K. S. Rangasamy College of Technology

(Autonomous)

Curriculum & Syllabi

for

B.Tech. Artificial Intelligence and Data Science

(For the batch admitted in 2022 – 2023)

R 2022

Accredited by NAAC with A++ grade,
Approved by AICTE, Affiliated to Anna University, Chennai.

KSR Kalvi Nagar, Tiruchengode – 637 215.
Namakkal District, Tamil Nadu, India.

ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

VISION

To achieve excellence in educational programming, industry collaboration, research and innovation in the field of data science and artificial intelligence.

MISSION

- To empower the cognitive skills in the students by enhancing knowledge in the artificial intelligence domain
- To facilitate data science technology and professionalism through value added courses and collaborative learning

1. PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEO1:	**Core Competence:** Graduates will demonstrate their technical skills and competency in various applications through the use of Artificial Intelligence and Data Science
PEO2:	**Successful Career:** Graduates will establish their knowledge by adopting Artificial Intelligence and Data Science technologies to solve the real-world problems
PEO3:	**Ethics and life-long learning:** Graduates will engage in lifelong learning to excel in their profession with social awareness and responsibility

2. PROGRAMME OUTCOMES (POs)

Engineering Graduates will be able to:

PO1:	**Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2:	**Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3:	**Design /development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4:	**Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5:	**Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations
PO6:	**The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO7:	**Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8:	**Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9:	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10:	**Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11:	**Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12:	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

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3. PROGRAMME SPECIFIC OUTCOMES (PSOs):

Engineering Graduates will be able to:

PSO1:	**Develop IT infrastructure:** Design, implement and apply computational skills related to Artificial Intelligence and Data Science
PSO2:	**Design / Develop software products:** Apply tools and techniques to provide successful solutions in the multidisciplinary field
PSO3:	**Innovative Career:** Create, select and apply the knowledge of information and analytics for an innovative career, research activities and consultancy

4. PEO/PO Mapping

Programme Educational Objectives	Programme Outcomes											
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
PEO 1	3	3	3	3	3	2	2	3	2	3	3	2
PEO 2	3	3	3	3	3	2	2	3	2	3	3	2
PEO 3	3	3	3	2	3	3	3	3	2	2	3	3

Contributions: 1- low, 2- medium, 3- high

MAPPING – UG – ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

Year	Semester	Course Name	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
Year I	I	Professional English I								2	3	3	2	3
		Matrices and Calculus	3	3	3	2	2							2
		Physics for Computer Technology	3	3	3	3	2	3	2	2	2	2	2	3
		Engineering Graphics	3	3	3	3	3	1	1	1		3	1	3
		C Programming	3	3	3		3				2	2		2
		Environmental Studies and Climate Change	3	3	3	3	3	3	3	3	2	2	2	3
		Engineering Physics Laboratory	3	3	3	3	2	2	2	2	2	2	2	2
		C Programming Laboratory	3	3	3		3				2	2		2
	II	Professional English II								2	3	3	2	3
		Linear Algebra and Optimization Techniques	3	3	3	2	2						2	2
		Engineering Chemistry	3	3	2	2	3	3	3	2	2	3	3	3
		Basic Electrical and Electronics Engineering	3	3	2	2	2	2	2	1	2	2	2	2
		Python Programming	3	2	3	2.8					2	2	2	2
		Python Programming Laboratory	3	2	3	2.8					2	2	2	2
		Fabrication and Reverse Engineering Laboratory	3	3		3	2	3	2	2	2	3	2	2
Year II	III	Probability and Random Processes	3	3	2.6	2.4	1.6						2	2
		Data Structures	3	3	2	2.67	2	2	2	3	2.6	2		2
		Digital Logic and Microprocessor	3	3	3	3	2					1	1	1
		Artificial Intelligence	3	2.6	2	2	2	2						2.4
		Software Engineering Methodologies	2.25	2.25	2	2	1				2		2	1
		Java Programming	2.6	3	3	2	3	2		2	3	3	2	3
		Data Structures Laboratory	3	3	2	2.67	2	2	2	3	2.6	2		2
		Java Programming Laboratory	2.6	3	3	2	3	2		2	3	3	2	3
	IV	Statistical Methods	3	2.4	1.6	2					2	1		2.4

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		Design and Analysis of Algorithms	3	3	3	2	3					2		
		Database Design and Development	2	3	2.5	3				1				
		Web Technology	2	2.6	2.8	2.6					2	2	2	2
		Data Mining Techniques	3	3	1.2	3	3			1.5				1
		Database Design Laboratory	2	2.6	2.8	2.6	3				2	2	2	2
		Data Mining Laboratory	2	2	2.6	2.6	3				2	2	2	2
Year III	V	Operating Systems	3	3	2.6	2.4	1.6						2	2
		Data Communication and Networks	3	3	2	2.67	2	2	2	3	2.6	2		2
		Machine Learning	3	3	3	3	2					1	1	1
		Design Thinking	3	2.6	2	2	2	2						2.4
		Elective I	2.25	2.25	2	2	1				2		2	1
		Open Elective II	2.6	3	3	2	3	2		2	3	3	2	3
		Startups and Entrepreneurship	3	3	2	2.67	2	2	2	3	2.6	2		2
		Networking Laboratory	2.6	3	3	2	3	2		2	3	3	2	3
		Machine Learning Laboratory	2.6	3	3	2	3	2		2	3	3	2	3
	VI	Engineering Economics and Financial Accounting	3	2.4	1.6	2					2	1		2.4
		Data Exploration and Visualization	3	3	3	2	3					2		
		Deep Learning	2	3	2.5	3				1				
		Robotic Process Automation	2	2.6	2.8	2.6					2	2	2	2
		Elective II	3	3	1.2	3	3			1.5				1
		Open Elective III	2	2.6	2.8	2.6	3				2	2	2	2
		Data Visualization Laboratory	2	2	2.6	2.6	3				2	2	2	2
		Deep Learning Laboratory	2.6	3	3	2	3	2		2	3	3	2	3
Year IV	VII	Computer Vision	3	2.4	1.6	2					2	1		2.4
		Natural Language Processing	3	3	2.6	2.4	1.6						2	2
		Cloud Computing	3	3	2	2.67	2	2	2	3	2.6	2		2
		Big Data Analytics	3	3	3	3	2					1	1	1
		Project Work – Phase I	3	3	2	2.67	2	2	2	3	2.6	2		2
		Elective III	3	2.6	2	2	2	2						2.4
		Elective IV	2.25	2.25	2	2	1				2		2	1
		Computer Vision Laboratory	2.6	3	3	2	3	2		2	3	3	2	3
	VIII	Elective V	3	3	3	2	3					2		
		Project Work – Phase II	2	3	2.5	3				1				

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K.S. RANGASAMY COLLEGE OF TECHNOLOGY

Credit Distribution for B.Tech (AI&DS) Programme – 2022 – 2023 Batch

S.No	Category	Credits Per Semester								Total Credits	Percentage %
		I	II	III	IV	V	VI	VII	VIII		
1	**HS**	2	2	-	-	-	3	-	-	07	**4.29**
2	**BS**	9	7	4	4	-	-	-	-	24	**14.72**
3	**ES**	9	11	-	-	-	-	-	-	20	**12.26**
4	**PC**	-	-	19	16	16	13	14		78	**47.85**
5	**PE**	-	-	-	-	3	3	6	3	15	**9.23**
6	**OE**	-	-	-	3	3	3			09	**5.52**
7	**CG**	1*	1*+1*	1*+1*	1*+1*	1*+1*	1*+1*	2	8	10	**6.13**
8	**MC**	MC I	-	-	MC II	MC III	-	-	-	-	-
9	**AC**	-	-	-	-	-	-	-	-	-	-
10	**GE**	-	1*	-	-	-	-	-	-	-	-
Total		**20**	**20**	**23**	**23**	**22**	**22**	**22**	**11**	**163**	**100**

Note: HS- Humanities and Social Sciences including Management Courses, BS- Basic Science Courses, ES-Engineering Science Courses, PC-Professional Core Courses, PE-Professional Elective Courses, GE- General Elective Courses, OE-Open Elective Courses, CG - Career Enhancement Course, MC- Mandatory Courses, AC – Audit Courses

- Open Electives are courses offered by different departments that do not have any prerequisites and could be of interest to students of any branch

HUMANITIES AND SOCIAL SCIENCE (HS)

S. No.	Course Code	Course Title	Category	Contact Periods	L	T	P	C	Prerequisite
1.	60 EN 001	Professional English I	HS	3	1	0	2	2	Basic knowledge of reading and writing in English
2.	60 EN 002	Professional English II	HS	3	1	0	2	2	Basic knowledge of reading and writing in English and should have completed Professional English I.
3.	60 AB 001	National Cadet Corps (Air Wing)	HS	4	2	0	2	3	NIL
4.	60 AB 002	National Cadet Corps (Army Wing)	HS	4	2	0	2	3	NIL
5.	60 HS 002	Engineering Economics and Financial Accounting	HS	3	3	0	0	3	NIL

BASIC SCIENCE (BS)

S. No.	Course Code	Course Title	Category	Contact Periods	L	T	P	C	Prerequisite
1.	60 MA 001	Matrices and Calculus	BS	5	3	1	0	4	NIL
2.	60 CH 004	Engineering Chemistry	BS	3	3	0	0	3	NIL
3.	60 MA 004	Linear Algebra and Optimization Techniques	BS	5	3	1	0	4	NIL
4.	60 PH 004	Physics for Computer Technology	BS	3	3	0	0	3	NIL

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5.	60 PH 0P1	Applied Physics Laboratory	BS	4	0	0	4	2	NIL
6.	60 MA 014	Probability and Random Processes	BS	5	3	1	0	4	NIL
7.	60 MA 019	Statistical Methods	BS	5	3	1	0	4	NIL

ENGINEERING SCIENCE (ES)

S. No.	Course Code	Course Title	Category	Contact Periods	L	T	P	C	Prerequisite
1.	60 CS 001	C Programming	ES	3	3	0	0	3	NIL
2.	60 CS 0P1	C Programming Laboratory	ES	4	0	0	4	2	NIL
3.	60 IT 001	Python Programming	ES	5	3	1	0	4	Basic knowledge of Mathematics and Programming
4.	60 IT 0P1	Python Programming Laboratory	ES	4	0	0	4	2	Basic knowledge of Mathematics and Programming
5.	60 ME 0P1	Fabrication and Reverse Engineering Laboratory	ES	4	0	0	4	2	NIL
6.	60 EE 001	Basic Electrical and Electronics Engineering	ES	3	3	0	0	3	NIL
7.	60 ME 002	Engineering Graphics	ES	6	2	0	4	4	NIL

PROFESSIONAL CORE (PC)

S. No.	Course Code	Course Title	Category	Contact Periods	L	T	P	C	Prerequisite
1.	60 CS 003	Data Structures	PC	3	3	0	0	3	Basics of C
2.	60 EC 001	Digital Logic and Microprocessor	PC	4	2	0	2	3	Basics of Electrical and Electronics Engineering
3.	60 AD 301	Artificial Intelligence	PC	3	3	0	0	3	Knowledge of Mathematics and Computer Programming
4.	60 AD 302	Software Engineering Methodologies	PC	3	3	0	0	3	NIL
5.	60 CS 004	Java Programming	PC	3	3	0	0	3	Basics of C
6.	60 CS 0P3	Data Structures Laboratory	PC	4	0	0	4	2	Basics of C
7.	60 CS 0P4	Java Programming Laboratory	PC	4	0	0	4	2	Basics of C
8.	60 IT 002	Design and Analysis of Algorithms	PC	3	3	0	0	3	Good knowledge of C
9.	60 AD 401	Database Design and Development	PC	3	3	0	0	3	Good knowledge of C, Computer Organization and Architecture.
10.	60 AD 402	Web Technology	PC	5	1	0	4	3	Java Programming, SQL, Database Connectivity
11.	60 AD 403	Data Mining Techniques	PC	3	3	0	0	3	Database Management Systems, Probability and Random Processes
12.	60 AD 4P1	Database Design Laboratory	PC	4	0	0	4	2	Relational Algebra, Data Structure, Java Programming
13.	60 AD 4P2	Data Mining Laboratory	PC	4	0	0	4	2	Good knowledge of C, Computer Organization and Architecture.
14.	60 AD 501	Operating Systems	PC	4	2	0	2	3	Basic Programming

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S. No.	Course Code	Course Title	Category	Contact Periods	L	T	P	C	Prerequisite
15.	60 AD 502	Data Communication and Networks	PC	3	3	0	0	3	C or Java Programming
16.	60 AD 503	Machine Learning	PC	3	3	0	0	3	Python programming, Probability and Statistics, Machine Learning
17.	60 IT 003	Design Thinking	PC	4	2	0	2	3	Basics of Software knowledge
18.	60 AD 5P1	Networking Laboratory	PC	4	0	0	4	2	C or Java Programming
19.	60 AD 5P2	Machine Learning Laboratory	PC	4	0	0	4	2	Python programming, Probability and Statistics, Machine Learning
20.	60 AD 601	Data Exploration and Visualization	PC	3	3	0	0	3	Statistical concepts, Programming Language: Python and R
21.	60 AD 602	Deep Learning	PC	3	3	0	0	3	Data Analytics, Probability and Statistics, Python
22.	60 AD 603/ 60 AD L01	Robotic Process Automation	PC	5	1	0	4	3	Basic Programming Knowledge
23.	60 AD 6P1	Deep Learning Laboratory	PC	4	0	0	4	2	Data Analytics, Probability and Statistics, Python
24.	60 AD 6P2	Data Visualization Laboratory	PC	4	0	0	4	2	Statistical concepts, Programming Language: Python and R
25.	60 AD 6P3	Mini Project	PC	2	0	0	2	1	NIL
26.	60 AD 701	Computer Vision	PC	3	3	0	0	3	Data Analytics, Probability and Statistics, Python
27.	60 AD 702	Natural Language Processing	PC	3	3	0	0	3	Data Analytics, Probability and Statistics, Python
28.	60 AD 703	Cloud Computing	PC	3	3	0	0	3	Basics in DBMS
29.	60 AD 704	Big Data Analytics	PC	3	3	0	0	3	Data Science
30.	60 AD 7P1	Computer Vision Laboratory	PC	4	0	0	4	2	Probability and Statistics, Python programming languages

PROFESSIONAL ELECTIVES (PE)

SEMESTER V, ELECTIVE I Artificial Intelligence and Data Science

S. No.	Course Code	Course Title	Category	Contact Periods	L	T	P	C	Prerequisite
1.	60 AD E11	Business Intelligence	PE	3	3	0	0	3	Basics of Data Mining
2.	60 AD E12	Knowledge Engineering	PE	3	3	0	0	3	Career path in AI language and knowledge representation.
3.	60 AD E13	Recommender Systems	PE	3	3	0	0	3	Understand the Business and Visualize the Data
4.	60 AD E14	Text and Speech Analysis	PE	3	3	0	0	3	Basic concepts of text analytics and perform natural language
5.	60 AD E15	Image and Video Analytics	PE	3	3	0	0	3	Basic programming skills
6.	60 AD E16	Healthcare Analytics	PE	3	3	0	0	3	Artificial Intelligence, Data Mining, Machine Learning

SEMESTER VI, ELECTIVE II Full Stack Development for IT

S. No.	Course Code	Course Title	Category	Contact Periods	L	T	P	C	Prerequisite

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1.	60 AD E21	Data Analytics	PE	4	2	0	2	3	Basic Understanding of Different Types of Cloud
2.	60 AD E22	App Development	PE	4	2	0	2	3	Knowledge of programming languages
3.	60 AD E23	Cloud Services Management	PE	4	2	0	2	3	Basic knowledge in operating system
4.	60 AD E24	UI and UX Design	PE	4	2	0	2	3	Understanding the psychology of human-computer interaction and knowledge of web design
5.	60 AD E25	Software Testing and Automation	PE	4	2	0	2	3	knowledge in engineering, math, computer science
6.	60 AD E26	Web Application Security	PE	4	2	0	2	3	Secure Configuration and Deployment Practices

SEMESTER VII, ELECTIVE III Cloud Computing &Data Center Technologies

S. No.	Course Code	Course Title	Category	Contact Periods	L	T	P	C	Prerequisite
1.	60 AD E31	Virtualization	PE	3	3	0	0	3	Recommended hardware requirements
2.	60 AD E32	Data Warehousing	PE	3	3	0	0	3	A central database, ETL tools, metadata, and access tools
3.	60 AD E33	Storage Technologies	PE	3	3	0	0	3	Environmentally friendly storage
4.	60 AD E34	Software Defined Networks	PE	3	3	0	0	3	Data management tools, structure and software platform
5.	60 AD E35	Stream Processing	PE	3	3	0	0	3	Basic storage and processing.
6.	60 AD E36	Security and Privacy in Cloud	PE	3	3	0	0	3	Widespread adoption of cloud as a platform

SEMESTER VII, ELECTIVE IV Cyber Security and Data Privacy

S. No.	Course Code	Course Title	Category	Contact Periods	L	T	P	C	Prerequisite
1.	60 AD E41	Ethical Hacking	PE	3	3	0	0	3	Problem-Solving and Critical Thinking Skills
2.	60 AD E42	Digital and Mobile Forensics	PE	3	3	0	0	3	Adequately preserved, processed, and admissible in a court of law
3.	60 AD E43	Social Network Security	PE	3	3	0	0	3	Analyzing dynamic social network data for security
4.	60 AD E44	Modern Cryptography	PE	3	3	0	0	3	Calculus and basic linear algebra
5.	60 AD E45	Cryptocurrency and Blockchain Technologies	PE	3	3	0	0	3	Basics of computer science, information technology and information security
6.	60 AD E46	Network Security	PE	3	3	0	0	3	Security information and event management

SEMESTER VIII, ELECTIVE V Emerging Technologies

S. No.	Course Code	Course Title	Category	Contact Periods	L	T	P	C	Prerequisite
1.	60 AD E51	Blockchain Technologies	PE	3	3	0	0	3	Basics of Programming Languages and Algorithms
2.	60 AD E52	Artificial Neural Networks	PE	3	3	0	0	3	Basics of Programming, Statistics, Linear algebra and Data Science
3.	60 AD E53	Cyber Security	PE	3	3	0	0	3	Basic Data Analysis. · Basic Scripting or Introductory Programming
4.	60 AD E54	Quantum Computing	PE	3	3	0	0	3	Basics of Linear algebra, group theory, probability and stochastic processes, Fourier transforms, algorithms, analysis of algorithms.
5.	60 AD E55	Game Development	PE	3	3	0	0	3	Basic Proficient with programming languages
6.	60 AD E56	Cognitive Science	PE	3	3	0	0	3	Probability or statistics

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SEMESTER VII & SEMESTER VIII, AUDIT COURSES (AC)

S. No.	Course Code	Course Title	Category	Contact Periods	L	T	P	C	Prerequisite
1.	60 AC 001	Research Skill Development	AC	1	1	0	0	0	NIL

GENERAL ELECTIVE COURSES (GE)

S. No.	Course Code	Course Title	Category	Contact Periods	L	T	P	C	Prerequisite
1.	60 GE 001	Heritage of Tamils / தமிழர் மரபு	GE	1	1	0	0	1*	NIL
2.	60 GE 002	Tamils and Technology / தமிழரும் தொழில்நுட்பமும்	GE	1	1	0	0	1*	Heritage of Tamils

* denotes Extra credits will be awarded

MANDATORY COURSES (MC)

S. No.	Course Code	Course Title	Category	Contact Periods	L	T	P	C	Prerequisite
1.	60 MY 001	Environmental Studies and Climate Change	MC	2	2	0	0	0	NIL
2.	60 MY 002	Universal Human Values	MC	3	3	0	0	3*	NIL
3.	60 MY 003	Startups and Entrepreneurship	MC	3	3	0	0	3*	NIL

* Denotes Extra credits will be awarded

OPEN ELECTIVES (OE)

S. No.	Course Code	Course Title	Category	Contact Periods	L	T	P	C	Prerequisite
1.	60 AD 603/ 60 AD L01	Robotic Process Automation	PC/OE	5	1	0	4	3	Basics of Web Technology.
2.	60 AD L02	Visualization Tools	OE	5	1	0	4	3	Basics of data analytics

INTEGRATED COURSES

S. No.	Course Code	Course Title	Category	Contact Periods	L	T	P	C	Prerequisite
1.	60 EC 001	Digital Logic and Microprocessor	PC	4	2	0	2	3	Basics of Electrical and Electronics Engineering
2.	60 AD 501	Operating Systems	PC	4	2	0	2	3	Basic Programming
3.	60 IT 003	Design Thinking	PC	4	2	0	2	3	Basic knowledge of mathematics and programming.
4.	60 AD E21	Data Analytics	PE	4	2	0	2	3	Basic Understanding of Different Types of Cloud
5.	60 AD E22	App Development	PE	4	2	0	2	3	Knowledge of programming languages
6.	60 AD E23	Cloud Services Management	PE	4	2	0	2	3	Basic knowledge in operating system
7.	60 AD E24	UI and UX Design	PE	4	2	0	2	3	Understanding the psychology of human-computer interaction and knowledge of web design
8.	60 AD E25	Software Testing and Automation	PE	4	2	0	2	3	knowledge in engineering, math, computer science
9.	60 AD E26	Web Application Security	PE	4	2	0	2	3	Secure Configuration and Deployment Practices

CAREER GUIDANCE COURSE (CGC)

S. No.	Course Code	Course Title	Category	Contact Periods	L	T	P	C	Prerequisite
1.	60 AD 7P2	Project Work - Phase I	CG	4	0	0	4	2	Subjects from Semester I – VI

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2.	60 AD 8P1	Project Work - Phase II	CG	16	0	0	16	8	Subjects from Semester I – VII
3.	60 CG 0P1	Career Skill Development I	CG	2	0	0	2	0	Basic Mathematics
4.	60 CG 0P2	Career Skill Development II	CG	2	0	0	2	0	Basic Verbal's
5.	60 CG 0P3	Career Skill Development III	CG	2	0	0	2	0	Basic Communication
6.	60 CG 0P4	Career Skill Development IV	CG	2	0	0	2	0	Basics Management Technique
7.	60 CG 0P5	Comprehension Test	CG	2	0	0	2	0	Basics of CSD
8.	60 CG 0P6	Internship	CG	3	3	0	0	1/2/3*	Basics Subject Knowledge

* denotes Extra credits will be awarded

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K.S. RANGASAMY COLLEGE OF TECHNOLOGY, TIRUCHENGODE - 637215
(An Autonomous Institution affiliated to Anna University)
COURSES OF STUDY
(For the candidates admitted from 2022-2023 onwards)
SEMESTER I

S. No.	Course Code	Course Title	Category	Contact Periods	L	T	P	C
		Induction Programme	-	-	-	-	-	-
Theory								
1.	60 EN 001	Professional English I	HS	3	1	0	2	2
2.	60 MA 001	Matrices and Calculus	BS	5	3	1	0	4
3.	60 PH 004	Physics for Computer Technology	BS	3	3	0	0	3
4.	60 ME 002	Engineering Graphics	ES	6	2	0	4	4
5.	60 CS 001	C Programming	ES	3	3	0	0	3
6.	60 MY 001	Environmental Studies and Climate Change	MC	2	2	0	0	0
Practical								
7.	60 PH 0P1	Applied Physics Laboratory	BS	4	0	0	4	2
8.	60 CS 0P1	C Programming Laboratory	ES	4	0	0	4	2
9.	60 CG 0P6	Internship	CG	0	0	0	0	1*
Total				**30**	**14**	**1**	**14**	**20**

NCC% - Course can be waived with 3 credits in VII semester or offered as extra credits
NSS/NSO/YRC/RRC/Fine Arts% 3 credits is not accounted for CGPA
Career Skill Development (CSD) - additional credit is offered not accounted for CGPA.
Internship 3 additional credits not accounted for CGPA is offered based on the Internship duration

SEMESTER II

S. No.	Course Code	Course Title	Category	Contact Periods	L	T	P	C
Theory								
1.	60 EN 002	Professional English II	HS	3	1	0	2	2
2.	60 MA 004	Linear Algebra and Optimization Techniques	BS	5	3	1	0	4
3.	60 CH 004	Engineering Chemistry	BS	3	3	0	0	3
4.	60 EE 001	Basic Electrical and Electronics Engineering	ES	3	3	0	0	3
5.	60 IT 001	Python Programming	ES	5	3	1	0	4
6.	60 GE 001	Heritage of Tamils / தமிழர் மரபு	GE	1	1	0	0	1*
Practical								
7.	60 IT 0P1	Python Programming Laboratory	ES	4	0	0	4	2
8.	60 ME 0P1	Fabrication and Reverse Engineering Laboratory	ES	4	0	0	4	2
9.	60 CG 0P1	Career Skill Development I	CG	2	0	0	2	1*
10.	60 CG 0P6	Internship	CG	0	0	0	0	1*
Total				**30**	**14**	**2**	**12**	**20**

Heritage of Tamils& additional 1 credit is offered and not account for CGPA.

SEMESTER III

S. No.	Course Code	Course Title	Category	Contact Periods	L	T	P	C
Theory								
1.	60 MA 014	Probability and Random Processes	BS	5	3	1	0	4
2.	60 CS 003	Data Structures	PC	3	3	0	0	3
3.	60 EC 001	Digital Logic and Microprocessor	PC	4	2	0	2	3
4.	60 AD 301	Artificial Intelligence	PC	3	3	0	0	3

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5.	60 AD 302	Software Engineering Methodologies	PC	3	3	0	0	3
6.	60 CS 004	Java Programming	PC	3	3	0	0	3
7.	60 GE 002	Tamils and Technology / தமிழரும் தொழில்நுட்பமும்	GE	1	1	0	0	1*
Practical								
8.	60 CS 0P3	Data Structures Laboratory	PC	4	0	0	4	2
9.	60 CS 0P4	Java Programming Laboratory	PC	4	0	0	4	2
10.	60 CG 0P2	Career Skill Development II	CG	2	0	0	2	1*
11.	60 CG 0P6	Internship	CG	0	0	0	0	1*
Total				**32**	**18**	**1**	**12**	**23**

Tamils and Technology[&] additional1 credit is offered and not account for CGPA.

SEMESTER IV

S. No.	Course Code	Course Title	Category	Contact Periods	L	T	P	C
Theory								
1.	60 MA 019	Statistical Methods	BS	4	3	1	0	4
2.	60 IT 002	Design and Analysis of Algorithms	PC	3	3	0	0	3
3.	60 AD 401	Database Design and Development	PC	3	3	0	0	3
4.	60 AD 402	Web Technology	PC	5	1	0	4	3
5.	60 AD 403	Data Mining Techniques	PC	3	3	0	0	3
6.	60 AD L**	Open Elective I	OE	3	3	0	0	3
7.	60 MY 002	Universal Human Values	MC	3	3	0	0	3*
Practical								
8.	60 AD 4P1	Database Design Laboratory	PC	4	0	0	4	2
9.	60 AD 4P2	Data Mining Laboratory	PC	4	0	0	4	2
10.	60 CG 0P3	Career Skill Development III	CG	2	0	0	2	1*
11.	60 CG 0P6	Internship	CG	0	0	0	0	1*
Total				**34**	**19**	**2**	**14**	**23**

UHV[#] additional 3 credit is offered and not accounted for CGPA

SEMESTER V

S. No.	Course Code	Course Title	Category	Contact Periods	L	T	P	C
Theory								
1.	60 AD 501	Operating Systems	PC	4	2	0	2	3
2.	60 AD 502	Data Communication and Networks	PC	3	3	0	0	3
3.	60 AD 503	Machine Learning	PC	3	3	0	0	3
4.	60 IT 003	Design Thinking	PC	4	2	0	2	3
5.	60 AD E1*	Elective I	PE	3	3	0	0	3
6.	60 AD L**	Open Elective II	OE	3	3	0	0	3
7.	60 MY 003	Startups and Entrepreneurship	MC	3	3	0	0	3*
Practicals								
8.	60 AD 5P1	Networking Laboratory	PC	4	0	0	4	2
9.	60 AD 5P2	Machine Learning Laboratory	PC	4	0	0	4	2
10.	60 CG 0P4	Career Skill Development IV	CG	2	0	0	2	1*
11.	60 CG 0P6	Internship	CG	0	0	0	0	1*
Total				**33**	**19**	**0**	**14**	**22**

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SEMESTER VI

S. No.	Course Code	Course Title	Category	Contact Periods	L	T	P	C
Theory								
1.	60 HS 002	Engineering Economics and Financial Accounting	HS	3	3	0	0	3
2.	60 AD 601	Data Exploration and Visualization	PC	3	3	0	0	3
3.	60 AD 602	Deep Learning	PC	3	3	0	0	3
4.	60 AD 603/ 60 AD L01	Robotic Process Automation	PC	5	1	0	4	3
5.	60 AD E2*	Elective II	PE	3	3	0	0	3
6.	60 AD L**	Open Elective III	OE	3	3	0	0	3
Practicals								
7.	60 AD 6P1	Data Visualization Laboratory	PC	4	0	0	4	2
8.	60 AD 6P2	Deep Learning Laboratory	PC	4	0	0	4	2
9.	60 AD 6P3	Mini Project	PC	2	0	0	2	1[&]
10.	60 CG 0P5	Comprehensive Test	CG	2	0	2	0	1*
11.	60 CG 0P6	Internship	CG	0	0	0	0	1*
Total				**32**	**16**	**2**	**14**	**22**

Comprehension Test* -one additional credit is offered and not accounted for CGPA calculation.
Mini project[&] - 1 additional credit is offered and not accounted for CGPA calculation

SEMESTER VII

S. No.	Course Code	Course Title	Category	Contact Periods	L	T	P	C
Theory								
1.	60 AD 701	Computer Vision	PC	3	3	0	0	3
2.	60 AD 702	Natural Language Processing	PC	3	3	0	0	3
3.	60 AD 703	Cloud Computing	PC	3	3	0	0	3
4.	60 AD 704	Big Data Analytics	PC	3	3	0	0	3
5.	60 AD E3*	Elective III	PE	3	3	0	0	3
6.	60 AD E4*	Elective IV	PE	3	3	0	0	3
7.	60 AC 001	Research Skill Development	AC	1	1	0	0	0
8.	60 AB 00*	NCC/NSS/NSO/YRC/RRC/Fine Arts*	HS	4	2	0	2	3*
Practicals								
9.	60 AD 7P1	Computer Vision Laboratory	PC	4	0	0	4	2
10.	60 AD 7P2	Project Work – Phase I	CG	4	0	0	4	2
11.	60 CG 0P6	Internship	CG	0	0	0	0	1*
Total				**31**	**21**	**0**	**10**	**22**

NCC[%] - Course can be waived with 3 credits in VII semester or offered as extra 3 credits.
NSS/NSO/YRC/RRC/Fine Arts[%] 3 extra credits not accounted for CGPA

SEMESTER VIII

S. No.	Course Code	Course Title	Category	Contact Periods	L	T	P	C
Theory								
1.	60 AD E5*	Elective V	PE	3	3	0	0	3
Practicals								
2.	60 AD 8P1	Project Work – Phase II	CG	16	0	0	16	8
3.	60 CG 0P6	Internship	CG	0	0	0	0	1*
Total				**19**	**3**	**0**	**16**	**11**

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PROFESSIONAL ELECTIVES (PE)

SEMESTER V, ELECTIVE I Artificial Intelligence and Data Science

S. No.	Course Code	Course Title	Category	Contact Periods	L	T	P	C	Prerequisite
7.	60 AD E11	Business Intelligence	PE	3	3	0	0	3	Basics of Data Mining
8.	60 AD E12	Knowledge Engineering	PE	3	3	0	0	3	Career path in AI language and knowledge representation.
9.	60 AD E13	Recommender Systems	PE	3	3	0	0	3	Understand the Business and Visualize the Data
10.	60 AD E14	Text and Speech Analysis	PE	3	3	0	0	3	Basic concepts of *text* analytics and perform natural *language*
11.	60 AD E15	Image and Video Analytics	PE	3	3	0	0	3	Basic programming skills
12.	60 AD E16	Healthcare Analytics	PE	3	3	0	0	3	Artificial Intelligence, Data Mining, Machine Learning

SEMESTER VI, ELECTIVE II Full Stack Development for IT

S. No.	Course Code	Course Title	Category	Contact Periods	L	T	P	C	Prerequisite
1.	60 AD E21	Data Analytics	PE	4	2	0	2	3	Basic Understanding of Different Types of Cloud
2.	60 AD E22	App Development	PE	4	2	0	2	3	Knowledge of programming languages
3.	60 AD E23	Cloud Services Management	PE	4	2	0	2	3	Basic knowledge in operating system
4.	60 AD E24	UI and UX Design	PE	4	2	0	2	3	Understanding the psychology of human-computer interaction and knowledge of web design
5.	60 AD E25	Software Testing and Automation	PE	4	2	0	2	3	knowledge in engineering, math, computer science
6.	60 AD E26	Web Application Security	PE	4	2	0	2	3	Secure Configuration and Deployment Practices

SEMESTER VII, ELECTIVE III Cloud Computing &Data Center Technologies

S. No.	Course Code	Course Title	Category	Contact Periods	L	T	P	C	Prerequisite
1.	60 AD E31	Virtualization	PE	3	3	0	0	3	Recommended hardware requirements
2.	60 AD E32	Data Warehousing	PE	3	3	0	0	3	A central database, ETL tools, metadata, and access tools
3.	60 AD E33	Storage Technologies	PE	3	3	0	0	3	Environmentally friendly storage
4.	60 AD E34	Software Defined Networks	PE	3	3	0	0	3	Data management tools, structure and software platform
5.	60 AD E35	Stream Processing	PE	3	3	0	0	3	Basic storage and processing.
6.	60 AD E36	Security and Privacy in Cloud	PE	3	3	0	0	3	Widespread adoption of cloud as a platform

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SEMESTER VII, ELECTIVE IV Cyber Security and Data Privacy

S. No.	Course Code	Course Title	Category	Contact Periods	L	T	P	C	Prerequisite
1.	60 AD E41	Ethical Hacking	PE	3	3	0	0	3	Problem-Solving and Critical Thinking Skills
2.	60 AD E42	Digital and Mobile Forensics	PE	3	3	0	0	3	Adequately preserved, processed, and admissible in a court of law
3.	60 AD E43	Social Network Security	PE	3	3	0	0	3	Analyzing dynamic social network data for security
4.	60 AD E44	Modern Cryptography	PE	3	3	0	0	3	Calculus and basic linear algebra
5.	60 AD E45	Cryptocurrency and Blockchain Technologies	PE	3	3	0	0	3	Basics of computer science, information technology and information security
6.	60 AD E46	Network Security	PE	3	3	0	0	3	Security information and event management

SEMESTER VIII, ELECTIVE V Emerging Technologies

S. No.	Course Code	Course Title	Category	Contact Periods	L	T	P	C	Prerequisite
1.	60 AD E51	Blockchain Technologies	PE	3	3	0	0	3	Basics of Programming Languages and Algorithms
2.	60 AD E52	Artificial Neural Networks	PE	3	3	0	0	3	Basics of Programming, Statistics, Linear algebra and Data Science
3.	60 AD E53	Cyber Security	PE	3	3	0	0	3	Basic Data Analysis. · Basic Scripting or Introductory Programming
4.	60 AD E54	Quantum Computing	PE	3	3	0	0	3	Basics of Linear algebra, group theory, probability and stochastic processes, Fourier transforms, algorithms, analysis of algorithms.
5.	60 AD E55	Game Development	PE	3	3	0	0	3	Basic Proficient with programming languages
6.	60 AD E56	Cognitive Science	PE	3	3	0	0	3	Probability or statistics

TOTAL NUMBER OF CREDITS TO BE EARNED FOR AWARD OF THE DEGREE = 163

Note: HS- Humanities and Social Sciences including Management Courses, BS- Basic Science Courses, ES-Engineering Science Courses, PC-Professional Core Courses, PE-Professional Elective Courses, GE- General Elective Courses, OE-Open Elective Courses, CG - Career Enhancement Course, MC- Mandatory Courses

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CURRICULUM & SYLLABI

K.S. RANGASAMY COLLEGE OF TECHNOLOGY, TIRUCHENGODE - 637215

(An Autonomous Institution affiliated to Anna University)

B.E. / B.Tech. Degree Programme

SCHEME OF EXAMINATIONS
(For the candidates admitted from 2022-2023 onwards)

FIRST SEMESTER

S.No.	Course Code	Name of the Course	Duration of Internal Exam	Weightage of Marks			Minimum Marks for Pass in End Semester Exam	
				Continuous Assessment *	End Semester Exam **	Max. Marks	End Semester Exam	Total
THEORY								
1	60 EN 001	Professional English I	2	40	60	100	45	100
2	60 MA 001	Matrices and Calculus	2	40	60	100	45	100
3	60 PH 004	Physics for Computer Technology	2	40	60	100	45	100
4	60 ME 002	Engineering Graphics	2	50	50	100	45	100
5	60 CS 001	C Programming	2	40	60	100	45	100
6	60 MY 001	Environmental Studies and Climate Change	2	100	-	100	-	
PRACTICALS								
7	60 PH 0P1	Applied Physics Laboratory	2	60	40	100	45	100
8	60 CS 0P1	C Programming Laboratory	2	60	40	100	45	100
9	60 CG 0P6	Internship	-	-	-	-	-	-

* CA evaluation pattern will differ from course to course and for different tests. This will have to be declared in advance to students. The department will put a process in place to ensure that the actual test paper follow the declared pattern.

