and java.awt.event)-Platform-dependence of AWT-	*15*

2	AWT Components – Label- Button- TextField - TextArea -Checkbox CheckboxGroup (Radio buttons)- List AWT Containers - Panel – Frame – Dialog – Applet.	
3	Event Handling in AWT- ActionEvent- WindowEvent- MouseEvent- KeyEvent- ItemEvent	
4	Event listeners: • ActionListener • WindowListener • MouseListener / MouseMotionListener • KeyListener	

	Teacher Specific Module	
	Lab1: Introduction to Object-Oriented Programming and Java Basics **1.** Create a simple Java program to print "Hello,World!" to the console **2.** To implement method overloading **3.** To implement inheritance Lab2: 1. Create java programme to implement interfaces 2. Create java programme to implement packages Lab3: Advanced Java Programming Concepts **1.** Write a Java program that demonstrates the use of exception handling. **2.** Write a Java program to implement multithreading **3.** Write a Java program to implement package Lab4: GUI Programming with Java AWT **1.** Create a simple AWT application with a Frame **2.** Create a simple calculator using AWT controls and Frame	

Essential Readings:

1. "Head First Java" by Kathy Sierra and Bert Bates.O'Reilly 3rd edition
2. Java The Complete Reference-Eleventh Edition- Oracle Press- Herbert Schildt
3. Object Oriented Programming through Java, P Radha Krsihna
4. https://www.tutorialspoint.com/java/

Suggested Readings:

1. "Clean Code: A Handbook of Agile Software Craftsmanship" by Robert C. Martin
2. "Java Threads" by S

Assessment Rubrics:

Evaluation Type			**Marks**	**Evaluation Type**			**Marks**	**Total**
Lecture			**75**	**Practical**			**25**	**100**
a)	**ESE**		**50**	a)	**ESE**		**15**	
					Program code and execution		**8**	
					Output		**3**	
					Viva		**2**	
					Modification		**2**	
b)	**CCA**		**25**	b)	**CCA**		**10**	
	i	Test Paper	5		i	Punctuality	3	
		Model exam	10					
	ii	Assignment/ Book-Article review /field report	5		ii	Model exam	4	
	iii	Seminar/ Viva-Voce	5		iii	Record	3	

KU3DSCCSC202: DIGITAL SYSTEM

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
4	DSC	200-299	**KU3DSCCSC202**	4	60

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

Course Description:

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

Course Prerequisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Differentiate between digital and analog systems and articulate the advantages of digital systems.	U

2	Demonstrate basic logic operations and convert between various number systems used in digital electronics	A
3	Use Boolean algebra and logic gates to design and simplify digital circuits.	A
4	Design and analyze combinational circuits, including adders,	C, An
	subtractors, encoders, decoders, multiplexers, and demultiplexers.	
5	Comprehend the functioning of sequential circuits, including flipflops, counters, and shift registers, and apply this knowledge to real-world digital system designs.	U,A,C

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

Mapping of Course Outcomes to PSOs

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

COURSE CONTENTS

Contents for Classroom Transaction:

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

		b) Number base conversion	
	4	Binary codes	
		a) BCD, Gray code	
		b) Alphanumeric codes	
		c) Error detecting codes	

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

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

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

		a) Different shift registers and Applications	

5	**Teacher Specific Module**	
	Directions	
	Conduct hands on training on digital devices and their working.	12

Essential Readings:

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

Suggested Readings:

1. Digital Logic and Computer Design, M Morris mano

Assessment Rubrics:

Evaluation Type		**Marks**	**Evaluation Type**		**Marks**	**Total**
Lecture		**70**	**Practical**		**0**	
a)	**ESE**	**70**	a)	**ESE**	**0**	
b)	**CCA**	**30**	b)	**CCA**	**0**	**100**

KU3DSCCSC203: PYTHON FOR DATA ANALYTICS

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
3	DSC	200-299	KU3DSCCSC203	4 (3+1)	75

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
3	2		35	65	100	2hrs.

Course Description:

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

Course Prerequisite: NIL

Course Outcomes:

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

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

Mapping of Course Outcomes to PSOs

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

Course Description:

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

Course Prerequisite: NIL

Course Outcomes:

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

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

Mapping of Course Outcomes to PSOs

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

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1		**MODULE TITLE:** INTRODUCTION TO DATAANALYTICS	15
	1	Data analytics definition-steps in data analytics-types of data analytics-Career Opportunities in Data Analytics	
	2	Importance of data analytics	
	3	Overview of data analytics process	
	4	Types of data analysis	
2		**MODULE TITLE: PROCESS OF DATA ANALYSIS**	15
	1	2. Define the Problem 3. Collect Data 3. Data Cleaning 4. Analyzing the Data 5. Data Visualization 6. Presenting Data	
	2	Sources of data -primary and secondary data- Data types -structured and unstructured data	
	3	Data collection methods -- Methods to collect primary and secondary data	
	4	Data storage and management -what is data management-need of data management-importance and types of data management	
3		**MODULE TITLE:** DATA CLEANING	15
	1	Data preprocessing techniques - Data cleaning -Dimensionality reduction -Feature engineering: Handling a large amount of data (sampling data)-Data transformation:	
	2	Handling missing data - Effective Strategies for Handling Missing Values in Data Analysis	
	3	Dealing with outliers - Trimming/Remove the outliers- Quantile Based Flooring and Capping- Mean/Median Imputation- Visualizing the Data after Treating the Outlier	

	4	Features of Python for data analysis- Syntax-Keywords in Python-Comments in Python-Python Variables	

4	**MODULE TITLE :** PANDA FOR DATA ANALYSIS		15
	1	Python Data Types-Strings-Numbers-Booleans-Python List-Python Tuples-Python Sets-Python Dictionary	
	2	Operators in Python -Arithmetic operators Comparison Operators-Logical Operators-Bitwise Operators-Assignment Operators- Control structures -branching and looping.	
	3	Pandas Library in Python-Why Python Pandas used for-data analysis Panda series.-how to create series. Data Frames- create data frame using DataFrame () pandas Read CSV-pandas analyzing data- head() and tail() functions.	
	4	Data set cleaning- removing Empty cells-dopna() -removing Data in wrong format- to_datetime()-removing Wrong data-loc() and drop(). removing Duplicates-duplicated(). Data Visualization using pandas-panda plot().	

5	**Teacher Specific Module**	
	Teacher can suggest activities on following titles	
	1. write a python code for arithmetic operations 2. write a python code for sorting a list of numbers. 3. Write a program to check whether a given number is even or odd. 4. Create a program to calculate the factorial of a given number. 5. Write a program to check if a given number is a prime number. 5. Write a Pandas program to create the mean and standard deviation of the data of a given Series. 6. Write a Pandas program to detect duplicates using duplicated() method. 7. Write a Pandas program to create a Pivot table and find the region wise total sale. 8. Write a Pandas program to split the following data frame into groups based on school code. Also check the type of GroupBy object. **Test Data:**	15

school	class	name	date_Of_Birth	age	height	weight	address
S1	s001	V Alberto Franco	15/05/2002	12	173	35	street1
S2	s002	V Gino Mcneill	17/05/2002	12	19232	street2	S3
s003		VI Ryan Parkes	16/02/1999	13	18633	street3	S4
s001		VI Eesha Hinton	25/09/1998	13	167	30	street1
S5	s002	V Gino Mcneill	11/05/2002	14	15131	street2	S6
s004		VI David Parkes	15/09/1997	12	159		

Essential Readings:

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

Assessment Rubrics:

Evaluation Type			**Marks**	**Evaluation Type**		**Marks**	**Total**
Lecture			**75**	**Practical**		**25**	
a)	**ESE**		**50**	a)	**ESE**	**15**	
					Program code and execution	**8**	**100**
					Output	**3**	
					Viva	**2**	
					Modification	**2**	
b)	**CCA**		**25**	b)	**CCA**	**10**	
	i	Test Paper	5		i Punctuality	3	
		Model exam	10				

	ii	Assignment/ Book-Article review /field report	5		ii	Model exam	4	
	iii	Seminar/ Viva-Voce	5		iii	Record	3	

KU3DSCCSC204: OBJECT ORIENTED PROGRAMMING CONCEPT USING C++

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
3	DSC	200-299	KU3DSCCSC204	4	75

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
3	2		35	65	100	1.5hrs.

Course Description:

This course introduces the fundamentals of C++ programming with a focus on Object-Oriented Programming (OOP) concepts.

Prerequisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains

1	Understand the principles of object-oriented programming.	U
2	Learn the syntax and semantics of C++.	R/U
3	Apply OOP concepts to solve real-world problems using C++.	U/A
4	Develop small to medium-sized C++ programs using classes and objects	A/An

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

Mapping of Course Outcomes to PSOs

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

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1	**MODULE TITLE**: **Introduction to OOP and C++ Basics**		**15**
	1	Procedural vs Object-Oriented Programming	
	2	Features of OOP: Encapsulation, Inheritance, Polymorphism, Abstraction	
	3	Structure of a C++ program,	
	4	Basic I/O, data types, operators in detail	

2	**MODULE TITLE: Classes and Objects**	**15**

	1	control structures (branching and looping)	
	2	Defining classes and creating objects	
	3	Member functions, constructors and destructors Operator overloading: unary and binary operators (mention only)	
	4	Member functions, constructors and destructors	

3	**MODULE TITLE : Inheritance and Polymorphism**		**15**
	1	Friend functions and classes	
	2	Types of inheritance: Concept and Need for Inheritance Reusability	
	3	Types of inheritance - single, multiple, multilevel- explanation with example programme	
	4	Hierarchical, hybrid explanation with example programme	

4	**MODULE TITLE : Virtual Functons and Polymorphism**		15
	1	Compile-time Polymorphism: Function Overloading-Operator Overloading (Explain with program)	
	2	Runtime Polymorphism**:** Virtual functions-Pure virtual functions and abstract classes	
	3	Abstract Classes and Interfaces- Creating interfaces using abstract classes	

5	**Teacher Specific Module**	
	1.Write a C++ program to print “Hello, World!”. 2, Write a program to perform arithmetic operations using functions. 3. Write a program to define a class Student with data members and display their details using a member function. 5. Write a program to illustrate the use of constructors and destructors. 6. Write a program to implement **single inheritance**. 7. Write a program for **multiple inheritance**. 8. Write a program demonstrating **multilevel inheritance**.	15

	9. Write a program using **hierarchical inheritance**. 10. Write a program to implement **function overloading**. 11. Write a program to illustrate **runtime polymorphism** using virtual functions. 12. Write a program to demonstrate **abstract class** using pure virtual functions.	

Essential Readings:

E. Balagurusamy, *Object-Oriented Programming with C++*, McGraw Hill

Other References:

- Robert Lafore, *Object-Oriented Programming in C++*, Sams Publishing
- Bjarne Stroustrup, *The C++ Programming Language*, Addison-Wesley
- Herbert Schildt, *C++: The Complete Reference*, McGraw Hill
- Yashavant Kanetkar, *Let Us C++*, BPB Publications

Assessment Rubrics:

Evaluation Type			**Marks**	**Evaluation Type**			**Marks**	**Total**
Lecture			**75**	**Practical**			**25**	**100**
a)	**ESE**		**50**	a)	**ESE**		**15**	
					Program code and execution		**8**	
					Output		**3**	
					Viva		**2**	
					Modification		**2**	
b)	**CCA**		**25**	b)	**CCA**		**10**	
	i	Test Paper	5		i	Punctuality	3	
		Model exam	10					
	ii	Assignment/ Book-Article review /field report	5		ii	Model exam	4	
	iii	Seminar/ Viva-Voce	5		iii	Record	3	

KU3DSCCSC205: RDBMS

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
3	DSC	200-299	KU3DSCCSC205	4	75

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
3	2		35	65	100	1.5 hrs.

Course Description:

This course offers to acquire basic conceptual background necessary to design and develop simple database system, Relational database mode and to write good queries using a standard query language called SQL.

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Describe basic concepts of database system	U
2	Design a Data model and Schemas in RDBMS	U, A
3	Competent in use of SQL	U, A, C
4	Analyze functional dependencies for designing Database	U, A, C

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

Mapping of Course Outcomes to PSOs

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

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1	**MODULE 1 :Introduction to DBMS**		
	1	Introduction to DBMS– Data and Information - Database – Database Management System – Advantages	15
	2	View of data in DBMS	
	3	Data Models, Database users and Administrator (DBA)	
	4	Concept of RDBMS, Features of RDBMS Difference between DBMS and RDBMS	
2	**MODULE 2 :Introduction to RDBMS**		
	1	Terminologies: Relation, attribute, domain, Tuple, Entities, Degree	15
	2	Key Constraints Super keys - Candidate keys - Primary keys and foreign key for the Relations	
	3	Relational Algebra Operations, RDMS-advantages and disadvantages	
	4	Relational Calculus – Domain Relational Calculus	
3	**MODULE 3: Normalization and basic SQL**		
	1	Normalization – 1NF – Functional Dependency - 2NF-Transitive dependency- 3NF – BCNF – Database Security	15
	2	SQL- Data types	
	3	DDL, DML, DCL, TCL Commands	
	4	Select Statement with Clauses-Where, Having, Orderby, groupby	
	5	SQL Operators- Relational, Logical, Like, Between, IN operator	

4	**MODULE 4: Functions in SQL**		
	1	Aggregate functions: avg, count, min, max, sum,count(*)	15
	2	String Functions: concat, instr, mid, length, strcmp, trim, ltrim, rtrim MathFunctions: abs, ceil, floor, mod, pow, sqrt	
	3	Join types – Inner Join, left-right- Outer Join, and self-Join	
	4	Sub-queries, view, Character functions-upper, lower, initcap etc	

5	**Teacher Specific Module**	
	Directions	
	1. Create table and implement various DDL commands 2. Create table and implement various DML commands 3. Create table and implement various aggregate functions. 4. Create table and implement various DDL commands 5. Create table and implement various clauses and pattern matching commands. 6. Create table and implement different types of joins	15

Essential Readings:

1. Abraham Silberchatz, Henry F. Korth, S. Sudarshan, "Database System Concepts", McGrawHill 2019, 7th Edition.
2. Alexis Leon & Mathews Leon, "Fundamentals of DBMS", Vijay Nicole Publications 2014, 2nd Edition.
3. Srivastava & Srivastava, "Relational Database Management System", New Age

Assessment Rubrics:

Evaluation Type		**Marks**	**Evaluation Type**		**Marks**	**Total**
Lecture		**75**	**Practical**		**25**	
a)	**ESE**	**50**	a)	**ESE**	**15**	
				Program code and execution	**8**	**100**
				Output	**3**	
				Viva	**2**	

				Modification	**2**
b)	**CCA**	**25**	b)	**CCA**	**10**

	i	Test Paper	5		i	Punctuality	3	
		Model exam	10					
	ii	Assignment/ Book-Article review /field report	5		ii	Model exam	4	
	iii	Seminar/ Viva-Voce	5		iii	Record	3	

KU3DSCCSC206: INTRODUCTION TO MACHINE LEARNING

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
3	DSC	200 -299	**KU3DSCCSC206**	4	75

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
3	2		35	65	100	1.5hrs.

Course Description:

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

Course Prerequisite: NIL

Course Outcoms:

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

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

Mapping of Course Outcomes to PSOs

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

COURSE CONTENTS

Contents for Classroom Transaction:

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

2	**MODULE TITLE: Supervised learning**	**15**

	1	Introduction to supervised learning	
	2	Linear regression	
	3	Logistic regression	
	4	Decision trees and ensemble methods (Random Forest, Gradient Boosting)	

3	**MODULE TITLE : Unsupervised Learning**		**15**
	1	Introduction to unsupervised learning	
	2	Clustering algorithms (K-means, Hierarchical clustering)	
	3	Dimensionality reduction techniques (PCA, t-SNE)	
	4	Instant based learning: K- Nearest Neighbor Learning Locally weighted Regression Radial Bases Functions – Case Based Learning.	