** End Semester Examination will be conducted for maximum marks of 100 and subsequently be reduced to 60 marks for the award of terminal examination marks.

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60 EN 001	Professional English I	Category	L	T	P	Credit
		HS	1	0	2	2

Objective

- To help learners improve their vocabulary and to enable them to use words appropriately in different academic and professional contexts
- To help learners develop strategies that could be adopted while reading texts
- To help learners acquire the ability to speak effectively in English in real life and career related situations
- To equip students with effective speaking and listening skills in English
- To facilitate learners to enhance their writing skills with coherence and appropriate format effectively

Prerequisite

Basic knowledge of reading and writing in English.

Course Outcomes

CO1	Compare and interpret complex academic texts	Understand
CO2	Recall the denotative and connotative meanings of technical texts	Remember
CO3	Interpret definitions, descriptions, narrations, and essays on various topics	Understand
CO4	Express fluently and accurately in formal and informal communicative contexts	Understand
CO5	Summarize their opinions effectively in both oral and written medium of communication	Understand

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	-	-	2	3	3	2	3
CO2	-	-	-	-	-	-	-	2	3	3	2	3
CO3	-	-	-	-	-	-	-	2	3	3	2	3
CO4	-	-	-	-	-	-	-	2	3	3	2	3
CO5	-	-	-	-	-	-	-	2	3	3	2	3

3- Strong; 2-Medium; 1-Some

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		Model Examination	End Sem Examination (Marks)
	1	2		
Remember (Re)	10	10	20	20
Understand (Un)	50	50	80	80

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Professional English I

Common to All Branches

Semester	Hours/Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
I	1	0	2	45	2	40	60	100

Introduction to Fundamentals of Communication **Listening:** General Information-Specific Details-Conversation: Introduction to Classmates – Audio / Video (Formal & Informal). **Speaking:** Self Introduction; Introducing a Friend; Conversation - Politeness Strategies. **Reading:** Reading Brochures (Technical Context), Telephone Messages / Social Media Messages Relevant to Technical Contexts and Emails. **Writing:** Writing Letters – Informal and Formal – Basics and Format Orientation **Language Focus:** Present Tenses; Word Formation (Affixes); Synonyms, Antonyms and Contranyms, and Phrasal Verbs; Abbreviations & Acronyms (As Used in Technical Contexts).	**[9]**
Narration and Summation **Listening:** Podcast, Anecdotes / Stories / Event Narration; Documentaries and Interviews with Celebrities. **Speaking:** Narrating Personal Experiences / Events; Interviewing A Celebrity; Reporting / And Summarizing of Documentaries / Podcasts/ Interviews. **Reading:** Biographies, Travelogues, Newspaper Reports, Excerpts from Literature, And Travel & Technical Blogs. **Writing:** Paragraph Writing, Short Report on An Event (Field Trip Etc.). **Language Focus:** Past Tenses and Prepositions; One-Word Substitution.	**[9]**
Description of a process / product **Listening:** Listen to A Product and Process Descriptions; Advertisements About Products or Services **Speaking:** Picture Description; Giving Instruction to Use the Product; Presenting A Product. **Reading:** Advertisements, Gadget Reviews and User Manuals. **Writing:** Definitions; Instructions; and Product /Process Description. **Language Focus:** Imperatives; Comparative Adjectives; Future Tenses. Homonyms; And Homophones, Discourse Markers (Connectives & Sequence Words)	**[9]**
Classification And Recommendations **Listening:** TED Talks; Scientific Lectures; and Educational Videos. **Speaking:** Small Talk; Mini Presentations **Reading:** Newspaper Articles and Journal Reports **Writing:** Note-Making / Note-Taking; Recommendations; Transferring Information from Non-Verbal (Chart, Graph etc, To Verbal Mode) **Language Focus:** Articles; Pronouns -Possessive & Relative Pronouns; Subject-Verb Agreement; Collocations.	**[9]**
Listening: Debates/ Discussions; Different Viewpoints on An Issue; And Panel Discussions. **Speaking:** Group Discussions, Debates & Role Plays. **Reading:** Editorials; And Opinion Blogs. **Writing:** Essay Writing (Descriptive or Narrative). **Language Focus:** Punctuation; Compound Nouns; Simple, Compound & Complex Sentences. Cause & Effect Expressions.	**[9]**
Total Hours	**45**

Text book(s):

1. 'English for Engineers & Technologists' Orient Blackswan Private Ltd. Department of English, Anna University, 2020
2. Norman Lewis, 'Word Power Made Easy - The Complete Handbook for Building a Superior Vocabulary Book', Penguin Random House India, 2020

Reference(s):

1.	Paul Emmerson and Nick Hamilton, 'Five Minute Activities for Business English', Cambridge University Press, New York, 2005
2.	Arthur Brookes and Peter Grundy,' Beginning to Write: Writing Activities for Elementary and Intermediate Learners', Cambridge University Press, New York, 2003
3.	Michael McCarthy and Felicity O Dell, 'English Vocabulary in Use: Upper Intermediate', Cambridge University Press, N.York, 2012
4.	Lakshmi Narayanan, 'A Course Book on Technical English' Scitech Publications (India) Pvt. Ltd. 2020

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Course Contents and Lecture Schedule

S.No	Topic	No.of Hours	Mode of content Delivery
1	**Introduction to Fundamentals of Communication**		
1.1	Listening for General Information and Specific Details	1	Activity Based
1.2	Self-Introduction	1	Activity Based
1.3	Narrating Personal Experiences	1	Activity Based
1.4	Reading Relevant to Technical Contexts and Emails	1	Activity Based
1.5	Writing Letters – Informal	1	Lecture
1.6	Writing Letters - Formal	1	Lecture
1.7	Present Tenses	1	Lecture
1.8	Synonyms, Antonyms and Contranyms, And Affixes	1	Lecture
1.9	Phrasal Verbs; Abbreviations & Acronyms	1	Lecture
2	**Narration and Summation**		
2.1	Listening To Podcasts, Documentaries and Interviews with Celebrities	1	Activity Based
2.2	Narrating Personal Experiences	1	Activity Based
2.3	Summarizing Of Documentaries	1	Activity Based
2.4	Reading Travelogues, And Excerpts from Literature	1	Activity Based
2.5	Paragraph Writing	1	Activity Based
2.6	Short Report on An Event (Field Trip Etc.).	1	Activity Based
2.7	Past Tenses	1	Lecture
2.8	Prepositions	1	Lecture
2.9	One-Word Substitution	1	Lecture
3	**Description of a process / product**		
3.1	Listen to a Product and Process Descriptions	1	Activity Based
3.2	Picture Description	1	Activity Based
3.3	Giving Instruction to Use the Product	1	Activity Based
3.4	Reading Advertisements, Gadget Reviews and User Manuals	1	Activity Based
3.5	Writing Definitions and Instructions	1	Lecture
3.6	Future Tenses	1	Lecture
3.7	Homonyms and Homophones	1	Lecture
3.8	Imperatives	1	Lecture
3.9	Comparative Adjectives, and Discourse Markers	1	Lecture
4	**Classification and Recommendations**		
4.1	Listening To TED Talks and Educational Videos	1	Activity Based
4.2	Listening To Scientific Lectures	1	Activity Based
4.3	Small Talk and Mini Presentations	1	Activity Based
4.4	Reading Newspaper Articles and Journal Reports	1	Activity Based
4.5	Note-Making / Note-Taking	1	Lecture

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4.6	Recommendations	1	Lecture
4.7	Transferring Information from Non-Verbal	1	Lecture
4.8	Articles And Pronouns	1	Lecture
4.9	Subject-Verb Agreement and Collocations	1	Lecture
5	**Expression**		
5.1	Listening To Debates and Panel Discussions	1	Activity Based
5.2	Group Discussions	2	Activity Based
5.3	Role Plays	1	Activity Based
5.4	Reading Editorials and Opinion Blogs	1	Activity Based
5.5	Essay Writing (Descriptive or Narrative)	1	Lecture
5.6	Punctuation And Cause & Effect Expressions.	1	Lecture
5.7	Compound Nouns	1	Lecture
5.8	Simple, Compound & Complex Sentences	1	Lecture
	Total	**45**	

Course Designers

1. Dr.A.Palaniappan - palaniappan@ksrct.ac.in

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60 MA 001	Matrices and Calculus	Category	L	T	P	Credit
		BS	3	1	0	4

Objectives

- To familiarize the basic concepts in Cayley-Hamilton theorem and orthogonal transformation
- To get exposed to the fundamentals of differentiation
- To acquire skills to understand the concepts involved in Jacobians and maxima and minima
- To solve various linear differential equations and method of variation of parameters
- To learn various techniques and methods in solving definite and indefinite integrals

Pre-requisites

NIL

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Apply the concepts of Cayley-hamilton theorem and orthogonal transformation to the matrix	Apply
CO2	Apply the concepts of differentiation in solving various Engineering problems	Apply
CO3	Obtain Jacobians and maxima and minima of functions of two variables	Apply
CO4	Employ various methods in solving differential equations	Apply
CO5	Apply different techniques to evaluate definite and indefinite integrals	Apply

Mapping with Programme Outcomes

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	-	-	2	-	-	-	-	-	-	-	-	3	3
CO2	3	2	-	-	2	-	-	-	-	-	-	-	-	3	3
CO3	3	2	-	-	2	-	-	-	-	-	-	-	-	3	3
CO4	3	2	-	-	2	-	-	-	-	-	-	-	-	3	3
CO5	3	2	-	-	2	-	-	-	-	-	-	-	-	3	3

3 - Strong; 2 - Medium; 1 - Some

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		Model Examination (Marks)	End Sem Examination (Marks)
	1	2		
Remember	10	10	10	10
Understand	10	10	20	20
Apply	40	40	70	70
Analyse	-	-	-	-
Evaluate	-	-	-	-
Create	-	-	-	-
Total	60	60	100	100

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K. S. Rangasamy College of Technology – Autonomous (R2022)

Common to MECH, ECE, EEE, CSE, MCT, CIVIL, IT, TXT, BT, FT, AI&DS, AI&ML

60 MA 001 – Matrices and Calculus

Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
I	3	1	0	60	4	40	60	100

Matrices Characteristic equation - Eigen values and Eigen vectors of a real matrix - Properties of Eigen values and Eigen vectors - Cayley-Hamilton theorem - Orthogonal transformation of a symmetric matrix to diagonal form - Reduction of quadratic form to canonical form by an Orthogonal transformation - Nature of quadratic form - Applications: Stretching of an elastic membrane **Hands-on:** **Matrix Operations - Addition, Multiplication, Transpose, Inverse and Rank**	[9]
Differentiation Representation of functions - Limit of a function - Continuity - Derivatives - Differentiation rules (sum, product, quotient, chain rules) - Successive Differentiation - Leibnitz's theorem **- Applications: Maxima and Minima of functions of one variable*** **Hands-on:** **Determine the solution of system of linear equations**	[9]
Functions of Several Variables Partial differentiation - Homogeneous functions and Euler's theorem - Jacobians - Taylor's series for functions of two variables - **Applications: Maxima and minima of functions of two variables - Constrained maxima and minima: Lagrange's Method of Undetermined Multipliers*** **Hands-on:** **Compute the Eigen values and Eigen vectors of a Matrix**	[9]
Differential Equations Linear differential equations of second and higher order with constant coefficients - R.H.S is of the form $e^{\alpha x}$, $\sin \alpha x$, $\cos \alpha x$, x^n, $n > 0$ - Differential equations with variable coefficients: Cauchy's and Legendre's form of linear equations - Method of variation of parameters **Hands-on:** **Solve the first and second order ordinary differential equations**	[9]
Integration Definite and Indefinite integrals - Substitution rule - Techniques of Integration: Integration by parts, Integration of rational functions by partial fraction, Integration of irrational functions - Improper integrals - Applications: Hydrostatic force and pressure, moments and centres of mass **Hands-on:** **Compute the Maxima and Minima of a function of one variable**	[9]
Total Hours: 45 + 15 (Tutorial)	**60**

Text Book(s):

1. Kirpal Singh, "Automobile Engineering", 14th Edition, Standard Publishers Distributor, New Delhi, 2021.
2. Crouse W. H., and Anglin D. L., "Automotive Mechanics", 10th Edition, McGraw Hill Education Private Limited, New Delhi, 2017.

Reference(s):

1. Dass H.K, "Higher Engineering Mathematics", 3rd (Revised) Edition, S.Chand & Company Ltd, New Delhi, 2014.
2. Veerarajan T, "Engineering Mathematics", for Semesters I & II, 1st Edition, Tata McGraw Hill Publishing Co., New Delhi, 2019.
3. Kandasamy P, Thilagavathy K and Gunavathy K, "Engineering Mathematics - I", S.Chand & Company Ltd, New Delhi, 2017.
4. Bali N P and Manish Goyal," A text book of Engineering Mathematics",10th Edition, Laxmi Publications (P) Ltd, 2016.

***SDG: 4 – Quality Education**

Rev. No.3/w.e.f. 22.07.2024
Passed in BoS Meeting held on 24/05/2024
Approved in Academic Council Meeting held on 25/05/2024

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Course Contents and Lecture Schedule

S. No.	Topics	No. of hours
1.	**Matrices**	
1.1	Characteristic equation	1
1.2	Eigen values and Eigen vectors of a real matrix	1
1.3	Properties of Eigen values and Eigen vectors	1
1.4	Cayley-Hamilton theorem	1
1.5	Orthogonal transformation of a symmetric matrix to diagonal form	1
1.6	Nature of quadratic form	1
1.7	Reduction of quadratic form to canonical form by Orthogonal transformation	2
1.8	Stretching of an elastic membrane	1
1.9	Tutorial	2
1.10	Hands-on	1
2.	**Differentiation**	
2.1	Representation of functions	1
2.2	Limit of a function and Continuity	1
2.3	Differentiation rules (sum, product, quotient, chain rules)	2
2.4	Successive differentiation	1
2.5	Leibnitz's theorem	2
2.6	Maxima and minima of functions of one variable	2
2.7	Tutorial	2
2.8	Hands-on	1
3.	**Functions of Several Variables**	
3.1	Partial differentiation	1
3.2	Homogeneous functions and Euler's theorem	1
3.3	Jacobians	2
3.4	Taylor's series for functions of two variables	1
3.5	Maxima and minima of functions of two variables	2
3.6	Lagrange's Method of Undetermined Multipliers	2
3.7	Tutorial	2
3.8	Hands-on	1
4.	**Differential Equations**	
4.1	Linear differential equations of second and higher order with constant co-efficient	1
4.2	R.H.S is of the form $e^{\alpha x},\ sin\,\alpha\, x,\ cos\,\alpha\, x,\ x^n, n > 0$	2
4.3	Differential equations with variable coefficients: Cauchy's form of linear equations	2
4.4	Differential equations with variable coefficients: Legendre's form of linear equations	2
4.5	Method of variation of parameters	2
4.6	Tutorial	2
4.7	Hands-on	1
5.	**Integration**	
5.1	Definite and Indefinite integrals	2
5.2	Substitution rule	1
5.3	Techniques of Integration: Integration by parts	1
5.4	Integration of rational functions by partial fraction	1
5.5	Integration of irrational functions	1
5.6	Improper integrals	1

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5.7	Hydrostatic force.	1
5.8	Pressure, moments and centres of mass.	1
5.9	Tutorial	2
5.10	Hands-on	1

Course Designer(s)

1.Dr.C.Chandran - cchandran@ksrct.ac.in
2.Mr.G.Mohan - mohang@ksrct.ac.in

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60 PH 004	Physics for Computer Technology (CSE, IT, AI&DS & AI&ML)	Category	L	T	P	Credit
		BS	3	0	0	3

Objectives

- To instil knowledge on physics of semiconductors, determination of charge carriers and device applications
- To enable the students to correlate the theoretical principles with application-oriented studies in optoelectronic materials
- To introduce the basics of laser, optical fiber and its applications in information science
- To understand the basic concepts of magnetic materials and its applications
- To inculcate an idea of significance of nano structures, ensuing nano device applications and quantum computing

Pre-requisites

NIL

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Acquire knowledge on basics of semiconductor physics and its applications in various devices	Apply
CO2	Apply the principles of LCD, photo detectors and optoelectronic devices for various engineeringapplications	Understand
CO3	Realize a strong foundational knowledge in lasers and fiber optics.	Understand
CO4	Impart knowledge on magnetic properties of materials and their applications in data storage.	Understand
CO5	Recognize the basics of quantum structures and their applications and basics of quantum computing	Understand

Mapping with Programme Outcomes

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	-	-	-	-	-	-	-	-	-	-	-	-	2	-
CO2	3	-	-	-	-	-	-	-	-	-	-	-	-	2	-
CO3	3	-	-	-	-	-	-	-	-	-	-	-	-	2	-
CO4	3	-	-	-	-	-	-	-	-	2	-	-	-	2	-
CO5	3	-	-	-	-	-	-	-	-	2	-	-	2	2	-
3 - Strong; 2 - Medium; 1 - Some															

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		Model Examination (Marks)	End Sem Examination (Marks)
	1	2		
Remember	20	20	34	34
Understand	40	40	66	66
Apply	-	-	-	-
Analyse	-	-	-	-
Evaluate	-	-	-	-
Create	-	-	-	-
Total	60	60	100	100

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Common to CSE, IT, AI&DS & AI&ML								
60 PH 004 - Physics for Computer Technology								
Semester	**Hours/Week**			**Total Hours**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
I	3	0	0	45	3	40	60	100

Semiconducting Materials* Intrinsic Semiconductors - Energy Band Diagram - Direct and Indirect Band Gap Semiconductors - Carrier Concentration in Intrinsic Semiconductors - Extrinsic Semiconductors - Carrier Concentration In N-Type & P-Type Semiconductors – Carrier Transport in Semiconductor: Random Motion, Drift, Mobility and Diffusion – Hall Effect and Devices – Ohmic Contacts –Schottky Diode.	[9]
Optoelectronic Materials and Devices* Photoconductive Materials – Light Dependent Resistor – Working of LDR – Applications of LDR – Photovoltaic Materials – Solar Cell – Construction and Working of a Solar Cell – Applications of Solar Cells – Liquid Crystals – Liquid Crystal Display (LCD) – Construction and Advantages of LCD – Electro Optic Materials – Optoelectric Effect - Electro-Optic Modulation.	[9]
Photonics* Theory Of Laser - Characteristics - Einstein's Coefficients - Population Inversion - Nd-YAG Laser, Semiconductor Laser - Applications of Lasers: Micro Machining, Measurement of Long Distances, IR Thermography, CD Write Devices and Printers - Optical Fibre- Principle - Types - Material, Mode, Refractive Index - Fibre Loss - Expression for Acceptance Angle and Numerical Aperture. Application – Fiber Optic Communication.	[9]
Magnetic Materials and Devices* Origin Of Magnetic Moment - Bohr Magneton - Classification of Magnetic Materials - Diamagnetism - Paramagnetism - Ferromagnetism - Anti Ferromagnetism - Ferri Magnetism - Domain Theory - Hysteresis - Soft and Hard Magnetic Materials - Examples and Uses - Magnetic Principle in Computer Data Storage - Magnetic Hard Disc (Giant Magneto Resistance Sensor).	[9]
Nanotechnology And Quantum Computing* Introduction - Preparation of Nano Materials: Top-Down Process: Ball Milling Method - Bottom-Up Process: Vapour Phase Deposition Method. Carbon Nano Tubes - Structures, Properties and Preparation by Electric Arc Method. Mems/Nems Devices and Applications- Quantum System for Information Processing - Quantum States - Classical Bits - Quantum Bits - Multiple Qubits - Quantum Gates.	[9]
Total Hours:	**45**

Text Book(s):	
1.	M. N. Avadhanulu, P. G. Kshirsagar, TVS Arun Murthy "A Text Book of Engineering Physics", S Chand Publications, New Delhi, 2022.
2.	H. K. Malik, A. K. Singh "Engineering Physics" McGraw Hill Education Private Limited, New Delhi.
3.	D. R. Joshi "Engineering Physics" McGraw Hill Education Private Limited, New Delhi. 2010
Reference(s):	
1.	S.O. Pillai "A Textbook of Engineering Physics" New Age International (P) Limited, New Delhi, 2014B. R. Puri, L.R. Sharma, and S. P. Madan. Principles of Physical Chemistry: Vishal Publishing Company. Gumber Market, Old Railway Road, Jalandhar.
2.	B. B. Laud "Lasers and Non-Linear Optics" New Age International Publications, New Delhi, 2015B.S. Bahl, G.D. Tuli, Arun Bahl. Essentials of Physical Chemistry. S.Chand and Company, Ltd. New Delhi.
3.	Palanisamy, P.K., "Physics of Materials", Scitech Publications, Chennai. 2012

*** SDG:4- Quality Education**

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Course Contents and Lecture Schedule

S. No.	Topics	No. of hours
1.0	**Semiconducting Materials**	
1.1	Intrinsic Semiconductors	1
1.2	Energy Band Diagram - Direct and Indirect Band Gap Semiconductors	1
1.3	Carrier Concentration in Intrinsic Semiconductors	1
1.4	Extrinsic Semiconductors	1
1.5	Carrier Concentration In N-Type & P-Type Semiconductors	1
1.6	Carrier Transport in Semiconductor: Random Motion	1
1.7	Carrier Transport in Semiconductor Drift, Mobility and Diffusion	1
1.8	Hall Effect and Devices	1
1.9	Ohmic Contacts –Schottky Diode	1
2.0	**Optoelectronic Materials and Devices**	
2.1	Photoconductive Materials.	1
2.2	Light Dependent Resistor – Working of LDR – Applications of LDR	1
2.3	Photovoltaic Materials	1
2.4	Solar Cell – Construction and Working of a Solar Cell	1
2.5	Applications of Solar Cells	1
2.6	Liquid Crystals – Liquid Crystal Display (LCD)	1
2.7	Construction and Advantages Of LCD	1
2.8	Electro Optic Materials – Optoelectric Effect	1
2.9	Electro-Optic Modulation	1
3.0	**Photonics**	
3.1	Theory Of Laser - Characteristics	1
3.2	Einstein's Coefficients - Population Inversion	1
3.3	Nd-YAG Laser, Semiconductor Laser	1
3.4	Applications Of Lasers: Micro Machining, Measurement of Long Distances	1
3.5	Applications Of Lasers IR Thermography, CD Write Devices and Printers	1
3.6	Optical Fibre- Principle	1
3.7	Types - Material, Mode, Refractive Index - Fibre Loss	1
3.8	Expression For Acceptance Angle and Numerical Aperture	1
3.9	Application – Fiber Optic Communication	1
4.0	**Magnetic Materials and Devices**	
4.1	Origin Of Magnetic Moment	1
4.2	Bohr Magneton - Classification of Magnetic Materials	1
4.3	Diamagnetism - Paramagnetism -	1
4.4	Ferromagnetism - Anti Ferromagnetism	1
4.5	Ferri Magnetism - Domain Theory	1
4.6	Domain Theory - Hysteresis	1
4.7	Soft And Hard Magnetic Materials - Examples and Uses	1
4.8	Magnetic Principle in Computer Data Storage	1
4.9	Magnetic Hard Disc (Giant Magneto Resistance Sensor).	1
5.0	**Nanotechnology and Quantum Computing**	
5.1	Introduction	1
5.2	Preparation of Nano Materials	1
5.3	Top-Down Process: Ball Milling Method	1
5.4	Bottom-Up Process: Vapour Phase Deposition Method	1

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5.5	Carbon Nano Tubes - Structures, Properties	1
5.6	Preparation By Electric Arc Method	1
5.7	MEMS/NEMS Devices and Applications	2
5.8	Quantum System for Information Processing	1

Course Designer(s)

1. Dr. V. Vasudevan - vasudevanv@ksrct.ac.in
2. Mr. S. Vanchinathan - vanchinathan@ksrct.ac.in
3. Dr. P. Suthanthira Kumar - suthanthirakumar@ksrct.ac.in

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60 ME 002	Engineering Graphics	Category	L	T	P	Credit
		ES	2	0	4	4

Objectives

- To acquire various concepts of dimensioning, conventions and standards.
- To impart the graphic skills for converting pictorial views of solids in to orthographic views.
- To learn the concept in projection of solids, section of solids and development of different types of surfaces.
- To learn the concept of isometric projection.
- To learn the geometry and topology of engineered components

Pre-requisites

- Nil

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Demonstrate the Impact of computer technologies on graphical communication	Apply
CO2	Convert the pictorial views in to orthographic views using drafting software	Apply
CO3	Draw the projection of simple solids, true shape of sections and development of surfaces	Apply
CO4	Construct the isometric projections of objects using drafting software.	Apply
CO5	Interpret a design project illustrating engineering graphical skills.	Apply

Mapping with Programme Outcomes

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	3	-	-	-	-	-	-	-	-	-	3	3	-
CO2	3	3	3	-	-	-	-	-	-	-	-	-	3	3	-
CO3	3	3	3	-	3	-	-	3	-	-	-	-	3	3	-
CO4	3	3	3	-	3	-	-	3	-	-	-	-	3	3	-
CO5	3	3	3	-	-	-	-	-	-	-	-	-	2	2	-
3 - Strong; 2 - Medium; 1 - Some															

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		Model Examination (Marks)	End Sem Examination (Marks)
	1	2		
Remember	10	10	20	20
Understand	20	20	30	30
Apply	30	30	50	50
Analyse	-	-	-	-
Evaluate	-	-	-	-
Create	-	-	-	-
Total	60	60	100	100

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K.S.Rangasamy College of Technology – Autonomous R2022								
Common to all Branches								
60 ME 002- Engineering Graphics								
Semester	**Hours/Week**			**Total Hours**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
I	2	0	4	90	4	40	60	100

Introduction to Computer Aided Drafting (CAD) software Theory of CAD software – Menu System, Tool bars (Standard, Object Properties, Draw, Modify and Dimension) – Drawing Area (Background, Crosshairs, Coordinate System) – Dialog boxes and windows – Shortcut menus (Button Bars) – The Command Line and Status Bar – Different methods of zoom – Select and erase objects	**[6+12]**
Orthographic Projection* Theory of projection – Terminology and Methods of projection – first angle and third angle projection – Conversion of pictorial views into orthographic views	**[6+12]**
Projection of Solids and Sections of Solids* Projections of simple solids: prism, pyramid, cylinder and cone (Axis parallel to one plane and perpendicular to other, axis inclined to one plane and parallel to other). Sections of simple solids: prism, pyramid, cylinder and cone in simple positions (cutting plane is inclined to one of the principal planes and perpendicular to the other) – True shape of sections **Development of Surfaces** Principle of development-Methods of development: Parallel line development-Cube, Prism and Cylinder. Radial line development – Pyramid and cone	**[6+12]**
Isometric Projection Principles of Isometric projection – Isometric scale, Isometric views, Conventions – Isometric views of lines, Planes, Simple and compound Solids – Conversion of Orthographic views in to Isometric view	**[6+12]**
Application of Engineering Graphics Geometry and topology of engineered components: Creation of engineering models and their presentation in standard 2D blueprint form, 3D wire-frame and shaded solids – Geometric dimensioning and Tolerance – Use of solid modeling software for creating associative models – Floor plans: windows, doors, and fixtures such as water closet (WC), bath sink, shower, etc. – Applying colour coding according to building drawing practice – Drawing sectional elevation showing foundation to ceiling – Introduction to Building Information Modelling (BIM).	**[6+12]**
Total Hours	**90**

Text Book(s):	
1.	Bhatt N.D., —Engineering Drawing‖, Charotar Publishing House Pvt. Ltd., 53rd Edition, Gujarat, 2019
2.	Venugopal K., “Engineering Graphics”, New Age International (P) Limited, 2014.
Reference(s):	
1.	Shah M.B., Rana B.C., and V.K.Jadon., —Engineering Drawing‖, Pearson Education, 2011.
2.	Natarajan K.V., —A Text Book of Engineering Graphics‖, Dhanalakshmi Publishers, Chennai, 2014.
3.	Basant Agarwal and C.M.Agarwal., “Engineering Drawing”, McGraw Hill Education, 2013.
4.	Dhawan, R.K., “A Text Book of Engineering Drawing” 3 rd Revised Edition, S. Chand Publishing, New Delhi, 2012.

*SDG 9 – Industry Innovation and Infrastructure

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Course Contents and Lecture Schedule

S. No.	Topics	No. of hours
1.0	**Introduction to Computer Aided Drafting (CAD) software**	
1.1	Theory of CAD software	1
1.2	Menu System, Tool bars (Standard, Object Properties, Draw, Modify and Dimension)	4
1.3	Drawing Area (Background, Crosshairs, Coordinate System)	4
1.4	Dialog boxes and windows – Shortcut menus	4
1.5	The Command Line and Status Bar	1
1.6	Different methods of zoom – Select and erase objects.	4
2.0	**Orthographic Projection**	
2.1	Introduction to orthographic projections	2
2.2	Planes of projection,	2
2.3	Projection of points	2
2.4	Projection of lines inclined to both planes.	2
2.5	Projection of planes	2
2.6	Projection of planes Inclined to both planes	2
2.7	Conversions of pictorial views to orthographic views.	2
2.8	Practice class for pictorial views to orthographic views.	2
2.9	Practice class for pictorial views to orthographic views.	2
3.0	**Projection of Solids, Sections of solids and Development of surfaces**	
3.1	Projections of simple solids: prism	1
3.2	Projections of simple solids: cylinder	1
3.3	Projections of simple solids: pyramid	1
3.4	Projections of simple solids: Cone	1
3.5	Practice class for Projection of Solids	1
3.6	Axis of solid inclined to both HP and VP	2
3.7	Section of solids for Prism,	1
3.8	Section of solids for Cylinder,	1
3.9	Section of solids for Pyramid,	1
3.10	Section of solids for Cone	1
3.11	Auxiliary Views - Draw the sectional orthographic views of geometrical solids.	2
3.12	Draw the sectional orthographic views of objects from industry.	1
3.13	Development of surfaces of Right solids Prism,	1
3.14	Development of surfaces of Right solids Pyramid	1
3.15	Development of surfaces of Right solids Cylinder and Cone	2
4.0	**Isometric Projection**	
4.1	Principles of isometric projection	2
4.2	Isometric scale	2
4.3	Isometric projections of simple solids: Prism,	2
4.4	Isometric projections of simple solids: Pyramid,	2
4.5	Isometric projections of simple solids: Cylinder	2
4.6	Isometric projections of simple solids: Cone	2
4.7	Isometric projections of frustum	2
4.8	Isometric projections of truncated solids	2
4.9	Combination of two solid objects in simple vertical positions.	2
5.0	**Application of Engineering Graphics**	

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5.1	Geometry and topology of engineered components:	2
5.2	Creation of engineering models and their presentation in standard 2D blueprint form,	2
5.3	3D wire-frame and shaded solids – Geometric dimensioning and Tolerance – Use of solid modeling software for creating associative models	4
5.4	Floor plans: windows, doors, and fixtures such as water closet (WC), bath sink, shower, etc.	2
5.5	Applying colour coding according to building drawing practice	2
5.6	Drawing sectional elevation showing foundation to ceiling	4
5.7	Introduction to Building Information Modelling (BIM).	2

Course Designer(s)

1. Dr.K.Mohan- mohank@ksrct.ac.in

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60 CS 001	C Programming	Category	L	T	P	Credit
		ES	3	0	0	3

Objectives

- To learn most fundamental element of the C language and to examine the execution of branching, looping statements,
- To examine the concepts of arrays, its characteristics and types and strings.
- To understand the concept of functions, pointers and the techniques of putting them to use
- To apply the knowledge of structures and unions to solve basic problems in C language
- To enhance the knowledge in file handling functions for storage and retrieval of data

Pre-requisites

NIL

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Construct the fundamental building blocks of structured Programming in C	Apply
CO2	Implement the different operations on arrays and strings	Apply
CO3	Develop simple real world applications utilizing functions, recursion and pointers.	Apply
CO4	Demonstrate the concepts of structures, unions, user defined data types and preprocessor	Apply
CO5	Interpret the file concepts using proper standard library functions for a given application	Apply

Mapping with Programme Outcomes

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	3	-	3	-	-	-	2	2	-	2	3	3	3
CO2	3	3	3	-	3	-	-	-	2	2	-	2	3	3	3
CO3	3	3	3	-	3	-	-	-	2	2	-	2	3	3	3
CO4	3	3	3	-	3	-	-	-	2	2	-	2	3	3	3
CO5	3	3	3	-	3	-	-	-	2	2	-	2	3	3	3
3 - Strong; 2 - Medium; 1 - Some															

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		Model Examination (Marks)	End Sem Examination (Marks)
	1	2		
Remember	10	10	34	20
Understand	40	40	66	20
Apply	-	-	-	60
Analyse	-	-	-	-
Evaluate	-	-	-	-
Create	10	10	-	-
Total	60	60	100	100

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K.S.Rangasamy College of Technology – Autonomous R2022								
Common to all Branches								
60 CS 001 – C Programming								
Semester	**Hours/Week**			**Total Hours**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
I	3	0	0	45	3	40	60	100

Basics of C, I/O, Branching and Loops* Structure of a C Program – Data types – Keywords - Variables – Type Qualifiers - Constants – Operators–expressions and precedence- Console I/O– Unformatted and Formatted Console I/O - Conditional Branching and Loops-Writing and evaluation of conditionals and consequent branching	[9]
Arrays and Strings* Arrays: One Dimensional Arrays - Two Dimensional Arrays – Matrix Manipulation - Character arrays – Strings: String Manipulation with and without String Handling Functions.	[9]
Functions and Pointers* Functions: Scope of a Function – Library Functions and User defined functions - Function Prototypes – Call by value and Call by reference – Function Categorization- Arguments to main function—Recursion and application - Passing Arrays to Functions– Storage class Specifiers. Introduction to Pointer Variables - The Pointer Operators - Pointer Expressions - Pointers and Arrays - Generating a Pointer to an Array - Indexing Pointers– Function and pointers - Dynamic memory allocation.	[9]
Structures, Unions, Enumerations, Typedef and Preprocessors* Structures - Introduction to Structures and Initialization - Arrays of Structures- Arrays and Structures, Nested Structures - Passing Structures to Functions - Structure Pointers - Unions – Bit Fields - Enumerations - typedef –The preprocessor and commands.	[9]
File Handling* File: Streams –Reading and Writing Characters - Reading and Writing Strings - File System functions – File Manipulation-Sequential access - Random Access Files – Command Line arguments.	[9]
Total Hours:	**45**

Text Book(s):	
1.	Herbert Schildt, “The Complete Reference C”, Fourth Edition, Tata McGraw Hill Edition, 2010.
2.	Byron Gottfried, “Programming with C”, Third Edition, McGraw Hill Education, 2014.
Reference(s):	
1.	E.Balagurusamy, “Programming in ANSI C”, Seventh Edition, Tata McGraw Hill Edition, New Delhi, 2016.
2.	Brian W. Kernighan and Dennis M. Ritchie, “C Programming Language”, Prentice-Hall.
3.	ReemaThareja, “Computer Fundamentals and Programming in C”, Second Edition, Oxford Higher Education, 2016.
4.	K N King, “C Programming: A Modern Approach”, Second Edition, W.W.Norton, New York, 2008.

*SDG:4- Quality Education

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Tiruchengode - 637 215.

Course Contents and Lecture Schedule

S. No.	Topics	No. of hours
1.0	**Basics of C, I/O, Branching and Loops**	
1.1	Structure of a C Program, Keywords	1
1.2	Data types, Type Qualifiers	1
1.3	Variables and Constants	1
1.4	Operators–expressions and precedence	1
1.5	Console I/O– Unformatted and Formatted Console I/O	1
1.6	Conditional Branching	2
1.7	Iteration and loops	1
1.8	Writing and evaluation of conditionals and consequent branching	1
2.0	**Arrays and Strings**	
2.1	One Dimensional Array	2
2.2	Two-Dimensional Array and Matrix Manipulation	2
2.3	Character arrays and Strings Basics	2
2.4	String Manipulation without String Handling Functions	2
2.5	String Manipulation with String Handling Functions	1
3.0	**Functions and Pointers**	
3.1	Scope of a Function – Library Functions, User defined functions and Function Prototypes	1
3.2	Function Call by value and Function Call by reference, Function Categorization	1
3.3	Arguments to main function	1
3.4	Recursion and application	1
3.5	Passing Arrays to Functions	1
3.6	Storage class Specifiers	1
3.7	Introduction to Pointer Variables - The Pointer Operators - Pointer Expressions	1
3.8	Pointers and Arrays - Generating a Pointer to an Array - Indexing Pointers	1
3.9	Function and pointers, Dynamic memory allocation	
4.0	**Structures, Unions, Enumerations, Typedef and Preprocessors**	
4.1	Introduction to Structures and Initialization	1
4.2	Arrays and Structures, Arrays of Structures	2
4.3	Structures within Structures, Passing Structures to Functions	2
4.4	Structure Pointers	1
4.5	Unions and Bit Fields.	1
4.6	Enumerations - typedef	1
4.7	Preprocessor commands	1
5.0	**File Handling**	
5.1	File Streams –Reading and Writing Characters - Reading and Writing Strings	2
5.2	File System functions and File Manipulation	2
5.3	Sequential access	2
5.4	Random Access Files	2
5.5	Command Line arguments and files	1

Course Designer(s)

1. Dr.P.Kaladevi - kaladevi@ksrct.ac.in

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Passed in BoS Meeting held on 24/05/2024
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60 MY 001	Environmental Studies and Climate Change	Category	L	T	P	Credit
		MC	2	0	0	2

Objectives

- To understand the impact climate changes in ecosystem and biodiversity.
- To analyze the impacts of pollution, control and legislation.
- To explain the importance of sustainable development practices.
- To explore the significance of organic farming.
- To identify the Geo-spatial tools for resource management

Pre-requisites

- Nil

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Interpret the impacts of pollution on climate change	Understand
CO2	Categorize the wastes and its management.	Analyze
CO3	Identify the different types of sustainable practices	Apply
CO4	Classify the organic farming techniques	Apply
CO5	Categorize the Geo-spatial tools for resource management	Analyze

Mapping with Programme Outcomes

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	-	-	-	-	3	-	-	-	-	2	-	-	-
CO2	3	2	-	-	-	3	3	2	-	-	-	2	-	-	-
CO3	3	2	-	-	-	3	3	2	-	-	-	2	-	-	-
CO4	3	2	-	-	-	2	3	-	-	-	-	2	-	-	-
CO5	3	2	-	-	3	-	2	-	-	-	-	2	-	-	-
3 - Strong; 2 - Medium; 1 - Some															

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		Model Examination (Marks)	End Sem Examination (Marks)
	1	2		
Remember	10	10	-	-
Understand	20	20	-	-
Apply	30	30	-	-
Analyse	30	30	-	-
Evaluate	-	-	-	-
Create	-	-	-	-
Total	60	60	-	-

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Syllabus

K.S.Rangasamy College of Technology – Autonomous R2022								
60 MY 001 – Environmental Studies and Climate Change								
Common to all branches								
Semester	**Hours/Week**			**Total Hours**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
I	2	0	0	20	0	100	-	100

Pollution and its Impact on Climate Change* Pollution: Sources and Impacts of Air Pollution – Greenhouse Effect- Global Warming- Climate Change - Ozone Layer Depletion - Acid Rain. Carbon Footprint - Climate Change on Various Sectors – Agriculture, Forestry and Ecosystem – Climate Change Mitigation and Adaptation. Action Plan on Climate Change. IPCC, UNFCCC, Kyoto Protocol, Montreal Protocol on Climatic Changes.	[6]
Integrated Waste Management** Waste - Types a nd Classification. Principles o f Waste Management (5R Approach) - Swachh Bharat Abhiyan – Commercial Waste, Plastic Waste, Domestic Waste, E-Waste - Biomedical Waste - RiskManagement: Collection, Segregation, Treatment and Disposal Methods. Waste Water Treatment- Activate Sludge Process.	[6]
Sustainable Development Practices*** Sustainable Development Goals (Sdgs) **–** Green Computing- Carbon Trading - Green Building – Eco- Friendly Plastic – Alternate Energy: Hydrogen – Bio-Fuels – Solar Energy – Wind – Hydroelectric Power. Water Scarcity- Watershed Management, Ground Water Recharge and Rainwater Harvesting.	[6]
Environment and Agriculture**** Organic Farming – Bio-Pesticides- Composting, Bio Composting, Vermi- Composting, Roof Gardening and Irrigation. Waste Land Reclamation. Climate Resilient Agriculture. Green Auditing	[6]
Geo-Science in Natural Resource Management Data Base Software in Environment Information- Digital Image Processing Applications in Forecasting. GPS - Remote Sensing and Geographical Information System (GIS) - World Wide Web (Www) - Environmental Information System (ENVIS).	[6]
Total Hours:	30

Text Book(s):	
1.	Anubha Kaushik , C P Kaushik. Perspectives In Environmental Studies, New Age International publishers; Sixth edition (1 January 2018).
Reference(s):	
1.	G.Tyler Miller Environmental Science 14th Edition Cengage Publications, Delhi, 2013
2.	Gilbert M.Masters and Wendell P. Ela,"Environmental Engineering And Science", Phi Learning Private Limited, 3rd Edition,2015
3.	Erach Bharucha. Textbook of Environmental Studies for Undergraduate Courses, Universities Press, 2000

***SDG: 13 – Climate Action**
****SDG: 4 – Clean Water and Sanitation**
*****SDG: 6 - Affordable and Clean Energy**
******SDG: 3 – Good Health and Well-being**

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Course Contents and Lecture Schedule

S. No.	Topics	No. of hours
1.0	**Pollution and its impact on climate change**	
1.1	Pollution: Sources and impacts of air pollution – greenhouse effect- Global warming- climate change - ozone layer depletion - acid rain	2
1.2	Climate change on various sectors: Agriculture, forestry and ecosystem. – climate change mitigation and adaptation	1
1.3	Action plan on climate change - IPCC, UNFCCC, Kyoto Protocol, Montreal Protocol on Climatic Changes	1
2.0	**Integrated Waste Management**	
2.1	Waste - Types and classification. Principles of waste management (5R approach) - Swachh Bharat Abhiyan	1
2.2	Commercial waste, plastic waste, domestic waste, e-waste and biomedical waste	1
2.3	Risk management: Collection, segregation, treatment and disposal methods.	1
3.0	**Sustainable development practices**	
3.1	Sustainable development goals (SDGs) **–** Green computing- Carbon trading -Green building – Eco- friendly plastic	
3.2	Alternate energy: Hydrogen – Bio-fuels – Solar energy – Wind – Hydroelectric power	2
3.3	Water scarcity- Watershed management, ground water recharge and rainwater harvesting	1
4.0	**Environment and Agriculture**	
4.1	Organic farming – bio-pesticides	
4.2	Composting, bio composting, vermi-composting	1
4.3	Roof gardening and irrigation	1
4.4	Waste land reclamation. Climate resilient agriculture, Green auditing	1
5.0	**Geo-science in natural resource management**	
5.1	Data base software in environment information, Digital image processingapplications in forecasting	
5.2	GPS, Remote Sensing and Geographical Information System (GIS)	1
5.3	World wide web (www), Environmental information system (ENVIS)	1

Course Designer(s)

1. Dr.T.A.Sukantha - sukantha@ksrct.ac.in
2. Dr.B.Srividhya - srividhya@ksrct.ac.in
3. Dr.S.Meenachi - meenachi@ksrct.ac.in
4. Ms.D.Kirthiga - kiruthiga@ksrct.ac.in

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60 PH 0P1	Applied Physics Laboratory (AIDS, AIML)	Category	L	T	P	Credit
		BS	0	0	4	2

Objectives

- To infer the practical knowledge by applying the experimental methods to correlate with the Physics theory.
- To demonstrate an ability to make physical measurements and understand the limits of precision in measurements
- To introduce different experiments to test basic understanding of physics concepts applied in optics and electronics
- To make ability to develop and fabricate engineering and technical equipments
- To analyze the behavior and characteristics of various materials for its optimum utilization

Pre-requisites

- Nil

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Interpret the knowledge of band gap, Hall coefficient, photovoltaic effect, Zener diode characteristics for its potential applications	Apply
CO2	Realize the interference and wave nature of light by experimentally	Apply
CO3	Recognize the particle behaviour of light & magnetic properties by experimental verification	Apply
CO4	Infer the concept of diffraction through spectrometer grating and dispersion of light by a prism	Apply
CO5	Analyze the wavelength of laser by diffraction phenomenon and the propagation of light through an optical fiber	Analyze

Mapping with Programme Outcomes

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	-	-	-	-	-	-	-	2	-	-	-	2	-	-
CO2	3	-	-	-	-	-	-	-	2	-	-	-	2	-	-
CO3	3	-	-	-	-	-	-	-	2	-	-	-	2	-	-
CO4	3	-	-	-	-	-	-	-	2	-	-	-	-	-	-
CO5	3	-	-	-	-	-	-	-	2	-	-	-	2	-	-

3 - Strong; 2 - Medium; 1 - Some

Assessment Pattern

Bloom's Category	Lab Experiments Assessment (Marks)		Model Examination (Marks)	End Sem Examination (Marks)
	Lab	Activity		
Remember	10	-	10	10
Understand	30	30	30	30
Apply	40	40	40	40
Analyse	20	30	20	20
Evaluate	-	-	-	-
Create	-	-	-	-
Total	100	100	100	100

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K.S.Rangasamy College of Technology – Autonomous R2022								
Common to AI&DS, AIML								
60 PH 0P1– Applied Physics Laboratory								
Semester	**Hours/Week**			**Total Hrs**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
I	0	0	3	45	1.5	60	40	100

List of Experiments:

1. Determination of Hall coefficient of a given semiconductor and its charge carrier density
2. Determination of band gap of a semiconductor PN junction diode
3. Characteristics of Zener diode
4. Air wedge - Determination of thickness of a thin sheet/wire
5. Determination of radius of a plano convex lens – Newton‘s ring
6. Determination of wavelength of mercury spectral lines – spectrometer grating
7. a) Laser- Determination of the wave length of the laser using grating
   b) Optical fibre -Determination of numerical aperture and acceptance angle
8. Determination of Planck’s constant.
9. Determination of Stefan’s Constant.
10. Magnetic field along the axis of current carrying coil – Stewart and Gee.

* SDG: 4- Quality Education

Lab Manual

1.	“Engineering Physics Lab Manual”, Department of Physics, KSRCT.

Course Designer(s)

1. Dr. V. Vasudevan - vasudevanv@ksrct.ac.in
2. Mr.S. Vanchinathan - vanchinathan@ksrct.ac.in
3. Dr. P.Suthanthira kumar - suthanthirakumar@ksrct.ac.in

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60 CS 0P1	C Programming Laboratory	Category	L	T	P	Credit
		ES	0	0	4	2

Objectives

- To enable the students to apply the concepts of C to solve simple problems
- To use selection and iterative statements in C programs
- To apply the knowledge of library functions in C programming
- To implement the concepts of arrays, functions, structures and pointers in C
- To implement the file handling operations through C

Pre-requisites

- NIL

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Implement computational problems using selection and iterative statements	Apply
CO2	Demonstrate C program to manage collection of related data.	Apply
CO3	Design and implement different ways of passing arguments to functions, Recursion and implement pointers concepts.	Apply
CO4	Develop a C program to manage collection of different data using structures, Union, user-defined data types and preprocessor directives.	Apply
CO5	Demonstrate C program to store and retrieve data using file concepts.	Apply

Mapping with Programme Outcomes

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	3	-	3	-	-	-	2	2	-	2	3	3	3
CO2	3	3	3	-	3	-	-	-	2	2	-	2	3	3	3
CO3	3	3	3	-	3	-	-	-	2	2	-	2	3	3	3
CO4	3	3	3	-	3	-	-	-	2	2	-	2	3	3	3
CO5	3	3	3	-	3	-	-	-	2	2	-	2	3	3	3
3 - Strong; 2 - Medium; 1 - Some															

Assessment Pattern

Bloom's Category	Lab Experiments Assessment (Marks)		Model Examination (Marks)	End Sem Examination (Marks)	
	Lab	Activity			
Remember	-	-	-	-	-
Understand	-	12	-	-	-
Apply	50	13	100		100
Analyse	-	-	-		-
Evaluate	-	-	-	-	-
Create	-	-	-	-	-
Total	50	25	100	-	100

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K.S.Rangasamy College of Technology – Autonomous R2022								
Common to All Branches								
60 CS 0P1 – C Programming Laboratory								
Semester	Hours/Week			Total Hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
I	0	0	4	60	2	60	40	100

List of Experiments:

1. Implementation of Simple computational problems using various formulas*.
2. Implementation of Problems involving Selection statements*.
3. Implementation of Iterative problems e.g., sum of series*.
4. Implementation of 1D Array manipulation*.
5. Implementation of 2D Array manipulation*.
6. Implementation of String operations*.
7. Implementation of Simple functions and different ways of passing arguments to functions and Recursive Functions*.
8. Implementation of Pointers*
9. Implementation of structures and Union*.
10. Implementation of Bit Fields, Typedef and Enumeration*.
11. Implementation of Preprocessor directives*.
12. Implementation of File operations*.

Lab Manual	
1.	"C Programming Lab Manual", Department of CSE, KSRCT.

*** SDG:4- Quality Education**

Course Designer(s)

1.Dr.P.Kaladevi - kaladevi@ksrct.ac.in

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K.S. RANGASAMY COLLEGE OF TECHNOLOGY, TIRUCHENGODE - 637215

(An Autonomous Institution affiliated to Anna University)

B.E. / B.Tech. Degree Programme

SCHEME OF EXAMINATIONS

(For the candidates admitted from 2022-2023 onwards)

SECOND SEMESTER

S.No.	Course Code	Name of the Course	Duration of Internal Exam	Weightage of Marks			Minimum Marks for Pass in End Semester Exam	
				Continuous Assessment *	End Semester Exam **	Max. Marks	End Semester Exam	Total
THEORY								
1	60 EN 002	Professional English II	2	40	60	100	45	100
2	60 MA 004	Linear Algebra and Optimization Techniques	2	40	60	100	45	100
3	60 CH 004	Engineering Chemistry	2	40	60	100	45	100
4	60 EE 001	Basic Electrical and Electronics Engineering	2	40	60	100	45	100
5	60 IT 001	Python Programming	2	40	60	100	45	100
6	60 GE 001	Heritage of Tamils / தமிழர் மரபு	2	100	-	100	-	
PRACTICAL								
7	60 IT 0P1	Python Programming Laboratory	2	60	40	100	45	100
8	60 ME 0P1	Fabrication and Reverse Engineering Laboratory	2	60	40	100	45	100
9	60 CG 0P1	Career Skill Development I	2	100	-	100	-	-
10	60 CG 0P6	Internship	-	-	-	-	-	-

* CA evaluation pattern will differ from course to course and for different tests. This will have to be declared in advance to students. The department will put a process in place to ensure that the actual test paper follow the declared pattern.

** End Semester Examination will be conducted for maximum marks of 100 and subsequently be reduced to 60 marks for the award of terminal examination marks.

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60 EN 002	Professional English II	Category	L	T	P	Credit
		HS	1	0	2	2

Objectives

- To Help Learners Improve Their Vocabulary and Enable Them to Use Words Appropriately in Different Academic and Professional Contexts.
- To Help Learners Develop Strategies That Could Be Adopted While Reading Texts.
- To Help Learners Acquire the Ability to Speak and Write Effectively in English in Real Life and Career Related Situations.
- Improve Listening, Observational Skills, And Problem-Solving Capabilities
- Develop Message Generating and Delivery Skills

Pre-requisites

- Basic knowledge of reading and writing in English and should have completed Professional English I.

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Compare and contrast products and ideas in technical texts.	Understand
CO2	Illustrate cause and effects in events, industrial processes through technical texts	Understand
CO3	Infer problems in order to arrive at feasible solutions and communicate them orally and in the written format.	Understand
CO4	Relate events and the processes of technical and industrial nature.	Remember
CO5	Demonstrate their opinions in a planned and logical manner, and draft effective résumés in context of job search.	Understand

Mapping with Programme Outcomes

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	-	-	-	-	-	-	-	2	3	3	2	3	2	2	3
CO2	-	-	-	-	-	-	-	2	3	3	2	3	2	2	3
CO3	-	-	-	-	-	-	-	2	3	3	2	3	2	2	3
CO4	-	-	-	-	-	-	-	2	3	3	2	3	3	3	3
CO5	-	-	-	-	-	-	-	2	3	3	2	3	3	3	3
3 - Strong; 2 - Medium; 1 - Some															

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		Model Examination (Marks)	End Sem Examination (Marks)
	1	2		
Remember	10	10	20	20
Understand	50	50	80	80
Apply	-	-	-	-
Analyse	-	-	-	-
Evaluate	-	-	-	-
Create	-	-	-	-
Total	60	60	100	100

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Syllabus

K.S.Rangasamy College of Technology – Autonomous R2022

B.Tech – Artificial Intelligence & Data Science

60 EN 001 - Professional English II

Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
II	1	0	2	45	-	40	60	100

Making Comparisons **Listening:** Evaluative Listening: Advertisements, Product Descriptions, - Audio / Video; Filling A Graphic Organizer (Choosing A Product or Service by Comparison) **Speaking:** Marketing A Product, Persuasive Speech Techniques. **Reading:** Reading Advertisements, User Manuals and Brochures. **Writing:** Professional Emails, Email Etiquette - Compare and Contrast Essay. **Language Focus:** Mixed Tenses, Prepositional Phrases, Same Words Used In Different Contexts And Discourse Markers	[9]
Expressing Causal Relations in Speaking and Writing **Listening:** Listening to Longer Technical Talks and Completing– Gap Filling Exercises. Listening Technical Information from Podcasts – Listening to Process/Event Descriptions to Identify Cause & Effects. **Speaking:** Describing and Discussing the Reasons of Accidents or Disasters Based on News Reports. **Reading:** Longer Technical Texts– Cause and Effect Essays, And Letters / Emails of Complaint, **Writing:** Writing Responses to Complaints **Language Focus:** Active Passive Voice Transformations, Infinitive and Gerunds – Word Formation (Noun-Verb-Adj-Adv), Adverbs.	[9]
Problem Solving **Listening:** Listening To / Watching Movie Scenes/ Documentaries Depicting a Technical Problem and Suggesting Solutions. **Speaking:** Group Discussion (Based on Case Studies), - Techniques and Strategies. **Reading:** Case Studies, Excerpts from Literary Texts, News Reports Etc. **Writing:** Letter to The Editor, Checklists, Problem Solution Essay / Argumentative Essay **Language Focus:** Error Correction; If Conditional Sentences - Compound Words, Sentence Completion.	[9]
Reporting Of Events and Research **Listening:** Listening Comprehension Based on New Report and Documentaries – **Speaking:** Interviewing, Presenting Oral Reports, Mini Presentations on Select Topics. **Reading:** Newspaper Articles. **Writing:** Recommendations, Transcoding, Accident Report, Precis Writing and Summarising, And Plagiarism **Language Focus:** Reported Speech – Modals - Conjunctions- Use of Prepositions	[9]
The Ability to Put Ideas or Information Coherently **Listening:** Listening to TED Talks, Presentations, Formal Job Interviews, (Analysis of The Interview Performance). **Speaking:** Participating in Role Plays, Virtual Interviews, Making Presentations with Visual Aids **Reading:** Excerpts of Interview with Professionals **Writing:** Job / Internship Application – Cover Letter & Résumé **Language Focus:** Numerical Adjectives, Question Types: Wh/ Yes or No/ And Tags; Relative Clauses - Idioms.	[9]
Total Hours:	**45**

Text Book(s):

1.	'English for Engineers & Technologists' Orient Blackswan Private Ltd. Department of English, Anna University, 2020
2.	Norman Lewis, 'Word Power Made Easy - The Complete Handbook for Building a Superior Vocabulary Book', Penguin Random House India, 2020

Reference(s):

1.	Raman. Meenakshi, Sharma. Sangeeta, 'Professional English'. Oxford university press. New Delhi. 2019
2.	Arthur Brookes and Peter Grundy,' Beginning to Write: Writing Activities for Elementary and Intermediate Learners', Cambridge University Press, New York, 2003
3.	Prof. R.C. Sharma & Krishna Mohan, 'Business Correspondence and Report Writing', Tata McGraw Hill & Co. Ltd., New Delhi, 2001
4.	V.N. Arora and Laxmi Chandra, 'Improve Your Writing', Oxford University Press, New Delhi, 2001

* SDG- 04- Quality Education

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Course Contents and Lecture Schedule

S.No	Topic	No.of Hours	Mode of content Delivery
1	**Making Comparisons**		
1.1	Evaluative Listening	1	Activity Based
1.2	Product Descriptions and Filling a Graphic Organiser	1	Activity Based
1.3	Marketing A Product by Using Persuasive Techniques	2	Activity Based
1.4	Reading Advertisements, User Manuals and Brochures	1	Activity Based
1.5	Writing Professional Emails	1	Lecture
1.6	Compare And Contrast Essay	1	Lecture
1.7	Mixed Tenses and Prepositional Phrases	1	Lecture
1.8	Same Words Used in Different Contexts	1	Lecture
2	**Expressing Causal Relations in Speaking and Writing**		
2.1	Listening to Longer Technical Talks	1	Activity Based
2.2	Listening to Process/Event Descriptions	1	Activity Based
2.3	Describing and Discussing the Reasons of Accidents or Disasters	1	Activity Based
2.4	Reading Longer Technical Texts– Cause and Effect Essays	1	Activity Based
2.5	Writing Responses to Complaints	1	Lecture
2.6	Active Passive Voice Transformations	2	Lecture
2.7	Infinitive And Gerunds	1	Lecture
2.8	Word Formation (Noun-Verb-Adj-Adv), Adverbs.	1	Lecture
3	**Problem Solving**		
3.1	Listening To Documentaries and Suggesting Solutions	1	Activity Based
3.2	Group Discussion (Based on Case Studies)	2	Activity Based
3.3	Reading Case Studies, Excerpts from Literary Texts and News Reports	1	Activity Based
3.4	Letter To the Editor	1	Lecture
3.5	Checklists	1	Lecture
3.6	Problem Solution and Argumentative Essays	1	Lecture
3.7	Error Correction and Sentence Completion	1	Lecture
3.8	If Conditional Sentences	1	Lecture
4	**Reporting Of Events and Research**		
4.1	Listening Comprehension	1	Activity Based
4.2	Interviewing And Presenting Oral Reports	1	Activity Based
4.3	Mini Presentations on Select Topics	1	Activity Based
4.4	Reading Newspaper Articles	1	Activity Based
4.5	Recommendations	1	Lecture
4.6	Transcoding	1	Lecture
4.7	Precis Writing, Summarising and Plagiarism	1	Lecture

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4.8	Reported Speech, Modals	1	Lecture
4.9	Conjunctions	1	Lecture
5	**The Ability to Put Ideas or Information Coherently**		
5.1	Listening To Formal Job Interviews	1	Activity Based
5.2	Role Plays	2	Activity Based
5.3	Virtual Interviews	1	Activity Based
5.4	Reading Company Profiles	1	Lecture
5.5	Writing Statement of Purpose (Sops)	1	Lecture
5.6	Writing Résumé	1	Lecture
5.7	Numerical Adjectives and Relative Clauses - Idioms	1	Lecture
5.8	Question Types: Wh/ Yes or No/ And Tags	1	Lecture
	Total	**45**	

Course Designer(s)

1. Dr.A.Palaniappan - palaniappan@ksrct.ac.in

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60 MA 004	Linear Algebra and Optimization Techniques	Category	L	T	P	Credit
		PC	3	1	0	4

Objectives

- To familiarize the concepts of linear algebra.
- To describe the concepts in solving system of equations.
- To get expose to the basics of linear programming problems.
- To facilitate the different techniques indecision making.
- To comprehend the connectedness and complexity of the model.

Pre-requisites

- NIL

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Apply linear transformation technique to solve real world applications.	Apply
CO2	Solve the system of linear equations.	Apply
CO3	Apply different techniques to optimize the solutions.	Apply
CO4	Apply the appropriate methods in decision making.	Apply
CO5	Apply graph theory concepts to analyze real-world problems.	Apply

Mapping with Programme Outcomes

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	-	-	2	-	-	-	-	-	-	-	-	2	-
CO2	3	2	-	-	2	-	-	-	-	-	-	-	-	2	-
CO3	3	2	-	-	2	-	-	-	-	-	-	-	-	2	-
CO4	3	2	-	-	2	-	-	-	-	-	-	-	-	2	-
CO5	3	2	-	-	2	-	-	-	-	-	-	-	-	2	-

3 - Strong; 2 - Medium; 1 - Some

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		Model Examination (Marks)	End Sem Examination (Marks)
	1	2		
Remember	10	10	20	20
Understand	10	10	30	30
Apply	40	40	50	50
Analyse	-	-	-	-
Evaluate	-	-	-	-
Create	-	-	-	-
Total	60	60	100	100

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B. TECH - Artificial Intelligence and Data Science

60 MA 004 - Linear Algebra and Optimization Techniques

Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
II	3	1	0	60	4	40	60	100

Linear Algebra Linear Equations in Linear Algebra: **System of Linear Equations*-** Row reduction and Echelon forms - Vector equations - Matrix Equation Ax = b – Linear independence – **Introduction to linear transformation*- Matrix of a linear transformation**.** **Hands - on:** Calculate the reduced row echelon form.	[9]
Numerical Linear Algebra System of linear algebraic equations: Gauss Elimination Method - Gauss-Jordan method - Gauss-Jacobi iteration method - Gauss-Seidal iteration method - Eigen value Problems: Power Method - Jacobi Method. **Hands - on:** Visualize the Iterative methods for solving linear system.	[9]
Linear Programming Problem Mathematical formulation of LPP - **Graphical Solution Method*** - Simplex Method - Two phase method – Big-M method. **Hands - on:** Solution of Linear programming problems.	[9]
Optimization Techniques **Transportation problems****: Mathematical Formulation - Methods for finding Initial Basic Feasible Solution - Transportation Algorithm (MODI method). **Assignment problems***: Mathematical Formulation - Hungarian method. **Hands - on:** Solution of transportation problem and assignment problem.	[9]
Graph Theory **Graphs and Subgraphs*** - Graph Isomorphism - Incidence and Adjacency Matrices - Vertex degrees - Paths and Connection - Cycles - Euler Tours - Hamilton Cycles - Directed graphs. **Hands - on:** Solve the problem about isomorphism of two graphs.	[9]
Total Hours: 45 +5(Hands on) +10 (Tutorial)	**60**

Text Book(s):

1. David C Lay, Steven R Lay and Judith McDonald, “Linear Algebra and its Applications”, 6th Edition, Pearson Education Limited, Harlow, 2022.
2. Kanti Swarup, Gupta P. K., and Manmohan, “Operations Research”, 20th Revised Edition, Sultan Chand & Sons, New Delhi, 2022.

Reference(s):

1. Gilbert Strang, “Introduction to linear algebra”, 5th Edition, Wellesley-Cambridge Press, U.S., 2021.
2. Sankara Rao K., “Numerical Methods for Scientists and Engineers”, 4th Edition, PHI Learning Private Limited, Delhi, 2017.
3. Taha H. A., “Operation Research”, 10th Edition, Pearson Education, 2017.
4. Bondy J. A., and Murty U. S. R., “Graph Theory”, 2008th Edition, Springer, 2013.
5. Srinivasan G., “Introduction to Operations Research” – NPTEL online video course.

*SDG 4 – Quality Education,

**SDG 9 – Industry, Innovation, and Infrastructure

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Course Contents and Lecture Schedule

S. No.	Topics	No. of hours
1.0	**Linear Algebra**	
1.1	Linear Equations in Linear Algebra	1
1.2	System of Linear Equations	1
1.3	Row reduction and Echelon forms	1
1.4	Vector equations	1
1.5	Matrix Equation Ax = b	2
1.6	Linear independence	1
1.7	Introduction to linear transformation	1
1.8	Matrix of a linear transformation	1
1.9	Tutorial	2
1.10	Hands on	1
2.0	**Numerical Linear Algebra**	
2.1	System of linear algebraic equations	1
2.2	Solution by Gauss Elimination	1
2.3	Solution by Gauss-Jordan method	1
2.4	Solution by Gauss-Jacobi iteration method	1
2.5	Solution by Gauss-Seidal iteration method	1
2.6	Eigen values of a matrix by Power method	2
2.7	Eigen values of a matrix by Jacobi method	2
2.8	Tutorial	2
2.9	Hands on	1
3.0	**Linear Programming Problems**	
3.1	Mathematical formulation of LPP	1
3.2	Graphical Solution Method	2
3.3	Simplex Method	2
3.4	Two phase method	2
3.5	Big-M method	2
3.6	Tutorial	2
3.7	Hands on	1
4.0	**Optimization techniques**	
4.1	Transportation problems: Mathematical Formulation	1
4.2	Methods for finding Initial Basic Feasible Solution: North West Corner Rule	1
4.3	Least Cost Method	1
4.4	Vogel's Approximation Method	1
4.5	Transportation Algorithm (MODI method)	2
4.6	Assignment problems: Mathematical Formulation	1
4.7	Hungarian method	2
4.8	Tutorial	2
4.9	Hands on	1
5.0	**Graph Theory**	
5.1	Graphs and Subgraphs	1
5.2	Graph Isomorphism	1
5.3	Incidence and Adjacency Matrices - Vertex degrees	1
5.4	Paths and Connection	2
5.5	Cycles	1

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5.6	Euler Tours	1
5.7	Hamilton Cycles	1
5.8	Directed graphs	1
5.9	Tutorial	2
5.10	Hands on	1

Course Designer(s)

1. Dr.D. Tamizharasan - tamizharasan@ksrct.ac.in

60 CH 004	Engineering Chemistry	Category	L	T	P	Credit
		BS	3	0	0	3

Objectives

- To help the learners to analyse the hardness of water and its removal
- To study the concepts of electrochemistry and its applications
- To explain the characteristics and application of chemical sensors
- To study the working principles of smart materials and its applications
- To learn the concepts of cheminformatics

Pre-requisites

- Nil

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Identify the types of hardness of water and its removal.	Apply
CO2	Interpret the applications of electro chemistry.	Understand
CO3	Categorize the types of sensors for various applications.	Apply
CO4	Identify the properties, principles, and applications of various smart materials in modern technologies.	Understand
CO5	Illustrate the significance of cheminformatics in drug development.	Understand

Mapping with Programme Outcomes

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	3	3	-	-	-	-	-	-	-	-	-	-	2	-	-
CO3	3	2	-	-	-	-	-	-	-	-	-	-	3	-	-
CO4	3	3	-	-	-	-	-	-	-	-	-	-	2	2	-
CO5	3	3	-	-	-	-	-	-	-	-	-	-	3	-	-
3 - Strong; 2 - Medium; 1 - Some															

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		Model Examination (Marks)	End Sem Examination (Marks)
	1	2		
Remember	20	20	20	20
Understand	30	40	60	60
Apply	10	-	20	20
Analyse	-	-	-	-
Evaluate	-	-	-	-
Create	-	-	-	-
Total	60	60	100	100

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B.E / B.TECH. - CSE, AIDS, AIML and IT								
60CH004 - ENGINEERING CHEMISTRY								
Semester	**Hours/Week**			**Total Hours**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
II	3	0	0	45	3	40	60	100

Water Technology* Introduction – Commercial and Industrial uses of Water - Hardness - Types – Estimation of Hardness by EDTA Method- Internal Conditioning (Colloidal, Phosphate, Calgon and Carbonate Conditioning Methods) – External Conditioning (Zeolite Process, Demineralization Process) - Desalination Methods (Reverse Osmosis and Electro Dialysis) - Flash Evaporation.	[9]
Electrochemistry ** Electrode Potential - Nernst Equation - Derivation and Problems - Reversible and Irreversible Cells - Types of Electrodes and its Applications - Reference Electrodes - pH, Conductometric and Potentiometric Titrations - Principles of Electro Plating and Electro Less Plating- Fabrication Process of Printed Circuit Board.	[9]
Chemical Sensors** Sensors - Chemical Sensors - Characteristics - Elements and Characterization - Potentiometric Sensors - Amperometric Sensors - Sensors Based on Electrochemical Methods - Electrochemical Biosensors – Optical Biosensors: Enzyme Sensors - Bio Affinity Sensors - DNA Sensors. Chemical Sensors as Detectors and Indicators: Indicators for Titration Processes - Separation Methods - Nano Technology in Chemical Sensors.	[9]
Smart Materials** Liquid Crystal Polymers - Organic Light Emitting Diode - Polythiopene - Working and Applications - Conductive Polymers and Semi Conducting Polymers - Principle and Applications - Organic Dielectric Material [Polystyrene, Pmma] - Smart Screen Materials: Inorganic Rare Earth Metals [Yttrium, Lanthanum, Cerium] - Conductive Components: Indium Tin Oxide [Properties and Applications] - Touch Screen [Resistive And Capacitive] - Magnetic Storage [Iron Oxide, Cobalt Alloy] – Optical Storage [Photo Chromic Materials] - Solid Storage.	[9]
Cheminformatics** Definition - Coordinate - Bonds - Bond Length - Bond Angles - Torsional Angles - Chemical Structure - Definition - Conformation - Representation of Structural Information - Linear Format - SMILEY Notation - MOL Format - PDB Format - Storage of Structural Data in a Database - Structural Keys - Finger Print - Canonical Structure using Chemdraw - Similarity Search –Sub Structure Search - Application of Chem-Informatics in Drugs Designing.	[9]
Total Hours:	**45**

Text Book(s):

1. .G. Palanna, “Engineering Chemistry”, Tata McGraw-Hill Pub.Co.Ltd, New Delhi, 2017.

Reference(s):

1. Jain. P.C. and Monica Jain, “Engineering Chemistry”, Dhanpatrai publishing co. New Delhi, 14th Edition, 2015.
2. eter Grundler “Chemical Sensors” ISBN 978-3-540-45742-8 Springer Berlin Heidelberg New York, 2007.
3. O.V. Roussak and H.D. Gesser, Applied Chemistry-A Text Book for Engineers and Technologists, Springer Science Business Media, New York, 2nd Edition, 2013.
4. Shikha Agarwal, “Engineering Chemistry-Fundamentals and Applications”, Cambridge University Press, Delhi, 2nd Edition, 2019.