4	**MODULE TITLE : PRACTICE ML WITH PYTHON**		
	1	Introduction to Python for Machine Learning- advantages- libraries-Numpy, Pandas, sciPy, Scikit-Learn, Matplotlib, TensorFlow and PyTorch -mention their usage.	15
	2	Data set- Datatypes-Numerical-Categorical- Ordinal- Sources of different dataset.	
	3	Numpy functions for Mean-median-mode- Standard Deviation and Percentile .	
	4	Data distribution and visualization- using Matplotlib.-various types of charts with examples.	

5	**Teacher Specific Module**	
	Discussion on ML application in real life Practice sample ML programmes to implement 1. linear regression 2. Decision trees 3. K-Nearest Neighbors	15

Essential Readings:

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

University Press, 1995

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

4. Online resources, research papers, and tutorials

Assessment Rubrics:

Evaluation Type			**Marks**	**Evaluation Type**			**Marks**	**Total**
Lecture			**75**	**Practical**			**25**	**100**
a)	**ESE**		**50**	a)	**ESE**		**15**	
					Programme code and execution		**8**	
					Output		**3**	
					Viva		**2**	
					Modification		**2**	
b)	**CCA**		**25**	b)	**CCA**		**10**	
	i	Test Paper	5		i	Punctuality	3	
		Model exam	10					
	ii	Assignment/ Book-Article review /field report	5		ii	Model exam	4	
	iii	Seminar/ Viva-Voce	5		iii	Record	3	

KU3DSCCSC207: CONTENT MANAGEMENT SYSTEM

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

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
3	2		35	65	100	1.5hrs.

Course Description:

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

Prerequisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Identify the concept of Content Management System and its importance	U
2	Demonstrate proficiency in installing, configuring, and customizing WordPress for different website requirements Discuss on features and functionality of a CMS platform	U
3	Identify the steps to install, configure, and manage a CMS platform	U/A
4	Design and manage digital content using a CMS	A

5	Use CMS skills to real-world scenarios	A

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

Mapping of Course Outcomes to PSOs

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

COURSE CONTENTS

Detailed Syllabus:

Module	Unit	Content	Hrs
I		**Introduction to Content Management Systems**	**15**
	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**	**15**
	1	Installation and setup of WordPress	
	2	Exploring the WordPress dashboard and interface	
	3	Understanding WordPress themes and templates	
	4	Customizing WordPress themes using HTML and CSS	

III		**Content Creation and Management**	**15**
	1	Creating and publishing different types of content (posts, pages, media)	
	2	Organizing content with categories and tags	
	3	Utilizing WordPress editor for content creation and formatting	
	4	Incorporating multimedia elements (images, videos, audio) into content	
	5	Managing comments and discussions on WordPress site	
IV		**Advanced WordPress Techniques**	**15**
	1	Implementing custom post types and taxonomies	
	2	Introduction to theme development with WordPress	
	3	Utilizing child themes for customization without affecting core themes	
	4	Introduction to WordPress APIs for extending functionality	
V		**Teacher specific module**	**15**
	1	Case Studies in WordPress Implementation	

	2	Comparing WordPress with other popular CMS platforms such as Joomla and Drupal	

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.

Assessment rubrics:

Evaluation Type	Marks	Evaluation Type	Marks	Total
Lecture	75	Practical	25	

a)	ESE		50	a)	ESE		15	100
					Programme code and execution		8	
					Output		3	
					Viva		2	
					Modification		2	
b)	CCA		25	b)	CCA		10	
	i	Test Paper	5		i	Punctuality	3	
		Model exam	10					
	ii	Assignment/ Book-Article review /field report	5		ii	Model exam	4	
	iii	Seminar/ Viva-Voce	5		iii	Record	3	

SEMESTER 4

KU4DSCCSC208: DATABASE MANAGEMENT SYSTEM

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
4	DSC	200-299	KU4DSCCSC208	4	75

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
3	2	-	35	65	100	1.5 Hrs

Course Description:

Computer databases typically store aggregations of data records or files that contain information, such as sales transactions, customer data, financials and product information.

Databases are used for storing, maintaining and accessing any sort of data.

They collect information on people, places or things.

Course Prerequisite: NIL

Course Outcomes:

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

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

Mapping of Course Outcomes to PSOs

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

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1	MODULE1: Database concept		
	1	Introduction – purpose of Database, Applications of Database, DBMS, DBMS software	15
	2	View of Data, Data Models, Transaction management	
	3	Database architecture – Storage manager-Query Processor	
	4	Database Administrator, Data Base Users	
2	MODULE 2: E-R Model		
	1	E-R model- Basic concepts, entity set & attributes.	15
	2	Relationships and constraints, cardinality, participation, notations, Mapping Constraints; Keys; Primary, Foreign, candidate.	
	3	E-R design issues, E-R diagram; Weak entity set; Extended E-R features: generalization and specialization	
	4	Concept Design - Conceptual design for University enterprises	
3	MODULE 3: Relational model and SQL		**15**
	1	Relational model – Structure of Relational database, Integrity constraints.	
	2	Relational Algebra -Fundamental operations , Relational calculus , Tuple and domain calculus	

	3	SQL: database languages; DDL- create, alter, drop, truncate; DML- Insert, Select, update, Delete; DCL, TCL, SQL Functions, Data types in SQL; Creation and deletion of database and user	
	4	SQL queries on single and multiple tables, Nested queries (correlated and non-correlated), Aggregation and grouping.	

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

5	**Teacher Specific Module**	
	1. Create table and implement various DDL commands 2. Create table and implement various DML commands 3. Create table and implement various aggregate functions. 4. Create table and implement various DDL commands 5. Create table and implement various clauses and pattern matching commands. 6. Queries to implement various string functions 7. Create table and implement different types of joins	

Essential Readings:

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

Suggested Readings:

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

Assessment Rubrics:

Evaluation Type	Marks	Evaluation Type	Marks	Total

Lecture			75	Practical			25	100
a)	ESE		50	a)	ESE		15	
					Program code and execution		8	
					Output		3	
					Viva		2	
					Modification		2	
b)	CCA		25	b)	CCA		10	
	i	Test Paper	5		i	Punctuality	3	
		Model exam	10					
	ii	Assignment/ Book-Article review /field report	5		ii	Model Exam	4	
	iii	Seminar/ Viva-Voce	5		iii	Record	3	

KU4DSCCSC 209 : DATA STRUCTURES

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
4	DSC	200 -299	KU4DSCCSC209	4	75

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
3	2		35	65	100	1.5hrs.

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

Course Prerequisite: NIL

Course Outcomes:

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

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

Mapping of Course Outcomes to PSOs

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

COURSE CONTENTS

Contents for Classroom Transaction:

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

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

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

3	**MODULE TITLE: Graphs**		
	1	Graph Theory terminology; Sequential Representation of Graphs – Adjacency Matrix, Path Matrix	
	2	Operations on graph	15

		a) traversing searching	
		b) inserting	
		c) deleting	
	3	Breadth- First Search and Depth First Search	
4	**MODULE TITLE: Design and Analysis of Algorithms**		
	1	From Problems to Programs - Algorithms, Pseudo Language and Stepwise Refinement.	
		a) Abstract Data Type definition, Data Structures and Abstract Data Types	15
	2	Measuring the Running Time of a Program	
		a) Asymptotic Notations – Big O, Omega,Theta	
	3	Search: Linear and Binary search; comparison of searching algorithms.	
		Sort: Insertion, bubble, selection, quick and merge sort; Comparison of Sort algorithms	

5	**Teacher Specific Module**	
	Directions	
	1. Arrays • Program to insert, delete, search, and display elements in an array. • Program to find the largest and smallest element in an array. • Program to reverse an array. **2. Strings** • Program for string operations: length, copy, concatenate, compare. • Program to check for palindrome. • Program to count vowels and consonants. **3. Linked List** • Singly linked list: insert (beginning, end, middle), delete, display. **4. Stacks** • Stack using arrays. • Stack using linked list. **5. Queues** • Queue using arrays (linear).	15

- Queue using linked list.

6. Recursion

- Factorial of a number.
- Fibonacci series using recursion.

7. Searching and Sorting

- Linear search.
- Binary search.
- Bubble sort.
- Selection sort.

8. Tree

- Binary tree creation and traversal (inorder, preorder, postorder).
- Binary search tree (BST) operations: insert, delete, search.

Essential Readings:

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

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

Suggested Readings:

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

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

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

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

Assessment Rubrics:

Evaluation Type		**Marks**	**Evaluation Type**		**Marks**	**Total**
Lecture		**75**	**Practical**		**25**	
a)	**ESE**	**50**	a)	**ESE**	**15**	
				Programme code and execution	**8**	**100**

					Output		**3**	
					Viva		**2**	
					Modification		**2**	
b)	**CCA**		**25**	b)	**CCA**		**10**	
	i	Test Paper	5		i	Punctuality	3	
		Model exam	10					
	ii	Assignment/ Book- Article review /field report	5		ii	Model exam	4	
	iii	Seminar/ Viva-Voce	5		iii	Record	3	

KU4DSCCSC210: Operating Systems

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

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

Course Description:

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

Course Prerequisite: NIL

Course Outcomes:

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

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

Mapping of Course Outcomes to PSOs

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

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1	MODULE1: Introduction to OS		
	1	Introduction, structure of Operating Systems, Different types of Operating systems-Batch Processing System, Multi programming system, Time Sharing System, Real Time System, Distributed system	12
	2	Functions of operating system-Process management, Main memory management, File management, I/O system management, Secondary storage management	
	3	User mode and Kernel mode, System Calls (Introduction only), Operating System Design and Implementation approaches	
	4	Operating System Design and Implementation approaches, Operating System Structures - simple, layered, micro Kernel	
2	MODULE 2: Process Management		
	1	Processes: Process Concept–The Process, Process State , Process Control Block	12
	2	Process Scheduling–Schedulers, Context Switch-CPU Scheduling: Basic Concepts–CPU scheduler	
	3	Pre-emptive and non pre-emptive scheduling, Dispatcher-Scheduling criteria	
	4	Scheduling algorithms–FCFS, SJFS, Priority Scheduling, Round Robin	
		Scheduling	
3	MODULE 3: Deadlock, Memory Management and Disk Scheduling		**12**

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

4	MODULE 4: Introduction to Linux and basic commands		
	1	History of Unix and Linux, Linux Overview, Processes in Linux	12
	2	Memory management in Linux, I/O in Linux, Linux file system, security in Linux	
	3	Linux commands: pwd, cd, absolute and relative paths, ls, mkdir, rmdir, , chmod nice-**Package Management)-** apt update apt upgrade apt update apt upgrade apt install package apt remove package	
	4	vi editor, security by file permissions	

5	**Teacher Specific Module**	
	Directions	
	Installation of OS **Practice various linux commands in lab**	12

Essential Readings:

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

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

3. "Operating Systems: Internals and Design Principles" by William Stallings.
4. "The Linux Programming Interface: A Linux and UNIX System Programming Handbook" by Michael Kerrisk.

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

Suggested Readings:

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

Assessment Rubrics:

Evaluation Type		**Marks**	**Evaluation Type**		**Marks**	**Total**
Lecture		**70**	**Practical**		**0**	
a)	**ESE**	**70**	a)	**ESE**	**0**	
b)	**CCA**	**30**	b)	**CCA**	**0**	**100**

V SEMESTER

KU5DSCCSC 301 : SOFTWARE ENGINEERING

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
5	DSC	300-399	KU5DSCCSC301	4	60

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

Course Description:

The course provide experience on various processes used in Software industry for the development of a software product. The course enable attain knowledge in testing and maintenance of software products.

Course Prerequisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Identify various phases of software development.	U
2	Select appropriate process model depending on the user requirements.	A
3	Identify various processes used in all the phases of the product.	U
4	Design software projects	A

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

Mapping of Course Outcomes to PSOs

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

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1		**INTRODUCTION TO SOFTWARE ENGINEERING**	12
	1	a)Program and Software	
		b) Definition, program versus software	
		c) software process	
	2	software characteristics	
	3	a) Product and Process	
		b) brief introduction about product and process	
		c) software process and product matrices	
	4	Software life cycle models – Definition, selection of the life cycle model	
		a) waterfall model	
		b) increment process model	
		c) evolutionary process model	

	SOFTWARE REQUIREMENT ANALYSIS AND SPECIFICATION		
	1	a)Requirements engineering,	

		b)types of requirements	12
	2	feasibility studies	
	3	a) requirement elicitation	
		b) requirement elicitation	
		c) various steps of requirement analysis	
	4	a) requirement documentation	
2		b) requirement validation	

3	**SOFTWARE DESIGN**		
	1	a) Definition and various types of design	12
		b) Objectives and importance of design phase	
	2	a) modularity	
		b) strategy of design	
	3	a) Function-oriented design. Objected Oriented Design – Analysis, design concept	
		b) design notations and specifications, design methodology	

4	**SOFTWARE TESTING**		
	1	a)What is testing?, Why should we test?, who should do testing	12
		b) Test case and Test suit	
	2	a)verification and validation definition and comparison	
		b)alpha beta and acceptance testing, functional testing	
		c)techniques to design test cause effect	
		d)cases Boundary value analysis, equivalence class testing, decision table based testing,	
	3	a) graphing techniques	
		b)structural testing, path testing, cyclomatic complexity, mutation testing, levels of testing, unit testing, integration testing, system testing, validation testing	

5	**Teacher Specific Module**	
	Assignmet to implement various software development life cycle to develop a sample software model	

		12

Essential Readings:

1. Software Engineering (Third Edition), K K Aggarwal, Yogesh Singh, New age International Publication
2. An integrated approach to software Engineering (Second Edition), Pankaj Jalote, Narosa Publishing House -
3. Software Engineering (Seventh edition), Ian Sommerville – Addison Wesley.

Assessment Rubrics:

Evaluation Type		**Marks**	**Evaluation Type**		**Marks**	**Total**
Lecture		**70**	**Practical**		**0**	
a)	**ESE**	**70**	a)	**ESE**	**0**	
b)	**CCA**	**30**	b)	**CCA**	**0**	**100**

KU5DSCCSC302: PYTHON PROGRAMMING

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
5	DSC	300-399	KU5DSCCSC302	4	75

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
3	2		35	65	100	1.5hrs.

Course Description:

This course includes an overview of the various tools available for writing and running Python, and gets students coding quickly. It also provides hands-on coding exercises using commonly used data structures, writing custom functions, and reading and writing to files.