* SDG 6: Improve Clean Water and Sanitation

** SDG 9 Industry, Innovation and Infrastructure

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Course Contents and Lecture Schedule

S. No.	Topics	No. of hours
1.0	**Water Technology**	
1.1	Introduction – Commercial and Industrial uses of Water	1
1.2	Hardness - Types	1
1.3	Estimation of Hardness of Water by EDTA Method	1
1.4	Internal Conditioning (Colloidal, Phosphate, Calgon and Carbonate)	1
1.5	External Conditioning (Zeolite Process)	1
1.6	Demineralization Process	1
1.7	Desalination Methods (Reverse Osmosis)	1
1.8	Electro dialysis	1
1.9	Flash Evaporation	1
2.0	**Electrochemistry**	
2.1	Electrode potential - Nernst Equation - derivation and problems	2
2.2	Reversible and irreversible cells	1
2.3	Types of Electrodes and its applications	1
2.4	Reference electrodes - pH	1
2.5	Conductometric and Potentiometric titrations	1
2.6	Principles of electro plating and electro less plating-	2
2.7	Fabrication process of Printed Circuit Board.	1
3.0	**Chemical Sensors**	
3.1	Sensors – Chemical Sensors - Characteristics	1
3.2	Elements and Characterization	1
3.3	Potentiometric Sensors, Amperometric Sensors	1
3.4	Sensors Based on Electrochemical Methods	1
3.5	Electrochemical Biosensors	1
3.6	Optical Biosensors : Enzyme Sensors – Bio affinity Sensors	1
3.7	DNA Sensors. Chemical Sensors as Detectors and Indicators	1
3.8	Indicators for Titration Processes	1
3.9	Separation Methods. Nano technology in chemical sensors.	1
4.0	**Smart Materials**	
4.1	Liquid Crystal Polymers - Organic Light Emitting Diode (OLED) - Polythiopene - Working and Applications	1
4.2	Conductive Polymers and Semi Conducting Polymers: Principle and Applications	1
4.3	Organic: Organic Dielectric Material [Polystyrene, PMMA].	1
4.4	Smart Screen Materials: Inorganic Rare Earth Metals [Yttrium, Lanthanum, Cerium]	1
4.5	Conductive Components: Indium Tin Oxide [Properties and Applications] - Touch Screen [Resistive and Capacitive]	1
4.6	Magnetic Storage [Iron Oxide, Cobalt Alloy]	1
4.7	Optical Storage [Photo Chromic Materials] - Solid Storage.	1
4.8	Liquid Crystal Polymers - Organic Light Emitting Diode (OLED) - [polythiopene] - Working and Applications	1
4.9	Conductive Polymers and Semi Conducting Polymers: Principle and Applications	1
5.0	**CHEMINFORMATICS**	
5.1	Definition – Coordinate –Bonds –Bond Length – Bond Angles – Torsional Angles – Chemical Structure –	2
5.2	Definition - Conformation – Representation of Structural Information	2

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5.3	Linear Format – SMILEY Notation – MOL Format – PDB Format –	1
5.4	Storage of Structural Data in a Database - Structural Keys	1
5.5	Finger Print -Canonical Structure using Chemdraw	1
5.6	Similarity Search – Sub Structure Search -	1
5.7	Application of Chem-Informatics in Drugs Designing	1

Course Designer(s)

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60 EE 001	Basic Electrical and Electronics Engineering	Category	L	T	P	Credit
		ES	3	0	0	3

Objectives

- To familiarize the basic concept on electrical circuits and its various parameters
- To facilitate the various types of electrical machines and their uses
- To gain knowledge on Electrical safety
- To provide exposure on the functions of various semiconductor devices
- To familiarize the use of various measuring instruments

Pre-requisites

NIL

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Apply the basic laws of electric circuits to calculate the unknown quantities.	Apply
CO2	Acquire knowledge on different electrical machines and select suitable machines for industrial applications.	Apply
CO3	Express the significance of various components of low voltage electrical installations and create awareness on electrical safety.	Understand
CO4	Demonstrate the operation and characteristics of various semiconductor devices.	Understand
CO5	Interpret the operating principles of measuring instruments and choose suitable instrument for measuring the parameters.	Understand

Mapping with Programme Outcomes

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	-	-	-	-		-	-	-	-	-	-	-	-
CO2	3	3	-	-	-	-	2	-	-	-	-	2	-	1	1
CO3	3	3	-	-	-	2		-	-	-	-	2	-	-	-
CO4	2	2	-	-	-	-	2	-	-	2	-	2	-	2	2
CO5	2	3	-	-	-	-	3	-	3	2	-	2	-	1	1
3 - Strong; 2 - Medium; 1 – Some															

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		Model Examination (Marks)	End Sem Examination (Marks)
	1	2		
Remember	20	20	30	20
Understand	20	40	30	40
Apply	20	-	30	40
Analyse	-	-	10	-
Evaluate	-	-	-	-
Create	-	-	-	-
Total	60	60	100	100

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Common to CSE, IT, AIDS, AIML, MECH, MCT, BT, FT and CIVIL								
60 EE 001 - Basic Electrical and Electronics Engineering								
Semester	**Hours/Week**			**Total Hours**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
II	3	0	0	45	3	40	60	100

Electrical Circuits DC Circuits: Circuit Components: Resistor, Inductor, Capacitor – Ohm's Law - Kirchhoff's Laws–Simple problems. Introduction to AC Circuits and Parameters: Waveforms, Average value and RMS Value of Sinusoidal Waveform Real Power, Reactive Power and Apparent Power, Power Factor – Steady State Analysis of RLC Series Circuits- Simple Problems. Introduction to Three Phase AC Circuits.	[10]
Electrical Machines* Construction and Working principle - Separately and Self Excited DC Generators, EMF Equation, Types and Applications. Working Principle of DC motors, Torque Equation, Types and Applications. Construction, Working principle and Applications of Transformer, Three Phase Alternator, Synchronous Motor and Three Phase Induction Motor.	[10]
Electrical Installations* Domestic Wiring, Types of Wires and Cables, Earthing, Protective Devices- Switch Fuse Unit- Miniature Circuit Breaker-Moulded Case Circuit Breaker- Earth Leakage Circuit Breaker, Batteries And Types, Ups, Safety Precautions And First Aid.	[9]
Analog Electronics* Introduction to Semiconductor Materials– PN Junction Diodes, Zener Diode – Characteristics and Applications – Bipolar Junction Transistor-Biasing and Configuration (NPN) - Regulated Power Supply Unit, Switched Mode Power Supply.	[8]
Measurements and Instrumentation* Functional Elements of an Instrument, Standards and Calibration, Operating Principle, Types -Moving Coil and Moving Iron Meters, Operating Principles and Types of Wattmeter, Energy Meter, Instrument Transformers-CT and PT, DSO- Block diagram-Data Acquisition.	[8]
Total Hours:	**45**

Text Book(s):	
1.	Kothari DP and I.J Nagrath, "Basic Electrical and Electronics Engineering", Second Edition, McGraw Hill Education, 2020.
2.	A.K. Sawhney, Puneet Sawhney 'A Course in Electrical & Electronic Measurements & Instrumentation', Dhanpat Rai and Co, 2015.
Reference(s):	
1.	Kothari DP and I.J Nagrath, "Basic Electrical Engineering", Fourth Edition, McGraw Hill Education, 2019.
2.	Albert Malvino, David Bates, 'Electronic Principles, McGraw Hill Education; 7th edition, 2017.
3.	Mahmood Nahvi and Joseph A. Edminister, "Electric Circuits", Schaum' Outline Series, McGraw Hill, 2002.
4.	H.S. Kalsi, 'Electronic Instrumentation', Tata McGraw-Hill, New Delhi, 2010.

*SDG 9 – Industry Innovation and Infrastructure

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Course Contents and Lecture Schedule

S. No.	Topics	No. of hours
1.0	**Electrical Circuits**	
1.1	Circuit Components: Resistor, Inductor, Capacitor	1
1.2	Ohm's Law - Kirchhoff's Laws	1
1.3	Ohm's Law - Kirchhoff's Laws - Problems	2
1.4	Introduction to AC Circuits and Parameters: Waveforms, Average value and RMS Value of Sinusoidal Waveform	2
1.5	Real Power, Reactive Power and Apparent Power, Power Factor	1
1.6	Steady State Analysis of RLC Series Circuits	1
1.7	RLC Series Circuits - Problems	1
1.8	Introduction to Three Phase System	1
2.0	**Electrical Machines**	
2.1	Construction and Working Principle of DC Generator	1
2.2	Types and Applications of Separately and Self Excited DC Generators	1
2.3	EMF Equation of DC Generator	1
2.4	Working Principle of DC motors	1
2.5	Torque Equation	1
2.6	Types and Applications	1
2.7	Construction, Working Principle and Applications of Transformer	1
2.8	Construction, Working Principle and Applications of Three phase Alternator	1
2.9	Construction, Working Principle and Applications of Synchronous motor	1
2.10	Construction, Working Principle and Applications of Three Phase Induction Motor	1
3.0	**Electrical Installations**	
3.1	Domestic Wiring, Types of Wires and Cables	1
3.2	Earthing, Protective Devices	2
3.3	Switch Fuse unit- Miniature Circuit Breaker	1
3.4	Molded Case Circuit Breaker- Earth Leakage Circuit Breaker	1
3.5	Batteries and Types	2
3.6	UPS	1
3.7	Safety Precautions and First Aid	1
4.0	**Analog Electronics**	
4.1	Introduction to Semiconductor Materials	1
4.2	Characteristics and Applications of PN Junction Diodes	1
4.3	Characteristics and Applications of Zener Diode	1
4.4	Bipolar Junction Transistor	1
4.5	Biasing & Configuration (NPN)	2
4.6	Regulated Power Supply Unit	1
4.7	Switched Mode Power Supply	1
5.0	**Measurements And Instrumentation**	
5.1	Functional Elements of an Instrument	2
5.2	Standards and Calibration	1
5.3	Moving Coil Meters - Operating Principle, Types	1
5.4	Moving Iron Meters - Operating Principle, Types	1
5.5	Operating Principles and Types of Wattmeter	1
5.6	Energy Meter	1
5.7	Instrument Transformers – CT& PT	1

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5.8	DSO- Block Diagram- Data Acquisition	1

Course Designer(s)

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60 IT 001	Python Programming	Category	L	T	P	Credit
		ES	3	1	0	4

Objectives

- To know the basics of programming in python
- To understand modules and functions
- To study files and exception handling
- To recognize the basic concepts of NumPy
- To create layouts using graphical tools

Pre-requisites

Basic Knowledge of Mathematics and Programming.

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Apply the basics of Python programming for problem-solving	Apply
CO2	Develop programs using modules and functions	Apply
CO3	Implement programs using file and exception handling	Apply
CO4	Create a solution for real world problems using NumPy arrays	Apply
CO5	Design layouts with GUI toolkits using Tkinter	Apply

Mapping with Programme Outcomes

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	3	3	-	-	-	-	2	2	2	2	3	3	-
CO2	3	2	3	2	-	-	-	-	2	2	2	2	3	3	-
CO3	3	2	3	3	-	-	-	-	2	2	2	2	3	3	-
CO4	3	2	3	3	-	-	-	-	2	2	2	2	3	3	-
CO5	3	2	3	3	-	-	-	-	2	2	2	2	3	3	-
3 - Strong; 2 - Medium; 1 – Some															

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		Model Examination (Marks)	End Sem Examination (Marks)
	1	2		
Remember	10	10	10	10
Understand	20	10	20	20
Apply	30	30	60	60
Analyse	-	-	-	-
Evaluate	-	-	-	-
Create	-	10	10	10
Total	60	60	100	100

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Syllabus

K.S.Rangasamy College of Technology – Autonomous R2022								
Common to AD,CS,IT								
60 IT 001- Python Programming								
Semester	**Hours / Week**			**Total hrs**	**Credit**	**Maximum Marks**		
	L	T	P		C	L	T	P
II	3	1	0	60	2	3	1	0

Introduction Introduction to Python – Strings – List – Tuples - Dictionaries – Basic Operators – Decision Making – Loops.	[9]
Modular Design Modules – Python Module – Namespaces – Importing Modules – Loading and Execution – Program Routine – Functions – Parameter Passing - Types – Recursion.	[9]
Files and Exception Handling Introduction - Data Streams - Creating Own Data Streams - Access Modes - Writing Data to a File – Reading Data from a File - Additional File Methods- Exceptions – Types, Handling Exceptions, User Defined Exceptions.	[9]
NumPy Basics NumPy Data Types – NumPy Arrays - Creating, Adding Items, Removing Items, Printing Items, Sorting Items, Reshaping, Indexing and Slicing.	[9]
GUI Programming and Graphics* GUI Programming Toolkits – Introduction to Tkinter – Creating GUI Widgets – Resizing – Configuring Widget Options – Creating Layouts – Radio Buttons – Check Boxes – Dialog Boxes – Drawing using Turtle.	[9]
Total Hours: 45 + 15(Tutorial)	**60**

Text Book(s):

1.	John Paul Mueller, “Beginning Programming with Python”, 2nd Edition, Wiley India Pvt Ltd, 2014
2.	Usman Malik, “Python NumPy for Beginners: NumPy Specialization for data Scientists”, AI Publishing, 2021

Reference(s):

1.	Wesley J. Chun, “Core Python Applications Programming”, 3rd Edition, Pearson Education, 2013
2.	Allen B. Downey, “Think Python: How to Think like a Computer Scientist”, 2nd Edition, O’Reilly Publishers, 2016.
3.	Charles Dierbach, “Introduction to Computer Science using Python”, 2nd Edition, Wiley India Pvt Ltd, 2015
4.	Dr. R.Nageswara Rao “Core Python Programming”, DreamTech Press, 2nd Edition, 2018

*SDG 9 – Industry Innovation and Infrastructure

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Course Contents and Lecture Schedule

S. No.	Topics	No. of hours
1.0	**Introduction**	
1.1	Introduction to Python	1
1.2	Basic Data Types	1
1.3	Strings	1
1.4	List	1
1.5	Tuples	1
1.6	Dictionaries	1
1.7	Basic Operators	1
1.8	Decision Making Statements	1
1.9	Looping Statements	1
2.0	**Modular Design**	
2.1	Modules	1
2.2	Python Module	1
2.3	Namespaces	1
2.4	Importing Modules	1
2.5	Loading and Execution	1
2.6	Program Routine	1
2.7	Functions	1
2.8	Parameter Passing Types	1
2.9	Recursion	1
3.0	**Files and Exception Handling**	
3.1	Introduction	1
3.2	Data Streams	1
3.3	Creating Own Data Streams	1
3.4	Access Modes	1
3.5	Writing Data to a File, Reading Data from a File	1
3.6	Additional File Methods	1
3.7	Exceptions and Types	1
3.8	Handling Exceptions	1
3.9	User Defined Exceptions	1
4.0	**NumPy Basics**	
4.1	NumPy Data Types	1
4.2	NumPy Arrays	1
4.3	Creating Arrays	1
4.4	Adding Items into Arrays	1
4.5	Removing Items	1
4.6	Printing Items	1
4.7	Sorting Items	1
4.8	Reshaping	1
4.9	Indexing and Slicing	1
5.0	**GUI Programming and Graphics**	
5.1	GUI Programming Toolkits	1
5.2	Introduction to Tkinter	1
5.3	Creating GUI Widgets	1
5.4	Resizing	1

5.5	Configuring Widget Options	1
5.6	Creating Layouts	1
5.7	Radio Buttons & Check Boxes	1
5.8	Dialog Boxes	1
5.9	Drawing using Turtle	1

Course Designer(s)

1. Dr.C.Nallusamy -nallusamyc@ksrct.ac.in
2. Mr.R.T.Dinesh Kumar -dineshkumarrt@ksrct.ac.in

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60 GE 001	**தமிழர் மரபு** (அனைத்து துறைகளுக்கும் பொதுவானது)	**Category**	**L**	**T**	**P**	**Credit**
		GE	1	0	0	1

பாடத்தின் நோக்கங்கள்:

- தமிழ் மொழியின் இலக்கணச் செறிவைக் கற்றுணர்தல்.
- தமிழர் பண்பாட்டின் நுண்கலைகள் பற்றிய ஒரு மீள்பார்வை.
- இந்திய சுதந்திரப் போராட்டத்தில் தமிழர்களின் பங்களிப்பை உணருதல்.

முன்கூட்டிய துறைசார் அறிவு:

தேவை இல்லை

பாடம் கற்றதின் விளைவுகள்:

பாடத்தை வெற்றிகரமாக கற்று முடித்த பின்பு, மாணவர்களால் முடியும் விளைவுகள்

CO1	தமிழ் மொழியின் செந்தண்மை மற்றும் இலக்கியம் குறித்த தெரிதல்.	புரிதல்
CO2	தமிழர்களின் சிற்பக்கலை, ஓவியக்கலை மற்றும் இசைக்கருவிகள் குறித்த தெளிவு.	புரிதல்
CO3	தமிழர்களின் நாட்டுப்புறக்கலைகள் மற்றும் வீரவிளையாட்டுகள் குறித்த தெளிவு.	புரிதல்
CO4	தமிழர்களின் திணைக் கோட்பாடுகள், சங்ககால வணிகம் மற்றும் சோழர்களின் வெற்றிகள் குறித்த தகவல்கள்.	புரிதல்
CO5	இந்திய தேசிய இயக்கம், சுயமரியாதையை இயக்கம் மற்றும் சித்த மருத்துவம் பற்றிய புரிதல்.	புரிதல்

Mapping with Programme Outcomes

COs	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO7**	**PO8**	**PO9**	**PO1 0**	**PO1 1**	**PO1 2**
CO1							3	3		2		3
CO2							3	3		2		3
CO3							3	3		2		3
CO4							3	3		2		3
CO5							3	3		2		3
3- Strong; 2-Medium; 1-Low												

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K. S. Rangasamy College of Technology – Autonomous R2022								
60 GE 001 – தமிழர் மரபு								
Semester	Hours/Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
II	1	0	0	15	1	100	-	100

மொழி மற்றும் இலக்கியம்: இந்திய மொழிக் குடும்பங்கள் – திராவிட மொழிகள் – தமிழ் ஒரு செம்மொழி – தமிழ் செவ்விலக்கியங்கள் - சங்க இலக்கியத்தின் சமயச் சார்பற்ற தன்மை – சங்க இலக்கியத்தில் பகிர்தல் அறம் – திருக்குறளில் மேலாண்மைக் கருத்துக்கள் - தமிழ்க் காப்பியங்கள் - தமிழகத்தில் சமண பௌத்த சமயங்களின் தாக்கம் – பக்தி இலக்கியம், ஆழ்வார்கள் மற்றும் நாயன்மார்கள் - சிற்றிலக்கியங்கள் - தமிழில் நவீன இலக்கியத்தின் வளர்ச்சி – தமிழ் இலக்கிய வளர்ச்சியில் பாரதியார் மற்றும் பாரதிதாசன் ஆகியோரின் பங்களிப்பு.	3
மரபு – பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை–சிற்பக் கலை: நடுகல் முதல் நவீன சிற்பங்கள் வரை – ஐம்பொன் சிலைகள் – பழங்குடியினர் மற்றும் அவர்கள் தயாரிக்கும் கைவினைப் பொருட்கள், பொம்மைகள் - தேர் செய்யும் கலை – சுடுமண் சிற்பங்கள் – நாட்டுப்புறத் தெய்வங்கள் – குமரிமுனையில் திருவள்ளுவர் சிலை – இசைக் கருவிகள் – மிருதங்கம், பறை, வீணை, யாழ், நாதஸ்வரம் – தமிழர்களின் சமூக பொருளாதார வாழ்வில் கோவில்களின் பங்கு.	3
நாட்டுப்புறக் கலைகள் மற்றும் வீர விளையாட்டுகள்: தெருக்கூத்து, கரகாட்டம், வில்லுப்பாட்டு, கணியான் கூத்து, ஒயிலாட்டம், தோல்பாவைக் கூத்து, சிலம்பாட்டம், வளரி, புலியாட்டம், தமிழர்களின் விளையாட்டுகள்.	3
தமிழர்களின் திணைக் கோட்பாடுகள்: தமிழகத்தின் தாவரங்களும், விலங்குகளும் – தொல்காப்பியம் மற்றும் சங்க இலக்கியத்தில் அகம் மற்றும் புறக் கோட்பாடுகள் - தமிழர்கள் போற்றிய அறக்கோட்பாடு - சங்ககாலத்தில் தமிழகத்தில் எழுத்தறிவும், கல்வியும் - சங்ககால நகரங்களும் துறை முகங்களும் - சங்க காலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி – கடல்கடந்த நாடுகளில் சோழர்களின் வெற்றி.	3
இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குத் தமிழர்களின் பங்களிப்பு: இந்திய விடுதலைப்போரில் தமிழர்களின் பங்கு – இந்தியாவின் பிறப்பகுதிகளில் தமிழ்ப் பண்பாட்டின் தாக்கம் - சுயமரியாதை இயக்கம் – இந்திய மருத்துவத்தில், சித்த மருத்துவத்தின் பங்கு – கல்வெட்டுகள், கையெழுத்துப்படிகள் - தமிழ்ப் புத்தகங்களின் அச்சு வரலாறு.	3
Total Hours	**15**

Text Book(s):

1.	தமிழக வரலாறு - மக்களும் பண்பாடும் கே. கே . பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2.	கணினித்தமிழ் – முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்).
3.	கீழடி – வைகை நதிக்கரையில் சங்ககால நகர நாகரீகம் (தொல்லியல் துறை வெளியீடு).
4.	பொருநை - ஆற்றங்கரை நாகரீகம் (தொல்லியல் துறை வெளியீடு).
5.	Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print).
6.	Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
7.	Historical Heritage of the Tamils (Dr.S.V.Subaramanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8.	The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
9.	Keeladi - 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
10	Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author).

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11	Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu).
12	Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

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K.S.Rangasamy College of Technology - Autonomous R2022								
61 GE 001- Heritage of Tamils (Common to all Branches)								
Semester	Hours/Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
II	1	0	0	15	1#	40	60	100

Language, Literature, Life Skills & Ethics* Language Families in India - Dravidian Languages – Tamil as a Classical Language - Classical Literature in Tamil – Secular Nature of Sangam Literature – Distributive Justice in Sangam Literature - Management Principles in Thirukural - Tamil Epics and Impact of Buddhism & Jainism in Tamil Land - Bakthi Literature Azhwars and Nayanmars - Forms of minor Poetry - Development of Modern literature in Tamil - Contribution of Bharathiyar and Bharathidhasan-Life, Responsibility, Self-exploration, Attitude, Self-confidence, Goals, Relationships, Leadership, Gender equality	[3]
Heritage - Rock Art Paintings to Modern Art – Sculpture* Hero stone to modern sculpture - Bronze icons - Tribes and their handicrafts - Art of temple car making -Massive Terracotta sculptures, Village deities, Thiruvalluvar Statue at Kanyakumari, Making of musical instruments - Mridhangam, Parai, Veenai, Yazh and Nadhaswaram - Role of Temples in Social and Economic Life of Tamils.	[3]
Folk and Martial Arts* Therukoothu, Karagattam, Villu Pattu, Kaniyan Koothu, Oyillattam, Leatherpuppetry, Silambattam, Valari, Tiger dance - Sports and Games of Tamils.	[3]
Thinai Concept of Tamils* Flora and Fauna of Tamils & Aham and Puram Concept from Tholkappiyam and Sangam Literature - Aram Concept of Tamils - Education and Literacy during Sangam Age - Ancient Cities and Ports of Sangam Age - Export and Import during Sangam Age - Overseas Conquest of Cholas.	[3]
Contribution of Tamils to Indian National Movement and Indian Culture* Contribution of Tamils to Indian Freedom Struggle - The Cultural Influence of Tamils over the other parts of India – Self-Respect Movement - Role of Siddha Medicine in Indigenous Systems of Medicine – Inscriptions & Manuscripts – Print History of Tamil Books.	[3]
Total Hours	15

Text Book(s) cum Reference Book(s)

1.	முனைவர் கே. கே. பிள்ளை, தமிழக வரலாறு - மக்களும் பண்பாடும், தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம், 18th Ed ,2022.
2.	முனைவர் இல. சுந்தரம், கணினித்தமிழ்,விகடன் பிரசுரம், 2nd Ed 2021
3.	முனைவர் இரா.சிவானந்தம், மு.சேரன், கீழடி - வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம், தொல்லியல் துறை வெளியீடு, 6th Ed ,2020.
4.	முனைவர் இரா.சிவானந்தம் , முனைவர் ஜெ.பாஸ்கர், பொருநை - ஆற்றங்கரை நாகரிகம், தொல்லியல் துறை வெளியீடு,1st Ed ,2022
5.	ஈரோடு கதிர், உயர்தல் உரிமை, சிக்ஸ் ப்ளஸ் ஒன் ட்ரெயினிங் அகாடமி,1st Ed, 2024
6.	Dr.K.K.Pillay, Social Life of Tamils, TNTB & ESC and RMRL – (In print).
7.	Dr.S.Singaravel, Social Life of the Tamils - The Classical Period, International Institute of Tamil Studies, 1st, 2001.
8.	Dr.S.V.Subaramanian, Dr.K.D. Thirunavukkarasu, Historical Heritage of the Tamils, International Institute of Tamil Studies, 2nd, 2010
9.	Dr.M.Valarmathi, The Contributions of the Tamils to Indian Culture, International Institute of Tamil Studies,
10.	Dr.R.Sivanantham, Keeladi - Sangam City Civilization on the banks of river Vaigai, Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation,
11.	Dr.K.K.Pillay, Studies in the History of India with Special Reference to Tamil Nadu, K.K. Pillay(Published by the Author.
12.	Dr.R.Sivanantham, Dr.J.Baskar, Porunai Civilization, Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation.
13	R.Balakrishnan, Journey of Civilization Indus to Vaigai, Roja Muthiah Research Library,3rd Ed, 2022

*SDG 4 – Quality Education

For Heritage of Tamils, additional 1 credit is offered and not accounted for CGPA.

Rev. No.3/w.e.f. 22.07.2024
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Tiruchengode - 637 215.

K. S. Rangasamy College of Technology – Autonomous R2022								
60 GE 001 – Heritage of Tamils								
Semester	Hours/Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
II	1	0	0	15	1	100	-	100

Language and Literature* Language Families in India - Dravidian Languages – Tamil as a Classical Language - Classical Literature in Tamil – Secular Nature of Sangam Literature – Distributive Justice in Sangam Literature - Management Principles in Thirukural - Tamil Epics and Impact of Buddhism & Jainism in Tamil Land - Bakthi Literature Azhwars and Nayanmars - Forms of minor Poetry - Development of Modern literature in Tamil - Contribution of Bharathiyar and Bharathidhasan.	3
Heritage - Rock Art Paintings to Modern Art – Sculpture* Hero stone to modern sculpture - Bronze icons - Tribes and their handicrafts - Art of temple car making - - Massive Terracotta sculptures, Village deities, Thiruvalluvar Statue at Kanyakumari, Making of musical instruments - Mridhangam, Parai, Veenai, Yazh and Nadhaswaram - Role of Temples in Social and Economic Life of Tamils.	3
Folk and Martial Arts* Therukoothu, Karagattam, Villu Pattu, Kaniyan Koothu, Oyillattam, Leatherpuppetry, Silambattam, Valari, Tiger dance - Sports and Games of Tamils.	3
Thinai Concept of Tamils* Flora and Fauna of Tamils & Aham and Puram Concept from Tholkappiyam and Sangam Literature - Aram Concept of Tamils - Education and Literacy during Sangam Age - Ancient Cities and Ports of Sangam Age - Export and Import during Sangam Age - Overseas Conquest of Cholas.	3
Contribution of Tamils to Indian National Movement and Indian Culture* Contribution of Tamils to Indian Freedom Struggle - The Cultural Influence of Tamils over the other parts of India – Self-Respect Movement - Role of Siddha Medicine in Indigenous Systems of Medicine – Inscriptions & Manuscripts – Print History of Tamil Books.	3
Total Hours	**15**

Text Book(s):

1.	தமிழகவரலாறு - மக்களும்பண்பாடும்கே. கே . பிள்ளை (வெளியீடு: தமிழ்நாடுபாடநூல்மற்றும்கல்வியியல்பணிகள்கழகம்).
2.	கணினித்தமிழ் – முனைவர்இல. சுந்தரம். (விகடன்பிரசுரம்).
3.	கீழடி – வைகைநதிக்கரையில்சங்ககாலநகரநாகரீகம் (தொல்லியல்துறைவெளியீடு).
4.	பொருநை - ஆற்றங்கரைநாகரீகம் (தொல்லியல்துறைவெளியீடு).
5.	Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print).
6.	Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
7.	Historical Heritage of the Tamils (Dr.S.V.Subaramanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8.	The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)

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9.	Keeladi - 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation,Tamil Nadu)
10	Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author).
11	Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu).
12	Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

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60 IT 0P1	Python Programming Laboratory	Category	L	T	P	Credit
		ES	0	0	4	2

Objectives

- To gain basic knowledge in Python programming Language
- To understand the concept of decision-making and looping statements
- To implement functions with the aid of modules using exception handling
- To implement the concepts of NumPy Arrays
- To create layouts using graphical modules such as Tkinter and Turtle

Pre-requisites

Basic Knowledge of Mathematics and Programming.

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Implement the basics and data structures of Python programming	Apply
CO2	Implement the concepts of decision-making and looping statements	Apply
CO3	Develop programs using functions and modules with exception handling	Apply
CO4	Create programs using NumPy arrays	Apply
CO5	Design layouts with GUI toolkits using Tkinter	Apply

Mapping with Programme Outcomes

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	3	3	-	-	-	-	2	2	2	2	3	3	-
CO2	3	2	3	2	-	-	-	-	2	2	2	2	3	3	-
CO3	3	2	3	3	-	-	-	-	2	2	2	2	3	3	-
CO4	3	2	3	3	-	-	-	-	2	2	2	2	3	3	-
CO5	3	2	3	3	-	-	-	-	2	2	2	2	3	3	-
3 - Strong; 2 - Medium; 1 - Some															

Assessment Pattern

Bloom's Category	Lab Experiments Assessment (Marks)		Model Examination (Marks)	End Sem Examination (Marks)	
	Lab	Activity			
Remember	-	-	-	-	-
Understand	-	-	-	-	-
Apply	25	12	50		50
Analyse	-	-	-	-	-
Evaluate	-	-	-	-	-
Create	25	13	50	-	50
Total	50	25	100	-	100

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K.S.Rangasamy College of Technology – Autonomous R2022								
Common to AD,CS,IT								
60 IT 0P1– Python Programming Laboratory								
Semester	**Hours/Week**			**Total Hrs**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
II	0	0	4	60	2	60	40	100

List of Experiments:

1. Implement the basic concepts of Python
2. Implement List, Tuples, Dictionary, and String
3. Implement the concept of decision-making and looping statements.
4. Working with functions and modules
5. Implement File operations
6. Build a program with Exception handling
7. Perform various NumPy operations and special functions
8. Design windows using Tkinter
9. Draw shapes and images using Turtle*
10. Mini Project*****

Lab Manual	
1.	"Python Programming Lab Manual", Department of Information Technology, KSRCT.

*****SDG 4: Quality Education

Course Designer(s)

1. Dr.C.Nallusamy- nallusamyc@ksrct.ac.in
2. Mr.R.T.Dinesh Kumar- dineshkumarrt@ksrct.ac.in

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60 ME 0P1	Fabrication and Reverse Engineering Laboratory (Common to All branches)	Category	L	T	P	Credit
		ES	0	0	4	2

Objectives

- To acquire skills in operating hand tools and instruments.
- To provide hands-on training on Carpentry, Sheet metal, Fitting and Welding.
- To provide hands-on training on household wiring and electronic circuits.
- To offer real time activity on plumbing connections in domestic applications.
- To provide hands-on activities on dismantling, and assembling the Home Appliance, Center lathe operations, computer's internal components and peripherals.

Pre-requisites

- Nil

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Perform power tools operations.	Apply
CO2	Make a wooden model using carpentry Process	Apply
CO3	Make a model using sheet metal, filing and joining a MS Plate	Apply
CO4	Repair and Maintenances of water lines for home applications	Apply
CO5	Trouble shoots the electrical and electronic circuits, Electrical machines and realizes the reputation of house wiring, home Appliance, computer internal components and peripherals.	Apply

Mapping with Programme Outcomes

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	3	-	-	2	2	-	3	-	-	3	-	3	3
CO2	3	2	3	-	-	2	2	-	3	-	-	3	-	3	3
CO3	3	2	3	-	-	2	2	-	3	-	-	3	-	3	3
CO4	3	2	3	-	-	2	2	-	3	-	-	3	-	3	3
CO5	3	2	3	-	-	2	2	-	3	-	-	3	-	3	3
3 - Strong; 2 - Medium; 1 - Some															

Assessment Pattern

Bloom's Category	Lab Experiments Assessment (Marks)		Model Examination (Marks)	End Sem Examination (Marks)	
	Lab	Activity			
Remember	-	-	-	-	-
Understand	25	12	50		50
Apply	25	13	50		50
Analyse	-	-	-	-	-
Evaluate	-	-	-	-	-
Create	-	-	-	-	-
Total	50	25	100	-	100

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Syllabus

K.S.Rangasamy College of Technology – Autonomous R2022								
Common to all branches								
60 ME 0P1 -Fabrication and Reverse Engineering Laboratory								
Semester	Hours/Week			Total Hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
II	0	0	4	60	2	60	40	100

List of Experiments:

1. Fitting of Wall mounting Parts using Power Tools

a) Drilling in different Walls and Materials

b) Fitting of Hand shower mount, Shirt hanger, Towel hanger and Pipe with Clamps.

2. Making of Wooden model using the Carpentry Process

a) T / Cross Joint

b) Mortise and Tenon Joint / different joints

3. Making of Metal Model

a) Making of Components using Sheet Metal Process

b) Mating of Components using the Filling Process

4. Fabrication of Welded model

5. Repair and Maintenance of Pipe Fitting for Home Applications

a) Assembly of GI pipes/PVC and Pipe Fitting

b) Cutting of Threads in GI pipes by thread Cutting Dies

6. Assembling and dismantling of

a) Iron box

b) Induction stove

c) Water heater

d) Mixer

e) Table fan

f) Ceiling fan

7. Design and Execution of Residential house wiring

a) 1 BHK

b) 2 BHK

8. Design and Execution of Residential house wiring with UPS.

a) 1 BHK

b) 2 BHK

9. Design and fabrication of domestic LED lamps

a) Circuit designing (calculation of components)

b) PCB fabrication

c) Soldering

10. Assembling of Audio Amplifiers

a) Connecting USB/Bluetooth MP3 player board

b) Connecting Volume controllers

c) Connecting bass & treble filter boards

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d) Connecting Surround and sub-woofer filter board

Study Exercises

1. Demonstration of Centre Lathe and its operations like Facing, Turning, and drilling.
2. Dismantle and Assemble of Vacuum Cleaner / Refrigerator.
3. Study of components of computer. Dismantle and assemble of desktop computer systems

Course Designer(s)

1. Mr.S Sakthivel - sakthivel_s@ksrct.ac.in
2. Dr. D Sri Vidya - srividhya@ksrct.ac.in
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60 CG 0P1	Career Skill Development I	Category	L	T	P	Credit
		CGC	0	0	2	0

Objectives

- To help learners improve their vocabulary and to enable them to use words appropriately in different academic and professional contexts
- To help learners develop strategies that could be adopted while reading texts
- To help learners acquire the ability to speak effectively in English in real life and career related situations
- To equip students with effective speaking and listening skills in English
- To facilitate learners to enhance their writing skills with coherence and appropriate format effectively

Pre-requisites

- Basic knowledge of reading and writing in English.

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Listen and comprehend complex academic texts	Understand
CO2	Read and infer the denotative and connotative meanings of technical texts	Analyze
CO3	Write definitions, descriptions, narrations, and essays on various topics	Apply
CO4	Speak fluently and accurately in formal and informal communicative contexts	Apply
CO5	Appraise the verbal ability skills in the career development and professional contexts	Analyze

Mapping with Programme Outcomes

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	2	2	2	3	-	3	-	-	-	2	3	3	3	-	3
CO2	3	3	3	3	-	2	-	-	-	2	3	3	3	2	3
CO3	2	2	2	2	-	3	-	-	-	2	3	3	2	-	3
CO4	3	3	3	3	-	2	-	-	-	2	3	3	3	2	3
CO5	3	3	3	3	-	2	-	-	-	2	3	3	3	-	3
3 - Strong; 2 - Medium; 1 - Some															

K.S.Rangasamy College of Technology – Autonomous R2022								
60 CG 0P1-Career Skill Development I								
Common to All Branches								
Semester	Hours/Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
II	-	-	2	30	-	100	-	100

Listening Listening for general information-specific details - audio / video (formal & informal) - Listen to podcasts/ TED talks/ anecdotes / stories / event narration / documentaries and interviews with celebrities - Listen to a product and process descriptions, advertisements about products or services.	[6]
Speaking Self-Introduction; Introducing a friend; conversation - politeness strategies - Narrating personal experiences / events; Interviewing a celebrity; reporting / and summarizing of documentaries / podcasts/ interviews - Picture description; giving instruction to use the product; presenting a product - Small Talk; Mini presentations - Group discussions, debates & role plays.	[6]
Reading Loud reading vs Silent reading, Skimming & Scanning of passages, reading brochures (technical context), social media messages relevant to technical contexts and emails - Biographies, travelogues, newspaper reports and travel & technical blogs - Advertisements, gadget reviews and user manuals - Newspaper articles and Journal reports - Editorials; and opinion blogs.	[6]
Writing Writing letters – informal and formal – basics and format orientation - paragraph texting, short report on an event (field trip etc.) - Definitions; instructions; and product /process description - Note-making / Note-taking; recommendations; transferring information from non-verbal (charts, graphs to verbal mode) - Essay texting.	[6]
Verbal Ability I Reading Comprehension (MCQs) – Cloze Test - Sequencing of sentences – Summarizing and paraphrase – Error Detection – Spelling Test – Sentence Improvement - Preposition	[6]
Total Hours	30

Reference(s):

1.	'English for Engineers & Technologists' Orient Blackswan Private Ltd. Department of English, Anna University, 2020
2.	Norman Lewis, 'Word Power Made Easy - The Complete Handbook for Building a Superior Vocabulary Book', Penguin Random House India, 2020
3.	Michael McCarthy and Felicity O Dell, 'English Vocabulary in Use: Upper Intermediate', Cambridge University Press, N.York, 2012
4.	Lakshmi Narayanan, 'A Course Book on Technical English' Scitech Publications (India) Pvt. Ltd. 2020

*SDG 4 – Quality Education
*SDG 8 – Decent work and Economic growth
*SDG 9 – Industry, innovation and Infrastructure

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Course Contents and Lecture Schedule

S.No	Topic	No. of Hours
1.0	**Listening**	
1.1	Listening for general information and Specific details	1
1.2	Listening to podcasts, documentaries and interviews with celebrities	1
1.3	Narrating personal experiences	1
1.4	Reading relevant to technical contexts and emails	1
1.5	Listen to a product and process descriptions	1
2.0	**Speaking**	
2.1	Self-introduction	1
2.2	Summarizing of documentaries & Picture Narration	1
2.3	Small Talk; Mini presentations	1
2.4	Group discussions, debates & role plays.	1
2.5	Group discussions	1
3.0	**Reading**	
3.1	Loud reading vs Silent reading, Skimming & Scanning of passages	1
3.2	Reading social media messages relevant to technical contexts	1
3.3	Reading newspaper reports and travel & technical blogs	1
3.4	Reading advertisements, gadget reviews and user manuals	1
3.5	Reading newspaper articles and journal reports	1
4.0	**Writing**	
4.1	Writing letters – informal and formal	1
4.2	Paragraph Texting	1
4.3	Definitions and instructions	1
4.4	Note-making / Note-taking	1
4.5	Essay texting	1
5.0	**Verbal Ability**	
5.1	Reading Comprehension (MCQs) and Cloze Test	1
5.2	Sequencing of sentences	1
5.3	Paraphrasing and Summarizing	1
5.4	Error Detection and Spelling Test	1
5.5	Prepositions	1
	Total	30

Course Designer

1. Dr.A.Palaniappan - palaniappan@ksrct.ac.in

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K.S. RANGASAMY COLLEGE OF TECHNOLOGY, TIRUCHENGODE - 637215
(An Autonomous Institution affiliated to Anna University)

B.E. / B.Tech. Degree Programme

SCHEME OF EXAMINATIONS
(For the candidates admitted from 2022-2023 onwards)

THIRD SEMESTER

S.No.	Course Code	Name of the Course	Duration of Internal Exam	Weightage of Marks			Minimum Marks for Pass in End Semester Exam	
				Continuous Assessment *	End Semester Exam **	Max. Marks	End Semester Exam	Total
THEORY								
1	60 MA 014	Probability and Random Processes	2	40	60	100	45	100
2	60 CS 003	Data Structures	2	40	60	100	45	100
3	60 EC 001	Digital Logic and Microprocessor	2	50	50	100	45	100
4	60 AD 301	Artificial Intelligence	2	40	60	100	45	100
5	60 AD 302	Software Engineering Methodologies	2	40	60	100	45	100
6	60 CS 004	Java Programming	2	40	60	100	45	100
7	60 GE 002	Tamils and Technology / தமிழரும் தொழில்நுட்பமும்	2	100	-	100	-	-
PRACTICAL								
8	60 CS 0P3	Data Structures Laboratory	2	60	40	100	45	100
9	60 CS 0P4	Java Programming Laboratory	2	60	40	100	45	100
10	60 CG 0P2	Career Skill Development II	2	100	-	100	-	-
11	60 CG 0P6	Internship	-	-		-	-	-

* CA evaluation pattern will differ from course to course and for different tests. This will have to be declared in advance to students. The department will put a process in place to ensure that the actual test paper follow the declared pattern.

** End Semester Examination will be conducted for maximum marks of 100 and subsequently be reduced to 60 marks for the award of terminal examination marks.

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60 MA 014	Probability and Random Processes	Category	L	T	P	Credit
		PC	3	1	0	4

Objectives

- To learn the basic concepts of probability and random variables.
- To impart knowledge on standard distributions.
- To familiarize various methods in hypothesis testing.
- To get exposed to the fundamentals of analysis of variance.
- To learn fundamentals of random processes.

Pre-requisites

- NIL

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Characterize probability models and function of random variables.	Apply
CO2	Apply suitable probability distributions to solve simple practical problems.	Apply
CO3	Apply Student's t test, F test and Chi-square test for testing the statistical hypothesis.	Apply
CO4	Apply ANOVA techniques to test the equality of means for more than two populations.	Apply
CO5	Identify the random processes and compute their averages.	Understand

Mapping with Programme Outcomes

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	-	-	2	-	-	-	-	-	-	-	-	2	-
CO2	3	2	-	-	2	-	-	-	-	-	-	-	-	2	-
CO3	3	2	-	-	2	-	-	-	-	-	-	-	-	2	-
CO4	3	2	-	-	2	-	-	-	-	-	-	-	-	2	-
CO5	3	2	-	-	2	-	-	-	-	-	-	-	-	2	-
3 - Strong; 2 - Medium; 1 - Some															

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		Model Examination (Marks)	End Sem Examination (Marks)
	1	2		
Remember	10	10	10	10
Understand	20	20	30	30
Apply	30	30	60	60
Analyse	-	-	-	-
Evaluate	-	-	-	-
Create	-	-	-	-
Total	60	60	100	100

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Syllabus

K.S. Rangasamy College of Technology – Autonomous R2022								
Common to AI&DS & AIML								
60 MA 014 – Probability and Random Processes								
Semester	**Hours/Week**			**Total Hours**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
III	3	1	0	60	4	40	60	100

Probability and Random Variables Axioms of probability - Conditional probability - **Baye's theorem*** - Random variable - Probability mass function - Probability density function - Expectation - Moment generating function. **Hands - on:** Evaluate the probability density function for the sample data.	[9]
Standard Distributions **Discrete Distributions***: Binomial distribution - Poisson distribution - Geometric distribution. Continuous Distributions: Uniform distribution - Exponential distribution - Normal distribution. **Hands - on:** Estimate probability distribution parameters from sample data.	[9]
Testing of Hypothesis* Type I and Type II errors - Test of significance of small samples - Student's 't' test - Single mean - Difference of means - F-test - Chi-square test - Goodness of fit - Independence of attributes. **Hands - on:** Use two-sample F-test to test if the variances of two populations are equal.	[9]
Design of Experiments Analysis of variance: One way classification - Completely randomized design - **Two-way classification*** - Randomized block design - Latin square design. **Hands - on:** Determine whether data from several groups of a factor have a common mean by using one-way ANOVA.	[9]
Random Processes Classification of random processes - First order and second order process - Strictly sense stationary process - Wide-sense stationary process - Autocorrelation function and its properties - Markov process - Markov chain. **Hands - on:** Compute autocorrelation function for a given series.	[9]
Total Hours: 45 +5(Hands on) +10 (Tutorial)	**60**

Text Book(s):

1. Gupta S. P., "Statistical Methods", 46th Revised Edition, Sultan Chand & Sons, New Delhi, 2021.
2. Ibe O. C., "Fundamentals of Applied Probability and Random Processes", 2nd Edition, Academic Press Inc, 2014.

Reference(s):

1. Ross S., "A First Course in Probability", 9th Edition, Pearson Education India, New Delhi, 2014.
2. Richard A Johnson, "Miller & Freund's Probability and Statistics for Engineers", 9th Edition, Pearson Education India, New Delhi, 2016.
3. Michael Mitzenmacher and Eli Upfal, "Probability and Computing: Randomization and Probabilistic Techniques in Algorithms and Data Analysis", 2nd Edition, Cambridge University Press, 2017.
4. Peyton Z Peebles Jr, "Probability, Random Variables and Random Signal Principles", 4th Edition, McGraw Hill Education, New Delhi, 2017.
5. Veerarajan T., "Probability, Statistics and Random Processes with Queueing Theory and Queueing Networks", 4th Edition, McGraw Hill Education, New Delhi, 2014.

* SDG 4 – Quality Education

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Course Contents and Lecture Schedule

S. No.	Topics	No. of hours
1.0	**Probability and Random Variables**	
1.1	Axiomatic probability – Conditional probability	1
1.2	Baye's theorem	2
1.3	Random variable	1
1.4	Probability mass function	1
1.5	Probability density function	2
1.6	Expectation	1
1.7	Moment generating function	1
1.8	Tutorial	2
1.9	Hands on	1
2.0	**Standard Distributions**	
2.1	Discrete Distributions: Binomial distribution	1
2.2	Poisson distribution	2
2.3	Geometric distribution	1
2.4	Continuous Distributions: Uniform distribution	1
2.5	Exponential distribution	2
2.6	Normal distribution	2
2.7	Tutorial	2
2.8	Hands on	1
3.0	**Testing of Hypothesis**	
3.1	Type I and Type II errors	1
3.2	Test of significance of small samples	1
3.3	Student's 't' test	2
3.4	Single mean	1
3.5	F- test	2
3.6	Chi-square test for goodness of fit and independence of attributes	2
3.7	Tutorial	2
3.8	Hands on	1
4.0	**Design of Experiments**	
4.1	Analysis of variance	1
4.2	One-way classification	2
4.3	Completely Randomized Design	1
4.4	Two-way classification	2
4.5	Randomized Block Design	1
4.6	Latin square design	2
4.7	Tutorial	2
4.8	Hands on	1
5.0	**Random Processes**	
5.1	Classification of random processes	1
5.2	First order and second order process	1
5.3	Strict sense stationary process	1
5.4	Wide-sense stationary process	2
5.5	Autocorrelation function and its properties	1
5.6	Markov process	2

5.7	Markov chain	1
5.8	Tutorial	2
5.9	Hands on	1

Course Designer(s)

1. Dr.D. Tamizharasan - tamizharasan@ksrct.ac.in

Chairman - Board of Studies
Dept. of Artificial Intelligence and Data Science
K.S.Rangasamy College of Technology
Tiruchengode - 637 215.

60 CS 003	Data Structures	Category	L	T	P	Credit
		PC	3	0	0	3

Objectives

- To Choose the Appropriate Data Structure for a Specified Application
- To Design and Implement Abstract Datatypes Such as Linked List, Stack, Queue and Trees
- To Learn and Implement the Hashing Techniques
- To Design a Priority Queue ADT and Its Applications
- To Demonstrate Various Sorting, Searching and Graph Algorithms

Pre-requisites

- Basic Knowledge of Mathematics and Programming Language In C.

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Apply linear data structures to solve real time applications	Apply
CO2	Experiment with trees and its operations	Apply
CO3	Apply algorithm for solving problems like Sorting and Searching	Apply
CO4	Implement Priority Queue with its operations and Hashing Techniques	Apply
CO5	Explain Shortest Path and Minimum Spanning Tree algorithms and Biconnectivity	Analyse

Mapping with Programme Outcomes

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	2	2	2	-	-	2	2	-	-	2	3	3	3
CO2	3	3	2	3	2	-	-	2	3	-	-	2	3	3	3
CO3	3	3	2	2	2	2	-	2	3	2	-	2	3	3	3
CO4	3	3	2	3	2	-	-	3	2	2	-	2	3	3	3
CO5	3	3	2	3	2	2	2	3	3	2	-	2	3	3	3
3 - Strong; 2 - Medium; 1 - Some															

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		Model Examination (Marks)	End Sem Examination (Marks)
	1	2		
Remember	10	10	20	20
Understand	10	10	20	20
Apply	30	30	40	40
Analyse	10	10	20	20
Evaluate	-	-	-	-
Create	-	-	-	-
Total	60	60	100	100

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Syllabus

K.S.Rangasamy College of Technology – Autonomous R2022								
B.Tech - Artificial Intelligence and Data Science								
60 CS 003 – Data Structures								
Semester	**Hours/Week**			**Total Hours**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
III	3	0	0	45	3	40	60	100

Lists, Stacks and Queues* Abstract Data Type (ADT) – The List ADT – The Stack ADT – The Queue ADT.	[12]
Trees* Preliminaries – Binary Trees – The Search Tree ADT – Binary Search Trees – AVL Trees – Tree Traversals – B–Trees – B+ Trees.	[9]
Sorting and Searching* Preliminaries – Insertion Sort – Shell Sort – Heap Sort – Merge Sort – Quick Sort – External Sorting – Searching: Sequential Search - Binary Search – Hashed List Searches.	[8]
Hashing and Priority Queues (Heaps) **Hashing – Hash Function – Separate Chaining – Open Addressing – Rehashing – Extendible Hashing – Priority Queues (Heaps)** * – Model – Simple Implementations – Binary Heap–Applications of Priority Queues – d-Heaps.	[7]
Graphs* Definitions – Topological Sort – Shortest-Path Algorithms – Unweighted Shortest Paths – Dijkstra's Algorithm – Minimum Spanning Tree – Prim's Algorithm, Kruskal's Algorithm – Applications of Depth-First Search – Undirected Graphs – Biconnectivity.	[9]
Total Hours:	**45**

Text Book(s):	
1.	M.A.Weiss, "Data Structures and Algorithm Analysis in C", Second Edition, Pearson Education Asia, 2008.
2.	Y.Langsam, M.J.Augenstein and A.M.Tenenbaum, "Data Structures using C", Pearson Education Asia, 2009.
Reference(s):	
1.	Rajesh K.Sukla, "Data Structure using C & C++", Wiley India, 2012.
2.	A.Tannenbaum, "Data Structure using C", Pearson Education, 2003.
3.	Goodrich and Tamassia, "Data Structures and Algorithms in C++", Second Edition, John Wiley and Sons, 2011
4.	Reema Thareja, "Data Structures using C", Second Edition, Oxford Higher Education, 2014.

* SDG:4- Quality Education

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Tiruchengode - 637 215.

Course Contents and Lecture Schedule

S. No.	Topics	No. of hours
1.0	**Lists, Stacks and Queues**	
1.1	Abstract Data Type (ADT)	2
1.2	List ADT	4
1.3	Stack ADT	3
1.4	Queue ADT	3
2.0	**Trees**	
2.1	Preliminaries	1
2.2	Binary Trees	1
2.3	The Search Tree ADT	1
2.4	Binary Search Trees	1
2.5	AVL Trees	1
2.6	Tree Traversals	1
2.7	B-Trees	2
2.8	B+ Trees	1
3.0	**Sorting and searching**	
3.1	Preliminaries, Insertion Sort	1
3.2	Shell Sort, Heap sort	1
3.3	Merge Sort, Quick sort	1
3.4	External Sorting	1
3.5	Sequential Searching	1
3.6	Binary Searching	1
3.7	Hashed List Searches	1
4.0	**Hashing and Priority Queues (Heaps)**	
4.1	Hashing, Hash Function	1
4.2	Separate Chaining, Open Addressing	1
4.3	Rehashing, Extendible Hashing	1
4.4	Priority Queues (Heaps)	1
4.5	Simple Implementations, Binary Heap	1
4.6	Applications of Priority Queues	1
4.7	d –Heaps	1
5.0	**Graphs**	
5.1	Graph Definitions - Topological Sort	1
5.2	Shortest-Path Algorithms	1
5.3	Unweighted Shortest Paths	1
5.4	Dijkstra’s Algorithm	1
5.5	Minimum Spanning Tree	1
5.6	Prim’s Algorithm	1
5.7	Kruskal’s Algorithm	1
5.8	Applications of Depth-First Search	1
5.9	Undirected Graphs	1
5.10	Biconnectivity	1

Course Designer(s)

1. Ms.J.MYTHILI - mythili@ksrct.ac.in

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Dept. of Artificial Intelligence and Data Science
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60 EC 001	Digital Logic and Microprocessor	Category	L	T	P	Credit
		ES	2	0	2	3

Objectives

- To learn Boolean algebra and simplification of Boolean functions
- To design and analyze different combinational circuits
- To study the basics of synchronous sequential logic, analyze and design sequential circuits
- To introduce the architecture and programming of 8086 microprocessors
- To perform the interfacing of peripheral devices with 8086 microprocessors

Pre-requisites

- Basic knowledge of Electrical and Electronics Engineering

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Simplify complex Boolean functions and design digital systems	Understand
CO2	Design and analyze combinational logic circuits	Analyze
CO3	Design and analyze synchronous sequential logic circuits	Analyze
CO4	Illustrate the architecture of 8086 microprocessor	Understand
CO5	Explain the interfacing techniques of various peripheral devices	Apply

Mapping with Programme Outcomes

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	3	3	2	-	-	-	-	1	1	1	3	2	-
CO2	3	3	3	3	2	-	-	-	-	1	1	1	3	2	-
CO3	3	3	3	3	2	-	-	-	-	1	1	1	3	2	-
CO4	3	3	3	3	2	-	-	-	-	1	1	1	3	2	-
CO5	3	3	3	3	2	-	-	-	-	1	1	1	3	2	-
3 - Strong; 2 - Medium; 1 - Some															

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)				Model Examination (Marks)		End Sem Examination (Marks)	
	Test 1		Test 2					
	Theory	Lab	Theory	Lab	Theory	Lab	Theory	Lab
Remember	10	-	10	-	20	-	20	-
Understand	20	-	20	-	30	-	30	-
Apply	20	50	10	50	20	50	20	50
Analyse	10	50	20	50	30	50	30	50
Evaluate	-	-	-	-	-	-	-	-
Create	-	-	-	-	-	-	-	-
Total	60	100	60	100	100	100	100	100

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Dept. of Artificial Intelligence and Data Science
K.S.Rangasamy College of Technology
Tiruchengode - 637 215.

Syllabus

K.S.Rangasamy College of Technology – Autonomous R2022

60 EC 001 – Digital Logic and Microprocessor

COMMON TO CS, IT, AD

Semester	Hours / Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
III	2	0	2	60	3	50	50	100

Digital Fundamentals Review of Number Systems –Binary codes - Boolean postulates and laws – Boolean function - Logic Gates- Universal Gates - Canonical and Standard Forms – Min terms and Maxterms – Sum of Products and Product of Sums - Simplification of Boolean Functions – Karnaugh Map	[6]
Combinational Circuits Design procedure – Adders - Subtractors - Multiplexer / Demultiplexer - Encoder / Decoder – Code Converters	[6]
Sequential Circuits Flip flops SR, JK, T, D and Master Slave – Characteristic table and equation – Analysis of clocked sequential circuits - Ripple counters – Synchronous counters – Modulo-n counters – Registers: Shift registers	[6]
8086 Microprocessor Architecture of 8086 – Execution unit – Bus Interface unit- Addressing modes – Instruction set of 8086: Data transfer Instructions – Branch Instructions - Logical Instructions - Arithmetic Instructions – Shift and rotate Instructions - Simple Assembly Language Programs of 8086	[6]
Peripherals Interfacing Programmable Peripheral Interface (PPI 8255) – Programmable Interval Timer (PIT 8253) – Programmable Interrupt Controller (8259) – Interfacing Serial I /O (8251)	[6]
Practical: 1. Verification of Boolean theorems using logic gates 2. Implementation of combinational circuits using gates for arbitrary functions 3. Implementation of binary adder/subtractor circuits 4. Implementation of code converters 5. Implementation of synchronous counters 6. Implementation of asynchronous counters 7. Implementation of basic arithmetic operations using 8086 8. Implementation of sorting and searching using 8086 9. Interfacing and programming of Programmable Peripheral Interface using 8086	[30]
Total Hours: (Lecture - 30; Practical - 30)	**60**

Text Book(s):

1.	M. Morris Mano, Michael D. Ciletti, “Digital Design”, 5th Edition, Pearson Education, New Delhi, 2016.
2.	Soumitra Kumar Mandal, “Microprocessors and Microcontrollers Architecture, Programming & Interfacing Using 8085, 8086 and 8051”, 7th Edition, McGraw Hill India, 2013.

Reference(s):

1.	Donald P.Leach and Albert Paul Malvino, GoutamSaha, “Digital Principles and Applications” , 7th Edition, Tata McGraw-Hill, New Delhi, 2016.
2.	Charles H.Roth, “Fundamentals of Logic Design”, 5th Edition, Brooks/cole, 2016.
3.	Yu-Cheng Liu, Glenn A. Gibson, “Microcomputer Systems: The 8086/8088 Family- Architecture Programming and Design” , 2nd Edition, Pearson, 2015.
4.	Krishna Kant, “Microprocessors and microcontrollers Architecture , Programming and System design 8085,8086,8051,8096”,PHI-Third Printing, 2010

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Course Contents and Lecture Schedule

S. No.	Topics	No. of Hours
1	**Digital Fundamentals**	
1.1	Review of Number Systems, Binary codes	1
1.2	Boolean postulates and laws, Logic Gates- Universal Gates	1
1.3	Canonical and Standard Forms – Minterms and Maxterms, SOP, POS	1
1.4	Simplification of Boolean Functions	1
1.5	Karnaugh Map	2
2	**Combinational Circuits**	
2.1	Design procedure	1
2.2	Adders , Subtractors	1
2.3	Multiplexer	1
2.4	Demultiplexer	1
2.5	Encoder / Decoder	1
2.6	Code Converters	1
3	**Sequential Circuits**	
3.1	Flip flops SR, JK, T, D	1
3.2	Master Slave, Characteristic table and equation	1
3.3	Analysis of clocked sequential circuits	1
3.4	Ripple counters, Modulo-n counters	1
3.5	Synchronous counters	1
3.6	Registers, Shift registers	1
4	**8086 Microprocessor**	
4.1	Architecture of 8086	1
4.2	Execution unit – Bus Interface unit	1
4.3	Addressing modes	1
4.4	Instruction set of 8086: Data transfer Instructions	1
4.5	Branch, Logical, Arithmetic, Shift and rotate Instructions,	1
4.6	Simple AssemblyLanguage Programs of 8086	1
5	**Peripherals Interfacing**	
5.1	Programmable Peripheral Interface (PPI 8255)	2
5.2	Programmable Interval Timer (PIT 8253)	2
5.3	Programmable Interrupt Controller (8259)	1
5.4	Interfacing Serial I /O (8251)	1
Practical:		
1.	Verification of Boolean theorems using logic gates	2
2.	Implementation of combinational circuits using gates for arbitrary functions	2
3.	Implementation of binary adder/subtractor circuits	3
4.	Implementation of code converters	4
5.	Implementation of synchronous counters	4
6.	Implementation of asynchronous counters	4
7.	Implementation of basic arithmetic operations using 8086	4
8.	Implementation of sorting and searching using 8086	3
9.	Interfacing and programming of Programmable Peripheral Interface using 8086	4

Course Designer(s)

1. Dr.J.Nithya - nithyaj@ksrct.ac.in

Rev. No.3/w.e.f. 22.07.2024
Passed in BoS Meeting held on 24/05/2024
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Chairman - Board of Studies
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Tiruchengode - 637 215.

60 AD 301	Artificial Intelligence	Category	L	T	P	Credit
		PC	3	0	0	3

Objectives

- To Use Appropriate Search Algorithms for Any AI Problem
- To Know About the Various Applications Of AI
- To Design Software Agents to Solve a Problem
- To Gain Knowledge on Different Types of Learning
- To Learn How to Represent Knowledge in Solving AI Problems

Pre-requisites

- Basic knowledge on Artificial Intelligence

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Recognize the various characteristics of intelligent agents.	Apply
CO2	Analyse the different search strategies in AI.	Analyse
CO3	Design software agents to solve a problem and represent a problem using first order and predicate logic.	Apply
CO4	Classify the different ways of planning and acting in the real world.	Analyse
CO5	Infer about the various learning of AI.	Apply

Mapping with Programme Outcomes

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	2	2	2	-	-	-	-	-	-	2	-	-	-
CO2	3	3	2	2	2	-	-	-	-	-	-	2	-	-	3
CO3	3	2	2	2	2	2	-	-	-	-	-	2	-	-	3
CO4	3	2	2	2	2	2	-	-	-	-	-	3	-	-	3
CO5	3	3	2	2	2	-	-	-	-	-	-	3	-	-	2
3 - Strong; 2 - Medium; 1 - Some															

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		Model Examination (Marks)	End Sem Examination (Marks)
	1	2		
Remember	10	10	10	10
Understand	20	20	30	30
Apply	30	30	60	60
Analyse	-	-	-	-
Evaluate	-	-	-	-
Create	-	-	-	-
Total	60	60	100	100

Chairman - Board of Studies
Dept. of Artificial Intelligence and Data Science
K.S.Rangasamy College of Technology
Tiruchengode - 637 215.

Syllabus

K.S.Rangasamy College of Technology – Autonomous R2022								
B.Tech - Artificial Intelligence and Data Science								
60 AD 301 & Artificial Intelligence								
Semester	**Hours/Week**			**Total Hours**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
III	3	0	0	45	3	40	60	100

Introduction to AI and Intelligent Systems Introduction to AI - The Foundations of AI - The History of AI – The State of the art – Agents and Environments – Good Behavior: The Concept of Rationality – The Nature of Environments – The Structure of agents - Case study: Google Duplex*****	[9]
Solving Problems by Searching Problem-Solving Agents – Example Problems: Toy problems – Searching for solution – Uninformed search strategies- Informed search and Exploration: Heuristic Functions – Constraint Satisfaction Problems: Backtracking search, Case Study: Scheduling	[9]
Knowledge and Reasoning Logical Agents: Knowledge based agents – The Wumpus World – Logic –Propositional Logic – First order Logic: Syntax and Semantics of First-order Logic – Knowledge Representation: Ontological Engineering - Categories and Objects - Actions, Situations and Events	[9]
Planning and Acting The Planning Problem – Planning with State-Space Search – Partial- Order Planning – Planning and acting in the real world: Time, Schedules and Resources – Hierarchical Task Network Planning – Conditional Planning – Continuous Planning – Multi Agent Planning*****	[9]
Uncertain knowledge and Reasoning Uncertainty: Acting under uncertainty – Basic Probability Notation – The Axioms of Probability – Making Simple decisions: Utility Functions – Decision Networks – Learning: Forms of Learning - Reinforcement Learning – Passive and Active Learning	[9]
Total Hours:	**45**

Text Book(s):	
1.	Stuart Russell and Peter Norvig, “Artificial Intelligence: A Modern Approach”, 4th Edition, Prentice Hall, 2020.
2.	K.R.Chowdhary, “Fundamentals of Artificial Intelligence”,Springer,2020.
Reference(s):	
1.	Tom Taulli, “Artificial Intelligence Basics A Non-Technical Introduction”, A press, 2019
2.	Melanie Mitchell,” Artificial Intelligence: A Guide for Thinking Humans”, Farrar, Straus and Giroux Publisher,2019
3.	Dan W. Patterson, “Introduction to AI and ES”, Third Edition, Pearson Education, 2007.
4.	Nils J. Nilsson, “The Quest for Artificial Intelligence”, Cambridge University Press, 2009.

*SDG 4 – Quality Education

Chairman - Board of Studies
Dept. of Artificial Intelligence and Data Science
K.S.Rangasamy College of Technology
Tiruchengode - 637 215.

Course Contents and Lecture Schedule		
S. No.	**Topics**	**No. of hours**
1.0	**Introduction to AI and Intelligent Systems**	
1.1	Introduction to AI	1
1.2	The Foundations of AI	1
1.3	The History of AI	1
1.4	The State of the art	1
1.5	Agents and Environments	1
1.6	Good Behavior: The Concept of Rationality	1
1.7	The Nature of Environments	1
1.8	The Structure of agents	1
1.9	Case study: Google Duplex	1
2.0	**Solving Problems by Searching**	
2.1	Problem-Solving Agents	1
2.2	Example Problems: Toy problems	1
2.3	Searching for solution	1
2.4	Uninformed search strategies	1
2.5	Informed search and Exploration	1
2.6	Heuristic Functions	1
2.7	Constraint Satisfaction Problems	1
2.8	Backtracking search	1
2.9	Case Study: Scheduling	1
3.0	**Knowledge and Reasoning**	
3.1	Knowledge based agents	1
3.2	The Wumpus World	1
3.3	Logic, Propositional Logic	1
3.4	First order Logic	1
3.5	Syntax and Semantics of First-order Logic	1
3.6	Knowledge Representation	1
3.7	Ontological Engineering - Categories and Objects	1
3.8	Actions, Situations and Events	1
3.9	Knowledge based agents	1
4.0	**Planning and Acting**	
4.1	The Planning Problem	1
4.2	Planning with State-Space Search	1
4.3	Partial-Order Planning	1
4.4	Planning and acting in the real world	1
4.5	Time, Schedules and Resources	1
4.6	Hierarchical Task Network Planning	1
4.7	Conditional Planning	1
4.8	Continuous Planning	1
4.9	Multi Agent Planning	1
5.0	**Uncertain knowledge and Reasoning**	
5.1	Uncertainty: Acting under uncertainty	1
5.2	Basic Probability Notation	1
5.3	The Axioms of Probability	1
5.4	Making Simple decisions	1

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5.5	Utility Functions	1
5.6	Decision Networks	1
5.7	Learning: Forms of Learning	1
5.8	Reinforcement Learning	1
5.9	Passive and Active Learning	1

Course Designer(s)

1. Dr.E.Mohanraj – mohanraj@ksrct.ac.in

60 AD 302	Software Engineering Methodologies	Category	L	T	P	Credit
		PC	3	0	0	3

Objectives

- To gain knowledge about various software development lifecycle (SDLC) models.
- To learn how to elicit and formulate requirements.
- To be aware of designing a software considering the various perspectives of end user.
- To develop a software component using coding standards and facilitate code reuse.
- To analyze the software using the Agile process.

Pre-requisites

- Basic Knowledge in software

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Apply software engineering principles and techniques	Apply
CO2	Translate end-user requirements in to software requirements	Understand
CO3	Develop, maintain and evaluate large-scale software systems	Apply
CO4	Implement an efficient, reliable, robust and cost-effective software solutions	Apply
CO5	Identify the Agile process in software development	Analyse

Mapping with Programme Outcomes

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	2	2	-	-	-	-	-	-	-	-	-	-	2	-	-
CO2	2	2	2	2	-	-	-	-	-	-	-	-	2	2	-
CO3	2	2	2	2	1	-	-	-	-	-	-	-	2	-	-
CO4	-	-	-	-	-	-	-	-	-	-	2	1	-	2	-
CO5	3	3	-	-	-	-	-	-	2	-	-	-	-	-	-
3 - Strong; 2 - Medium; 1 - Some															

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		Model Examination (Marks)	End Sem Examination (Marks)
	1	2		
Remember	10	10	10	10
Understand	20	20	30	30
Apply	30	30	60	60
Analyse	-	-	-	-
Evaluate	-	-	-	-
Create	-	-	-	-
Total	60	60	100	100

Chairman - Board of Studies
Dept. of Artificial Intelligence and Data Science
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Syllabus

K.S.Rangasamy College of Technology – Autonomous R2022								
B.Tech - Artificial Intelligence and Data Science								
60 AD 302 – Software Engineering Methodologies								
Semester	**Hours/Week**			**Total Hours**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
III	3	0	0	45	3	40	60	100

Software Process Models The Nature of Software-Software Process Models-Waterfall Model-Incremental Process Models- Evolutionary Process Models- Prototyping-Spiral Model-Concurrent Model.	[9]
Requirements Analysis and Specification Requirements Analysis – Software Requirements – Requirements Engineering – Eliciting Requirements – Developing Use Cases – Building the Requirements Model – Negotiating and Validating Requirements.	[9]
Analysis and Design Requirements Modeling: Scenarios, Information, Analysis Classes – Scenario Based Modeling – Data Modeling – Class-Based Modeling – Flow Oriented Models – Behavioral Models. Design Process and Concepts – Design Model: Data Design Elements – Architectural Design – Component Level Design – Deployment Level Design – User Interface Design – Pattern-Based Design.	[9]
Software Testing Software Testing Strategies – System Testing – Debugging – White Box Testing – Black Box Testing – Model Based Testing – Testing for Specialized Environments, Architectures and Applications – Testing Object-Oriented and Web Based Applications – User Interface Testing – Configuration Testing – Security Testing – Performance Testing.	[9]
Agile Development Agility-Agile Process-Extreme programming-XP Process-Overview of Scrum-Feature Driven development- **Lean Software Development-Agile Modeling**.*	[9]
Total Hours:	**45**

Text Book(s):	
1.	Roger S. Pressman, “Software Engineering: A Practitioner‘s Approach” , McGraw Hill International Edition, Eighth Edition, 2019.
2.	Ian Sommerville, “Software Engineering”, Tenth Edition, Pearson Education, 2015.
Reference(s):	
1.	Pankaj Jalote, Software Engineering, A Precise Approach, Wiley India, 2010
2.	Rajib Mall, Fundamentals of Software Engineering, Third Edition, PHI Learning Private Limited, 2009.
3.	Kelkar S.A., Software Engineering, Prentice Hall of India Pvt Ltd, 2007
4.	Stephen R.Schach, Software Engineering, Tata McGraw-Hill Publishing Company Limited, 2007.

*SDG 9 – Industry Innovation and Infrastructure

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Course Contents and Lecture Schedule

S. No.	Topics	No. of hours
1.0	**Software Process Models**	
1.1	The Nature of Software	1
1.2	Software Process Models	1
1.3	Waterfall Model	1
1.4	Incremental Process Models	1
1.5	Evolutionary Process Models	1
1.6	Evolutionary Process Models	1
1.7	Prototyping	1
1.8	Spiral Model	1
1.9	Concurrent Model	1
2.0	**Requirements Analysis and Specification**	
2.1	Requirements Analysis	1
2.2	Software Requirements	1
2.3	Requirements Engineering	1
2.4	Eliciting Requirements	1
2.5	Developing Use Cases	1
2.6	Building the Requirements Model	1
2.7	Building the Requirements Model	1
2.8	Negotiating	1
2.9	Validating Requirements	1
3.0	**Analysis and Design**	
3.1	Requirements Modeling: Scenarios, Information, Analysis Classes	1
3.2	Scenario Based Modeling – Data Modeling	1
3.3	Class-Based Modeling – Flow Oriented Models	1
3.4	Behavioral Models	1
3.5	Design Process and Concepts	1
3.6	Design Model: Data Design Elements	1
3.7	Architectural Design	1
3.8	Component Level Design – Deployment Level Design	1
3.9	User Interface Design – Pattern-Based Design	1
4.0	**Software Testing**	
4.1	Software Testing Strategies	1
4.2	System Testing	1
4.3	Debugging – White Box Testing	1
4.4	Black Box Testing – Model Based Testing	1
4.5	Testing for Specialized Environments, Architectures and Applications	1
4.6	Testing Object-Oriented and Web Based Applications	1
4.7	Oriented and Web Based Applications	1
4.8	User Interface Testing – Configuration Testing	1
4.9	Security Testing – Performance Testing	1
5.0	**Agile Development**	
5.1	Agility	1
5.2	Agile Process	1
5.3	Extreme programming	1
5.4	XP Process	1

5.5	Overview of Scrum	1
5.6	Overview of Scrum	1
5.7	Feature Driven development	1
5.8	Lean Software Development	1
5.9	Agile Modeling	1

Course Designer(s)

1. Dr.E.Mohanraj – mohanraj@ksrct.ac.in

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60 CS 004	Java Programming	Category	L	T	P	Credit
		PC	3	0	0	3

Objectives

- To learn object-oriented programming concepts.
- To understand Java fundamentals and String Methods.
- To implement code reduction through packages and collection methods.
- To apply the knowledge of Threads and IO streams.
- To build applications with JDBC technology for real world problems.

Pre-requisites

- Basic knowledge of any programming language with ability to solve logical problems.

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Apply Java fundamentals to construct functional programs to solve real-world problems,	Apply
CO2	Implement object-oriented principles, exception handling and string operations to solve real world problems	Apply
CO3	Design packages and utilize collections to achieve reusability.	Apply
CO4	Apply multithreading concepts and IO Streams in various real-world scenario	Apply
CO5	Explore database using regular expression with JDBC	Analyse

Mapping with Programme Outcomes

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	2	-	3	-	-		3	3	2	3	3	-	-
CO2	3	3	2	-	3	-	-	2	3	3	2	3	3	2	-
CO3	2	3	3	-	3	-	-	2	3	3	2	3	3	2	-
CO4	3	3	3	2	3	-	-	-	3	3	2	3	3	2	-
CO5	2	3	3	2	3	-	-	-	3	3	2	3	3	-	-
3 - Strong; 2 - Medium; 1 - Some															

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		Model Examination (Marks)	End Sem Examination (Marks)
	1	2		
Remember	10	10	10	10
Understand	10	10	10	10
Apply	40	40	60	70
Analyse	-	-	20	10
Evaluate	-	-	-	-
Create	-	-	-	-
Total	60	60	100	100

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Syllabus

K.S. Rangasamy College of Technology – Autonomous R2022								
60 CS 004 - Java Programming								
Common TO CS, IT, AD, AM								
Semester	**Hours/Week**			**Total Hours**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
III	3	0	0	45	3	40	60	100

Introduction Of Java Fundamentals and OOP Features Of Java, The Java Environment, Java Source File Compilation, Structure of Java, Data Types, Variables, Operators, Control Flow, Arrays, Concepts of Object-Oriented Programming - OOP In Java, Defining Classes and Methods in Java, Constructors, Access Specifiers, Final and Static Keywords.	[9]
Java OOP Concepts and Strings Java Inheritance, Polymorphism, Interfaces, Abstract Class, Exception Handling - Exception Hierarchy, Throwing and Catching Exceptions, Built-In Exceptions, Creating Own Exceptions, String Handling with String and String Buffer Classes.	[9]
Packages And Collection Framework Packages – Pre-Defined and User Defined Packages, Boxing and Unboxing, Wrapper Classes, Introduction to Collection, The Collection Interfaces – List, Set, Map, Generic Class, Vector, Iterator and List Iterator, String Tokenizer.	[9]
Java Multithread And I/O Streams* Multithreaded Programming-The Java Thread Model-Lifecycle, The Main Thread, Creating A Thread, Creating Multiple Threads, Thread Priority, Input / Output Basics, Streams, The Byte Streams, The Character Streams, Reading and Writing Console, Reading and Writing Files, Object Serialization and Object De-Serialization.	[9]
Java Database Connectivity and Regex Database Programming – Introduction, SQL Queries, JDBC, Statement, Prepared Statement, Regular Expression: Matcher Class, Pattern Class and Pattern Syntax, Exception Class, Regex Character Classes and Quantifiers, Metacharacters.	[9]
Total Hours:	**45**

Text Book(s):	
1.	Herbert Schildt, “Java : The complete Reference”, Comprehensive coverage of the Java language,Oracle press, 12th Edition, Tata McGraw-Hill, 2021.
2.	Vivian Siahaan, Rismon Hasiholan Sianipar, “Java In Practice: JDBC And Database Applications”Sparta Publishing, Kindle 1st Edition, 2019
Reference(s):	
1.	Kathy Sierra ,Bert Bates, “Head First Java”, A Brain Friendly Guide, O’Reilly, 3nd Edition, 2022
2.	Cay S.Horstmann, “ Core Java Volume – I Fundamentals”,’ 11th Edition, 2018
3.	Y.Daniel Liang, “Introduction to Java Programming”, Comprehensive Version,10th Edition, Pearson Education,2015 [JDBC only]
4.	Jeffrey E. F. Friedl, "Mastering Regular Expressions", 3rdEdition, O'Reilly Media, Inc.,2006

*SDG 9 – Industry Innovation and Infrastructure

**SDG 4: Quality Education

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Course Contents and Lecture Schedule

S. No.	Topics	No. of hours
1.0	**Introduction to OOP and Java Fundamentals**	
1.1	Features of Java, The Java Environment	1
1.2	Structure of Java, Data Types, Variables	1
1.3	Operators, Control Flow	1
1.4	Arrays	1
1.5	Object Oriented Programming - Objects and Classes	1
1.6	OOP in Java	1
1.7	Defining classes and methods in Java	1
1.8	Constructors	1
1.9	Access specifiers, Final, Static Keywords	1
2.0	**Java Concepts and Strings**	
2.1	Java Inheritance	1
2.2	Polymorphism	1
2.3	Interfaces, Abstract class	1
2.4	Exception handling- built-in exceptions	1
2.5	Try, Catch, finally	1
2.6	Throw, Throws	1
2.7	Creating own exceptions	1
2.8	String Methods	1
2.9	String Buffer	1
3.0	**Packages And Collection Framework**	
3.1	Packages	1
3.2	User defined Packages	1
3.3	Boxing and Unboxing	1
3.4	Wrapper classes	1
3.5	Introduction to Collection	1
3.6	Set, List, Map	2
3.7	Vector	1
3.8	Iterator	1
4.0	**Java Multithreading and Stream IO**	
4.1	The Java Thread Model-Lifecycle	1
4.2	The Main Thread	1
4.3	Creating a thread	1
4.4	Creating Multiple Thread	1
4.5	Thread Priority	1
4.6	IO Basics	1
4.7	Reading and Writing Console	1
4.8	Reading and Writing Files	1
4.9	Object Serialization and Object De-Serialization.	1
5.0	**Regex and Java Database Connectivity**	
5.1	Database Programming – Introduction	1
5.2	SQL queries	1
5.3	JDBC	1
5.4	Statement	1
5.5	Prepared Statement	1

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5.6	Regular Expression: Matcher Class, Pattern class	1
5.7	Pattern Syntax, Exception class	1
5.8	Regex Character Classes and Quantifiers	1
5.9	Meta characters	1

Course Designer(s)

1. Mr.S.Vadivel – vadivels@ksrct.ac.in

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60 GE 002	Tamils and Technology (Common to all Branches)	Category	L	T	P	Credit
		GE	1	0	0	1

Objectives:

- To learn weaving, ceramic and construction technology of Tamils.
- To understand the agriculture, irrigation and manufacturing technology of Tamils.
- To realize the development of scientific Tamil and Tamil computing.