Course Prerequisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Identify basic features of python	U
2	Implement OOPs concepts in programming	A
3	Use Arrays, and Data structures in programming	A/An
4	Implement database connectivity in programming	A/An
5	Create an application with the support of graphics in Python	U/C

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

Mapping of Course Outcomes to PSOs

PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO6	PSO 7	

CO 1	3	2	3	2			
CO 2	3	3	3	2	2		
CO 3	2	3	3		2		
CO 4	2	3	3				
CO 5	3	3	3				2

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1	**BASIC ELEMENTS AND CONTROL STATEMENTS**		15
	1	a) Features of Python, Different Methods to Run Python,	
		b) Basic Elements (Objects, Expressions, Numerical Types, Strings, Variables)	
		c) Comments, Indentation in Python	
		d) Input and Output in Python	
	2	Import function	
	3	a) Branching (if, else, elif)	
		b) Iteration (while, for)	
		c) Range and enumerate functions	
	4	a)Tuples, Lists, Sets, Dictionaries	
		b)Built-in methods of lists	
		c)Sets and dictionaries	
		d)Mutable and Immutable Objects	
	FUNCTIONS, MODULES AND EXCEPTION HANDLING		
	1	c)Functions Definition, Function Calling, Function Arguments (Required, Keyword, Default)	

		d)Recursion	15
	2	a) Modules, Built-in Modules	
		b) Creating Modules	
	3	d) File Handling	
		e) Opening, Closing, Writing and Reading files	
2	4	c) Exceptions	
		d) Built-in Exceptions (IndexError, OverflowError, ZeroDivisionError, RuntimeError)	
		e) Exception Handling	

3	**OBJECT ORIENTED PROGRAMMING, NUMPY ARRAYS AND DATA VISUALIZATION**		
	1	a)Class Definition	15
		b)Object Creation	
		c)Built-in Attribute Methods	
		d)Object Oriented Programming Features of Python	
	2	c) Arrays in Python	
		d) Numpy Module, ndarray, Creating Arrays (array, zeros, ones, empty, linspace, arrange, random)	
	3	c) Two-Dimensional Array, Indexing, Slicing, Iterating, Copying, Splitting	
		d) Shape Manipulation (reshape, transpose, resize)	
		e) Arithmetic Operations on Arrays	
	4	a) Data Visualization in Python matplotlib Module, pyplot, plot(), scatter, bar charts, Formatting, figure(), subplot(), text(), xlabel(), ylabel(), title(),	
		b) Plotting Simple Mathematical Functions (sin x, x^2)	

4	**CONNECTING TO DATABASE AND GUI PROGRAMMING**		
	1	a)Connecting to a Database	15
		b)Basic Operations on Database (Crater, Insert, Update, Delete)	
		c)Fetching Data from a Database	
	2	e)Transaction Control	
	3	c)GUI Programming using Tkinter	

		d)Tkinter Widgets (Label, Message, Entry, Text, Button, tkMessagebox, RadioButton, Checkbutton, Listbox, Menu, Menubutton, Scale, Scrollbar, Canvas)	
		e)Layout Managers	

5	**Teacher Specific Module**	
	Directions	
	1. Write a program to perform basic arithmetic operations (addition, subtraction, multiplication, division) on two numbers. **2. Develop a function that determines if a given year is a leap year.** **3. Write a program that reverses a number and calculates the sum of its digits.** **4. Develop a function to check if a given string is a palindrome.** **5. Perform operations like removing duplicates, finding the second-largest element, and reversing a list without using the reverse() method.** **6. Implement a class to calculate the area and perimeter of a rectangle..** **7. Write programs to perform linear and binary search on a list of numbers.** **8. Write a program to read from and write to text files.** **9. Develop a program to perform matrix multiplication.** **10. Develop a class to simulate a bank account with methods to deposit, withdraw, and check balance.**	15

Essential Readings:

1. Taming Python By Programming, Dr. Jeeva Jose, Khanna Publishing
2. Introduction to Computation and Programming Using Python with Application to Understanding Data - John V. Guttag, PHI (2016)
3. Introduction to Computer Science using Python - Charles Dierbach, Wiley (2015)

Reference Links:

1. https://www.numpy.org/devdocs/user/quickstart.html
2. https://matplotlib.org/users/pyplot_tutorial.html
3. https://www.tutorialspoint.com/python/
4. https://docs.python.org/3/tutorial/index.html

Assessment Rubrics:

Evaluation Type	Marks	Evaluation Type	Marks	Total

Lecture			**75**	**Practical**			**25**	**100**
a)	**ESE**		**50**	a)	**ESE**		**15**	
					Program code and execution		**8**	
					Output		**3**	
					Viva		**2**	
					Modification		**2**	
b)	**CCA**		**25**	b)	**CCA**		**10**	
	i	Test Paper	5		i	Punctuality	3	
		Model exam	10					
	ii	Assignment/ Book- Article review /field report	5		ii	Model exam	4	
	iii	Seminar/ Viva-Voce	5		iii	Record	3	

KU5DSCCSC 303 : WEB TECHNOLOGY

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
5	DSC	300-399	KU5DSCCSC303	4	75

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
3	2	-	35	65	100	1.5 Hrs

Course Description:

Web technology refers to the means by which computers communicate with each other using mark-up languages and multimedia packages. It gives us a way to interact with hosted information, like websites. Web technology involves the use of hypertext mark-up language (HTML) and cascading style sheets (CSS).

Course Prerequisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Discuss various components in web technology and WWW	U
2	Use HTML Forms and CSS Styling in designing documents.	U,A
3	Develop interactive Webpages using Javascript	U, A, C
4	Design a web document with server-side scripting using PHP	U, A, C
5	Identify the basics of AJAX	U

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

Mapping of Course Outcomes to PSOs

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

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1	MODULE1: Introduction to Web		
	1	Introduction to Internet and WWW, Evolution of the Internet and World Wide Web, Web Basics	15
	2	Static Vs Dynamic web pages, Client-Side Scripting versus Server-Side Scripting, World Wide Web Consortium (W3C)	
	3	Web hosting, Types of web hosting, Hosting Space	
	4	Domain Name Registration, Free Hosting, Responsive Web designing	
2	MODULE 2: Introduction to HTML and CSS		
	1	Introduction to HTML, Editing HTML5, W3C HTML5 Validation Service, Headings, Linking, Images, Special Characters and Horizontal Rules	15
	2	Lists, Tables, Forms, HTML5 Form Input types, input and data list Elements and autocomplete Attribute, Frames and frameset	
	3	Introduction to Cascading Style Sheets(CSS)- Concept of CSS ,Creating Style Sheet , CSS Properties ,CSS Styling(Background, Text Format, Controlling Fonts), CSS Id and Class	

	4	Working with block elements and objects ,Working with Lists and Tables	

3	MODULE 3: Scripting with JavaScript		**15**
	1	Introduction to JavaScript , operators	
	2	Arrays-declaring and allocating arrays, examples using arrays	
	3	Functions-Function Definitions, Notes on Programmer-Defined Functions, scope rules and recursion,	
	4	Document Object Model, Objects-math, string and date objects, dialog boxes	

4	MODULE 4: PHP and Ajax Enabled Rich Internet Applications		
	1	Introduction to PHP Evaluation of Php, Basic Syntax, Defining variable and constant, Php Data type, Operator and Expression	*15*
	2	Function What is a function, Define a function, Array -Creating index based and Associative array Accessing array, Element Looping with Index based array	
	3	Looping with associative array using each () and foreach(), Handling Html Form with Php Capturing Form, Data Dealing with Multi-value filed	
	4	Introduction to AJAX, Traditional Web Applications vs. Ajax Applications, Traditional web applications, Ajax applications, Rich Internet Applications (RIAs) with Ajax, History of Ajax	

5	**Teacher Specific Module**		
	Directions		
	Sample Lab List		15
	1. Create a webpage with HTML describing your department. Use paragraph and list tags. Apply various colours to suitably distinguish key words. Also apply font styling like italics, underline and two other fonts to words you find appropriate. Also use header tags. Insert appropriate images. 2. Design a webpage showing the mark list of student.		

3. Design a website for your college .Include frames, links, and lists.
4. Design a Registration form.
5. Write a javascript code using functions to perform arithmetic operations two numbers
6. Write a javascript code to sort and reverse array elements
7. Javascript code to find the factorial of a number using recursion.
8. Javascript code to show the working of math object (Use at least 3 math functions).
9. Javascript code to display the current date and time
10. Javascript code to illustrate Dialog boxes

Essential Readings:

1. Internet & World Wide Web How to Program, 5/e – Paul J Deitel, Harvey M Deital, AbbaeyDeital
2. Julie C. Meloni, HTML and CSS in 24 Hours, Sams Teach Yourself (Updated for HTML5 and CSS3), Ninth Edition
3. Javascript The Definite Guide David Flanagan OR'EILLY
4. Programming in PHP, O'Reilly

Suggested Readings:

1. Mastering HTML, CSS &Javascript Web Publishing Paperback,2016 - by Laura Lemay, Rafe Colburn & Jennifer Kyrnin , BPB Publications
2. HTML & CSS: The Complete Reference, Fifth Edition - Thomas a Powell, Tata McGraw Hill

Assessment Rubrics:

Evaluation Type		**Marks**	**Evaluation Type**		**Marks**	**Total**
Lecture		**75**	**Practical**		**25**	
a)	**ESE**	**50**	a)	**ESE**	**15**	

					Program code and execution		**8**	**100**
					Output		**3**	
					Viva		**2**	
					Modification		**2**	
b)	**CCA**		**25**	b)	**CCA**		**10**	
	i	Test Paper	5		i	Punctuality	3	
		Model exam	10					
	ii	Assignment/ Book- Article review /field report	5		ii	Model exam	4	
	iii	Seminar/ Viva-Voce	5		iii	Record	3	

KU5DSCCCSC 304 : DATABASE ADMINISTRATION

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
5	DSC	300 -399	KU5DSCCSC304	4	75

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
4	0		35	65	100	1.5 Hrs

Course Description:

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

Course Prerequisite: Nil

Course Outcomes:

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

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

Mapping of Course Outcomes to PSOs

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

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1		**MODULE TITLE: Advanced SQL**	15
	1	Transactional Control: Commit, Save point, Rollback	
	2	DCL commands : Grant and Revoke	
	3	Types of locks -Row level locks -. Table level locks-. Shared lock -. Exclusive lock - Deadlock	
	4	Synonym : Create synonym(views) -Sequences	
	5	Create and alter sequences Index : Unique and composite - Views : Create/Replace, Update and alter views	

2		**MODULE TITLE: Database Design And Implementation**	15
	1	Database Application Life Cycle - Conceptual Database application	

	2	Design -Retrieve transaction -Update Transaction - Mixed Transaction	
	3	Logical and Physical Database Design - Response Time	
	4	Space Utilization - Transaction Throughput	

3	**MODULE TITLE: Transaction Processing**		**15**
	1	Transaction concepts - Concurrency	
	2	Methods for Concurrency control	
	3	Locking Methods -Timestamp methods - Optimistic methods	

4	**MODULE TITLE :Database Administrator**		
	1	Types of Database Users- User Creation and management	15
	2	Tasks of a Database Administrator- Submitting Commands and SQL to the Database	
	3	About Database Administrator Security and Privileges -Database	
	4	Administrator Authentication - Creating and Maintaining a Password File - Data Utilities	

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

Essential Readings:

1. Database Systems Concepts, design and Applications

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

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

3. Database System Concepts, Korth, Henry MGH

Assessment Rubrics:

Evaluation Type	Marks	Evaluation Type	Marks	Total

Lecture		**70**	**Practical**		**0**	
a)	**ESE**	**70**	a)	**ESE**	**0**	
b)	**CCA**	**30**	b)	**CCA**	**0**	**100**

DISCIPLINE SPECIFIC ELECTIVE
KU5DSECSC 301: COMPILER DESIGN

Semester	Course Type	Course Level	Course Code		Credits	Total Hours
5	DSE	300-399	KU5DSECSC301		4	60
Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
4	0		30	70	100	2hrs.

Course Description:

This course deals with the basic techniques of Compiler Construction and tools that can used to perform Syntax-directed translation of a high-level programming language into an executable code. This will provide deeper insights into the more advanced semantics aspects of programming languages, code generation, machine independent optimizations, dynamic memory allocation, types and their inferences.

Course Prerequisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Identify different phases and passes of the compiler	U
2	Examine the parser and its types	A
3	Implement the compiler using syntax-directed translation method and get knowledge about the synthesized and inherited attributes.	A

4	Describe run time data structure like symbol table organization and different techniques used in it.	U

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

Mapping of Course Outcomes to PSOs

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

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1	**MODULE TITLE**		12
	1	INTRODUCTION TO COMPILING	
		a) Compilers	
		b) Analysis of the Source program	
	2	a)phases of a compiler	
		b) grouping of phases	
	3	cousins of the compiler	
	4	compiler construction tools.	

2	**MODULE TITLE: LEXICAL ANALYSIS**		
	1	Role of Lexical Analyzer	
	2	Input buffering	
	3	Specification of tokens	12
	4	recognition of tokens	

	5	Finite Automata	

3	**MODULE TITLE: SYNTAX ANALYSIS**		
	1	The role of a Parser	12
	2	context free grammars	
	3	Top down parsing	
		a)Recursive Descent Parsing	
		b)Predictive Parsers	
	4	a)bottom up parsing,	
		b)shift reduce parsing	
		c)operator precedence parsing.	

4	**MODULE TITLE: CODE GENERATION & OPTIMIZATION**		
	1	Symbol table, Intermediate languages,	12
	2	Issues in the design of code generator	
		a) the target machine	
		b) basic blocks and flow graphs	
	3	a)peep-hole optimization	
		b) principal sources of optimization	
		c)optimization of basic blocks	
		d)Loops in flow graphs	

5	**Teacher Specific Module**	
	Directions	
	Discussion on application of various algorithms in real life.	12

Essential Readings:

1. Alfred V Aho, Ravi Sethi& Jeffrey D Ullman, "Compilers- Principles, Techniques and Tools", Pearson education

Suggested Readings:

5. Parag H Dave, Himanshu B Dave, Compilers –Principles and Practice
6. KVN Sunitha,Compiler Construction, Pearson Education

Assessment Rubrics:

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

KU5DSECSC302: DESIGN AND ANALYSIS OF ALGORITHMS

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
5	DSE	300-399	KU5DSECSC302	4	60

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

Course Description:

This course introduces basic methods for the design and analysis of efficient algorithms emphasizing methods useful in practice. Different algorithms for a given computational task are presented and their relative merits evaluated based on performance measures. The following important computational problems will be discussed: sorting, searching, elements of dynamic programming and greedy algorithms.

Course Prerequisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Compare the complexity of algorithm.	A
2	Identify various programming Paradigm.	U/A
3	Design the appropriate Algorithm for a given problem.	A
4	Use the various types of Algorithms to develop programmes	A/An

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

Mapping of Course Outcomes to PSOs

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

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1	**MODULE TITLE:** Algorithm Analysis:		
	1	Algorithm, Properties of a good algorithm, efficiency considerations, Complexity: Time and Space complexity	12
	2	Asymptotic notations: Big O notations, best case, worst case, average case, simple examples	
	3	recursion and its elimination- recursive and no-recursive algorithms for binary search.	
2	**MODULE TITLE:** Algorithm design techniques		
	1	Divide and conquer method: binary search as a divide-and conquer algorithm, finding maximum and minimum, ,	
	2	Strassen's matrix multiplication, Greedy method:	12
	3	Knapsack problem, minimum cost spanning trees	
	4	Prim's algorithm, Kruskal's algorithm	
3	**MODULE TITLE:** Dynamic programming		
	1	principle of optimality, all pair shortest paths, single source shortest path.	12
	2	Travelling salesperson's problem, Back tracking	
		Implicit constraints and explicit constraints	

	3	N queen problem, Branch and bound: LC search.	

4	**MODULE TITLE :** Standard Algorithms		
	1	Sorting-quicksort, merge sort, complexity of sorting algorithms, ,	
	2	Deterministic and non-deterministic algorithms	12
	3	NP- hard and NP complete- basic concepts.	

5	**Teacher Specific Module**	
	Directions	
	Teacher can supplement advanced algorithms in Machine learning t which are used in AI based technologies and applications	12

Essential Readings:

1. Ellis Horowitz, Sartaj Sahni, S Rajasekharan–Computer Algorithms/C++- Second Edition, Universities press, 2008 (Paperback Edn)

Suggested Readings:

1. Introduction to the design and Analysis of Algorithms, Anany Levitin, 2nd Edn, Pearson education.
2. The design and analysis of computer Algorithms Alfred V Aho John E Hopcroft Pearson Education.
3. Algorithm Design, Foundation, Analysis and Examples, Dr. Vijayakumar and Dr. Juby Mathew, Vimala Publications

Assessment Rubrics:

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

c)	Assignment- 2 Numbers	10
d)	Seminar	5
e)	Book/ Article Review	
f)	Viva-Voce	
g)	Field Report	
Total		**100**

KU5DSECSC 303 :ARTIFICIAL INELLIGENCE AND MACHINE LEARNING

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
5	DSE	300-399	KU5DSECSC303	4	60

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

Course Description:

This course serves as an introduction to the fascinating and rapidly evolving field of Artificial Intelligence (AI) and Machine Learning (ML). Designed for students with varying levels of background knowledge, the course provides a comprehensive overview of fundamental concepts, techniques, and applications in AI and ML.