Prerequisite:

Nil

Course Outcomes:

On the successful completion of the course, students will be able to

CO1	Understand the weaving and ceramic technology of ancient Tamil people nature.	Understand
CO2	Comprehend the construction technology, building materials in sangam period and case studies.	Understand
CO3	Infer the metal process, coin and beads manufacturing with relevant archeological evidence.	Understand
CO4	Realize the agriculture methods, irrigation technology and pearl diving.	Understand
CO5	Apply the knowledge of scientific Tamil and Tamil computing.	Apply

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	-	3	3	-	2	-	3
CO2	-	-	-	-	-	-	3	3	-	2	-	3
CO3	-	-	-	-	-	-	3	3	-	2	-	3
CO4	-	-	-	-	-	-	3	3	-	2	-	3
CO5	-	-	-	-	-	-	3	3	-	2	-	3
3- Strong; 2-Medium; 1-Low												

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K.S. Rangasamy College of Technology – Autonomous R2022								
60 GE 002 – Tamils and Technology								
Common to all branches								
Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
III	1	0	0	15	1	100	-	100

Weaving and Ceramic Technology Weaving Industry during Sangam Age – Ceramic Technology – Black and Red Ware Potteries (BRW) – Graffiti on Potteries.	3
Design and Construction Technology Designing and Structural construction House & Designs in household materials during Sangam Age – Building materials and Hero stones of Sangam age – Details of Stage Constructions in Silappathikaram – Sculptures and Temples of Mamallapuram – Great Temples of Cholas and other worship places – Temples of Nayaka Period - Type Study (Madurai Meenakshi Temple)- Thirumalai Nayakar Mahal – Chetti Nadu Houses , Indo – Saracenic architecture at Madras during British Period.	3
Manufacturing Technology Art of Ship Building – Metallurgical studies – Iron Industry – Iron smelting, Steel -Copper and gold coins as source of history – Minting of Coins – Beads making – industries Stone beads – Glass beads – Terracotta beads – Shell beads/bone beats – Archeological evidences -Gem stone types described in Silappathikaram.	3
Agriculture and Irrigation Technology Dam,Tank,Ponds,Sluice,Significance of Kumizhi Thoompu of Chola Period,Animal Husbandry – Wells designed for cattle use – Agriculture and Agro Processing – Knowledge of Sea- Fisheries – Pearl – Conche diving -Ancient Knowledge of Ocean – Knowledge Specific Society.	3
Scientific Tamil & Tamil Computing Development of Scientific Tamil – Tamil Computing – Digitalization of Tamil Books – Development of Tamil Software – Tamil Virtual Academy- Tamil Digital Library – Online Tamil Dictionaries – Sorkuvai Project.	3
Total Hours:	15

Text Book(s):

1.	தமிழக வரலாறு - மக்களும் பண்பாடும் கே. கே . பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2.	கணினித்தமிழ் – முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்).
3.	கீழடி – வைகை நதிக்கரையில் சங்ககால நகர நாகரீகம் (தொல்லியல் துறை வெளியீடு).
4.	பொருநை - ஆற்றங்கரை நாகரீகம் (தொல்லியல் துறை வெளியீடு).
5.	Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print).
6.	Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
7.	Historical Heritage of the Tamils (Dr.S.V.Subaramanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8.	The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
9.	Keeladi - 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
10.	Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author).
11.	Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu).
12.	Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

*SDG 9 – Industry Innovation and Infrastructure
**SDG 4: Quality Education

Rev. No.3/w.e.f. 22.07.2024
Passed in BoS Meeting held on 24/05/2024
Approved in Academic Council Meeting held on 25/05/2024

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60 GE 002	**தமிழரும் தொழில்நுட்பமும்** (அனைத்து துறைகளுக்கும் பொதுவானது)	Category	L	T	P	Credit
		GE	1	0	0	1

பாடத்தின் நோக்கங்கள்:

- தமிழர்களின் சங்ககால நெசவு, பனை வனைதல் மற்றும் கட்டிட தொழில் நுட்பம் குறித்து அறிதல்.
- தமிழர்களின் சங்ககால வேளாண்மை, நீர்ப்பாசனம் மற்றும் உற்பத்தி முறைகள் குறித்த கற்றல்.
- நவீன அறிவியல் தமிழ் மற்றும் கணித்தமிழ் குறித்த புரிதல்.

முன்கூட்டிய துறைசார் அறிவு:

தேவை இல்லை

பாடம் கற்றதின் விளைவுகள்:

பாடத்தை வெற்றிகரமாக கற்று முடித்த பின்பு, மாணவர்களால் முடியும் விளைவுகள்

CO1	சங்ககாலத் தமிழர்களின் நெசவு மற்றும் பானை வனைதல் தொழில்நுட்பம் குறித்த கற்றுணர்தல்	புரிதல்
CO2	சங்ககாலத் தமிழர்களின் கட்டிட தொழில்நுட்பம் கட்டுமானப் பொருட்கள் மற்றும் அவற்றை விளக்கும் தளங்கள் குறித்த அறிவு.	புரிதல்
CO3	சங்ககாலத் தமிழர்களின் உலோகத் தொழில், நாணயங்கள் மற்றும் மணிகள் சார்ந்த தொல்லியல் சான்றுகள் பற்றிய அறிவு.	புரிதல்
CO4	சங்ககாலத் தமிழர்களின் வேளாண்மை, நீர்ப்பாசன முறைகள் மற்றும் முத்து குளித்தல் குறித்த தெளிவு.	புரிதல்
CO5	நவீன அறிவியல் தமிழ் மற்றும் கணித்தமிழ் குறித்த புரிந்துகொள்ளலும் மற்றும் பயன்படுத்துதலும்.	பகுப்பாய்வு

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	-	3	3	-	2	-	3
CO2	-	-	-	-	-	-	3	3	-	2	-	3
CO3	-	-	-	-	-	-	3	3	-	2	-	3
CO4	-	-	-	-	-	-	3	3	-	2	-	3
CO5	-	-	-	-	-	-	3	3	-	2	-	3
3- Strong; 2-Medium; 1-Low												

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K.S. Rangasamy College of Technology – Autonomous R2022								
60 GE 002 – தமிழரும் தொழில்நுட்பமும்								
Common to all branches								
Semester	**Hours/Week**			**Total Hours**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
III	1	0	0	15	1	100	-	100

நெசவு மற்றும் பானைத் தொழில்நுட்பம்: சங்க காலத்தில் நெசவுத் தொழில் - பானைத் தொழில்நுட்பம் - கருப்பு சிவப்பு பாண்டங்கள் - பாண்டங்களில் கீறல் குறியீடுகள்.	3
வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பம்: சங்க காலத்தில் வடிவமைப்பு மற்றும் கட்டுமானங்கள் & சங்க காலத்தில் வீட்டுப் பொருட்களில் வடிவமைப்பு - சங்க காலத்தில் கட்டுமானப் பொருட்களும் நடுகல்லும் - சிலப்பதிகாரத்தில் மேடை அமைப்பு பற்றிய விவரங்கள் – மாமல்லபுரச் சிற்பங்களும், கோவில்களும் - சோழர் காலத்துப் பெருங்கோயில்கள் மற்றும் பிற வழிபாட்டுத் தலங்கல் - நாயக்கர் காலக் கோயில்கள் – மாதிரி கட்டமைப்புகள் பற்றி அறிதல், மதுரை மீனாட்சி அம்மன் ஆலயம் மற்றும் திருமலை நாயக்கர் மஹால் - செட்டிநாட்டு வீடுகள் - பிரிட்டிஷ் காலத்தில் சென்னையில் இந்தோ - சாரோசெனிக் கட்டிடக் கலை.	3
உற்பத்தித் தொழில் நுட்பம்: கப்பல் கட்டும் கலை – உலோகவியல் - இரும்புத் தொழிற்சாலை - இரும்பை உருக்குதல், எஃகு - வரலாற்றுச் சான்றுகளாக செம்பு மற்றும் தங்க நாணயங்கள் - நாணயங்கள் அச்சடித்தல் - மணி உருவாக்கும் தொழிற்சாலைகள் - கல்மணிகள் , கண்ணாடி மணிகள் - சுடுமண் மணிகள் - சங்கு மணிகள் - எலும்புத் துண்டுகள் - தொல்லியல் சான்றுகள் – சிலப்பதிகாரத்தில் மணிகளின் வகைகள்.	3
வேளாண்மை மற்றும் நீர்பாசனத் தொழில் நுட்பம்: அணை, ஏரி, குளங்கள், மதகு - சோழர்காலக் குமுழித் தூம்பின் முக்கியத்துவம் - கால்நடை பராமரிப்பு - கால்நடைகளுக்கான வடிவமைக்கப்பட்ட கிணறுகள் – வேளாண்மை மற்றும் வேளாண்மை சார்ந்த செயல்பாடுகள் - கடல்சார் அறிவு - மீன்வளம் - முத்து மற்றும் முத்துக்குளித்தல் - பெருங்கடல் குறித்த பண்டைய அறிவு - அறிவுசார் சமூகம்.	3
அறிவியல் தமிழ் மற்றும் கணித்தமிழ் அறிவியல் தமிழின் வளர்ச்சி - கணித்தமிழ் வளர்ச்சி - தமிழ் நூல்களை மின்பதிப்பு செய்தல் - தமிழ் மென்பொருட்கள் உருவாக்கம் - தமிழ் இணையக் கல்விக்கழகம் - தமிழ் மின் நூலகம் - இணையத்தில் தமிழ் அகராதிகள் - சொற்குவைத் திட்டம்.	3
Total Hours:	15

Text Book(s):

1.	தமிழக வரலாறு - மக்களும் பண்பாடும் கே. கே . பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2.	கணினித்தமிழ் – முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்).
3.	கீழடி – வைகை நதிக்கரையில் சங்ககால நகர நாகரீகம் (தொல்லியல் துறை வெளியீடு).
4.	பொருநை - ஆற்றங்கரை நாகரீகம் (தொல்லியல் துறை வெளியீடு).
5.	Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print).
6.	Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
7.	Historical Heritage of the Tamils (Dr.S.V.Subaramanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8.	The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
9.	Keeladi - 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
10.	Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author).
11.	Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu).

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12.	Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

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60 CS 0P3	Data Structures Laboratory	Category	L	T	P	Credit
		PC	0	0	4	2

Objectives

- To design and implement simple linear and nonlinear data structures.
- To strengthen the ability to identify and apply the suitable data structure for the given real-world problem.
- To program for storing data as tree structure and implementation of various traversal techniques.
- To implement sorting and searching techniques.
- To gain knowledge of graph applications.

Pre-requisites

- Programming knowledge in C language

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Demonstrate the implementation of Linear Data structures and its applications	Apply
CO2	Investigate Balanced Parenthesis and Postfix expressions with the help of Stack ADT	Apply
CO3	Implement Non-Linear Data Structure	Apply
CO4	Implement sorting and searching techniques	Apply
CO5	Implement Shortest Path and Minimum Spanning Tree Algorithm	Apply

Mapping with Programme Outcomes

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	2	-	-	-	-	-	2	-	-	2	3	3	-
CO2	3	3	2	3	-	-	-	-	3	-	-	2	3	3	-
CO3	3	3	2	2	2	2	-	-	3	2	-	2	3	3	-
CO4	3	3	2	3	2	-	-	3	2	2	-	2	3	3	-
CO5	3	3	2	-	2	2	2	3	3	2	-	2	3	3	-
3 - Strong; 2 - Medium; 1 - Some															

Assessment Pattern

Bloom's Category	Lab Experiments Assessment (Marks)		Model Examination (Marks)	End Sem Examination (Marks)
	Lab	Activity		
Remember	-	-	-	-
Understand	-	-	-	-
Apply	25	12	50	50
Analyse	25	13	50	50
Evaluate	-	-	-	-
Create	-	-	-	-
Total	50	25	100	100

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K.S. Rangasamy College of Technology – Autonomous R2022								
Common to CS, IT, AD, AM								
60 CS 0P3 – Data Structures Laboratory								
Semester	**Hours/Week**			**Total Hrs**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
III	0	0	3	45	1.5	60	40	100

List of Experiments:

1. Implementation of List Abstract Data Type (ADT)*
2. Implementation of Stack ADT*
3. Implementation of Queue ADT*
4. Implementation of stack applications: *
5. Program for ‘Balanced Parenthesis’
6. Program for ‘Evaluating Postfix Expressions’
7. Implementation Search Tree ADT*
8. Implementation of Internal Sorting*
9. Develop a program for external sorting*
10. Develop a program for various Searching Techniques*
11. Implementation of Shortest Path Algorithm*
12. Implementation of Minimum Spanning Tree Algorithm*

Design Experiments:

1. Mini project

Lab Manual	
1.	“Data Structures Laboratory”, Department of Computer Science and Engineering, KSRCT.

*SDG 9 – Industry Innovation and Infrastructure

** SDG:4- Quality Education

Course Designer(s)

1. K.Poongodi - poongodik@ksrct.ac.in

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60 CS 0P4	Java Programming Laboratory	Category	L	T	P	Credit
		PC	0	0	4	2

Objectives

- To apply core Java concepts to solve real-world problems.
- To implement object-oriented programming (OOP) principles
- To apply exception Handling, Strings, and Collections to manipulate strings and data efficiently.
- To apply the knowledge of Threads and IO streams
- To create a JDBC-integrated mini project that applies a wide range of Java concepts

Pre-requisites

- Basic knowledge of any programming language with ability to solve logical problems

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Demonstrate Java fundamentals to solve real world problems	Apply
CO2	Design applications involving Object Oriented Programming concepts such as inheritance, polymorphism, abstract classes and interfaces.	Apply
CO3	Implement Java Applications using Strings, Collections and exception Handling.	Apply
CO4	Develop concurrent and input/output-intensive applications using Threads and IO streams	Apply
CO5	Develop a JDBC-integrated mini project to provide extensible software solutions.	Analyse

Mapping with Programme Outcomes

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	2	-	3	-	-	-	3	3	2	3	3	-	-
CO2	3	3	2	-	3	-	-	2	3	3	2	3	3	2	-
CO3	2	3	3	-	3	-	-	2	3	3	2	3	3	2	-
CO4	3	3	3	2	3	-	-	-	3	3	2	3	3	2	-
CO5	2	3	3	2	3	-	-	-	3	3	2	3	3	-	-
3 - Strong; 2 - Medium; 1 - Some															

Assessment Pattern

Bloom's Category	Lab Experiments Assessment (Marks)		Model Examination (Marks)	End Sem Examination (Marks)
	Lab	Activity		
Remember	-	-	-	-
Understand	-	-	-	-
Apply	25	12	50	50
Analyse	25	13	50	50
Evaluate	-	-	-	-
Create	-	-	-	-
Total	50	25	100	100

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K.S. Rangasamy College of Technology – Autonomous R2022								
60 CS 0P4–Java Programming Laboratory								
Common to CS, IT, AD, AM								
Semester	**Hours/Week**			**Total Hrs**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
III	0	0	3	45	1.5	60	40	100

List of Experiments:

1. Implementation of java fundamentals to solve real world problems
2. Demonstrate Class and method, Constructor and Inheritance
3. Demonstrate Polymorphism, Abstract and Interface
4. Implementation of Exception Handling to check abnormal condition
5. Implementation of String and String Buffer
6. Demonstrate various methods of Collection and Iterator
7. Implementation of multithreading and IO Streams*
8. Implementation of Database Connectivity using JDBC*

Design Experiments:

1.Mini project: Develop an application using the concepts of Inheritance, Polymorphism, Interfaces, Packages, Exception handling and collections along with JDBC.

Lab Manual	
1.	"**Java Programming Laboratory**", Department of Computer Science and Engineering, KSRCT.

*SDG 9 – Industry Innovation and Infrastructure
**SDG 3 – Good Health and Well Being
***SDG 7 – Affordable and Clean Energy

Course Designer(s)

1.Mr.S.Vadivel – vadivels@ksrct.ac.in

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60 CG 0P2	Career Skill Development II	Category	L	T	P	Credit
		CS	0	0	2	2

Objective

- To help learners improve their logical reasoning skills at different academic and professional contexts.
- To help learners relate basic quantitative problems and solve them.
- To help learners Infer critically the statements with optimal conclusions and assumptions.
- To Solve the quantitative problems pertaining to calculations of averages, ratio and proportions, and profit and loss effectively
- To compute quantitative problems related to time and work, speed and distance, and simple and compound interest

Prerequisite

Basic knowledge of Arithmetic and Logical Reasoning

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Deduce the topics in logical reasoning at the preliminary and intermediate level.	Analyze
CO2	Relate basic quantitative problems and solve them effectively at the preliminary level	Apply
CO3	Infer critically the statements with optimal conclusions and assumptions with the data and information given.	Analyze
CO4	Solve the quantitative problems pertaining to calculations of averages, ratio and proportions, and profit and loss effectively at the pre-intermediate level.	Apply
CO5	Compute quantitative problems related to time and work, speed and distance, and simple and compound interest at intermediate level.	Apply

Mapping with Programme Outcomes

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	-	-	-	-	-	-	-	2	3	3	2	3	-	-	-
CO2	-	-	-	-	-	-	-	2	3	3	2	3	2	2	-
CO3	-	-	-	-	-	-	-	2	3	3	2	3	-	-	-
CO4	-	-	-	-	-	-	-	2	3	3	2	3	2	-	-
CO5	-	-	-	-	-	-	-	2	3	3	2	3	-	2	2
3 - Strong; 2 - Medium; 1 - Some															

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K.S.Rangasamy College of Technology – Autonomous R2022								
Career Skill Development II								
Common to All Branches								
Semester	Hours/Week			Total Hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
III	0	0	2	25	0	100	00	100

Listening Evaluative Listening: Advertisements, Product Descriptions, - Audio / video; filling a graphic organiser (choosing a product or service by comparison) - Listening to longer technical talks and completing– gap filling exercises. Listening technical information from podcasts – Listening to process/event descriptions to identify cause & effects, documentaries depicting a technical problem and suggesting solutions - Listening to TED Talks	**[5]**
Speaking Marketing a product, persuasive speech techniques - Describing and discussing the reasons of accidents or disasters based on news reports, Group Discussion (based on case studies), presenting oral reports, Mini presentations on select topics with visual aids, participating in role plays, virtual interviews	**[5]**
Reading Reading advertisements, user manuals and brochures - longer technical texts– cause and effect essays, and letters / emails of complaint - Case Studies, excerpts from literary texts, news reports etc. - Company profiles, Statement of Purpose (SoPs)	**[5]**
Writing Professional emails, Email etiquette - compare and contrast essay - Writing responses to complaints Precis writing, Summarizing and Plagiarism- Job / Internship application – Cover letter & Résumé	**[5]**
Verbal Ability II Reading Comprehension (Inferential fillups) – Spotting Errors – Verbal Analogies – Theme Detection – Change of Voice – Change of Speech – One word substitution	**[5]**
Total Hours	**25**

Reference(s):

1.	'English for Engineers & Technologists' Orient Blackswan Private Ltd. Department of English, Anna University, 2020
2.	Norman Lewis, 'Word Power Made Easy - The Complete Handbook for Building a Superior Vocabulary Book', Penguin Random House India, 2020
3.	Raman. Meenakshi, Sharma. Sangeeta, 'Professional English'. Oxford University Press. New Delhi. 2019
4.	Arthur Brookes and Peter Grundy,' Beginning to Write: Writing Activities for Elementary and Intermediate Learners', Cambridge University Press, New York, 2003

*SDG 4: Quality Education

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B.E. / B.Tech. Degree Programme

SCHEME OF EXAMINATIONS

(For the candidates admitted from 2022-2023 onwards)

FOURTH SEMESTER

S.No.	Course Code	Name of the Course	Duration of Internal Exam	Weightage of Marks			Minimum Marks for Pass in End Semester Exam	
				Continuous Assessment *	End Semester Exam **	Max. Marks	End Semester Exam	Total
THEORY								
1	60 MA 019	Statistical Methods	2	40	60	100	45	100
2	60 IT 002	Design and Analysis of Algorithms	2	40	60	100	45	100
3	60 AD 401	Database Design and Development	2	40	60	100	45	100
4	60 AD 402	Web Technology	2	50	50	100	45	100
5	60 AD 403	Data Mining Techniques	2	40	60	100	45	100
6	60 AD L**	Open Elective I	2	40	60	100	45	100
7	60 MY 002	Universal Human Values	2	100	-	100	-	-
PRACTICAL								
8	60 AD 4P1	Database Design Laboratory	2	60	40	100	45	100
9	60 AD 4P2	Data Mining Laboratory	2	60	40	100	45	100
10	60 CG 0P3	Career Skill Development III	2	100	-	100	-	-
11	60 CG 0P6	Internship	-	-	-	-	-	-

* CA evaluation pattern will differ from course to course and for different tests. This will have to be declared in advance to students. The department will put a process in place to ensure that the actual test paper follow the declared pattern.

** End Semester Examination will be conducted for maximum marks of 100 and subsequently be reduced to 60 marks for the award of terminal examination marks.

Rev. No.3/w.e.f. 22.07.2024
Passed in BoS Meeting held on 24/05/2024
Approved in Academic Council Meeting held on 25/05/2024

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60 MA 019	Statistical Methods	Category	L	T	P	Credit
		PC	3	1	0	4

Objectives

- To acquire knowledge about uses of statistical tools.
- To learn basics of descriptive statistics.
- To familiarize the concepts of correlation and regression.
- To get exposed to estimation of parameters.
- To familiarize the basic concepts of non-parametric hypothesis testing.

Pre-requisites

- NIL

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Exhibit competence in data analysis using statistics.	Understand
CO2	Compute measures of central tendency and measures of dispersion.	Apply
CO3	Calculate coefficient of correlation and regression.	Apply
CO4	Apply various estimation techniques to generate estimators.	Apply
CO5	Apply various non-parametric methods for testing of hypothesis.	Apply

Mapping with Programme Outcomes

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	-	-	2	-	-	-	-	-	-	-	-	2	-
CO2	3	2	-	-	2	-	-	-	-	-	-	-	-	2	-
CO3	3	2	-	-	2	-	-	-	-	-	-	-	-	2	-
CO4	3	2	-	-	2	-	-	-	-	-	-	-	-	2	-
CO5	3	2	-	-	2	-	-	-	-	-	-	-	-	2	-

3 - Strong; 2 - Medium; 1 - Some

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		Model Examination (Marks)	End Sem Examination (Marks)
	1	2		
Remember	20	10	20	20
Understand	20	20	40	40
Apply	20	30	40	40
Analyse	-	-	-	-
Evaluate	-	-	-	-
Create	-	-	-	-
Total	60	60	100	100

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Syllabus

K.S.Rangasamy College of Technology – Autonomous R2022

B. TECH - Artificial Intelligence and Data Science

60 MA 019 – Statistical Methods

Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
IV	3	1	0	60	4	40	60	100

Statistics Definition of statistics **-** **Collection of data***: Internal and external data **-** Primary and secondary data **-** Population and sample **-** Representative sample **-** Classification and tabulation of univariate data **-** Graphical representation **-** Frequency curves **-** Bivariate data **-** Summarization, marginal and conditional frequency distribution. **Hands - on:** Visualize the data using various statistical plots.	[9]
Descriptive Statistics **Measures of central tendency*** **-** Mean, Median and Mode **-** Moments **-** Measure of dispersion **-** Skewness and Kurtosis **-** Range **-** Quartile deviation **-** Karl Pearson's coefficient of skewness **-** Bowley's coefficient of skewness. **Hands - on:** Calculate mean, median, mode and range for discrete frequency distribution.	[9]
Correlation and Regression **Correlation - Covariance*** **-** Karl Pearson's coefficient of correlation **-** Rank correlation **-** Regression **-** Lines of regression **-** Regression coefficients **- Multiple regressions****. **Hands - on:** Calculate the correlation coefficients for given series.	[9]
Estimation Theory Types of estimation **-** Unbiased estimators **-** Efficiency **-** Consistency **-** Sufficiency **-** Basics of parametric inference: Method of moments estimator **-** Properties of moments estimator **-** Maximum likelihood estimator **-** Properties of maximum likelihood estimators. **Hands - on:** Estimate parameters and states.	[9]
Non-parametric Inference Sign test **-** Paired sample sign test **-** Mann-Whitney U test **-** One sample run test **- Kruskal Wallis test** -** Kolmogorov-Smirnov test**.** **Hands - on:** Obtain exact and approximate non-parametric statistics on small data.	[9]
Total Hours: 45 +5(Hands on) +10 (Tutorial)	**60**

Text Book(s):

1.	Gupta S. P., "Statistical Methods", 46th Revised Edition, Sultan Chand & Sons, New Delhi, 2021.
2.	Arora P. N., and Arora S., "Statistics for Management", 5th Revised Edition, S.Chand & Company Limited, New Delhi, 2010.

Reference(s):

1.	Gupta S. C., and Kapoor V. K., "Fundamentals of Mathematical statistics", 12th Edition, Sultan Chand & Sons, New Delhi, 2020.
2.	Hogg R. V., McKean J. W., and Craig A. T., "Introduction to Mathematical Statistics", 8th Edition, Pearson Education, Asia, 2018.
3.	Ross S. M., "Introduction to Probability and Statistics for Engineers and Scientists", 5th Edition, Academic Press Inc, 2014.
4.	Douglas C Montgomery and George C Runger, "Applied Statistics and Probability for Engineers", 7th Edition, John Wiley & Sons, 2019.
5.	Johnson R. A., Miller I. R., and Freund J. E., "Miller and Freund's Probability and Statistics for Engineers", 9th Edition, Pearson Education, Asia, 2016.

*SDG 4 – Quality Education,

**SDG 9 – Industry, Innovation, and Infrastructure

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Course Contents and Lecture Schedule

S. No.	Topics	No. of hours
1.0	**Statistics**	
1.1	Definition of statistics	1
1.2	Collection of data: Internal and external data	1
1.3	Primary and secondary data	1
1.4	Population and sample	1
1.5	Representative sample	1
1.6	Classification and tabulation of univariate data	1
1.7	Graphical representation - Frequency curves	2
1.8	Bivariate data – Summarization, marginal and conditional frequency distribution	1
1.9	Tutorial	2
1.10	Hands on	1
2.0	**Descriptive Statistics**	
2.1	Measures of central tendency – Mean	1
2.2	Median and Mode	2
2.3	Moments	1
2.4	Measure of dispersion	1
2.5	Skewness and Kurtosis	1
2.6	Range – Quartile deviation	1
2.7	Karl Pearson’s coefficient of skewness	1
2.8	Bowley’s coefficient of skewness	1
2.9	Tutorial	2
2.10	Hands on	1
3.0	**Correlation and Regression**	
3.1	Correlation	1
3.2	Covariance	1
3.3	Karl Pearson’s coefficient of correlation	2
3.4	Rank correlation	1
3.5	Regression – Lines of regression	1
3.6	Regression coefficients	1
3.7	Multiple regressions	2
3.8	Tutorial	2
3.9	Hands on	1
4.0	**Estimation Theory**	
4.1	Types of estimation	1
4.2	Unbiased estimators - Efficiency	1
4.3	Consistency - Sufficiency	1
4.4	Basics of parametric inference: Method of moments estimator	2
4.5	Properties of moments estimator	1
4.6	Maximum likelihood estimator	2
4.7	Properties of maximum likelihood estimators	1
4.8	Tutorial	2
4.9	Hands on	1
5.0	**Non-parametric Inference**	
5.1	Sign test	1
5.2	Paired sample sign test	1

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5.3	Mann-Whitney U test	2
5.4	One sample run test	1
5.5	Kruskal Wallis test	2
5.6	Kolmogorov-Smirnov test	2
5.7	Tutorial	2
5.8	Hands on	1

Course Designer(s)

1. Dr.D. Tamizharasan - tamizharasan@ksrct.ac.in

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60 IT 002	Design and Analysis of Algorithms	Category	L	T	P	Credit
		PC	3	0	0	3

Objectives

- To Design Algorithms in Both the Science and Practice of Computing.
- To Choose the Appropriate Data Structure and Algorithm Design Method for A Specified Application.
- To Understand How the Choice of Data Structures and Algorithm Design Methods Impacts the Performance of Programs.
- To Solve Problems Using Algorithm Design Methods Such as The Greedy Method, Divide and Conquer, Dynamic Programming, Backtracking and Branch and Bound.
- To Solve NP-Hard And NP-Complete Problems.

Pre-requisites

- Basic knowledge of Data Structures and Computer programming.

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Classify The Problem Types and Compare Orders of Growth to Represent Asymptotic Notations.	Understand
CO2	Apply And Inspect Recursive and Non-Recursive Algorithms by Mathematical Notations Using Sample Algorithms.	Analyse
CO3	Apply 'Brute Force' And 'Divide and Conquer' Design Techniques for Sorting and Searching Problems.	Analyse
CO4	Construct Analogous Algorithms for Graph Related Problems.	Understand
CO5	Apply 'Backtracking' And 'Branch and Bound' Techniques to Solve NP-Hard Problems.	Apply

Mapping with Programme Outcomes

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	3	2	-	-	-	-	-	2	-	-	3	2	-
CO2	3	3	3	2	-	-	-	-	-	2	-	-	3	2	-
CO3	3	3	3	2	3	-	-	-	-	2	-	-	3	2	-
CO4	3	3	3	2	-	-	-	-	-	2	-	-	3	2	-
CO5	3	3	3	2	3	-	-	-	-	2	-	-	3	2	-
3 - Strong; 2 - Medium; 1 - Some															

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		Model Examination (Marks)	End Sem Examination (Marks)
	1	2		
Remember	-	-	-	-
Understand	20	20	20	20
Apply	20	20	30	20
Analyse	20	20	30	20
Evaluate	-	-	10	-
Create	-	-	-	-
Total	60	60	100	100

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Syllabus

K.S. Rangasamy College of Technology – Autonomous R2022								
Common to CS, IT, AD								
60 IT 002- Design and Analysis of Algorithms								
Semester	**Hours/Week**			**Total Hours**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
IV	3	0	0	45	3	40	60	100

Basic Concepts of Algorithms * Introduction - Fundamentals of Algorithmic Problem Solving - Important Problem Types - Fundamentals of The Analysis of Algorithm Efficiency - Analysis Framework - Asymptotic Notations and Basic Efficiency Classes - Recurrence Relations: Methods for Solving Recurrence Relations.	[9]
Mathematical Analysis of Algorithms Mathematical Analysis of Non-Recursive Algorithms and Examples - Mathematical Analysis of Recursive Algorithms - Example: Fibonacci Numbers - Empirical Analysis of Algorithms.	[9]
Brute Force and Divide & Conquer Techniques Selection Sort and Bubble Sort - Brute-Force String Matching - Merge Sort - Multiplication of Two N-Bit Numbers - Quick Sort - Binary Search - Binary Tree Traversal and Related Properties.	[9]
Algorithm Design Paradigm* Decrease And Conquer Technique: Insertion Sort - Depth First Search and Breadth First Search – Transform and Conquer Technique: Presorting - Dynamic Programming: Computing A Binomial Coefficient - Warshall's and Floyd's Algorithm - The Knapsack Problem and Memory Functions - Optimal Binary Search Trees – Greedy Technique: Huffman Trees.	[9]
NP Hard And NP-Complete Problems P And NP Problems - NP Complete Problems - Backtracking: N-Queen's Problem - Hamiltonian Circuit Problem Branch and Bound Techniques: Traveling Salesman Problem.	[9]
Total Hours:	**45**

Text Book(s):	
1.	AnanyLevitin, "Introduction to the Design and Analysis of Algorithm", 3rd Edition, Tenth Impression, Pearson Education Asia, 2017.
2.	T.H. Cormen, C.E. Leiserson, R.L. Rivest and C. Stein, "Introduction to Algorithms", 3rd Edition, PHI Pvt. Ltd., 2012.
Reference(s):	
1.	Sara Baase and Allen Van Gelder, "Computer Algorithms - Introduction to Design and Analysis", Pearson Education Asia, 2010.
2.	A.V.Aho, J.E. Hopcroft and J.D.Ullman, "The Design and Analysis of Computer Algorithms", Pearson Education Asia, 2003.
3.	Ellis Horowitz, SartajSahni and SanguthevarRajasekaran, "Computer Algorithms/ C++", 2nd Edition, Universities Press, 2007.

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Course Contents and Lecture Schedule

S. No.	Topics	No. of hours
1.0	**Basic Concepts of Algorithms**	
1.1	Fundamentals of Algorithmic Problem Solving	1
1.2	Important Problem Types	1
1.3	Fundamentals of the Analysis of Algorithm Efficiency	1
1.4	Analysis Framework	1
1.5	Asymptotic Notations	1
1.6	Asymptotic Notations and Basic Efficiency Classes	1
1.7	Recurrence Relations	1
1.8	Methods For Solving Recurrence Relations.	2
2.0	**Mathematical Analysis of Algorithms**	
2.1	Mathematical Analysis of Non-Recursive Algorithms	2
2.2	Non-Recursive Algorithms and Examples	2
2.3	Mathematical Analysis of Recursive Algorithms	2
2.4	Fibonacci Numbers	1
2.5	Empirical Analysis of Algorithms.	2
3.0	**Brute Force and Divide & Conquer Techniques**	
3.1	Selection Sort	1
3.2	Bubble Sort	1
3.3	Brute-Force String Matching	1
3.4	Merge Sort	1
3.5	Multiplication Of Two N-Bit Numbers	1
3.6	Quick Sort	1
3.7	Binary Search	1
3.8	Binary Tree Traversal	2
4.0	**Algorithm Design Paradigm**	
4.1	Decrease And Conquer Technique: Insertion Sort	1
4.2	Depth First Search and Breadth First Search	1
4.3	Transform And Conquer Technique: Pre-sorting	1
4.4	Dynamic Programming: Computing A Binomial Coefficient	1
4.5	Warshall's And Floyd's Algorithm	1
4.6	The Knapsack Problem and Memory Functions	1
4.7	Optimal Binary Search Trees	1
4.8	Greedy Technique: Huffman Trees.	2
5.0	**NP Hard And NP-Complete Problems**	
5.1	P And NP Problems	1
5.2	NP Complete Problems	1
5.3	Backtracking: N-Queen's Problem	2
5.4	Hamiltonian Circuit Problem	2
5.5	Branch And Bound Techniques	1
5.6	Traveling Salesman Problem.	2

Course Designer(s)

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60 AD 401	Database Design and Development	Category	L	T	P	Credit
		PC	3	0	0	3

Objectives

- To learn the fundamentals of data models, relational algebra and SQL
- To represent a database system using ER diagrams and to learn normalization techniques
- To understand the internal storage structures using different file and indexing techniques which will help in physical DB design
- To understand the fundamental concepts of transaction, concurrency, and recovery processing
- To have an introductory knowledge about the advanced databases, and database security

Pre-requisites

- Relational Algebra, Data Structure, Java Programming

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Create conceptual models of relational databases and translate a conceptual model to the relational model	Apply
CO2	Create, modify and query relational databases using the SQL language and apply normalization techniques to reduce data redundancy and improve data integrity	Apply
CO3	Compare and contrast various indexing strategies and apply the knowledge to tune the performance of the database	Analyse
CO4	Analyse the properties of a transaction using various locking protocols	Analyse
CO5	Analyse how advanced databases differ from Relational Databases and find a suitable database	Analyse

Mapping with Programme Outcomes

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	2	2	3	-	-	-	-	-	2	2	2	-	-	2	-
CO2	2	3	3	-	-	-	-	-	2	2	2	2	2	3	-
CO3	2	2	3	-	-	-	-	-	-	-	-	-	2	3	-
CO4	2	3	2	-	-	-	-	-	-	-	-	-	2	-	-
CO5	2	3	3	-	-	-	-	-	2	2	2	2	2	-	-

3 - Strong; 2 - Medium; 1 - Some

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		Model Examination (Marks)	End Sem Examination (Marks)
	1	2		
Remember	-	-	-	-
Understand	-	-	-	-
Apply	20	20	34	34
Analyse	40	40	66	66
Evaluate	-	-	-	-
Create	-	-	-	-
Total	60	60	100	100

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Syllabus

K.S.Rangasamy College of Technology – Autonomous R2022								
B.Tech-Artificial Intelligence and Data Science								
60 AD 401- Database Design and Development								
Semester	**Hours/Week**			**Total Hours**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
IV	3	0	0	45	3	40	60	100

Introduction to Databases Introduction to Database Systems - DBMS Applications - Purpose of DBMS - View of Data - Data Models - ER Model - Database System Architecture - Database Users and Administrators – Relational Algebra - Case Study: ERD Plus Tool	9
Relational Database & SQL SQL Concepts: Basics of SQL, DDL, DML Commands – Intermediate SQL- Integrity Constraints: primary key, foreign key, unique, not null, check, IN operator, Functions - Aggregate functions, Built in functions – Numeric, date, String functions – Normalization - – First Normal Form – Second Normal Form –Third Normal Form – Boyce/Codd Normal Form	9
Data Storage and Querying Overview of Physical Storage Media - RAID - File Organization - Organization of Records in Files – Index Structure for Files - Different types of Indexes– Hashing Techniques-Query Processing – Query Optimization	9
Transactions* Transaction Concepts – ACID Properties – Schedules – Serializability – Concurrency control –Two Phase Locking- Timestamp – Recovery -Concepts – Recovery based on deferred and immediate update	9
Advanced Databases* Object-Based Databases- ODMG Object Model, ODL, OQL – Distributed Databases- Homogenous and Heterogeneous Databases - **Distributed Data Storage - Distributed Transactions- Commit Protocols –XML Databases- Data Security and Privacy***	9
Total Hours:	**45**

Text Book(s):	
1.	Abraham Silberschatz, Henry F. Korth and S. Sudarshan, “Database System Concepts”, 6th Edition, McGraw-Hill, 2017.
2.	Ramez Elmasri and Shamkant B. Navathe, “Fundamental Database Systems”, 6th Edition, Pearson Education, 2010.
Reference(s):	
1.	Ramez Elmasri and Shamkant B. Navathe, “Fundamental Database Systems”, 4th Edition, Pearson Education, 2009.
2.	Raghu Ramakrishnan, “Database Management System”, Tata McGraw-Hill Publishing, 3rd Edition, 2014.
3.	Hector Garcia–Molina, Jeffrey D.Ullman and Jennifer Widom, “Database System Implementation”, Pearson Education, 2003.
4.	Peter Rob and Corlos Coronel, “Database System, Design, Implementation and Management”, Thompson Learning Course Technology, 5th Edition, 2003.

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Course Contents and Lecture Schedule

S. No.	Topics	No. of hours
1.0	**Introduction to Databases**	
1.1	Introduction to Database Systems	1
1.2	DBMS Applications	1
1.3	Purpose of DBMS	1
1.4	View of Data	1
1.5	Data Models	1
1.6	ER Model (Case Study: ERD Plus Tool)	1
1.7	Database System Architecture	1
1.8	Database Users and Administrators	1
1.9	Relational Algebra	1
2.0	**Relational Database & SQL**	
2.1	SQL Concepts: Basics of SQL	1
2.2	DDL, DML Commands,	1
2.3	Intermediate SQL	1
2.4	Integrity Constraints : primary key, foreign key, unique, not null, check, IN operator	1
2.5	Functions - Aggregate functions, Built in functions – Numeric, date, String functions	1
2.6	Normalization, First Normal Form	1
2.7	Second Normal Form	1
2.8	Third Normal Form	1
2.9	Boyce/Codd Normal Form	1
3	**Data Storage and Querying**	
3.1	Overview of Physical Storage Media	1
3.2	RAID	1
3.3	File Organization	1
3.4	Organization of Records in Files	1
3.5	Index Structure for Files	1
3.6	Different types of Indexes	1
3.7	Hashing Techniques	1
3.8	Query Processing	1
3.9	Query Optimization	1
4.0	**Transactions**	
4.1	Transaction Concepts	1
4.2	ACID Properties	1
4.3	Schedules	1
4.4	Serializability	1
4.5	Concurrency control	1
4.6	Two Phase Locking	1
4.7	Timestamp	1
4.8	Recovery -Concepts	1
4.9	Recovery based on deferred and immediate update	1
5	**Advanced Databases**	
5.1	Object-Based Databases	1
5.2	ODMG Object Model	1
5.3	ODL, OQL	1

Rev. No.3/w.e.f. 22.07.2024
Passed in BoS Meeting held on 24/05/2024
Approved in Academic Council Meeting held on 25/05/2024

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5.4	Distributed Databases- Homogenous and Heterogeneous Databases	1
5.5	Distributed Data Storage	1
5.6	Distributed Transactions	1
5.7	Commit Protocols	1
5.8	XML Databases	1
5.9	Data Security and Privacy	1

Course Designer(s)

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60 AD 402	Web Technology	Category	L	T	P	Credit
		PC	1	0	4	3

Objectives

- To provide knowledge of web design using HTML and CSS, client-side and server-side scripting
- To understand the processing of data using jQuery
- To understand the fundamentals of various MySQL Queries and Database access
- To understand the fundamentals PHP
- To demonstrate the Web Hosting using local web servers

Pre-requisites

- Basic knowledge of Higher Secondary Mathematics, Binary Operations, Mathematical Logic and Programming Skills.

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Categorize the issues in designing a web page by utilizing HTML 5	Understand
CO2	Design the website using the properties of CSS and Bootstrap	Apply
CO3	Create Web Page with dynamic styles and validate the HTML form data using Java Script and jQuery	Apply
CO4	Design the webpage using server-side scripting	Apply
CO5	Create a Web Page to store, retrieve and process the data using database connectivity	Create

Mapping with Programme Outcomes

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	1	-	-	-	-	1	-	-	-	-	3		3
CO2	3	3	1	3	-	-	-	-	-	-	-	-	3	2	3
CO3	3	3	1	3	-	-	-	-	-	-	-	-	3	2	3
CO4	3	3	1	-	3	-	-	-	-	-	-	1	3	2	3
CO5	3	3	2	-	3	-	-	2	-	-	-	1	3	2	3

3 - Strong; 2 - Medium; 1 - Some

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		Model Examination (Marks)	End Sem Examination (Marks)
	1	2		
Remember	-	-	-	-
Understand	-	-	-	-
Apply	30	30	50	50
Analyse	-	-	-	-
Evaluate	-	-	-	-
Create	30	30	50	50
Total	60	60	100	100

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Syllabus

K.S.Rangasamy College of Technology – Autonomous R2022								
B.Tech – Artificial Intelligence and Data Science								
60 AD 402- Web Technology								
Semester	**Hours/Week**			**Total Hours**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
IV	1	0	6	75	4	50	50	100

Introduction to HTML Introduction to HTML, Essential Tags, Tags and Attributes, Text Styles and Text Arrangements, Text, Effects, Exposure to Various Tags, Colour and Background of Web Pages, Lists and their Types, Attributes of Image Tag, Hypertext, Hyperlink and Hypermedia, Links, Anchors and URLs, Links to External Documents, Different Section of a Page and Graphics, Creating Table, Frame, Form and Style Sheet	[3+12]
Stylesheet* Introduction, Cascading Style Sheets (CSS), CSS Syntax, Inserting CSS: Inline, Internal, External, ID and Class Selectors, Colours, Backgrounds, Borders, Text, Font, List, Table, CSS Box Model, Normal Flow Box Layout: Basic Box Layout, Display Property, Padding, Margin, Positioning: Relative, Float, Absolute; CSS3 Borders, Box Shadows, Text Effects and shadow, Basics of Responsive Web Designs, Media Queries, Introduction to Bootstrap.	[3+12]
Java Script and jQuery* Java Script: Objects, Methods, Events and Functions, Operators, Data Types, Literals, Array and Dialog Boxes, Dynamically Changing Text, Style, Content, jQuery: Fundamentals of jQuery, Loading and using jQuery, Library files, Call-back functions, jQuery Selectors, jQuery Events, jQuery Effects, jQuery with AJAX.	[3+12]
Server-Side Scripting* Web Servers (Apache and IIS), Introduction to PHP, Basic Programming Concepts of PHP: Variables, Data types, Constants, Scope of Variables, Type of Variables, Operators, Arrays, Control Structures, Looping, Functions: User Defined Functions, Built-in Function, Array Functions, Date and Time Functions, String Functions, PHP Server Variables, Working with form, Uploading files to Web Server using PHP, Session Handling	[3+12]
Web Services:* Working with PHP and MySQL, Connecting to Database, Creating, Selecting, Deleting, Updating Records in a table, Inserting Multiple Data. Installation and usages of CodeIgniter, WordPress.	[3+12]
Total Hours:	**75**

Text Book(s):	
1.	Web Technologies, Uttam K Roy, Oxford University Press
2.	The Complete Reference PHP – Steven Holzner, Tata McGraw-Hill
Reference(s):	
1.	Web Programming, building internet applications, Chris Bates 2nd edition, Wiley Dremtech
2.	Java Server Pages – Hans Bergsten, SPD O'Reilly
3.	Java Script, D.Flanagan, O'Reilly, SPD
4.	Beginning Web Programming-Jon Duckett WROX

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Course Contents and Lecture Schedule

S. No.	Topics	No. of hours
1	**Introduction to HTML**	
1.1	Introduction to HTML, Essential Tags, Tags and Attributes Text Styles and Text Arrangements, Text Effects, Exposure to Various Tags, Colour and Background of Web Pages	1
1.2	Lists and their Types, Attributes of Image Tag, Hypertext, Hyperlink and Hypermedia, Links, Anchors and URLs, Links to External Documents	1
1.3	Different Section of a Page and Graphics, Creating Table, Frame, Form and Style Sheet	1
2	**Stylesheet**	
2.1	Introduction, Cascading Style Sheets (CSS), CSS Syntax, Inserting CSS: Inline, Internal, External, ID and Class Selectors, Colours, Backgrounds, Borders	1
2.2	Text, Font, List, Table, CSS Box Model, Normal Flow Box Layout: Basic Box Layout, Display Property, Padding, Margin, Positioning: Relative, Float, Absolute; CSS3 Borders	1
2.3	Box Shadows, Text Effects and shadow, Basics of Responsive Web Designs, Media Queries, Introduction to Bootstrap	1
3	**Java Script and jQuery**	
3.1	Java Script: Objects, Methods, Events and Functions, Operators, Data Types, Literals, Array and Dialog Boxes, Dynamically Changing Text, Style, Content	1
3.2	jQuery: Fundamentals of jQuery, Loading and using jQuery, Library files, Call-back functions, jQuery Selectors	1
3.3	jQuery Events, jQuery Effects, jQuery with AJAX	1
4	**Server-Side Scripting**	
4.1	Web Servers (Apache and IIS), Introduction to PHP, Basic Programming Concepts of PHP: Variables, Data types, Constants, Scope of Variables, Type of Variables, Operators, Arrays	1
4.2	Control Structures, Looping, Functions: User Defined Functions, Built-in Function, Array Functions, Date and Time Functions, String Functions	1
4.3	PHP Server Variables, working with form, uploading files to Web Server using PHP, Session Handling	1
5	**Web Services**	
5.1	Working with PHP and MySQL, Connecting to Database, Creating, Selecting	1
5.2	Deleting, Updating Records in a table	1
5.3	Inserting Multiple Data. Installation and usages of CodeIgniter, WordPress, Discussion	1

Course Designer(s)

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60 AD 403	Data Mining Techniques	Category	L	T	P	Credit
		PC	3	0	0	3

Objectives

- To serve as an introductory course for undergraduate students to acquire the fundamental principles and contemporary methodologies for data mining
- To concentrate on the core tasks of data mining, including data preparation and data warehousing with a special emphasis on architecture
- To plan, examine, and resolve essential data mining activities, such as preparation of data, classification, clustering, and association rule mining
- To examine the core ideas of outliers
- To concentrate on the uses of data mining

Pre-requisites

- Database Management Systems, Probability and Statistics

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Identify the suitable data mining functionalities to find the similarity and dissimilarity between data.	Understand
CO2	Solve real-time problems using data pre-processing techniques and design warehouse models for organizational requirements.	Understand
CO3	Apply the different pattern mining methods to extract frequent item sets in a transactional dataset	Apply
CO4	Analyse the diverse classifiers and clustering techniques, apply the same to large datasets	Analyse
CO5	Analyse the outlier analysis techniques to solve real world problems	Analyse

Mapping with Programme Outcomes

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	2	3	2	-	-	-	-	-	2	2	2	-	-	2	2
CO2	2	3	3	-	-	-	-	-	2	2	2	-	2	3	2
CO3	2	3	3	-	-	-	-	-	2	2	2	-	2	3	-
CO4	2	3	2	-	-	-	-	-	2	2	2	2	2	-	3
CO5	2	2	3	-	-	-	-	-	2	2	2	2	2	-	3
3 - Strong; 2 - Medium; 1 - Some															

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		Model Examination (Marks)	End Sem Examination (Marks)
	1	2		
Remember	10	10	33	33
Understand	10	10	33	33
Apply	20	20	24	24
Analyse	20	20	10	10
Evaluate	-	-	-	-
Create	-	-	-	-
Total	60	60	100	100

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Syllabus

K.S.Rangasamy College of Technology – Autonomous R2022								
B.Tech-Artificial Intelligence and Data Science								
60 AD 403- Data Mining Techniques								
Semester	**Hours/Week**			**Total Hours**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
IV	3	0	0	45	3	40	60	100

Introduction Introduction, Data Mining, Kinds of data & pattern, Technologies, Applications, Issues, Data Objects and Attribute Types, Basic Statistical Descriptions of Data, Measuring Data Similarity and Dissimilarity.	9
Data Pre-processing, Data Warehousing Data Pre-processing, Overview, Cleaning, Integration, Reduction, Transformation, Data Discretization, Data Warehouse: Basic Concepts, Data Warehouse Modelling, Data Warehouse Design and Usage, Data Warehouse Implementation	9
Pattern Mining Basic Concepts, Frequent Itemset Mining Methods, Infrequent Itemset Mining Methods - Pattern Evaluation Methods, Pattern Mining: A Road Map, Pattern Mining in Multilevel, Multidimensional Space.	9
Classification and Clustering Classification, Basic Concepts, Decision Tree Induction, Bayes Classification Methods, Bayesian Belief Networks, Classification by Backpropagation, Clustering, Cluster Analysis, Types of Clustering -Partitioning Methods, Hierarchical Methods.	9
Outlier Detection and Data Mining Trends* Outliers and Outlier Analysis, Outlier Detection Methods, Statistical Approaches, Mining Complex Data Types, Other Methodologies of Data Mining, Data Mining Applications, Data Mining and Society, Data Mining Trends.	9
Total Hours:	**45**

Text Book(s):	
1.	Jiawei Han, Micheline Kamber, Jian Pei, “Data Mining: Concepts and Techniques”, 3rd Edition, Morgan Kaufmann Publishers, 2012.
2.	Alex Berson and Stephen J.Smith, “Data Warehousing, Data Mining and OLAP”, Tata McGraw – Hill, Thirteenth Reprint 2008.
Reference(s):	
1.	David Hand, Heikki Manila, Padhraic Symth, “Principles of Data Mining”, PHI 2012.
2.	Margaret H.Dunham, “Data Mining: Introductory and Advanced Topics”, Pearson Education, 2006
3.	Alex Berson, Stephen J.Smith, “Data Warehousing, Data Mining & OLAP”, McGraw-Hill Edition, 2007.
4.	Pang-Ning Tan, Michael Steinbach and Vipin Kumar, “Introduction to Data Mining”, Person Education, 2007

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Course Contents and Lecture Schedule

S. No.	Topics	No. of hours
1.0	**Introduction**	
1.1	Introduction	1
1.2	Data Mining	1
1.3	Kinds of data & pattern, Technologies	1
1.4	Applications, Issues	1
1.5	Data Objects and Attribute Types	1
1.6	Basic Statistical Descriptions of Data	1
1.7	Basic Statistical Descriptions of Data - Problem Solving	1
1.8	Measuring Data Similarity and Dissimilarity	1
1.9	Measuring Data Similarity and Dissimilarity – Problem Solving	1
2.0	**Data Pre-processing, Data Warehousing**	
2.1	Data Pre-processing - Overview	1
2.2	Cleaning	1
2.3	Integration	1
2.4	Reduction	1
2.5	Transformation	1
2.6	Data Discretization	1
2.7	Data Warehouse: Basic Concepts	1
2.8	Data Warehouse Modeling	1
2.9	Data Warehouse Design and Usage, Data Warehouse Implementation	1
3	**Pattern Mining**	
3.1	Basic Concepts	1
3.2	Frequent Itemset Mining Methods	1
3.3	Frequent Itemset Mining Methods - Apriori	1
3.4	Frequent Itemset Mining Methods – Frequent Pattern Growth	1
3.5	Infrequent Itemset Mining Methods	1
3.6	Pattern Evaluation Methods	1
3.7	Pattern Mining: A Road Map	1
3.8	Pattern Mining in Multilevel Space	1
3.9	Pattern Mining in Multidimensional Space	1
4.0	**Classification and Clustering**	
4.1	Classification, Basic Concepts	1
4.2	Decision Tree Induction	1
4.3	Bayes Classification Methods	1
4.4	Bayesian Belief Networks	1
4.5	Classification by Backpropagation	1
4.6	Clustering, Cluster Analysis	1
4.7	Types of Clustering	1
4.8	Partitioning Methods	1
4.9	Hierarchical Methods	1
5	**Outlier Detection and Data Mining Trends**	
5.1	Outliers and Outlier Analysis	1
5.2	Outlier Detection Methods	1
5.3	Statistical Approaches	1
5.4	Statistical Approaches – Problem Solving	1

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5.5	Mining Complex Data Types	1
5.6	Other Methodologies of Data Mining	1
5.7	Data Mining Applications	1
5.8	Data Mining and Society	1
5.9	Data Mining Trends	1

Course Designer(s)

1. Dr.S.Sarumathi - sarumathi@ksrct.ac.in

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60 MY 002	Universal Human Values	Category	L	T	P	Credit
		MY	3	0	0	3

Objectives

- To identify the essential complementarily between 'values' and 'skills'
- To ensure core aspirations of all human beings.
- To acquire ethical human conduct, trustful and mutually fulfilling human behavior.
- To enrich interaction with Nature
- To achieve holistic perspective towards life and profession

Pre-requisites

- NIL

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Understand the significance of value inputs in formal education and start applying them in their life and profession	Understand
CO2	Evaluate coexistence of the “I” with the body.	Analyze
CO3	Identify and evaluate the role of harmony in family, society and universal order.	Analyze
CO4	Classify and associate the holistic perception of harmony at all levels of existence and Nature	Analyze
CO5	Develop appropriate human conduct and management patterns to create harmony in professional and personal lives.	Create

Mapping with Programme Outcomes

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	-	-	-	-	-	-	-	3	2	-	2	3	-	-	-
CO2	-	-	-	-	-	3	-	3	3	-	-	3	-	-	-
CO3	-	-	-	-	-	3	3	3	3	-	-	3	-	-	-
CO4	-	-	-	-	-	3	3	3	3	-	-	3	-	-	-
CO5	-	-	-	-	-	3	3	3	3	3	-	3	-	-	-
3 - Strong; 2 - Medium; 1 - Some															

Assessment Pattern

Bloom’s Category	Continuous Assessment Tests (Marks)		Model Examination (Marks)	End Sem Examination (Marks)
	1	2		
Remember	10	10	20	-
Understand	10	10	20	-
Apply	20	20	30	-
Analyse	20	20	30	-
Evaluate	-	-	-	-
Create	-	-	-	-
Total	60	60	100	-

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Syllabus

K.S.Rangasamy College of Technology – Autonomous R 2022								
60 MY 002- Universal Human Values								
Semester	Hours/Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
IV	3	0	0	45	3*	100	--	100

Introduction to value Education* Understanding value Education-Self exploration as the process for value education-Continuous Happiness and prosperity-the basic human aspirations-right understanding-relationship and physical facility –happiness and prosperity - current scenario – **method to fulfill the basic human aspirations**.**	[9]
Harmony in the Human Being* Understanding Human being as the Co-Existence of the self and the Body-Distinguishing between the needs of the self and the body-the body as an instrument of the self-**understanding harmony in the self-harmony of the self with the body**** – programme to ensure self-regulation and health.	[9]
Harmony in the Family and Society* Harmony in the Family –the basic unit of human interaction-values in human- to - human relationship –'Trust' the foundation value in relationship –'Respect'- as the right evaluation-understanding harmony in the society –vision for the universal human order.	[9]
Harmony in the Nature/Existence* Understanding harmony in the Nature-Interconnectedness, self-regulation and mutual fulfillment among the four orders of nature – realizing existence as co-existence at all levels –the holistic perception of harmony in existence.	[9]
Implications of the Holistic Understanding* Natural Acceptance of human values- definitiveness of human conduct- a basis for humanistic education, humanistic constitution and universal human order- competence in professional ethics – holistic technologies, production systems and management models-typical case studies – strategies for transition towards value base life and profession	[9]
Total Hours	**45**

Text Book(s):	
1.	A Foundation Course in Human Values and Professional Ethics, R R Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1
2	Teachers' Manual for A Foundation Course in Human Values and Professional Ethics, R R Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53-2
Reference(s):	
1.	Jeevan Vidya: EkParichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
2.	Human Values, A.N. Tripathi, New Age International. Publishers, New Delhi, 2004.

***SDG:3 – Good Health and Well-Being**
****SDG:5 – Quality Education**

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Course Contents and Lecture Schedule

S.No	Topic	No. of Hours
1	**Introduction to Value Education**	
1.1	Discussion on Present Education System and Skill Based Education	1
1.2	Understanding Value Education	1
1.3	Self-exploration as the process for value education	1
1.4	Basic Human Aspirations - Continuous Happiness and Prosperity	1
1.5	Basic requirements to fulfill Human Aspirations - Right understanding, Relationship and Physical facility	1
1.6	Transformation from Animal Consciousness to Human Consciousness	1
1.7	Sources of Happiness and Prosperity – Harmony and Disharmony	1
1.8	Current Scenario and Role of Education	1
1.9	Outcome of Human Education and Method to fulfill the basic human aspirations	1
2	**Harmony in the Human Being**	
2.1	Understanding Human being - As Co-Existence of the self and the Body - The Needs of the Self and the Body	1
2.2	Understanding Human being - As Co-Existence of the self and the Body - The Activities and Response of the Self and the Body	2
2.3	The body as an instrument of the self	1
2.4	Understanding harmony in the self	1
2.5	Harmony of the self with the body	2
2.6	Programme to ensure self-regulation and health	1
2.7	My Participation (Value) regarding Self and my Body - Correct Appraisal of our Physical needs	1
3	**Harmony in the Family and Society**	
3.1	Harmony in the Family - Understanding Values in Human Relationships	1
3.2	Family as the basic Unit of Human Interaction	1
3.3	Values in human Relationships	1
3.4	Trust - the foundation value in relationship	1
3.5	Respect as the right evaluation, the Basis for Respect, Assumed Bases for Respect today	1
3.6	Harmony from Family to World Family: Undivided Society	1
3.7	Extending Relationship from family to society , Identification of the Comprehensive Human Goal	1
3.8	Programs needed to achieve the Comprehensive Human Goal: The Five Dimensions of Human Endeavour	1
3.9	Harmony from Family Order to World Family Order – Universal Human Order	1
4	**Harmony in the Nature / Existence**	
4.1	The Four Orders in Nature	1
4.2	Participation of Human Being in Entire Nature	1
4.3	Natural Characteristics - Tendency of Human Living with Animal Consciousness / The Holistic Perception of Harmony in Existence	1
4.4	Present day Problems	1
4.5	Recyclability and self-regulation in Nature	1
4.6	Relationship of Mutual Fulfillment	1
4.7	An Introduction to space, Co-existence of Units in Space	1
4.8	Harmony in Existence – Understanding Existence as Co- Existence	1
4.9	Natural Characteristic of Human Living with Human Consciousness	1
5	**Implications of the Holistic Understanding**	
5.1	Natural Acceptance of human values	1
5.2	Definitiveness of Ethical Human Conduct - Development of Human Consciousness	1
5.3	Identification of Comprehensive Human Goal	1

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5.4	Basis for Humanistic Education and Humanistic Constitution	1
5.5	Ensuring Competence in professional Ethics	1
5.6	Issues in Professional Ethics-The Current Scenario	1
5.7	Holistic Technologies and Production Systems and management models -Typical Case Studies	2
5.8	Strategies for transition towards value based life and profession	1
	Total	45

Course Designers

1. Dr.G.Vennila - vennila@ksrct.ac.in
2. Dr.K.Raja - rajak@ksrct.ac.in

60 AD 4P1	Database Design Laboratory	Category	L	T	P	Credit
		PC	0	0	4	2

Objectives

- To understand data definitions and data manipulation commands
- To learn the use of nested and join queries
- To understand functions, procedures and procedural extensions of databases
- To be familiar with the use of a front-end tool
- To design and implementation of typical database applications

Pre-requisites

- Relational Algebra, Data Structure, Java Programming

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Implement the Data Definition Language commands, Data Manipulation Language, Data Control Language Commands and Transaction Control Language in RDBMS	Apply
CO2	Construct Joins and Sub queries to retrieve data from multiple tables.	Apply
CO3	Implement the database programming with Cursors, Triggers Procedures and Functions in PL/SQL	Apply
CO4	Implement the database programming with Procedures and Functions in PL/SQL	Apply
CO5	Design and implement applications using ODBC	Apply

Mapping with Programme Outcomes

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	2	2	3	2	3	-	-	-	2	2	2	-	-	2	-
CO2	2	3	3	2	3	-	-	-	2	2	2	2	2	3	-
CO3	2	2	3	3	3	-	-	-	-	-	-	-	2	3	-
CO4	2	3	2	3	3	-	-	-	-	-	-	-	2	-	-
CO5	2	3	3	3	3	-	-	-	2	2	2	2	2	-	-
3 - Strong; 2 - Medium; 1 - Some															

Assessment Pattern

Bloom's Category	Lab Experiments Assessment (Marks)		Model Examination (Marks)	End Sem Examination (Marks)	
	Lab	Activity			
Remember	-	-	-	-	-
Understand	-	-	-	-	-
Apply	25	12	50		50
Analyse	25	13	50		50
Evaluate	-	-	-	-	-
Create	-	-	-	-	-
Total	50	25	100	-	100

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K.S.Rangasamy College of Technology – Autonomous R2022								
B.Tech- Artificial Intelligence and Data Science								
60 AD 4P1- Database Design Laboratory								
Semester	**Hours/Week**			**Total Hrs**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
IV	0	0	4	60	2	60	40	100

List of Experiments:

1. Data Definition Language (DDL) commands in RDBMS.
2. Data Manipulation Language (DML), Data Control Language (DCL) and Transaction Control Language (TCL) commands in RDBMS.
3. Implementation of SQL Joins and Sub queries.
4. Database Design using ER modeling, normalization and Implementation for any application.
5. Date, String and Numeric functions.
6. Database Programming: Implicit and Explicit Cursors
7. High level language extension with Triggers
8. Procedures and Functions.
9. Embedded SQL**. ***

Design Experiments:

- Payroll Processing System
- Banking System
- Railway Reservation System
- Inventory Control System
- Online Retail System
- Hospital Management System
- Library Management System
- Restaurant Management System
- Blood Donation System

Lab Manual	
1.	"Database Design Lab Manual", Department of Artificial Intelligence and Data Science, KSRCT.

*SDG 9 – Industry Innovation and Infrastructure

Course Designer(s)

1. Dr.S.Sarumathi - sarumathi@ksrct.ac.in

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60 AD 4P2	Data Mining Laboratory	Category	L	T	P	Credit
		PC	0	0	4	2

Objectives

- To understand the data sets and data pre-processing.
- To analyse data, choose relevant models and algorithms for respective applications.
- To demonstrate the working of algorithms for data mining tasks such association rule mining, classification, and clustering.
- To obtain practical experience working with all real data sets.
- To develop a research interest towards advances in data mining

Pre-requisites

- Database Management Systems, Probability and Statistics

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Create a training data set using data mining tools.	Apply
CO2	Analyse and interpret different data distribution using statistical measures	Analyse
CO3	Apply data mining techniques and methods to mine frequent item sets in large data sets	Apply
CO4	Identify appropriate data mining algorithms to solve real world problems	Apply
CO5	Classify the data objects using supervised and unsupervised learning technique	Apply

Mapping with Programme Outcomes

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	2	2	2	2	3	-	-	-	2	2	2	-	-	2	2
CO2	2	2	3	2	3	-	-	-	2	2	2	-	2	3	2
CO3	2	2	3	3	3	-	-	-	2	2	2	-	2	3	-
CO4	2	2	2	3	3	-	-	-	2	2	2	2	2	-	2
CO5	2	2	3	3	3	-	-	-	2	2	2	2	2	-	2
3 - Strong; 2 - Medium; 1 - Some															

Assessment Pattern

Bloom's Category	Lab Experiments Assessment (Marks)		Model Examination (Marks)	End Sem Examination (Marks)	
	Lab	Activity			
Remember	-	-	-	-	-
Understand	-	-	-	-	-
Apply	50	25	100		100
Analyse	-	-	-	-	-
Evaluate	-	-	-	-	-
Create	-	-	-	-	-
Total	50	25	100	-	100

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B.Tech- Artificial Intelligence and Data Science								
60 AD 4P2 – Data Mining Laboratory								
Semester	**Hours/Week**			**Total Hrs**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
IV	0	0	4	60	2	60	40	100

List of Experiments:

1. Create a training data set using Weka tool.
2. Apply pre-processing techniques to the training data set.
3. Implementation of statistical measures and data visualization using R.
4. Implementation of Apriori algorithm.
5. Implementation of FP-growth algorithm.
6. Implementation of Decision tree algorithm.
7. Implementation of Bayesian classification algorithm.
8. Implementation of K-means algorithm.
9. Implementation of Association rule mining using MATLAB
10. Implementation of Supervised Learning Algorithms using MATLAB

Design Experiments:

11. **Implementation of Unsupervised Learning Algorithms using MATLAB***
12. **Implementation of Outlier Detection Algorithms using MATLAB***

Lab Manual	
1.	"Database Design Lab Manual", Department of Artificial Intelligence and Data Science, KSRCT.

*SDG 9 – Industry Innovation and Infrastructure

Course Designer(s)

1. Dr.S.Sarumathi - sarumathi@ksrct.ac.in

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60 CG 0P2	Career Skill Development III	Category	L	T	P	Credit
		CS	0	0	2	2

Objective

- To help learners improve their logical reasoning skills at different academic and professional contexts.
- To help learners relate basic quantitative problems and solve them.
- To help learners Infer critically the statements with optimal conclusions and assumptions.
- To Solve the quantitative problems pertaining to calculations of averages, ratio and proportions, and profit and loss effectively
- To compute quantitative problems related to time and work, speed and distance, and simple and compound interest

Prerequisite

Basic knowledge of Arithmetic and Logical Reasoning

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Deduce the topics in logical reasoning at the preliminary and intermediate level.	Analyze
CO2	Relate basic quantitative problems and solve them effectively at the preliminary level	Apply
CO3	Infer critically the statements with optimal conclusions and assumptions with the data and information given.	Analyze
CO4	Solve the quantitative problems pertaining to calculations of averages, ratio and proportions, and profit and loss effectively at the pre-intermediate level.	Apply
CO5	Compute quantitative problems related to time and work, speed and distance, and simple and compound interest at intermediate level.	Apply

Mapping with Programme Outcomes

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	-	-	-	-	-	-	-	2	3	3	2	3	-	-	-
CO2	-	-	-	-	-	-	-	2	3	3	2	3	2	2	-
CO3	-	-	-	-	-	-	-	2	3	3	2	3	-	-	-
CO4	-	-	-	-	-	-	-	2	3	3	2	3	2	-	-
CO5	-	-	-	-	-	-	-	2	3	3	2	3	-	2	2
3 - Strong; 2 - Medium; 1 - Some															

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K.S.Rangasamy College of Technology – Autonomous R2022								
Career Skill Development III								
Common to All Branches								
Semester	Hours/Week			Total Hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
IV	0	0	2	30	0	100	00	100

Logical Reasoning Analogies - Alpha and numeric series - Number Series - Coding and Decoding - Blood Relations - Coded Relations - Order and Ranking – odd man out - Direction and distance	**[6]**
Quantitative Aptitude – Part 1 Number system - Squares & cubes - Divisibility - Unit digits - Remainder Theorem - HCF & LCM - Geometric and Arithmetic progression - Surds & indices	**[6]**
Critical Reasoning Syllogism - Statements and Conclusions, Cause and Effect, Statements and Assumptions - identifying Strong Arguments and Weak Arguments – Cause and Action -Data sufficiency	**[6]**
Quantitative Aptitude – Part 2 * Average - Ratio and proportion – Ages – Partnership– Percentage - Profit & loss – Discount - Mixture and Allegation	**[6]**
Quantitative Aptitude – Part 3 * Time & Work - Pipes and cistern – Time, Speed & distance - Trains - Boats and Streams - Simple interest and Compound interest	**[6]**
Total Hours	**30**

Reference(s):

1.	Aggarwal, R.S. *'A Modern Approach to Verbal and Non-verbal Reasoning'*, Revised Edition 2008, Reprint 2009, S.Chand & Co Ltd., New Delhi.
2.	Abhijit Guha, *'Quantitative Aptitude'*, McGraw Hill Education, 6th edition, 2016
3.	Dinesh Khattar, 'Quantitative Aptitude For Competitive Examinations', Pearson Education 2020
4.	Anne Thomson, *'Critical Reasoning: A Practical Introduction'* Lexicon Books, 3rd edition, 2022. Warszaw

*** SDG- 04- Quality Education**

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Course Contents and Lecture Schedule

S.No	Topic	No. of Hours	Mode of content Delivery
1	**Logical Reasoning**		
1.1	Analogies - Alpha and numeric series	1	Chalk & Board
1.2	Number Series - Coding and Decoding	1	Chalk & Board
1.3	Blood Relations - Coded Relations	1	Chalk & Board
1.4	Order and Ranking – odd man out	1	Chalk & Board
1.5	Direction and distance	1	Chalk & Board
2	**Quantitative Aptitude – Part 1**		
2.1	Number system	1	Chalk & Board
2.2	Squares & cubes - Divisibility	1	Chalk & Board
2.3	Unit digits - Remainder Theorem	1	Chalk & Board
2.4	HCF & LCM- Geometric and Arithmetic progression	1	Chalk & Board
2.5	Surds & indices	1	Chalk & Board
3	**Critical Reasoning**		
3.1	Syllogism	1	Chalk & Board
3.2	Statements and Conclusions, Cause and Effect	1	Chalk & Board
3.3	Statements and Assumptions	1	Chalk & Board
3.4	identifying Strong Arguments and Weak Arguments	1	Chalk & Board
3.5	Cause and Action -Data sufficiency	1	Chalk & Board
4	**Quantitative Aptitude – Part 2**		
4.1	Average - Ratio and proportion	1	Chalk & Board
4.2	Ages – Partnership	1	Chalk & Board
4.3	Percentage	1	Chalk & Board
4.4	Profit & loss	1	Chalk & Board
4.5	Discount - Mixture and Allegation	1	Chalk & Board
5	**Quantitative Aptitude – Part 3**		
5.1	Time & Work	1	Chalk & Board
5.2	Pipes and cistern	1	Chalk & Board
5.3	Time, Speed & distance - Trains	1	Chalk & Board
5.4	Boats and Streams	1	Chalk & Board
5.5	Simple interest and Compound interest	1	Chalk & Board
	Total	**25**	

Course Designer

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(An Autonomous Institution affiliated to Anna University)

B.E. / B.Tech. Degree Programme

SCHEME OF EXAMINATIONS

(For the candidates admitted from 2022-2023 onwards)

FIFTH SEMESTER

S.No.	Course Code	Name of the Course	Duration of Internal Exam	Weightage of Marks			Minimum Marks for Pass in End Semester Exam	
				Continuous Assessment *	End Semester Exam **	Max. Marks	End Semester Exam	Total
THEORY								
1	60 AD 501	Operating Systems	2	50	50	100	45	100
2	60 AD 502	Data Communication and Networks	2	40	60	100	45	100
3	60 AD 503	Machine Learning	2	40	60	100	45	100
4	60 IT 003	Design Thinking	2	50	50	100	45	100
5	60 AD E1*	Elective I	2	40	60	100	45	100
6	60 AD L**	Open Elective II	2	40	60	100	45	100
7	60 MY 003	Startups and Entrepreneurship	2	100	-	-	-	-
PRACTICAL								
8	60 AD 5P1	Networking Laboratory	2	60	40	100	45	100
9	60 AD 5P2	Machine Learning Laboratory	2	60	40	100	45	100
10	60 CG 0P3	Career Skill Development IV	2	100	-	100	-	-
11	60 CG 0P6	Internship	-	-	-	-	-	-

* CA evaluation pattern will differ from course to course and for different tests. This will have to be declared in advance to students. The department will put a process in place to ensure that the actual test paper follow the declared pattern.