Course Prerequisite: NIL
Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Discuss the concept of Artificial Intelligence and problem solving	U
2	Identify advanced problem solving paradigms and knowledge representation.	U /An
3	Describe the basic machine learning concepts	U
4	Relate how neural networks are used to solve various classification problems.	A/E
5	Examine deep neural networks and its applications.	A/E

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

Mapping of Course Outcomes to PSOs

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

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1	**MODULE TITLE: introduction to artificial intelligence**		12
	1	Introduction To Artificial Intelligence: Definition – Future of Artificial Intelligence	
	2	Intelligent Agents: Agents and Environments, The Concept of Rationality, The Nature of Environments, The structure of Agents	

	3	Problem solving by Searching: Heuristic search and state space search	
	4	Techniques for Heuristic Search, State Space Search	
	5	Applications of Search Techniques in Game Playing- Minimax strategy and Alpha Beta Pruning, and Planning	
2	**MODULE TITLE: Knowledge Representation**		
	1	Knowledge Representation: Logical Agents	
	2	Propositional and first order Predicate logic	12
	3	Using First-order logic, Inference in First-order logic, forward and Backward Chaining	
	4	Probabilistic reasoning	
3	**MODULE TITLE : Introduction to Machine Learning**		
	1	Concept of learning, different types of learning; supervised learning, unsupervised learning, reinforcement learning- Measuring classifier performance, Confusion matrix	12
	2	Supervised Learning: Introduction, SVM, learning multiple classes, model selection and generalization, linear regression and feature selection, Bayesian and Decision Tree learning.	
	3	Unsupervised Learning: Introduction, clustering; mixture densities, kmeans clustering, expectation maximization algorithm, spectral and hierarchical clustering	
	4	Dimensionality reduction; principal component analysis	
4	**MODULE TITLE: Introduction to Artificial Neural Network**		
	1	Understanding brain, perceptron, Multi-Layer perceptron, general architecture of artificial neural network, feed forward and backpropagation,	12
	2	Linear and nonlinear activation functions for binary and multi class classification.	
	3	Introduction to Deep Learning: Fundamentals of deep learning, Existing Deep neural networks, Regularization for Deep Learning, Optimization for Training Deep Models	
	4 Introduction to Convolutional Networks, Classification and segmentation using CNN, Sequence Modelling using Recurrent Nets, overview of LSTM, Generative adversarial network.		

5	**Teacher Specific Module**	
	Directions	
	Teacher can adopt suitable methodologies and evaluation metrics to identify real world problems connected with the topics.	12

Essential Readings:

1. Russell, S. and Norvig, P, Artificial Intelligence: A Modern Approach, Third Edition, Prentice-Hall
2. Artificial Intelligence, E Rich, K Knight, and S B Nair Tata Mc-Graw Hill 3rd Ed
3. Pattern Recognition and Machine Learning" by Christopher M. Bishop:
4. Deep Learning" by Ian Goodfellow, Yoshua Bengio, and Aaron Courville

Suggested Readings:

1. Duda, Richard, Peter Hart, and David Stork. Pattern Classification. 2nd ed. New York, NY: Wiley-Interscience, 2000. ISBN: 9780471056690.
2. Hastie, T., R. Tibshirani, and J. H. Friedman. The Elements of Statistical Learning: Data Mining, Inference and Prediction. New York, NY: Springer, 2001. ISBN: 9780387952840.
3. MacKay, David. Information Theory, Inference, and Learning Algorithms. Cambridge, UK: Cambridge University Press, 2003. ISBN: 9780521642989.
4. Mitchell, Tom. Machine Learning. New York, NY: McGraw-Hill, 1997. ISBN: 9780070428072.
5. https://www.andrewng.org/
6. https://www.coursera.org/
7. https://ocw.mit.edu/

Assessment Rubrics:

Evaluation Type	Marks
End Semester Evaluation	**70**

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

KU5DSECSC 304 : INTRODUCTION TO DEEP LEARNING

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
5	DSE	300-399	**KU5DSECSC304**	4	60

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

Course Description:

This course provides an introduction to deep learning, a subset of machine learning that uses neural networks to model complex patterns in data. Students will learn the foundational concepts of deep learning, including neural networks, activation functions ,and optimization algorithms.

Course Prerequisite: knowledge in Basic Statistics & Mathematics

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Identify the basic concepts and principles of deep learning.	U
2	Compare different types of neural networks and their architectures.	A
3	Examine common activation functions and optimization algorithms used in deep learning.	A
4	Solve problems in building and training deep learning models.	A/An

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

Mapping of Course Outcomes to PSOs

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

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1	**MODULE TITLE: Introduction to Deep Learning**		12
	1	What is deep learning?	
	2	History and evolution of deep learning	
	3	Applications of deep learning	
	4	Tools and frameworks for deep learning (TensorFlow, PyTorch)	
2	**MODULE TITLE: Artificial Neural Networks**		12
	1	Basics of artificial neural networks	

2	Perceptron model

	3	Multilayer perceptron (MLP)	
	4	Feedforward and backpropagation	

3	**MODULE TITLE: Convolutional Neural Networks (CNNs)**		**12**
	1	Introduction to CNNs	
	2	Convolutional and pooling layers	
	3	CNN architectures (LeNet, AlexNet, VGG, ResNet)	

4	**MODULE TITLE :** Recurrent Neural Networks (RNNs)		12
	1	Basics of RNNs Long Short-Term Memory (LSTM) and Gated Recurrent Unit (GRU)	
	2	Applications of RNNs (sequence prediction, language modeling	
	3	Optimization Algorithms Gradient descent Stochastic gradient descent (SGD)	
	4	Adam, RMSprop, and other optimization algorithms Learning rate scheduling	

5	**Teacher Specific Module**		
	1. Real-World Applications 2. Case studies and examples of deep learning in image recognition, natural language processing, and other domains 3. conduct discussion on ethical considerations and challenges in deep learning		12

Essential Readings:

1. "Deep Learning" by Ian Goodfellow, Yoshua Bengio, and Aaron Courville

2. Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow" by Aurélien Géron
3. Introduction to Deep Learning By Eugene Charniak - Online resources, research papers, and tutorials

Assessment Rubrics:

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

KU5DSECSC305: BASICS OF IMAGE PROCESSING

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
5	DSE	300 -399	**KU5DSECSC305**	4	60

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

Course Description:

This course provides an introduction to the principles and techniques of digital image processing. It covers the basics of digital images, including their representation and types, as well as fundamental steps in image processing such as acquisition, enhancement, restoration, and compression. The course also explores digital image fundamentals, including visual perception, sampling, quantization, and pixel representation. Additionally, students will learn about basic mathematical tools used in image processing, such as matrix operations, arithmetic operations, logical operations, and geometric operations.

Course Prerequisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Distinguish between different types of images and image file formats.	U,A

2	Identify fundamental steps in digital image processing, including image acquisition, enhancement, restoration, and compression.	U, A

3	Discuss digital image fundamentals, including elements of visual perception, image sampling, quantization, and pixel representation.	U
4	Develop proficiency in basic mathematical tools used in image processing, such as matrix operations, arithmetic operations, logical operations, and geometric operations.	A
5	Use various image enhancement techniques, including spatial domain methods, spatial filtering, frequency domain methods, and noise reduction techniques.	A

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

Mapping of Course Outcomes to PSOs

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

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
I		**INTRODUCTION TO IMAGE PROCESSING**	
	1	**Basics of Digital Images**	12
		a) Definition and representation of digital images	
		b) Types of images, image file format	

	2	**Fundamental Steps in Digital Image Processing**	
		a)Image Acquisition, image enhancement, image restoration, image compression	
	3	**Digital Image Fundamentals**	
		a) Elements of visual perception	

		b) Image Sampling and Quantization, Pixel representation and intensity values	
	4	**Basic Mathematical Tools Used in Image Processing**	
		a) Matrix operations: Addition, Subtraction	
		b) Arithmetic operations, Logical operations	
		c) Geometric operations (translation, scaling, rotation)	

2	**IMAGE ENHANCEMENT TECHNIQUES**		
	1	**Spatial Domain Methods**: Point processing**,** Histogram-based techniques	12
	2	**Spatial Filtering:** Smoothing ,Sharpening	
	3	**Frequency Domain Methods:** Fourier transform and its properties	
	4	**Noise Reduction:** Types of noise, Techniques for noise reduction	

3	**IMAGE TRANSFORMATION AND RESTORATION**		
	1	**Image Transformations:** Discrete Fourier Transform (DFT),Discrete Cosine Transform (DCT),Wavelet Transform	12
	2	**Image Compression**	
		a) Lossless compression	
		b) Lossy compression	
		c) Performance metrics	
	3	**Image Restoration, Morphological Processing**	

4	**IMAGE COMPRESSION**		
	1	*Image Segmentation And Representation*	12
		a) Segmentation Techniques	
	2	**Feature Extraction**	
		a) Texture analysis	
		b) Shape descriptors	
	3	**Image Representation**	

		a) Boundary representation, Region representation, Segmentation based representation	
5	**Teacher Specific Module**		
	Directions		
	Discussion on application s of image processing in healthcare and its pros and corns		12

Essential Readings:

1. Gonzalez, R. C., & Woods, R. E. Digital Image Processing. Pearson Education.
2. Pratt, W. K. (2007). Digital Image Processing: PIKS Scientific Inside. WileyInter science.
3. Jain, A. K. (1989). Fundamentals of Digital Image Processing. Prentice-Hall.
4. Russ, J. C. (2011). The Image Processing Handbook. CRC Press.

Suggested Readings:

1. Sonka, M., Hlavac, V., & Boyle, R. (2014). Image Processing, Analysis, and Machine Vision. Cengage Learning.
2. Umbaugh, S. E. (2010). *Digital Image Processing and Analysis: Human and Computer Vision Applications with CVIPtools*. CRC Press.

Assessment Rubrics:

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

Total	**100**

KU5DSECSC306: BIG DATAANALYTICS

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
5	DSE	300-399	KU5DSECSC306	4	60

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

Course Description:

In the age of big data, data science (the knowledge of deriving meaningful outcomes from data) is an essential skill that should be equipped by software engineers. It can be used to predict useful information on new projects based on completed projects. This course provides a practitioner's approach to some of the key techniques and tools used in Big Data analytics. Knowledge of these methods will help the students to become active contributors to the field of Data Science and Big Data Analytics

Course Prerequisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Discuss on predictive modeling techniques for data analytics	U
2	Use data preprocessing techniques for big data	A
3	Demonstrate the performance of data classification and regression models	A

4	Implement the use of Classification Trees and Rule-Based Models in big data analytics project	A

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

Mapping of Course Outcomes to PSOs

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

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1	PREDICTIVE MODELS		**12**
	1	Process, Data Pre-processing.	
	2	Data Transformations.	
	3	Over-Fitting and Model Tuning.	
	4	Data Splitting, Resampling Techniques.	
	MEASURING PERFORMANCE IN REGRESSION MODELS		12
2	1	The Variance-Bias Trade-off.	
	2	Penalized Models, Nonlinear Regression Models.	
	3	Linear Regression for Solubility Data, Multivariate Adaptive Regression. Splines	
	4	Support Vector Machines, K-Nearest Neighbors.	
3	DISCRIMINANT ANALYSIS AND OTHER LINEAR CLASSIFICATION MODELS		
	1	Linear Discriminant Analysis	12
	2	Partial Least Squares Discriminant Analysis.	

	3	Nearest Shrunken Centroids, Nonlinear Discriminant Analysis.	
	4	Flexible Discriminant Analysis.	

4	MEASURING PERFORMANCE IN CLASSIFICATION MODELS		
	1	Class Predictions.	12
	2	Class Probabilities, Evaluating Predicted Classes.	
	3	Two-Class Problems, Evaluating Class Probabilities.	
	4	Receiver Operating Characteristic (ROC) Curves.	

5	**Teacher Specific Module**	
	Assignments and seminars on Bigdata applications	

Essential Readings:

1. Max Kuhn and Kjell Johnson, Applied Predictive Modeling, Springer 2013,2nd printing 2018 edition

2. AnkamVenkat, Big Data Analytics, Packt Publishing Limited, Birmingham, UK, 2016

3. EMC Education Services, Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data, Wiley; 1st edition (2015)

4. Hadley Wickham, Garrett Grolemund, R for Data Science: Import, Tidy, Transform, Visualize, and Model Data, Shroff/O'Reilly; First edition (2017)

5. Joel Grus, Data Science from Scratch, Shroff , O'Reilly Media (2015)

6. James D. Miller, Statistics for Data Science, Packt Publishing Limited (2017) 7. Thomas Rahlf, Data Visualisation with R: 100 Examples, Springer, 1st ed. (2017

7. **Assessment Rubrics:**

Evaluation Type		**Marks**
End Semester Evaluation		**70**
Continuous Evaluation		**30**
a)	Test Paper- 1	5
b)	Model Examination	10
c)	Assignment- 2 Numbers	10
d)	Seminar	5

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

SEMESTER 6

KU6DSCCSC305:DATA COMMUNICATION AND COMPUTER NETWORKING

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
6	DSC	300-399	KU6DSCCSC305	4	60

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

Course Description:

The course data communication refers to the exchange of data between two or more networked or connected devices. The topics in this course include networking principles, Transmission Control Protocol/Internet Protocol, naming and addressing (Domain Name System), data encoding/decoding techniques, link layer protocols, routing protocols, transport layer services, congestion control, quality of service, network services, and Software Defined Networks.

Course Prerequisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Explain the basics of data communication, networking, internet and their importance	U
2	Identify the services and features of various protocol layers in data networks.	R/ U

3	Differentiate wired and wireless computer networks	R/U/A
4	Describe TCP/IP and their protocols.	U/A
5	Recognize the different internet devices and their functions.	U/A

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

Mapping of Course Outcomes to PSOs

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

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1	**MODULE TITLEIntroduction to data communication**		
		a) Ccomponents of data communication	12
	2	b) Network Transmission media- Guided media, Unguided media. Synchronous	
		c) Asynchronous data transmission. – Simplex, Half duplex, Duplex communication	
	3	Network topologies – star, Bus, ring, Mesh. , ,	
		a) Computer networks	
		b) Use	
	4	Hardware, network structure	
		a) point to point connection	
		b) multicast, broadcast	

		c) classification of networks-LAN, WAN, MAN	

2	**MODULE TITLE: Reference models**		
	1	The OSI reference model, TCP / IP reference model.	
	2	Comparison between OSI and TCP / Ip models.	12
	3	Data Link Layer, Design issues,	
	4	Services to network layer	
	5	Framing- character count, character stuffing, bit stuffing, physical layer coding violation	
	6	Error control, flow control,	
	7	Elementary data link protocols- unrestricted simplex protocol	
	8	simplex stop and wait protocol, simplex protocol for a noisy channel	

3	**MODULE TITLE: Network layer**		
	1	Design issues, services to the transport layer,	12
	2	a)Routing algorithms- adaptive, Non-adaptive algorithms	
		b) optimality principle, dijkstras shortest path routing algorithm,	
		c) flow-based routing, hierarchical routing	
	3	congestion control algorithms–the leaky bucket algorithm, the token bucket algorithm.	

4	**MODULE TITLE : Transport layer,**		
	1	Design issues , connection management-addressing	
		a) Establishing and releasing connection,	

	2	Transport layer protocols- ,	12
		a) TCP	
		b) UDP	
	3	Application layer – Basic Idea of telnet,	
		a) ftp, http, smtp, pop3	

5	**Teacher Specific Module**	
	Directions	
	Hands on training to identify and connect network devices. *Discussion on network issues in various design layers while communication*	12

Essential Readings:

1. Computer Networks, Andrew S. Tanenbaum& David J. Wetherall, Pearson

Suggested Readings:

7. Data Communication and Networking, Behrouz A. Forouzan, McGraw Hill Education.

8. Achyut S. Godbole and AtulKahate, Data communication and Networks, 2nd Ed, McGraw Hill
9. Computer Networking: A Top-Down Approach, Kurose James F. and Ross Keith W., Pearson.
10. R. S. Rajesh, K. S. Easwara Kumar and R. Balasubramanian, Computer Networks Fundamentals and Applications, Vikas Publishing House.

Assessment Rubrics:

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

c)	Assignment- 2 Numbers	10
d)	Seminar	5
e)	Book/ Article Review	
f)	Viva-Voce	
g)	Field Report	
Total		**100**

KU6DSCCSC 306 : COMPUTER ORGANISATION AND ARCHITECTURE

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
6	DSC	300-399	KU6DSCCSC306	4	60

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

Course Description:

This course introduces the principles of computer organization and the basic architecture concepts. The course emphasizes performance and cost analysis, instruction set design, pipelining, memory technology, memory hierarchy, virtual memory management, and I/O systems.

Prerequisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Identify various components of computer and their interconnections	U
2	Identify basic components and design of the CPU: the ALU and control unit	U
3	Compare and select various Memory devices as per requirement	U/A
4	Compare various types of IO mapping technique	A

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

Mapping of Course Outcomes to PSOs

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

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1	**MODULE TITLE**: STRUCTURE OF COMPUTERS		**12**
	1	Computer types, Functional units, Basic operational concepts, VonNeumann Architecture.	
	2	Bus Structures, Software, Performance, Multiprocessors and Multicomputer	
	3	Data representation, Fixed and Floating point	
	3	Error detection and correction codes	

2	**MODULE TITLE:** BASIC COMPUTER ORGANIZATION AND DESIGN		**12**
	1	Instruction codes, Computer Registers, Computer Instructions and Instruction cycle.	
	2	Timing and Control, Memory-Reference Instructions, Input-Output and interrupt	
	3	Central processing unit: Stack organization, Instruction Formats,	
		Service providers, challenges and risks in cloud adoption.	
	4	Addressing Modes, Data Transfer and Manipulation.	

	5	Complex Instruction Set Computer (CISC) Reduced Instruction Set Computer (RISC), CISC vs RISC	

3	**MODULE TITLE :** REGISTER TRANSFER AND MICROOPERATIONS:		**12**
	1	Register Transfer Language, Register Transfer, Bus and Memory Transfers, ,.	
	2	Arithmetic Micro-Operations, Logic Micro-Operations, Shift MicroOperations- Arithmetic logic shift unit	
	3	MICRO-PROGRAMMED CONTROL: Control Memory, Address Sequencing, Micro-Program example, Design of Control Unit.	

4	**MODULE TITLE :** MEMORY SYSTEM		12
	1	Memory Hierarchy, Semiconductor Memories, RAM(Random Access Memory), Read Only Memory (ROM), Types of ROM, Cache Memory, Performance considerations	
	2	Virtual memory, Paging, Secondary Storage, RAID.	
	3	Cloud Computing and Security – Risks in Cloud Computing, Types of Risks,	
	4	Multiprocessors: Characteristics of multiprocessors, Interconnection structures, Inter Processor Arbitration, Inter processor Communication and Synchronization, Cache Coherence.	

5	**Teacher Specific Module**	
	Conduct hands-on sessions to identify various hardware components Assignments and seminars on advanced technologies storage devices.	12

TEXT BOOKS:

1. M. Moris Mano (2006), Computer System Architecture, 3rd edition, Pearson/PHI, India.

REFERENCE BOOKS:

1. Carl Hamacher, Zvonks Vranesic, SafeaZaky (2002), Computer Organization, 5th edition, McGraw Hill, New Delhi, India.
2. William Stallings (2010), Computer Organization and Architecture- designing for performance, 8th edition, Prentice Hall, New Jersy.
3. Anrew S. Tanenbaum (2006), Structured Computer Organization, 5th edition, Pearson Education Inc,
4. John P. Hayes (1998), Computer Architecture and Organization, 3rd edition, Tata

McGrawHill.

Assessment Rubrics:

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

KU6DSCCSC307 SOFTWARE DESIGN AND IMPLEMENTATION

Student of B.Sc. Computer Science Programme shall have to work on a project of FOUR credits under the supervision of a faculty member as per the curriculum. The duration of the project is 6 month and submission of the dissertation at the end of sixth semester. Individual projects are recommended but, in an instance, where the number of supervising teachers is less, the project may be done as group. The maximum number of students in a group shall be limited to THREE.

PROJECT EVALUATION

Evaluation of the Project Work shall be done under Mark System at two stages: 1. Internal Assessment (supervising teachers will assess the project and award internal Marks) 2. External evaluation (external examiner appointed by the University) Marks secured for the project will be awarded to candidates, combining the internal and external Marks. Assessment of different components may be taken as below.

CONTINUOUS EVALUATION FOR PROJECT

COMPONENT	WEIGHTAGE
Punctuality	20%
Relevance of topic System study / Design of tables	20%
Project Report	30%
Presentation & Viva-voce	30%
Total	100

END SEMESTER EVALUATION FOR PROJECT

COMPONENT	WEIGHTAGE
Written Synopsis/Abstract	12.5%
Content of the Project	12.5%
Quality of project work/Use of software/ tools	12.5%
Perfection of the work (Designs of tables/ Input & Output forms)	25%
Live demo	12.5%
Viva-voce	25%
Total	100%

DISCIPLINE SPECIFIC E LECTIVE

KU6DSECSC 307 : DATAMING

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
6	DSE	300-399	KU6DSECSC307	4	75

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

Course Description:

The course enables to preprocess and analyze data, to choose relevant models and algorithms for respective applications and to develop research interest towards advances in data mining

Course P**rerequisite: NIL**

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Understand different types of data to be mined	U
2	Categorize the scenario for applying different data mining techniques	U/A
3	Evaluate different models used for classification and Clustering	U/A
4	Focus towards research and innovation	E

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

Mapping of Course Outcomes to PSOs

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

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

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1	**MODULE TITLE**:: INTRODUCTION AND DATA PREPROCESSING		12
	1	Data Mining – Kinds of data to be mined – Kinds of patterns to be mined.	
	2	Technologies – Targeted Applications - Major Issues in Data Mining	
	3	Data Objects and Attribute Types – Measuring Data similarity and dissimilarity	
	4	Data Cleaning –Data Integration - Data Reduction – Data Transformation – Data Discretization	

2	**MODULE TITLE:** MINING FREQUENT PATTERNS AND ADVANCED PATTERN MINING		**12**
	1	Basic Concepts – Frequent Itemset Mining Methods – Pattern Evaluation Methods	
	2	Pattern Mining in Multilevel, Multidimensional space	
	3	Constraint-Based Frequent Pattern Mining – Mining Compressed or Approximate Patterns	
	4	Pattern Exploration and Application.,	

3	**MODULE TITLE :** CLASSIFICATION TECHNIQUES		**12**
	1	Basic Concepts – Decision Tree Induction – Bayes Classification Methods – Rule-Based Classification —	
	2	Model Evaluation and Selection – Techniques to Improve Classification Accuracy	
	3	Bayesian Belief Networks – Classification by Backpropagation	
	4	Support Vector Machines	

4	**MODULE TITLE :** CLUSTERING TECHNIQUES		12
	1	Cluster Analysis – Partitioning Methods - Hierarchical Methods – Density-Based Methods	
	2	Outlier detection and applications Outliers and Outlier Analysis – Clustering-Based Approach –	
	3	Classification-Based Approach – Mining Complex Data Types	
	4	Data Mining Applications	

5	**Teacher Specific Module**	
	Teacher can supplement additional methodologies and evaluation metrics to appropriate topics.	12

Essential Readings:

9. Jiawei Han, Micheline Kamber and Jian Pie, Data Mining Concept and Techniques, Morgan and Kaufmann Publisher, Third Edition, 2012.
10. Arun K Pujari, Data Mining Techniques, Second Edition, Universities Press India Pvt. Ltd. 2010.

Recommended Reading

1. Daniel T. Larose and Chantal D. Larose, Data Mining and Predictive Analytics, Wiley Series on Methods and Applications in Data Mining, Wiley Publications.
2. Ian H. Witten, Eibe Frank and Mark A. Hall, Data Mining: Practical Machine Learning Tools and Techniques, Morgan and Kaufmann Publisher, Third Edition, 2014.

Web Resources:

[1] https://data-flair.training/blogs/data-mining-tutorial/

[2]https://www.tutorialride.com/data-mining/data-mining-tutorial.htm **Assessment Rubrics:**

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

KU6DSECSC308: LINUX ADMINISTRATION

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
6	DSE	300-399	KU6DSECSC308	4	75

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
3	2	-	35	65	100	1.5 Hrs

Course Description:

Linux system administration is a process of setting up, configuring, and managing a computer system in a Linux environment. System administration involves creating a user account, taking reports, performing backup, updating configuration files, documentation, and performing recovery actions.

Course Prerequisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Discuss basic Linux commands and the file system structure	U
2	Judge the Boot loaders and the configuration files	E
3	Demonstrate different system services and maintenance	U, A
4	Implement Shell Scripting	U, A
5	Demonstrate the steps for Linux installation and System Configuration	U, A

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

Mapping of Course Outcomes to PSOs

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

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1	MODULE1: Introduction to Linux Operating system		
	1	Linux OS: History, Features and benefits of Linux, basic concepts of multi user system ,open source, free Software concepts	15
	2	Types of users in Linux, Types of files. BASICS :login, password, creating an account	
	3	Shell and commands, logout, changing password, files and directories, relative and absolute pathnames, directory tree, current working directory, referring home directory, creating new directories	
	4	Copying files, moving files, deleting files and directories , wild cards, hidden files, cat command	
2	MODULE 2: Vi editor and shell commands		
	1	Vi editor: different modes-command mode, insert mode, last line mode, vi Editing commands – moving within a file, deleting, editing, Copy and Paste Commands, Saving and Closing the file	15
	2	redirecting input/output-filter, pipes. File permissions: user, group, ls command (long listing), changing file permission	
	3	Shell Scripting: Types of shell, Basic shell configuration for bourne and bash shell: /etc/profile, /etc/bashrc, ~/.bash_profile, ~/.bash_login, ~/.profile,~/.bashrc, ~/.bash_logout, ~/.bash_history	
	4	Bourne shell scripts, script execution, variables and parameters, Control structures - Shell if then else, Shell if then elif, Shell for loop, Shell while loop, Shell until loop, Shell case, Shell function.	

3	MODULE 3: Linux Boot process and services		**15**
	1	LILO - boot process, /edc/lilo.conf file, GRUB - /etc/grub.conf file runlevels, rc files, startup scripts.	
	2	Mounting: mounting file systems, structure of /etc/fstab	
	3	Major services in Linux system - init, /etc/inittab file, login from terminal, syslog and its configuration file /etc/syslog.conf, periodic command execution: at and cron, crontab file	
	4	GUI, X windows. Starting and stopping different services – service command	

4	MODULE 4: System Maintenance and Linux Installation		
	1	System Maintenance: tmpwatch command, logrotate utility	15
	2	Backup and Restore: types of backup - full, differential, incremental, cp, tar commands	
	3	Linux Installation: Partitioning, MBR, SWAP	
	4	File system mount points, rpm utility - installation of packages.	

5	**Teacher Specific Module**	
	Directions	
	Teacher can adopt proper methodologies and evaluation methods related to the topics.	15

Essential Readings:

1. Unix Shell Programming, Yeshwanth kanethkar
2. Essential System Administration, O'reilly & Associates.
3. "The Linux Programming Interface: A Linux and UNIX System Programming Handbook" by Michael Kerrisk.
4. Unix and shell Programming Behrouz A. Forouzan, Richard F. Gilberg.Thomson

Suggested Readings:

1. Unix in a Nutshell, by Daniel Gilly, O'Reilly & Associates.
2. Linux Administration handbook, Nemeth, PHI.
3. Red Hat Linux Bible.
4. A user guide to the Unix system, Thomas, Yates Tata McGraw Hill

Assessment Rubrics:

Evaluation Type	Marks

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

KU6DSECSC309: CLOUD COMPUTING

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
6	DSE	300-399	KU6DSECSC309	4	75

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
3	2		35	65	100	1.5hrs.

Course Description:

This course gives students an insight into the basics of cloud computing along with virtualization, cloud computing is one of the fastest growing domain from a while now. It will provide the students basic understanding about cloud and virtualization along with it how one can migrate over it.

Prerequisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Identify the basics of cloud computing	U
2	Discuss the main concepts and key technologies of cloud computing.	U/A
3	Examine the concept of virtualization in the cloud computing	U/A
4	Select the technologies for implementation and use of cloud	E
5	Relate the evolution of cloud from the existing technologies.	A n

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

Mapping of Course Outcomes to PSOs

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

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1	**MODULE TITLE**: Cloud Computing Foundation		**15**
	1	Introduction to Cloud Computing- Basics, History, importance, Characteristics, Pros and Cons of Cloud computing	
	2	Types of Cloud – Public and Private Cloud.	
		Cloud Computing infrastructure	
	3	Cloud Services SaaS, DaaS, IaaS, PaaS	

2	**MODULE TITLE:** Cloud Computing Architecture		**15**
	1	Cloud Computing Technology- Cloud Life Cycle Model. Cloud System Architecture	
	2	Layers in cloud architecture, Software as a Service (SaaS, ,	
	3	Platform as a Service (PaaS), features of PaaS and benefits, Infrastructure as a Service (IaaS), features of IaaS and benefits	
		Service providers, challenges and risks in cloud adoption.	
	4	Cloud deployment model: Public clouds – Private clouds – Community clouds - Hybrid clouds - Advantages of Cloud computing.,	

3	**MODULE TITLE :** Virtualization		**15**
	1	Definition, Adopting Virtualization, Application types.	
	2	Virtualization and Software	
	3	Virtual Clustering, Virtualization applications	
	4	Pitfalls of Virtualization	

4	**MODULE TITLE :**Data Storage & Security		15
	1	Introduction to Enterprise Data Storage, Data Storage Management,.	
	2	File Systems, Cloud Data Stores	
	3	Cloud Computing and Security – Risks in Cloud Computing, Types of Risks,	

5	**Teacher Specific Module**	
		5

Essential Readings:

1 Cloud Computing: Principles and Paradigms, edited by Rajkumar Buyya, James Broberg, Andrzej, Wiley India Publications, 2011

2. Barrie Sosinsky, "Cloud Computing Bible", 1st Edition, Wiley India Pvt. Ltd., New Delhi, 2011.3.

Assessment Rubrics:

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

e)	Report	
f)	presentation	
Total		**100**

KU6DSECSC310: PARALLELCOMPUTING

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
6	DSE	300-399	KU6DSECSC310	4	60

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

Course Description:

Parallel computing is a type of computing architecture in which several processors simultaneously execute multiple, smaller calculations broken down from an overall larger, complex problem. The course give an outline of parallel architecture, CUDA etc.

Prerequisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Locate the use and problem solving in of parallel computers.	U
2	Classify Different Structures of Parallel Computers.	U
3	Compare the Performance Evaluation of Parallel Computers	U/An
4	Examine the programmes in CUDA	U

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

Mapping of Course Outcomes to PSOs

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

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	**UNIT**	**DESCRIPTION**	**HOURS**
1	**MODULE TITLE: INTRODUCTION**		**12**

	1	History of Parallel Computers. Solving problems in parallel: Utilizing Temporal, Parallel Processing ,	
	2	Utilizing Data Parallelism , Comparison of Temporal and Data Parallelism	
	3	Data Parallel Processing with Specialized Processors.	

2	**MODULE TITLE:** STRUCTURE OF PARALLEL COMPUTERS		**12**
	1	A Generalized Structure of a Parallel Computer, Classification of Parallel Computers, Vector Computers	
	2	A Typical Vector Super Computer, Array Processors	
	3	Shared Memory Parallel Computers	
	4	Distributed Shared Memory Parallel Computers, Message Passing Parallel Computers.	

3	**MODULE TITLE :OPERATING SYSTEMS FOR PARALLEL COMPUTERS**		**12**
	1	Resource Management , Process Management , Process Synchronization ,	
	2	Inter-process Communication , Memory Management , Input/output (Disk Arrays) ,	
	3	Basics of Performance Evaluation , Performance Measurement Tool	

4	**MODULE TITLE :COMPUTER UNIFIED DEVICE ARCHITECTURE**		12
	1	The age of parallel processing, The rise of GPU computing, CUDA, NVIDIA Device driver	
	2	Applications of CUDA, Development Environment-CUDA Enabled Graphics Processors	
	3	CUDA Development Tool kit, Standard C compiler.	

5	**Teacher Specific Module**	
	Concerned teacher can adopt proper methodologies to apply and enhance the skill in respective topics.	12

Essential Readings:

1. Parallel Computers Architecture and Programming, V. Rajaraman, C. Siva Ram Murthy,PHI.
2. CUDA By Example, Jason Sanders, Edward Kandrot, Addison_Wesley.

References :

1. Introduction to Parallel Computing, Ananth Grama, Anshul Gupta, George Karypis, Vipin Kumar, Pearson Education.
2. Parallel Computing Theory and Practice, Michel j.Quinn

Assessment Rubrics:

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

KU6SECSC311: INTERNET OF THINGS

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
6	DSE	300-399	**KU6DSECSC311**	4	60

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

Course Description:

This Course focuses on hands-on IoT concepts such as sensing, actuation and communication. It covers the development of Internet of Things (IoT) prototypes—including devices for sensing, actuation, processing, and communication and applications of IoT that helps to develop skills and experiences.

Prerequisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains

1	Understand the various concepts, terminologies and architecture of IoT systems..	U
2	Identify the use of sensors and actuators to design IoT	U/A
3	Understand and apply various protocols for design of IoT systems	U/A
4	Understand various applications of IoT	U/An

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

Mapping of Course Outcomes to PSOs

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

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	**UNIT**	**DESCRIPTION**	**HOURS**
1	**MODULE TITLE**: Fundamentals of IoT		**12**
	1	Introduction, Definitions & Characteristics of IoT	
	2	IoT Architectures, Physical & Logical Design of IoT	
	3	Enabling Technologies in IoT, History of IoT, About Things in IoT	
	4	The Identifiers in IoT- About the Internet in IoT	
	5	IoT frameworks, IoT and M2M.	
2	**MODULE TITLE:** Sensors Networks		**12**
	1	Definition, Types of Sensors, Types of Actuators, Examples and Working,	

	2	Development Boards: Arduino IDE and Board Types, RaspberriPi- IoT Development Kit, RFID Principles and components,	
	3	Wireless Sensor Networks: History and Context, The node, Connecting nodes,	
	4	Networking Nodes, WSN and IoT.	

3	**MODULE TITLE :** Wireless Technologies for IoT		**12**
	1	WPAN Technologies for IoT: IEEE 802.15.4, Zigbee,.	
	2	HART, NFC, Z-Wave, BLE, Bacnet, Modbus	
	3	IP Based Protocols for IoT IPv6, 6LowPAN, RPL, REST, AMPQ, CoAP, MQTT.	
	4	Edge connectivity and protocols	

4	**MODULE TITLE :** Applications of IoT		12
	1	Home Automation, Smart Cities, Energy, Retail Management, Logistics,	
	2	Agriculture, Health and Lifestyle, Industrial IoT	
	3	Legal challenges, IoT design Ethics	
	4	IoT in Environmental Protection.	

5	**Teacher Specific Module**	
		12

Essential Readings:

Text Books:

1. Hakima Chaouchi, — "The Internet of Things Connecting Objects to the Web" ISBN : 978-1- 84821-140-7, Wiley Publications

2. Olivier Hersent, David Boswarthick, and Omar Elloumi, — "The Internet of Things: Key Applications and Protocols", WileyPublications

3. Vijay Madisetti and ArshdeepBahga, — "Internet of Things (A HandsonApproach)", 1 st Edition, VPT, 2014.

4. J. Biron and J. Follett, "Foundational Elements of an IoT Solution", O'Reilly Media, 2016.

5. Keysight Technologies, "The Internet of Things: Enabling Technologies and Solutions for Design and Test", Application Note, 2016.

References

1. Daniel Minoli, ― "Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications", ISBN: 978-1-118-47347-4, Willy Publications
2. Pethuru Raj and Anupama C. Raman, "The Internet of Things: Enabling Technologies, Platforms, and Use Cases", CRC Press
3. https://onlineurses.nptel.ac.in/noc17_cs22/course
4. http://www.cse.wustl.edu/~jain/cse570-15/ftp/iot_prot/index.html

Assessment Rubrics:

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

KU6DSECSC312: BLOCKCHAIN TECHNOLOGY

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
6	DSE	300-399	KU6DSECSC312	4	60

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
4	-	-	30	70	100	1.5 hrs.

Course Description:

This course intends to provide a comprehensive insight into various Blockchain techniques. The objectives are to give an insightful introduction to the basic concepts of blockchain and its applications in various domains.

Course Prerequisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Discus the fundamentals of blockchain technology	U
2	Identify the essentials of Bitcoin and beholding bitcoins as blockchains	U
3	Demonstrate the Ethereum Blockchain network	A

4	Identify the powers of blockchains and their applications in various domains	U

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

Mapping of Course Outcomes to PSOs

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

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1	Introduction to blockchain		**12**
	1	Structure of blockchains, Blockchain life cycle.	
	2	working of a blockchain, picking a blockchain.	
	3	exploring blockchain applications, building trust with blockchains.	
	4	Blockchain in action: Use cases, introducing bitcoin blockchains.	
	Bitcoin & Ethereum blockchains		12
2	1	Understanding bitcoins, comprehending bitcoins as blockchains.	
	2	Analyzing Ethereum blockchains.	
	3	introducing ripple and factom blockchains and their importance.	
3	Powerful blockchain platforms		
	1	Getting introduced to Hyperledger, Hyperledger vision.	12

	2	Hyperledger sawtooth, understanding the blockchain fabric.	
	3	understanding business, and smart blockchains, IBM Blockchains.	
	4	Stellar: an optimized blockchain.	

4	Industry impacts of blockchains		
	1	Blockchains in financial technology, Blockchains in various industries such as insurance, Government.	12
	2	Real-estate, health care, Telecommunication, Transportation.	
	3	Studying different blockchain projects as a case study and submit a report and present the work.	

5	**Teacher Specific Module**	
	Directions	
	Discussion on applications of Blockchain technology Discussion on cryptocurrency its usage and bussiness	12

Essential Readings:

1. Blockchain and Crypto Currency, Editors: Makoto YanoChris DaiKenichi MasudaYoshio Kishimoto,1 st Edition, Springer, 2020.

2. Blockchain or Dummies, Tiana Laurence, 1 st Edition , John Wiley & Sons, Inc, , 2017.

3. Blockchain Blueprint for a new economy, Melanie Swan, 1 st Edition,O'Reilly, 2017.

4. Blockchain Technology: Applications and Challenges, Panda, S.K., Jena, A.K., Swain, S.K., Satapathy, S.C. , 1 st Edition, Springer, 2021

5. Blockchain and Distributed Ledgers, Alexander Lipton and Adrien Treccani, 1 st Edition, World Scientific Press, 2021

Assessment Rubrics:

Evaluation Type	Marks

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

SEMESTER 7

KU7DSCCSC401: DATA PROCESSING USING PYTHON

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
7	DSC	400-499	**KU7DSCCSC401**	4	75

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
3	2	-	35	65	100	1.5hrs.

Course Description:

This course introduces students to the principles and practices of data processing using Python, a powerful and widely-used programming language in data science and analytics. The course focuses on data acquisition, cleaning, transformation, and analysis using key Python libraries such as Pandas, NumPy, and Matplotlib, along with tools for handling various data formats including CSV, JSON, and Excel.

Course Prerequisite: Basic knowledge in Python programming

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Apply Python syntax and semantics to write well-structured and efficient programs.	A
2	Utilize functions with arguments to modularize code and improve reusability	U/E
3	Apply core data structures to organize and manipulate data in Python programs.	A
4	Apply techniques to read data from and write data to files using Python.	A
5	Interact with the operating system using Python libraries to automate file management and system commands	U/E

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

Mapping of Course Outcomes to PSOs

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

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1		**Programming Environment and Python Basics:**	15
	1	Getting Started with Python Programming - Running code in the interactive shell, Editing, Saving, and Running script, Using editors - Jupyter.	
	2	Functions in Python, arguments to functions	
	3	The os and sys modules	
	4	Introduction to file I/O - Reading and writing text files, Manipulating binary files.	

2		**WORKING WITH PYTHON LIBRARIES**	
	1	NumPy - Basics, Creating arrays, Arithmetic, Slicing, Matrix Operations, Random numbers.	15
	2	Plotting and visualization	
	3	Pandas - Reading, Manipulating, and Processing Data	
	4	Working with Files and Data Formats (CSV, JSON, Excel)	

3		**DATA PROCESSING**	
	1	Data Cleaning: Handling Missing Data, Duplicates	15
	2	Data Transformation: Filtering, Sorting, Grouping	
	3	Data Exploration	
	4	Text Data Processing with Python	

4		**INTRODUCTION TO DATA WRANGLING FOR ML**	
	1	Grouping and Aggregation	15
	2	Merging and joining data sets	
	3	Exploratory Data Analysis (EDA)- case study with real world data set	
	4	Introduction to APIs and Web Data Extraction- Use of requests and BeautifulSoup	

5	**Teacher Specific Module**	
	Lab Exercises	

	Direct the students to read and write binary files *Perform matrix operations using Numpy* *Create visualization using Matplotlib and seaborn* *Read csv, excel and JSON files using Pandas* *Work with text data processing (use re, nltk, or string libraries.)*	
		15

Essential Readings:

1. Wes McKinney – *Python for Data Analysis*, 3rd Edition, O'Reilly Media, 2022.
2. Jake VanderPlas – *Python Data Science Handbook*, O'Reilly Media, 2016.

References:

1. Joel Grus – *Data Science from Scratch: First Principles with Python*, 2nd Edition, O'Reilly Media, 2019.
2. Tony Ojeda, Sean Patrick Murphy et al. – *Practical Data Science Cookbook*, Packt Publishing, 2014.
3. Eric Matthes – *Python Crash Course*, 2nd Edition, No Starch Press, 2019.
4. Online documentation for Pandas, NumPy, and Matplotlib.
5. Real Python tutorials: https://realpython.com/
6. Kaggle datasets and notebooks

Assessment Rubrics:

Evaluation Type	**Marks**	**Evaluation Type**	**Marks**	**Total**
Lecture	**75**	**Practical**	**25**	

a)	**ESE**		**50**	a)	**ESE**		**15**	**100**
					Programme code and execution		**8**	
					Output		**3**	
					Viva		**2**	
					Modification		**2**	
b)	**CCA**		**25**	b)	**CCA**		**10**	
	i	Test Paper	5		i	Punctuality	3	

		Model exam	10					
	ii	Assignment/ Book- Article review /field report	5		ii	Model exam	4	
	iii	Seminar/ Viva-Voce	5		iii	Record	3	

KU7DSCCSC402: BIGDATA TECHNOLOGIES

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
7	DSC	400-499	**KU7DSCCSC402**	4	75

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
3	2	-	35	65	100	1.5hrs.

Course Description:

This course introduces students to the concepts, tools, and techniques used in the Big Data ecosystem, enabling them to handle, process, and analyze massive volumes of structured and unstructured data. It covers the architecture, frameworks, and platforms that power big data applications, with a focus on distributed computing, scalable storage, and real-time data processing.

Course Prerequisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Summarise map reduce concepts	U/E
2	Implement data processing in Hadoop and apply Hive to YARN administration	A
3	Develop cluster management system using Apache Ambari	A
4	Redesign HDFS, NoSQL and Apache Spark	A

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

Mapping of Course Outcomes to PSOs

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

Contents for Classroom Transaction:

MODULE	**UNIT**	**DESCRIPTION**	**HOURS**

1	**INTRODUCTION**		**15**
	1	Big Data: Definition, Properties, Applications;	
	2	Hadoop: Introduction, Understanding the Hadoop Distributed File System (HDFS)	
	3	Getting Data into Hadoop, Understanding Data Processing in Hadoop	

2	**ADVANCED MAP REDUCE CONCEPTS**		
	1	Advanced Map Reduce API Concepts,	15
	2	Introduction to Apache Pig, Advanced Pig Usage	
	3	Introduction to Apache Hive, Advanced Hive Usage, YARN Administration.	

3	**SQL AND CLUSTER MANAGEMENT**		
	1	SQL on Hadoop Overview, The Hadoop Ecosystem,	15
	2	Cluster Management using Apache Ambari, Scaling Hadoop, Advanced Cluster Configuration	
	3	The Hadoop User Environment (HUE).	

4	**ADVANCED HADOOP**		
	1	Advanced HDFS, Securing Hadoop, Troubleshooting Hadoop,	15
	2	Integrating Hadoop into the Enterprise, Hadoop in the Cloud	
	3	Introduction to NoSQL, Introduction to Apache Spark.	

5	**Teacher Specific Module**	
	Directions: *Log File Analysis using Hadoop MapReduce: Use Hadoop's distributed processing to analyze web server log files and extract useful statistics, such as:* • *Total number of requests* • *Most frequent IP addresses* • *Number of requests per status code* • *Most requested resources*	
		15

Essential Readings:

1. Jeffrey Aven , Hadoop In 24 Hours Sams Teach Yourself, 2018.

Assessment Rubrics:

Evaluation Type	**Marks**	**Evaluation Type**	**Marks**	**Total**
Lecture	**75**	**Practical**	**25**	

a)	**ESE**		**50**	a)	**ESE**		**15**	**100**
					Programme code and execution		**8**	
					Output		**3**	
					Viva		**2**	
					Modification		**2**	
b)	**CCA**		**25**	b)	**CCA**		**10**	
	i	Test Paper	5		i	Punctuality	3	
		Model exam	10					
	ii	Assignment/ Book- Article review /field report	5		ii	Model exam	4	
	iii	Seminar/ Viva-Voce	5		iii	Record	3	

KU7DSCCSC403: SOFT COMPUTING

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
7	DSC	400-499	**KU7DSCCSC403**	4	60

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

Course Description:

This course provides an in-depth introduction to Soft Computing, a consortium of methodologies that aim to exploit the tolerance for imprecision, uncertainty, partial truth, and approximation to achieve robust and low-cost solutions. It focuses on techniques that mimic human reasoning and learning, such as Fuzzy Logic, Neural Networks, Genetic Algorithms, and Hybrid Systems.

Course Prerequisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Defines the basic concepts of soft computing	U/E
2	Discuss about neural networks and its various applications	U
3	Analyse the use of fuzzy logic in various contexts	An
4	Illustrate the use Genetic Algorithms	A
5	Illustrate the use of neural networks and hybrid systems	A

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

Mapping of Course Outcomes to PSOs

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

CO 4	3	3	2				2

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1		**INTRODUCTION TO SOFT COMPUTING**	12
	1	What is Soft Computing, Difference between Hard and Soft Computing, areas of soft computing	
	2	Requirements and applications of soft computing	
	3	Basics of Neural Network - Learning rules and various activation functions, Single layer Perceptron, Back Propagation networks	
	4	Architecture of Back Propagation (BP) Networks, Backpropagation Learning, Recent Applications	
2		**FUZZY LOGIC AND FUZZY SYSTEMS**	
	1	Fuzzy Set theory, Fuzzy versus Crisp set, Fuzzy Relation, Fuzzification, Minmax Composition,	12
	2	Defuzzification Method, Fuzzy Logic	
	3	Fuzzy Rule based systems, Predicate logic, Fuzzy Decision Making	
	4	Fuzzy Classification	
3		**GENETIC ALGORITHMS**	
	1	History of Genetic Algorithms (GA) , Working Principle,	12
	2	Various Encoding Methods	
	3	Fitness Function, GA Operators- Reproduction, Crossover, Mutation	
	4	Convergence of GA, Bit wise operation in GA	
4		**HYBRID SYSTEMS**	
	1	Sequential Hybrid Systems, Auxiliary Hybrid Systems	12

	2	Embedded Hybrid Systems, Neuro-Fuzzy Hybrid Systems	
	3	Neuro-Genetic Hybrid Systems	
	4	Case studies on recent applications of Genetic Algorithms / Fuzzy Logic	

5	**Teacher Specific Module**	
	Directions: • *Implement a **single-layer perceptron** in Python to solve the **logical OR** function* • *Design and implement a fuzzy logic controller (FLC) to simulate a room temperature control system.(Define fuzzy sets for inputs: **Temperature (Cold, Warm, Hot)**)* • *Build a neuro-fuzzy system that classifies patterns (e.g., Iris dataset).* *Tools: scikit-fuzzy, pandas, scikit-learn, optionally Keras*	
		12

Essential Readings:

1. S.Rajasekaran, G. A. Vijayalakshmi, PHI, "Neural Networks, Fuzzy Logic and Genetic Algorithms: Synthesis & Applications"
2. E. Goldberg, "Genetic Algorithms: Search and Optimization"
3. Chin Teng Lin, C. S. George Lee, PHI, "Neuro-Fuzzy Systems"

Assessment Rubrics:

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

KU7DSCCSC404: NATURAL LANGUAGE PROCESSING

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
7	DSC	400-499	**KU7DSCCSC404**	4	60

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

Course Description:

This course provides a comprehensive introduction to Natural Language Processing (NLP), the field of computer science and artificial intelligence concerned with enabling machines to understand, interpret, and generate human language. Students will explore both foundational concepts and modern techniques used in NLP, including text preprocessing, part-of-speech tagging, and language modelling.

Course Prerequisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Define the phases of traditional NLP as well as various NLP tasks	U/E
2	Apply Hidden Markov Models, and Naive Bayes models for various NLP tasks	A
3	Apply word embedding techniques and N-gram language models for Named Entity Recognition	An
4	Apply deep learning models like LSTM, GRU for sequence modeling, and CNN for coreference resolution	A

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

Mapping of Course Outcomes to PSOs

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

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1		**INTRODUCTION TO NLP**	12
	1	Phases of Traditional NLP - Lexical Analysis, Syntactic Analysis, Semantic Analysis,	
	2	Discourse Analysis, Pragmatic Analysis	
	2	Introduction to NLP Tasks - Parts-of-Speech Tagging, Word Sense Disambiguation, Anaphora Resolution, Text classification, Recognizing Textual Entailment, Named Entity Recognition	
2		**INTRODUCTION TO STATISTICAL NLP**	12
	1	Vector Space Models - Bag-of-Words, TF-IDF weighing, PPMI	
	2	Basics of Supervised and Semi-supervised Learning for various NLP tasks - Noisy Channel Model for spelling correction.	
	3	Naive Bayes model for Text Classification.	
3		**INTRODUCTION TO NEURAL NLP**	12
	1	Word Embedding - Contextual and non-contextual Word Embedding. Subword embeddings.	
	2	Evaluation of word vectors. N-gram language models.	
	3	Neural Networks for named entity recognition- Word window classification.	

4	**NATURAL LANGUAGE GENERATION**		
	1	Seq2Seq models - Attention	12
	2	Case studies and real-world applications of NLP in various domains.	
	3	Introduction to Large Language Models.	

5	**Teacher Specific Module**	
	• *Implement the basic phases of the traditional NLP pipeline and perform foundational NLP tasks* **Tools*:*** *spaCy, NLTK, NeuralCoref* **Dataset***: Small paragraph from News or literature* • Convert a set of documents into: Bag-of-Words TF-IDF **Tools:** Scikit-learn, pandas, matplotlib **Dataset:** IMDB	
		12

Essential Readings:

1. Dan Jurafsky and James H. Martin. Speech and Language Processing (2024 pre-release)
2. Jacob Eisenstein. Natural Language Processing
3. Yoav Goldberg. A Primer on Neural Network Models for Natural Language Processing
4. Ian Goodfellow, Yoshua Bengio, and Aaron Courville. Deep Learning
5. Delip Rao and Brian McMahan. Natural Language Processing with PyTorch.
6. Lewis Tunstall, Leandro von Werra, and Thomas Wolf. Natural Language Processing with Transformers.

Assessment Rubrics:

Evaluation Type	Marks

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

KU7DSCCSC405: COMPUTER VISION

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
7	DSC	400-499	**KU7DSCCSC405**	4	60

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

Course Description:

This course offers a thorough introduction to Computer Vision, the field of computer science that enables machines to interpret and understand visual information from the world. It covers both foundational techniques and modern approaches, including image processing, feature extraction, object detection, image segmentation, and deep learning-based vision models.

Course Prerequisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning

		Domains
1	Summarize the fundamental concepts and principles of computer vision, including image formation, transformations, and photometric image formations.	U/E
2	Illustrate the concepts of linear and non-linear filtering techniques, their role in image enhancement and noise reduction.	A
3	Evaluate the performance of periodic noise reduction filters and image segmentation algorithms.	An

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

Mapping of Course Outcomes to PSOs

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

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	**UNIT**	**DESCRIPTION**	**HOURS**
1	**INTRODUCTION**		**12**
	1	Computer Vision, Image formation, 2D transformation, 3D transformations, 3D to 2D projections	
	2	Photometric image formations: Lighting, Reflectance and shading, optics	
	3	Digital camera: Sampling and aliasing, colour, compression	
2	**FILTERING AND FITTING**		
	1	Point operators: Pixel transforms, Colour transforms	12
	2	Linear filtering: Non-linear filtering, Bilateral filtering	
	3	Model fitting and optimization: Scattered data interpolation. Variational methods and regularization, Markov random fields	

3	**RECOGNITION AND FEATURE DETECTION**		
	1	Recognition: Instance recognition.	12
	2	Image classification, Feature-based methods, Deep networks	
	3	Object detection, video understanding. Feature detection and matching: feature detectors, feature descriptors, feature matching, edge detection	

4	**COMOUTATIONAL PHOTOGRAPHY**		
	1	Photometric calibration, High dynamic range imaging	12
	2	Image matting and compositing: blue screen matting, natural image matting, optimization-based matting	
	3	Smoke, shadow, and flash matting	

5	**Teacher Specific Module**		
	Directions		
			12

Essential Readings:

1. Richard Szeliski, 2020. Computer Vision: Algorithms and Applications. Springer, 2ndEdn,
2. Linda F. Shapiro, George C. Stockman, 2001. Computer Vision. Prentice Hall, 1stEdn.
3. David. A. Forsyth, Jean Ponce, 2011. Computer Vision: A Modern Approach, 2ndEdn.

Assessment Rubrics:

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

Total	100

KU7DSCCSC406 : SEMINAR

Asper The Direction given by the Department

KU7DSCCSC407: BIOINFORMATICS

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
7	DSC	400-499	KU7DSCCSC407	4	60

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
4	0	-	30	70	100	1.5hrs.

Course Description: This course offers a comprehensive overview on the various concepts involved in bioinformatics.

COURSE OUTCOME

CO No.	Expected Outcome	Learning Domains
1	Summarize the foundation al concepts and applications of bioinformatics	U
2	Sketch DNA and RNA structures, Genetic Code, Gene Expression, and RNA classification.	Ap

3	Illustrate sequence alignment techniques and usage of scoring matrices	Ap
4	Outline the structure of protein and amino acids, and basic concepts of molecular docking.	U

Mapping of Course Outcomes to PSOs

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

	Unit	Content	Hrs
I	**Introduction**		**12**
	1	Introduction to Bioinformatics and Computational biology, Nature & Scope of Bioinformatics.	
	2	Biological databases -Primary database, Secondary database, Nucleic Acid databases, Protein database	
	3	The central dogma of molecular biology.	

	4	Applications of Bioinformatics.	
II	**DNA and RNA Structure**		**12**
	1	DNA and RNA structure – Nucleic Acid structure and function, Genetic Code, Genes and Gene expression.	
	2	Transcription, Translation	
	3	General introduction to Gene expression in prokaryotes and eukaryotes	
	4	RNA classification –coding and non-coding RNAs- mRNA, tRNA, microRNA and circular RNA.	
III	**Sequence Alignment**		**12**
	1	Sequence alignment – local/global, pairwise sequence alignment, Needleman algorithm, global and local alignments, Multiple sequence alignment, BLAST.	
	2	Scoring matrices: basic concept of a scoring matrix, Matrices for nucleic acid and protein sequences.	

	3	Differences between distance & similarity matrix.	
IV	**Amino Acids and Protein Structure**		**12**
	1	Amino acids- Building blocks of proteins	
	2	Protein Structure- Primary, Secondary - alpha helix, beta sheets & turns, Tertiary and Quaternary structures. Protein Folding	
	3	Introduction to Molecular Docking	
V		**Teacher Specific module**	**12**
		Literature review on Biomedical data classification **Lab Exercises** 1. Basic programs in Python. 2. Implementation of Bioinformatics problems	

References

1. Lesk, Arthur, Introduction to genomics, Oxford University Press, 2017
2. Neil C Jones and Pavel A Pevzner, An Introduction to Bioinformatics Algorithms, MIT

press, 2004.

3. David W. Mount, Bioinformatics: Sequence & Genome Analysis, Cold spring Harbor press, 2004.
4. Gautam B. Singh, Fundamentals of bioinformatics and computational biology, Springer, 2015
5. Jean-Michel Claverie, Cerdric Notredame, Bioinformatics- A Beginner's Guide, WILEY Dreamtech India Pvt. Ltd, 2006

6. Ruchi Singh, Richa Sharma, Bioinformatics- Basics, Algorithms and Applications, University Press, 2010
7. Orpita Bosu, S K Thukral, Bioinformatics- Databases, Tools, and Algorithms, Oxford University Press, 2007
8. Gautam B. Singh, Fundamentals of Bioinformatics and Computational Biology - Methods and Exercises in MATLAB, Gautam B. Singh,Springer International Publishing Switzerland 2015

Assessment Rubrics:

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

SEMESTER 8(WITH RESEARCH)

KU8DSCCSC408: RESEARCH METHODOLOGY

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
8	DSC	400-499	KU8DSCCSC408	4	60

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
4	--	-	30	70	100	1.5hrs.

Course Description:

The course will cover topics ranging from the principles of experiment design, statistics, to various aspects of reading, writing, evaluating papers, and presenting research.

Prerequisite: NIL

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	understand and comprehend the basics in research methodology and applying them in research/ project work.	U
2	select an appropriate research design.	U/A
3	implement a research project by appropriate data collection methods and analyse it accordingly	U/A
4	Develop skills in qualitative and quantitative data analysis and presentation	A/E /C
5	Demonstrate and present research documents with appropriate research objectives.	U/A/C

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

Mapping of Course Outcomes to PSOs

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

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

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1	**MODULE TITLE Philosophical Underpinnings of Research**		12
	1	Introduction to Research: Novelty, Originality, Organized Method of Investigation, and Communication of Problem, Data, Method, and Results for Peer Group Verification; Paradigm and paradigm shift.	
	2	Types of Research: Theoretical, Empirical, Experimental, and Design and Characterization of New Materials, Components, Processes, and Systems.	
	3	Broad Objectives of Research: Problem-oriented—Defining Problems and Problem Issues, Analysing Data, Predicting, and Designing; Technique-oriented-Improving Performance and Expanding Scope.	
	4	Research Topic, Problem, Questions, Objectives, and Scope - Methodology, Methods, Tools, and Techniques - Research Ethics, Plagiarism, and Their Prevention	
2	**MODULE TITLE:** Measurement, Data, and Analytics		12
	1	Structured and Unstructured Data, Scales of Measurement.	
	2	Probability and Random Variables	
	3	Population and Sample, Descriptive Statistics, Data Visualization	
	4	Sampling and Estimation, Hypothesis Testing, ANOVA, Correlation, and Regression	
	5	Data Analytics: Elements of Association, Clustering, and Classification.	
3	**MODULE TITLE :** Research Methods for Computer Science		12
	1	Formal Methods: Formal Specification, Algorithm, and complexity	
	2	Building Artefacts: Proof of Performance, Proof of Concept, and Proof of Existence;	

	3	Complexity Process Methodology: Methods for Software Engineering and Human-Computer Interaction, Cognitive Processes ,Interactive Games, Social Networks, and Web Analytics.	

4	**MODULE TITLE :** Research Documentation		12
	1	Elements of Preparing a Paper and a Thesis: Title, Abstract, Keywords, Acknowledgements, Symbols and Abbreviations.	
	2	Introduction, Literature Review, Materials and Methods, SI Units, Mathematical Materials, Graphical and Tabular Presentation.	
	3	Results and Discussion ,Conclusion, Interpretation, Generalization, Scope for Future Work, Citations and List of References, and Appendixes.	

5	**Teacher Specific Module**	
	Discussion on various research issues Analyse the papers related with the discussed issues Analyse the types of research methodologies applied in the related papers.	12

Essential Readings:

1. Kothari, C. R. and G. Garg (2019), Research Methodology: Methods and Techniques, Fourth MultiColour Edition, New Age International Publishers.

Assessment Rubrics:

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

KU8DSCCSC 409 : RESEARCH AND PUBLICATION ETHICS

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
8	DSC	400-499	KU8DSCCSC409	4	60

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
4	-	-	30	70	100	1..5hrs.

Course Description:

The course familiarize students with the fundamentals of research ,to make appropriate grammatical and lexical choices while writing research articles and organize information effectively, and integrate theoretical research knowledge with practical skills that will help students to undertake research.

Course Prerequisite: Nil

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Develop and write a complete research paper (including an abstract, citations, references etc.)	A
2	Understand how to find, evaluate, and use data for research	U
3	Analyse and evaluate research reviews to produce quality research papers.	A /E

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

Mapping of Course Outcomes to PSOs

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

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1	**MODULE TITLE:** TYPES OF RESEARCH		12
	1	Role & purposes of Research Designs, Defining and differentiating research	
	2	Descriptive Research, Analytical Research, Applied Research	
	3	Fundamental Research, Quantitative Research, Qualitative Research	
	4	Conceptual Research, and Empirical Research	
2	**MODULE TITLE:** SOURCES OF INFORMATION		12
	1	Finding/Gathering information for research	
	2	Using information, Using research tools	
	3	Using Library and electronic databases	
3	**MODULE TITLE:** WRITING RESEARCH LITERATURE REVIEW		12
	1	Need for a literature review, Strategies for writing literature review	
	2	Reviewing skills, Literature search and evaluation	
	3	Method of conducting a literature review, Organizing the literature review	
4	**MODULE TITLE:** CITING SOURCES/REFERENCES AND MAINTAINING ACADEMIC HONESTY		12
	1	Referencing and in-text citations, Styles of referencing, Paraphrasing and summarizing, Citing sources, Developing academic honesty	
	2	Ethical issues in collecting data - Ethics, stakeholders in research, ethical issues concerning participants,	
	3	Seeking consent, providing incentives, confidentiality, bias	
	4	Incorrect reporting, issues with sponsoring organization	
5	**Teacher Specific Module**		

	Discussion on various research issues Analyse papers related with the discussed issues Practice to write survey papers and literature reviews	12

Essential Reading :

Primary References: Kothari, C. R. (2004). Research Methodology: Methods and Techniques. New Delhi: New Age International. Kumar, R. (2005). Research Methodology-A Step-by-Step Guide for. Singapore: Pearson Education. Saravanavel, P. (2012). Research Methodology. Allahabad: Kitab Mahal Publishers. Page 3 of 3

Assessment Rubrics:

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

KU8DSCCSC410
PAPER PRESENTAION IN NATIONAL OR INTERNATIONAL CONFERENCE

Present two papers with the format as specified in the conference procedure and submit the records and result of participation to the concerned tutor.

KU8DSCCSC411RESEARCH PROJECT
(12 credit-13hr./week. Details are specified in the evaluation criteria)

Semester 8(Degree with Honour)

KU8DSCCSC412
Seminar
(Direction to select topics of seminar and presentation can be decided by the department)

KU8DSCCSC413
Research Project(8 Credit)

Capstone level courses

KU8DSCCSC 414: CLOUD SECURITY

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
8	DSC	400-499	KU8DSCCSC414	4	60

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
4	--	-	30	70	100	1.5hrs.

CO No.	Expected Outcome	Learning Domains
1	Outline risks in Cloud Computing	U
2	Analyze issues in Cloud Security	U/A
3	Plan appropriate Cloud security services	U/A

4	Identify an effective Secure Cloud architecture	U/A

Mapping of Course Outcomes to PSOs

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

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**
	1	Current State, Security issues and challenges	
	2	Security advantages and disadvantages in Cloud environment	

	3	Cloud, Digital Persona and Data Security,	
	4	Content Level Security	
III	**Cloud Security Services**		**12**
	1	CIA triad- Data Confidentiality, Data Integrity and Data Availability	
	2	Security Authorization Challenges in the Cloud- Auditing, Risk Administration	
	3	Secure Cloud Software Requirements- Monitoring a constantly changing environment	
	4	Secure Cloud Software Testing- Reducing Testing Costs. Software Testing Tools to test Cloud Computing	
IV	**Cloud Security Architecture**		**12**
	1	Introduction, (CSA) Cloud Security Architecture	
	2	Authentication- Single Sign on	
	3	Authorization	
	4	Identity and Access Management	

	5	Securing Data in Rest, Securing Data in Motion, Key Management	
V	**Teacher specific module**		**12**
	1	Virtual private clouds (VPCs) and network segmentation, Secure connectivity options (VPN, Direct Connect), Distributed denial of service (DDoS) protection	
	2	Compliance and Legal Considerations, Regulatory compliance requirements (GDPR, HIPAA, etc.)	
	3	Cloud Security standards and frameworks (ISO27001, NIST, etc)	
	4	Legal aspects of cloud security (contracts, data jurisdiction)	

References

1. A Srinivasan, J Suresh, Cloud Computing- A Practical Approach for Learning and implementation, Pearson Education, 2022

2. Arshdeep Bahga, Vijay Madisetti, Cloud Computing- A Hands on Approach, Universities Press (India) Private Limited, 2023

3. Tim Mather, Subra Kumaraswamy, Shaheed Latif, Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance, O'Reilly, 2009

Assessment Rubrics:

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

	2 Numbers	
d)	Seminar	5
e)	Book/ Article Review	
f)	Viva-Voce	
g)	Field Report	
Total		**100**

KU8DSCCSC 415: PROMPT ENGINEERING

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
8	DSC	400-499	KU8DSCCSC415	4	75

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
3	2	-	35	65	100	1.5hrs.

CO No.	Expected Outcome	Learning Domains
1	Summarize prompt engineering principles	U
2	Develop effective prompts	U/A
3	Illustrate prompt engineering strategies	U/A
4	Make use of prompt engineering technologies	U/A

Mapping of Course Outcomes to PSOs

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

Detailed Syllabus:

Module	**Unit**	**Content**	**Hrs**
I		**Introduction to Prompt Engineering**	**15 hrs**

	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**
	1	Types of Prompts. Visual Prompts, Auditory Prompts, Tactile Prompts, Open ended Prompts, closed ended prompts, Instructional prompts, Contextual prompts.	
	2	Factors influencing Model responses- Context, Length, Structure, Complexity, Fine tuning. Conciseness and specificity in prompt design	

	3	Query Formulation Techniques, importance of context in prompt formulation, Techniques for crafting clear and effective instructions, tailoring prompts to specific tasks or domains	
	4	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,	
	5	Approaches for adjusting prompt language, structure and complexity, Fine tuning, techniques used – Supervised learning, Reinforcement learning	

	6	Prompt generation Tools- Prompt Studio, Prompt Bard, Prompt Insight, Prompt evaluation tools- Prompt Evaluator, Prompt Ranker, Prompt Tuning	
III	**Prompt Engineering Strategies and Applications**		**15**
	1	Pillars of Prompting- Providing Examples, Giving Direction, Formatting Responses, Evaluating Quality, Chaining AIs	
	2	Debiasing techniques, Context Manipulation, Controlled Generation, Iterative Prompting	
	3	Prompt strategies for tasks – summarization, translation, Q & A, creative writing, other tasks	
	4	Role of Prompt Engineering in various applications- Search and Recommendation, Natural Language Processing, Creative AI, AT Safety. Examples of applications using prompt engineering- Google AI, Microsoft AI, Salesforce AI, Open AI	
IV	**Prompt Engineering Technologies & Ethical issues**		**15**
	1	Machine Learning Models for personalized prompts- Rule based Models, Collaborative filtering Models, Content based Models, Hybrid Models	
	2	Emerging Technologies in Prompting- Natural Language Processing, Machine Learning, Augmented Reality, Virtual Reality, Sustainable Prompting Strategies- Energy efficient hardware, optimizing prompt frequency and timing	

	3	Ethical considerations in Prompt Engineering- Privacy and Consent, Manipulative prompting practices, Ensuring Prompt conformity to Ethical standards	
	4	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	**Teacher specific Module**		**15**
	1	Advanced Techniques-Meta Prompting, Multimodal prompt engineering, prompt embedding, conditional generation.	
	2	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

1. Utkarsh Pal, Mastering Prompt Engineering: A Guide to Effective Communication with language Models, December 2023
2. Alan Weston, Prompt Engineering for Beginners, February 2024
3. A Scholtens, Course book Prompt Engineering, January 2023, SAS155,
4. Naween Balani, Prompt Engineering: Unlocking Generative AI, April 2023, ISBN -13-979-8390487082
5. Yaswanth Sai Palghat, The Art of Asking prompt Engineering, Notion Press Media Pvt Ltd, August 2023, ISBN 13979-8890673169
6. Nathan Hunter, The Art of Prompt Engineering with ChatGPT: A Hands On Guide, Shroff/Hunter, First edition, June 2023

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

Assessment Rubrics

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

KU8DSCCSC 416: MEDICAL IMAGE PROCESSING

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
8	DSC	400-499	KU8DSCCSC416	4	75

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
3	2	-	35	65	100	1.5hrs.

COURSE OUTCOME

CO No.	Expected Outcome	Learning Domains
1	Summarize about medical image processing techniques	U
2	Discuss about medical image formation principles	U
3	Describe about Imaging modalities	U
4	Explain about Nuclear imaging techniques	U

Mapping of Course Outcomes to PSOs

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

Detailed Syllabus:

Module	Unit	Content	Hrs
I		**Medical Image Processing**	**15**
	1	Introduction to Medical imaging, Elements of Image Processing, Image Processing Techniques	
	2	Digital Image Classification Types, Brief history, Importance, Applications, Trends, Challenges	
	3	Spatial Domain Filtering, Filtering in Frequency domain	
	4	Image restoration, Image Compression, Waveletbased image compression, Morphological Image Processing, Image Segmentation.	
II		**Medical Image Formation Principles**	**12**
	1	X-Ray and Computed Tomography (CT) imaging, Basic principles of CT	
	2	2D Image reconstruction- Fourier space and Filtered back projection methods. Iterative reconstruction	
	3	3D reconstruction basics; Discrete Radon Transform (DRT).	
III		**Imaging Modalities:**	**18**
	1	Magnetic Resonance Imaging (MRI), Introduction, Nuclear Spin, Nuclei in a Magnetic Field	
	2	RF Excitation for the Resonance Phenomenon Generation- MR Signal Generation and Acquisition, MR Signal Characteristics - Relaxation, Proton Density	
	3	MR Signal Generation and Acquisition, MR Signal Characteristics - Relaxation, Proton Density- The Bloch Equations, Multiple RF Pulses	
	4	The Bloch Equations, Multiple RF Pulses- Magnetic Field Gradients-, Spatial Localization of MR Signals	
	5	Timing Diagram of an Imaging Sequence- Acquiring MR Signals in the K-Space	
	6	Different MRI sequences-Spin Echo Sequence, Gradient Echo Sequence	
IV		**Nuclear Imaging**	**15**
	1	Positron Emission Tomography (PET), Single Photon Emission Computed Tomography (SPECT), Ultrasound Imaging, Mathematical principles, Applications;	
	2	Medical Image Storage: Archiving and Communication Systems and Formats Picture Archiving and Communication System(PACS),	
	3	Formats - DICOM, Radiology Information Systems (RIS) and Hospital Information Systems (HIS);	

	4	Medical Image Visualization: Fundamentals of visualization, Different generations of visualization techniques, surface and volume rendering/visualization.	
	5	Introduction to Microscopes: Types of Microscopes, Microscopy Imaging Techniques – Bright field microscopy Dark field microscopy, Phase contrast microscopy, Differential Interference Contrast (DIC) microscopy, Fluorescence microscopy, Polarizing microscopy.	
V	**Teacher specific module**		**15**
	1	Medical Image Segmentation: Histogram-based methods, Region Growing, Watersheds, Edge based segmentation techniques, Multispectral Techniques, Segmentation by Fuzzy clustering methods and issues, Segmentation with Neural Networks, Segmentation with Deformable Models	

References:

1. Bankman I.N. "Hand book of Medical Image Processing and Analysis", Second Edition, Academic Press, 2008.
2. Bovik A.I. "Handbook of Image and Video processing", Second Edition, Academic Press 2005
3. Jiri Jan, "Medical Image Processing, Reconstruction and Restoration- Concepts and Methods", CRC Tayler & Francis, 2006.
4. L. Landini, V. Positano, M.L. Santarelli, "Advanced Image Processing in Magnetic Resonance Imaging", CRC Tayler & Francis, 2005
5. Rafel C Gonzalez, Richard E Woods, Digital Image Processing, PHI, 3rd edition,2007
6. Anil K Jain, Fundamentals of Digital Image Processing, Prentice Hall, US Edn, 1989

Assessment Rubrics:

Assessment Rubrics:

Evaluation Type			**Marks**	**Evaluation Type**			**Marks**	**Total**
Lecture			**75**	**Practical**			**25**	
a)	**ESE**		**50**	a)	**ESE**		**15**	
					Program code and execution		**8**	**100**
					Output		**3**	
					Viva		**2**	
					Modification		**2**	
b)	**CCA**		**25**	b)	**CCA**		**10**	
	i	Test Paper	5		i	Punctuality	3	
		Model exam	10					

	ii	Assignment/ Book- Article review /field report	5		ii	Model exam	4	
	iii	Seminar/ Viva-Voce	5		iii	Record	3	

KU8DSECSC417: ARTIFICIAL NEURAL NETWORKS

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
8	DSE	400-499	KU8DSECSC417	4	60

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
4	-	-	30	70	100	1.5hrs.

O No.	Expected Outcome	Learning Domains
1	Outline neural network fundamentals.	U
2	Demonstrate neural network architectures	Ap
3	Experiment various learning methods	Ap
4	Sketch the features and applications of SOM	Ap

Mapping of Course Outcomes to PSOs

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

Detailed Syllabus:

Module	Unit	Content	Hrs
I	**Introduction**		**1**
	1	Introduction, Why neural network?, Research History, Biological Neuron model.	
	2	Artificial Neuron model, Notations, Neuron equation	
	3	Model of Artificial Neuron: Artificial neuron - basic elements,	
	4	Activation functions – Threshold function, Piecewise linear function, Sigmoidal function, Example	
II	**Neural Network Architectures**		**12**
	1	Neural Network Architectures: Single layer Feed-forward network, Multi layer Feed-forward network, Recurrent networks.	
	2	Learning Methods in Neural Networks- Learning algorithms: Unsupervised Learning - Hebbian Learning,	
	3	Competitive learning; Supervised Learning	
	4	Stochastic learning, Grant descent learning; Reinforced Learning.	
III	**Taxonomy Of Neural Network Systems**		**12**
	1	Popular neural network systems; Classification of neural network systems with respect to learning methods and architecture types.	

	2	Single-Layer NN System Single layer perceptron : Learning algorithm for training Perceptron, Linearly separable task, XOR Problem; ADAptive LINear Element (ADALINE) : Architecture, Training.	
	3	Multilayer Perceptrons: Introduction, Some Preliminaries, Batch Learning and On-Line Learning.	
	4	The Back-Propagation Algorithm, XOR Problem.	
IV	**Self Organizing Maps**		**12**
	1	Introduction; Two basic feature-mapping models; SOM: Competitive process, Cooperative process, Adaptive process;.	
	2	Summary of SOM Algorithm; Properties of feature map	
	3	Kohonen Self Organizing Maps: Architecture, Algorithm, Application.	
V		**Teacher specific module**	**12**
		Lab Exercises 1. Implement AND problem. 2. Implement XOR problem. 3. Single-Layer Perceptron Implementation . Implement a single-layer perceptron in a programming language of choice (Python recommended). . Train the perceptron on a binary classification task using a simple dataset. . Visualize the decision boundary and analyze the perceptron's performance. 1. Multi-Layer Perceptron (MLP) Demonstration: . Develop a multi-layer perceptron (MLP) . Train the MLP on a dataset such as MNIST	

	1	Applications of Artificial Neural Networks: Pattern Recognition, Medicine, Speech Production, Speech Recognition, Business.	
	2	Deep Neural Networks (Basic Concepts only)	
		for handwritten digit classification. . Experiment with different architectures, activation functions, and optimization algorithms to optimize performance. 2. Implement Self organizing maps. 3. Implement applications using Neural Network.	

References

2. Simon Haykin, "Neural Networks and Learning Machines" , Pearson Prentice Hall, Third Edition.
3. Laurene Fausett, "Fundamentals of Neural Networks Architectures, Algorithms and Applications", Pearson Education India, 2004.

Assessment Rubrics:

Evaluation Type		**Marks**
End Semester Evaluation		**70**
Continuous Evaluation		**30**
a)	Test Paper- 1	5
b)	Model Examination	10
c)	Assignment- 2 Numbers	10

d)	Seminar	5
e)	Book/ Article Review	
f)	Viva-Voce	
g)	Field Report	
Total		**100**

KUDSECSC418: MOOC COURSES FROM SWAYAM/NPTEL/COURSEERA