** End Semester Examination will be conducted for maximum marks of 100 and subsequently be reduced to 60 marks for the award of terminal examination marks.

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60 AD 501	Operating Systems	Category	L	T	P	Credit
		PC	2	0	2	3

Objectives

- To provides the comprehensive knowledge on components of operating system with its working principles
- To provides an ample way to identify and solve the issues related to operating system components
- To implement page replacement and disk scheduling algorithm
- To recognize various implementation of file systems
- To understand the storage management techniques

Pre-requisites

- Digital Logic and Microprocessors, Data structures, C Programming

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Recognize the basics of system software, operating systems and its structures.	Understand
CO2	Analyse the process scheduling and synchronization problem.	Analyse
CO3	Examine the deadlocks and memory management.	Analyse
CO4	Comprehend the file concepts and directory structure	Understand
CO5	Recognize the concepts of allocation methods and disk scheduling.	Understand

Mapping with Programme Outcomes

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	-	3	-	-	-	-	-	-	-	-	-	-	3	-	-
CO2	2	-	2	3	-	-	-	1	-	-	-	-	3	2	2
CO3	2	-	2	3	-	-	-	-	-	-	-	-	3	-	2
CO4	-	-	3	3	-	-	-	1	-	-	-	-	3	-	2
CO5	2	-	3	3	-	-	-	-	-	-	-	-	3	2	2

3 - Strong; 2 - Medium; 1 - Some

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)				Model Examination (Marks)		End Sem Examination (Marks)	
	Test 1		Test 2					
	Theory	Lab	Theory	Lab	Theory	Lab	Theory	Lab
Remember	10	-	10	-	10	-	10	-
Understand	20	-	10	-	20	-	20	-
Apply	30	50	30	50	60	50	60	50
Analyse	-	50	-	50	-	50	-	50
Evaluate	-	-	-	-	-	-	-	-
Create	-	-	10	-	10	-	10	-
Total	60	100	60	100	100	100	100	100

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Syllabus

K.S.Rangasamy College of Technology – Autonomous R2022

B.Tech- Artificial Intelligence and Data Science

60 AD 501 – Operating Systems

Semester	Hours / Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
V	2	0	2	60	3	50	50	100

Introduction to Operating Systems** Introduction to system software: Assemblers-Loaders-Linkers-Compilers, Definition of Operating systems -Computer system organization- Operating system structure- Operating system operations. System Structures: Operating system services-User and Operating-system Interface-System calls-Types of system calls-System programs	[6]
Process Management* Process of OS: Process concept -Process scheduling- Operations on processes- Inter process communication- Examples of IPC systems, Multithreaded programming: Overview-Multicore programming- Multithreading models- Threading issues, Process scheduling - Scheduling Algorithms, Synchronization: The critical section problem-Synchronization hardware - Semaphores-Classic problems of synchronization-Monitors	[6]
Deadlocks and Memory Management** Deadlocks: System model-Deadlock characterization-Methods for handling deadlocks-Deadlock prevention-Deadlock avoidance-Deadlock detection-Recovery from deadlock, Memory Management strategies:- Swapping-Contiguous memory allocation-Segmentation-Paging-Structure of the Page table	[6]
Virtual Memory and Storage Management** Virtual Memory Management: Background-Demand paging- Copy-on-write-Page replacement- Allocation of frames-Thrashing - File systems: File concept-Access methods-Directory and Disk structure- File-system mounting-File sharing-Protection	[6]
File Management** Implementing file systems: File-system structure- File-system implementation-Directory implementation-Allocation methods-Free-space management. Mass storage structure: Overview of mass-storage structure-Disk structure- scheduling-Disk management-Swap-space management	[6]
Practical: 1. Analysis and Synthesis of Basic Linux Commands 2. Implementation of System calls 3. Simulation and Analysis of Non pre-emptive CPU Scheduling Algorithms 4. Simulation and Analysis of Pre-emptive CPU Scheduling Algorithms 5. Implementation of Producer – Consumer Problem using Semaphores 6. Implementation of Banker's Algorithm for Deadlock Avoidance 7. Implementation of Page Replacement Techniques 8. Implementation of Disk Scheduling Algorithms 9. Windows OS installation with VMWare*	[30]
Total Hours: (Lecture - 30; Practical - 30)	**60**

Text Book(s):

1.	Abraham Silberschatz,Peter B Galvin,Gerg Gagne,"Operating System Concepts", Wiley India Pvt.Ltd.,2015,Ninth edition
2.	William Stallings, "Operating System: Internals and Design Principles", Prentice Hall of India, 6th Edition, 2009.

Reference(s):

1.	Leland L.Beck, "System Software-A Introduction to System Programming", 3rd Edition, Pearson Education, Sixth Impression 2009.
2.	Harvey M. Deitel, Paul J.Deitel and David R. Choffnes, "Operating Syatems", Prentice Hall of India, 3rd Edition, 2003.
3.	W Richard Stevens, Stephen A Rago, "Advanced Programming in the UNIX Environment"; 3/E, Addison Wesley Professional, 2013.
4.	A Tanenbaum,A Woodhull: "Operating Systems - Design and Implementation", 3/E, PHI EEE, 2006.

*** - SDG 8 - Decent work and Economic growth**

**** - SDG 4 - Quality Education**

Rev. No.3/w.e.f. 22.07.2024
Passed in BoS Meeting held on 24/05/2024
Approved in Academic Council Meeting held on 25/05/2024

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Course Contents and Lecture Schedule

S. No.	Topics	No. of Hours
1	**Introduction to Operating Systems**	
1.1	Introduction to system software and Computer system organization	1
1.2	Operating system structure, Operating system operations	1
1.3	System Structures: Operating system services	1
1.4	User and Operating-system Interface	1
1.5	System calls-Types of system calls, Unix system calls	1
1.6	System programs	1
2	**Process Management**	
2.1	Process concept -Process scheduling	1
2.2	Operations on processes- Interprocess communication- Examples of IPC systems	1
2.3	Multithreaded programming: Multicore programming- Multithreading models-Threading issues	1
2.4	Process scheduling - Scheduling Algorithms	1
2.5	Synchronization: The critical section problem - Synchronization hardware-Mutex locks- Semaphores	1
2.6	Classic problems of synchronization-Monitors	1
3	**Deadlocks and Memory Management**	
3.1	System model-Deadlock characterization-Methods for handling deadlocks	1
3.2	Deadlock prevention	1
3.3	Deadlock avoidance	1
3.4	Deadlock detection-Recovery from deadlock	1
3.5	Swapping - Contiguous memory allocation	1
3.6	Segmentation – Paging - Structure of the Page table	1
4	**Virtual Memory and Storage Management**	
4.1	Virtual Memory Management: Background-Demand paging	1
4.2	Copy-on-write - Page replacement	1
4.3	Allocation of frames-Thrashing	1
4.4	File concept-Access methods	1
4.5	Directory and Disk structure	1
4.6	File-system mounting - File sharing-Protection	1
5	**File Management**	
5.1	File-system structure	1
5.2	File-system implementation	1
5.3	Directory implementation-Allocation methods - Free-space management	1
5.4	Overview of mass-storage structure, Disk structure, Disk attachment	1
5.5	Disk scheduling	1
5.6	Disk management-Swap-space management	1
Practical:		
1.	Analysis and Synthesis of Basic Linux Commands	2
2.	Implementation of System calls	2
3.	Simulation and Analysis of Non-pre-emptive CPU Scheduling Algorithms	4
4.	Simulation and Analysis of Pre-emptive CPU Scheduling Algorithms	4
5.	Implementation of Producer – Consumer Problem using Semaphores	2
6.	Implementation of Banker's Algorithm for Deadlock Avoidance	4
7.	Implementation of Page Replacement Techniques	2
8.	Implementation of Disk Scheduling Algorithms	4

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9.	Windows OS installation with VMWare*	6

Course Designer(s)

1. Mrs.I.Kalaimani – kalaimani@ksrct.ac.in

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60 AD 502	Data Communication and Networks	Category	L	T	P	Credit
		PC	3	0	0	3

Objectives

- To learn the concepts of protocol layering and communication
- To explore the various components required to build networks
- To learn the functions of network layer and the various routing protocols
- To familiarize the functions and protocols of the Transport layer
- To learn the working principles of application layer protocols

Pre-requisites

- Digital Logic and Microprocessor, C or Java Programming

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Acquire knowledge about protocol layering and communication	Understand
CO2	Recognize the different error control techniques and LAN models in data link layer	Understand
CO3	Attain solutions to various problems in network addressing and routing	Analyze
CO4	Explore the concepts of congestion control and flow control techniques	Apply
CO5	Learn the principles of application layer protocols	Analyze

Mapping with Programme Outcomes

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	2	2	2	-	-	-	-	-	-	-	3	3	3
CO2	3	3	3	2	2	-	-	-	-	-	-	-	3	3	3
CO3	3	3	3	2	2	-	-	-	3	-	-	-	3	3	3
CO4	3	3	3	2	2	-	-	-	3	-	-	-	3	3	3
CO5	3	2	2	2	2	-	-	-	-	-	-	-	3	3	3
3 - Strong; 2 - Medium; 1 - Some															

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		End Sem Examination (Marks)
	1	2	
Remember	10	10	10
Understand	20	10	20
Apply	30	30	60
Analyse	-	-	-
Evaluate	-	-	-
Create	-	10	10
Total	60	60	100

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Syllabus

K.S.Rangasamy College of Technology – Autonomous R2022

B.Tech- Artificial Intelligence and Data Science

60 AD 502 – Data Communication and Networks

Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
V	3	0	0	45	3	40	60	100

Introduction and Physical Layer* Networks – Network Types – Protocol Layering – TCP/IP Protocol suite – OSI Model – Physical Layer: Performance – Transmission media – Switching – Circuit Switched Networks – Packet Switched Networks	[9]
Data Link Layer* Introduction – Framing - Link-Layer Addressing – DLC Services – Data-Link Layer Protocols – Block coding – CRC- Checksum– Hamming Codes - HDLC – PPP - Wired LANs : Ethernet and IEEE 802.3 – Wireless LANs– IEEE 802.11 – Connecting Devices- Flow control techniques- MAC	[9]
Network Layer* Internet Protocol (IP) suite;IPv4 and IPv6 addressing and headers –Address Space - Classful Addressing - Classless Addressing - Next Generation IP –Transition from IPv4 to IPv6 – Routing protocols - Distance-vector and Link-state approaches; Interior and Exterior Gateway Protocol concepts - Multicast Routing – Multicast Distance Vector- Network layer performance	[9]
Transport Layer* Introduction -Transport Layer Protocols - User Datagram Protocol – Transmission Control Protocol – TCP Services-Features – Segment - TCP Connection -TCP congestion control – Data Compression - Quality of services (QOS) –Data Flow Characteristics - Flow control to improve QOS	[9]
Application Layer* World Wide Web and HTTP - FTP- SFTP- Electronic Mail: SMTP, POP3, IMAP, MIME – Domain Name System- Cryptography and Network Security-Introduction–Confidentiality-Symmetric-Key Ciphers - Asymmetric-Key Ciphers- DES - RSA - SSL / TLS	[9]
Total Hours:	**45**

Text Book(s):

1.	Behrouz A. Forouzan, “Data communication and Networking”, 5th Edition, Tata McGraw Hill, 2013.
2.	Behrouz A. Forouzan, “TCP/IP Protocol Suite”, 4thEdition, Tata McGraw Hill, 2015.

Reference(s):

1.	James F. Kurose and Keith W. Ross, “Computer Networking: A Top-Down Approach”, 6th Edition, Pearson Education, 2012.
2.	Larry L.Peterson and Bruce S. Davie, “Computer Networks, A Systems Approach”, 5th Edition, The Morgan Kaufman Series in Networking, 2011.
3.	Andrew S. Tanenbaum, “Computer Networks”, 4th Edition, PHI, 2003.
4.	William Stallings, “Data and Computer Communication”, 10th Edition, Pearson Education, 2013.

* - SDG 9 - Industry, Innovation and Infrastructure

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Course Contents and Lecture Schedule

S. No.	Topics	No. of hours
1.0	**Introduction and Physical Layer**	
1.1	Networks – Network Types	1
1.2	Protocol Layering	1
1.3	TCP/IP Protocol suite	1
1.4	OSI Model	1
1.5	Physical Layer: Performance	1
1.6	Transmission media	1
1.7	Switching	1
1.8	Circuit Switched Networks	1
1.9	Packet Switched Networks	1
2.0	**Data Link Layer**	
2.1	Introduction – Framing	1
2.2	Link-Layer Addressing	1
2.3	DLC Services	1
2.4	Data-Link Layer Protocols : Block coding – CRC- Checksum	2
2.5	Data-Link Layer Protocols : Hamming Codes - HDLC – PPP	1
2.6	Wired LANs : Ethernet and IEEE 802.3	1
2.7	Wireless LANs– IEEE 802.11-Connecting Devices	1
2.8	Flow control techniques, MAC	1
3.0	**Network Layer**	
3.1	Internet Protocol (IP) suite;IPv4 and IPv6 addressing and headers	1
3.2	Address Space	1
3.3	Classful Addressing	1
3.4	Classless Addressing	1
3.5	Next Generation IP –Transition from IPv4 to IPv6	1
3.6	Routing protocols - Distance-vector and Link-state approaches	1
3.7	Interior and Exterior Gateway Protocol concepts	1
3.8	Multicast Routing – Multicast Distance Vector	1
3.9	Network layer performance	1
4.0	**Transport Layer**	
4.1	Introduction -Transport Layer Protocols	1
4.2	User Datagram Protocol	1
4.3	Transmission Control Protocol	1
4.4	TCP Services-Features	1
4.5	Segment - TCP Connection	1
4.6	TCP congestion control – Data Compression	1
4.7	Quality of services (QOS)	1
4.8	Data Flow Characteristics	1
4.9	Flow control to improve QOS	1
5.0	**Application Layer**	
5.1	World Wide Web and HTTP	1
5.2	FTP- SFTP	1
5.3	Electronic Mail: SMTP, POP3, IMAP, MIME	1
5.4	Domain Name System	1
5.5	Cryptography and Network Security-Introduction	1

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5.6	Confidentiality - Symmetric-Key Ciphers	1
5.7	Asymmetric-Key Ciphers	1
5.8	DES - RSA	1
5.9	SSL / TLS	1

Course Designer(s)

1. Mrs.I.Kalaimani - kalaimani@ksrct.ac.in

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60 AD 503	Machine Learning	Category	L	T	P	Credit
		PC	3	0	0	3

Objectives

- To understand the need for machine learning to solve the problem
- To study the various supervised, semi-supervised, and unsupervised learning algorithms in machine learning
- To understand the machine learning theory and implement linear and non-linear learning models
- To implement distance-based clustering techniques, build tree and rule-based models
- To apply reinforcement learning techniques for solving real-time applications

Pre-requisites

- Python Programming, Probability and Statistics, Data Mining

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Compare supervised, unsupervised, and reinforcement learning	Analyse
CO2	Select and apply the apt linear model to solve real-world applications	Understand
CO3	Use distance-based techniques to solve supervised and unsupervised learning tasks	Understand
CO4	Design ensemble model to improve the efficiency of large datasets	Remember
CO5	Model the trial-and-error learning process in an interactive environment using reinforcement learning	Remember

Mapping with Programme Outcomes

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	2	3	3	3	3	-	-	-	2	2	2	-	-	2	2
CO2	2	3	3	3	3	-	-	-	2	2	2	2	2	3	3
CO3	2	3	3	3	3	-	-	-	-	-	-	-	2	3	-
CO4	2	3	3	3	3	-	-	-	-	-	-	-	2	-	3
CO5	2	3	3	3	3	-	-	-	2	2	2	2	2	-	3

3 - Strong; 2 - Medium; 1 - Some

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		End Sem Examination (Marks)
	1	2	
Remember	10	10	20
Understand	20	20	20
Apply	30	30	60
Analyse	-	-	-
Evaluate	-	-	-
Create	-	-	-
Total	60	60	100

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Syllabus

K.S.Rangasamy College of Technology – Autonomous R2022								
B.Tech – Artificial Intelligence and Data Science								
60 AD 503 – Machine Learning								
Semester	**Hours/Week**			**Total Hours**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
V	3	0	0	45	3	40	60	100

Foundations of Learning Components of Learning – Learning Models: Geometric Models, Probabilistic Models, Logic Models, Grouping and Grading – Learning versus Design – Types of Learning: Supervised, Unsupervised, Reinforcement – Theory of Learning – Feasibility of Learning – Error and Noise – Training versus Testing – Theory of Generalization – Generalization Bound – Approximation Generalization Tradeoff – Bias and Variance	[9]
Linear Models* Linear Regression Models: Univariate Linear Regression, Multivariate Linear Regression, Logistic Regression – Linear Classification Models: Discriminant Function - Perceptrons – Multilayer Perceptron: Activation Functions, Network Training, Gradient Descent, Error Backpropagation – Support Vector Machines – Decision Tree – Regularization – Validation	[9]
Distance-Based Models Nearest Neighbor Models – Self-Organizing Map (SOM) - K-Means – Clustering Around Medoids – Silhouttes – Hierarchical clustering: Agglomerative, Divisive – k-D Trees – Locality Sensitive Hashing – Non-parametric Regression	[9]
Ensemble Learning * Combining Multiple Learners: Ensemble Learning Model Combination Schemes, Voting, Bagging: Random Forest Trees - Boosting: Adaboost - Stacking.	[9]
Reinforcement Learning ** Types of Reinforcement Learning, Passive Reinforcement Learning: Direct Utility Estimation, Adaptive Dynamic Programming, Temporal-Difference Learning – Active Reinforcement Learning - Learning Models of Reinforcement– Generalization in Reinforcement Learning – Policy Search – Quantum Machine Learning – Quantum Enhanced Reinforcement Learning	[9]
Total Hours:	**45**

Text Book(s):	
1.	Peter Flach, “Machine Learning: The art and science of algorithms that make sense of data”, Cambridge University Press, 2012.
2.	Ethem Alpaydin, “Introduction to Machine Learning”, 3rd Edition, MIT Press, 2014.
Reference(s):	
1.	T. M. Mitchell, “Machine Learning”, McGraw Hill, 1997.
2.	Andreas Muller, Sarah Guido, “Introduction to Machine Learning with Python: A Guide for Data Scientists”, 4th Edition, O’Reilly, 2018.
3.	D. Barber, “Bayesian Reasoning and Machine Learning”, Cambridge University Press, 2012.
4.	Jiawei Han and Jian Pei, "Data Mining Concepts and Techniques", 3rd Edition, Morgan Kaufmann Publishers, 2012.

*SDG:3 - Good Health and Well-being
**SDG:9 - Industry innovation and infrastructure
**SDG:12 - Responsible consumption and production

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Course Contents and Lecture Schedule

S. No.	Topics	No. of hours
1.0	**Foundations of Learning**	
1.1	Components of learning	1
1.2	Learning models: geometric models, probabilistic models	1
1.3	Logic models, grouping, and grading	1
1.4	Learning versus design, types of learning: supervised, unsupervised, reinforcement	1
1.5	Theory of learning, feasibility of learning, error, and noise	1
1.6	Training versus testing	1
1.7	Theory of generalization, generalization bound	1
1.8	Approximation generalization tradeoff	1
1.9	Bias and variance	1
2.0	**Linear Models**	
2.1	Linear Regression Models: univariate linear regression, multivariate linear regression	1
2.2	Logistic regression	1
2.3	Linear classification Models: Discriminant function	1
2.4	Perceptrons, Multilayer perceptron, activation functions	1
2.5	network training, gradient descent, error backpropagation	1
2.6	Support Vector Machines	1
2.7	Decision Tree	1
2.8	Regularization	1
2.9	Linear Regression Models: univariate linear regression, multivariate linear regression	1
3.0	**Distance-Based Models**	
3.1	Nearest neighbor models	1
3.2	Self-Organizing Map (SOM)	1
3.3	K-means	1
3.4	clustering around medoids	1
3.5	Silhouettes	1
3.6	hierarchical clustering: Agglomerative, Divisive	1
3.7	k-d trees	1
3.8	locality sensitive hashing	1
3.9	non-parametric regression	1
4.0	**Ensemble Learning**	
4.1	Combining multiple learners: Ensemble Learning Model Combination Schemes	1
4.2	Voting	1
4.3	Bagging	1
4.4	Random Forest Trees	1
4.5	Analyze Random Forest Trees with different parameters	1
4.6	Boosting	1
4.7	Adaboost	1
4.8	Stacking	1
4.9	Analyze Boosting with different parameters	1
5.0	**Reinforcement Learning**	
5.1	direct utility estimation	1
5.2	adaptive dynamic programming	1

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5.3	temporal-difference learning	1
5.4	active reinforcement learning— Policy Search – Quantum Machine Learning – Quantum Enhanced Reinforcement Learning	1
5.5	Learning Models of Reinforcement	1
5.6	Generalization in reinforcement learning	1
5.7	policy search	1
5.8	Quantum Machine Learning – Quantum Enhanced Reinforcement Learning	1
5.9	Passive reinforcement learning	1

Course Designer(s)

1. Dr.S. Sarumathi - sarumathi@ksrct.ac.in

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60 IT 003	Design Thinking	Category	L	T	P	Credit
		PC	2	0	2	3

Objectives

- To learn design thinking concepts and principles.
- To design thinking methods in every stage of the problem.
- To learn the different phases of design thinking.
- To learn the application of design thinking for the IT industry
- To apply various methods in design thinking to different problems.

Pre-requisites

- Basic knowledge of mathematics and programming.

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Apply design thinking for product development	Understand
CO2	Use design thinking tools	Understand
CO3	Identify need for products and disruption	Apply
CO4	Design innovative products	Analyze
CO5	Apply design thinking to improve on existing products in IT	Apply

Mapping with Programme Outcomes

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	3	3	3	3	3	3	3	3	-	-	3	2	3
CO2	3	2	3	2	3	3	3	2	3	3	-	-	2	3	3
CO3	3	3	3	2	3	3	2	3	-	-	-	-	3	3	3
CO4	3	3	3	3	3	3	3	-	3	-	-	-	2	2	2
CO5	3	3	3	3	3	-	3	-	-	-	-	-	3	3	2
3 - Strong; 2 - Medium; 1 - Some															

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)				Model Examination (Marks)		End Sem Examination (Marks)	
	Test 1		Test 2					
	Theory	Lab	Theory	Lab	Theory	Lab	Theory	Lab
Remember	20	-	20	-	34	-	34	-
Understand	40	-	40	-	66	-	66	-
Apply	-	50	-	50	-	50	-	50
Analyse	-	50	-	50	-	50	-	50
Evaluate	-	-	-	-	-	-	-	-
Create	-	-	-	-	-	-	-	-
Total	60	100	60	100	100	100	100	100

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Syllabus

K.S.Rangasamy College of Technology – Autonomous R2022								
B.Tech – Information Technology								
60 IT 003 – Design Thinking								
Semester	**Hours/Week**			**Total Hours**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
V	2	0	2	60	3	50	50	100

Introduction to Design Thinking * Why Design? - Four Questions, Ten Tools - Principles of Design Thinking - The process of Design Thinking - How to plan a Design Thinking project.	**[6]**
Understand, Observe and Define the Problem Search field determination - Problem clarification - Understanding of the problem – Problem analysis - Reformulation of the problem - Observation Phase - Empathetic design - Tips for observing - Methods for Empathetic Design - Description of customer needs.	**[6]**
Ideation and Prototyping ** Ideate Phase - The creative process and creative principles - Creativity techniques - Evaluation of ideas - Prototype Phase – Learn Startup Method for Prototype Development - Visualization and presentation techniques.	**[6]**
Testing and Implementation *** Test Phase - Tips for interviews - Tips for surveys - Kano Model - Desirability Testing - How to conduct workshops - Requirements for the space - Material requirements - Agility for Design Thinking.	**[6]**
Future Design Thinking meets the corporation – The New Social Contract – Design Activism – Designing tomorrow.	**[6]**
Practical: 1. 2030 Schools Challenge: Concept: Design thinking is often presented without teaching content. This is very different. Learners get 30 minutes to choose a UN 2030 Goal (there are 17) that is relevant and meaningful to them, then they get into small groups. The group researches the goal quickly, by answering the questions: What does the world need to know about this goal and what can we do about it? The group then creates a short PSA (Public Service Announcement) and shares it widely with an authentic audience. It is fun, fast, and shows the power of design sprints to teach content and skills. 2. THE GIFT-GIVING PROJECT VIA STANFORD D-SCHOOL Concept: The Gift-Giving Project is 90-minute (plus debrief) fast-paced project through a full design cycle. Students pair up to interview each other, come to a point-of-view of how they might design for their partner, ideate, and prototype a new solution to “redesign the gift giving experience” for their partner. 3. THE WALLET PROJECT VIA STANFORD D-SCHOOL Concept: Very similar to the Gift- Giving Project, the Wallet Project is 90-minute (plus Tentative 48 debrief) fast-paced project through a full design cycle. Students pair up, show and tell each other about their wallets, ideate, and make a new solution that is “useful and meaningful” to their partner. 4. INVENT A SPORT (WITH JUST THESE ITEMS) Concept: We’ve all played sports at some point in our life. Who came up with the rules? Who created the game? Who made the constraints? And who decided the objects to play with? Now, with limited time and resources, your group will create and invent a new sport, and a set of directions for people to actually play the game. 5. “BOOK IN AN HOUR” ACTIVITY (VIA ALL WHO WONDER) Concept: Give a group a book (fiction or non-fiction). Then you break them up into smaller groups (or individuals) to read different parts of the book. Each group (or person) has to read and then create an overview/trailer of their part of the book to share chronologically with the rest of the	**30**

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class. Here the design really starts with the creative process driving how you share the information, plot, characters etc. Perfect use for professional development when you want to introduce a topic in a fun, engaging way. 6. CHILDREN'S STORY DESIGN ACTIVITIES Concept: The University of Arkansas created a series of STEM Challenges that work as great design activities with groups old and young! For example after reading "The Three Billy Goat's Gruff" they set up a challenge like this: You decide to help the billy goats reach the opposite side of the creek so they can eat. You must create a model structure to help the billy goats get from one side to the other while using the design loop and only the materials provided. Your teacher will also provide you with model billy goats, with specific weights, that your bridge must be able to withstand. 7. New Product Development Activity: Student teams were given products ranging from toys to air fresheners. In 2 days, they had to create pitches on how to improve these products. The idea was to give them a clear sense of the scope of what they would do in a product development.	
Total Hours:(Theory – 30 + Practical – 30)	60
Text Book(s):	
1.	Christian Mueller-Roterberg, Handbook of Design Thinking - Tips & Tools for how to design thinking. [Unit 1, 2, 3, 4]
2.	Designing for Growth: a design thinking tool kit for managers By Jeanne Liedtka and Tim Ogilvie. [Unit 1]
3.	Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation by Tim Brown. [Unit 5]
Reference(s):	
1.	Johnny Schneider, "Understanding Design Thinking, Lean and Agile", O'Reilly Media, 2017.
2.	Roger Martin, "The Design of Business: Why Design Thinking is the Next Competitive Advantage", Harvard Business Press , 2009.
3.	Hasso Plattner, Christoph Meinel and Larry Leifer (eds), "Design Thinking: Understand – Improve – Apply", Springer, 2011.
4.	Alistair Cockburn, "Agile Software Development", 2nd ed, Pearson Education, 2007.
5.	http://ajjuliani.com/design-thinking-activities
6.	https://venturewell.org/class-exercises

***** SDG-4 – Quality Education
*** *** SDG-8 – Employment and decent work for all
*** * *** SDG-9 – Industrialization and foster innovation

Course Contents and Lecture Schedule

S. No.	Topics	No. of hours
1.0	**Introduction to Design Thinking**	
1.1	Why Design? - Four Questions	1
1.2	Ten Tools	1
1.3	Principles of Design Thinking	2
1.4	The process of Design Thinking	1
1.5	How to plan a Design Thinking project.	1
2.0	**Understand, Observe and Define the Problem**	
2.1	Search field determination	1
2.2	Problem clarification - Understanding of the problem	1
2.3	Problem analysis - Reformulation of the problem	1
2.4	Observation Phase - Empathetic design	1
2.5	Tips for observing, Methods for Empathetic Design	1
2.6	Description of customer needs	1
3.0	**Ideation and Prototyping**	
3.1	Ideate Phase	1
3.2	The creative process and creative principles	1
3.3	Creativity techniques	1
3.4	Evaluation of ideas, Prototype Phase	1
3.5	Learn Startup Method for Prototype Development	1
3.6	Visualization and presentation techniques.	1
4.0	**Testing and Implementation**	
4.1	Test Phase - Tips for interviews	1
4.2	Tips for surveys - Kano Model	1
4.3	Desirability Testing - How to conduct workshops	1
4.4	Requirements for the space	1
4.5	Material requirements	1
4.6	Agility for Design Thinking	1
5.0	**Future**	
5.1	Design Thinking meets the corporation	2
5.2	The New Social Contract	2
5.3	Design Activism	1
5.4	Designing tomorrow	1
Practical:		
1	2030 Schools Challenge: Concept: Design thinking is often presented without teaching content. This is very different. Learners get 30 minutes to choose a UN 2030 Goal (there are 17) that is relevant and meaningful to them, then they get into small groups. The group researches the goal quickly, by answering the questions: What does the world need to know about this goal and what can we do about it? The group then creates a short PSA (Public Service Announcement) and shares it widely with an authentic audience. It is fun, fast, and shows the power of design sprints to teach content and skills.	4
2	THE GIFT-GIVING PROJECT VIA STANFORD D-SCHOOL Concept: The Gift-Giving Project is 90-minute (plus debrief) fast-paced project through a full design cycle. Students pair up to interview each other, come to a point-of-view of how they might design for their partner, ideate, and prototype a new solution to “redesign the gift giving experience” for their partner.	4

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3	THE WALLET PROJECT VIA STANFORD D-SCHOOL Concept: Very similar to the Gift- Giving Project, the Wallet Project is 90-minute (plus Tentative 48 debrief) fast-paced project through a full design cycle. Students pair up, show and tell each other about their wallets, ideate, and make a new solution that is “useful and meaningful” to their partner.	4
4	INVENT A SPORT (WITH JUST THESE ITEMS) Concept: We’ve all played sports at some point in our life. Who came up with the rules? Who created the game? Who made the constraints? And who decided the objects to play with? Now, with limited time and resources, your group will create and invent a new sport, and a set of directions for people to actually play the game.	4
5	“BOOK IN AN HOUR” ACTIVITY (VIA ALL WHO WONDER) Concept: Give a group a book (fiction or non-fiction). Then you break them up into smaller groups (or individuals) to read different parts of the book. Each group (or person) has to read and then create an overview/trailer of their part of the book to share chronologically with the rest of the class. Here the design really starts with the creative process driving how you share the information, plot, characters etc. Perfect use for professional development when you want to introduce a topic in a fun, engaging way.	4
6	CHILDREN’S STORY DESIGN ACTIVITIES Concept: The University of Arkansas created a series of STEM Challenges that work as great design activities with groups old and young! For example after reading “The Three Billy Goat’s Gruff” they set up a challenge like this: You decide to help the billy goats reach the opposite side of the creek so they can eat. You must create a model structure to help the billy goats get from one side to the other while using the design loop and only the materials provided. Your teacher will also provide you with model billy goats, with specific weights, that your bridge must be able to withstand.	5
7	New Product Development Activity: Student teams were given products ranging from toys to air fresheners. In 2 days, they had to create pitches on how to improve these products. The idea was to give them a clear sense of the scope of what they would do in a product development.	5
	Total	60

Course Designer(s)

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60 MY 003	Startups and Entrepreneurship	Category	L	T	P	Credit
		MY	3	0	0	3

Objectives

- To Learn basic concepts in entrepreneurship, develop mind-set and skills necessary to explore entrepreneurship
- To provide practical proven tools for transforming an idea into a product or service that creates value for others.
- To Comprehend the process of opportunity identification through design thinking, identify market potential and customers while developing a compelling value proposition solution and prototypes
- To create business plan, conduct financial analysis and feasibility analysis to assess the financial viability of a venture ideas & solutions built with domain expertise
- To Prepare and present an investible pitch deck of their practice venture to attract stakeholders

Pre-requisites

- Basic knowledge of reading and writing in English

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Develop an entrepreneurial mindset and appreciate the concepts of design thinking, entrepreneurship and innovation	Understand
CO2	Apply process of problem -opportunity identification and validation through human centred approach to design thinking in building solutions	Apply
CO3	Understand market types, conduct market estimation, identify customers, create customer persona, develop the skills to create a compelling value proposition and build a Minimum Viable Product	Apply
CO4	Create business plan, conduct financial analysis and feasibility analysis to assess the financial viability of a venture	Apply
CO5	Prepare and deliver an investible pitch deck of their practice venture to attract stakeholders	Create

Mapping with Programme Outcomes

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	3	3	1	3	1	2	1	-	2	2	3	3	3
CO2	2	3	3	2	2	-	2	2	2	-	2	2	2	3	3
CO3	3	2	3	1	2	-	-	-	1	3	1	3	3	2	3
CO4	3	3	3	3	3	2	2	1	-	1	3	3	3	3	3
CO5	3	2	3	3	3	-	-	2	-	-	3	2	3	2	3
3 - Strong; 2 - Medium; 1 - Some															

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		Pitch Deck final submission & Via voce
	Milestone 1 (25 Marks)	Milestone 2 & 3 (25 Marks)	
Remember	10	-	50
Understand	05	10	
Apply	10	10	
Analyse	-	-	
Evaluate	-	5	
Create	-	-	
Total	25	25	

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Syllabus

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Common to ALL Branches								
60 MY 003 – Startups and Entrepreneurship								
Semester	**Hours/Week**			**Total Hours**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
V	3	0	0	45	-	100	-	100

Introduction to Entrepreneurship & Entrepreneur Meaning and concept of Entrepreneurship, the history of Entrepreneurship development, Myths of Entrepreneurship, role of Entrepreneurship in Economic Development, Agencies in Entrepreneurship Management and Future of Entrepreneurship. The Entrepreneur: Meaning, the skills required to be an entrepreneur, the entrepreneurial decision process, Role models, Mentors and Support system.Innovation and Creativity, types of innovations, Innovations in current scenario	[9]
Problem-Opportunity Identification, Customers Discovery and competitive advantage Understanding the Problem and opportunity, define problem using Design thinking principles and validate problem. Exploring market types and estimating the market size, knowing your customer and consumer, Customer segmentation and creating customer personas. Importance of Value Proposition, Value Proposition Canvas, Developing Problem-solution fit, Competition analysis, Blue ocean strategy, Competitive positioning and understanding unique selling points.	[9]
Business model and build your MVP Introduction to Business model and types, Lean approach, 9 block lean canvas model, riskiest assumptions to Business models. Prototyping, building a Minimum viable product, Hypothesis testing and MVP Validation, MVP Iteration-Importance of Build - Measure – Learn approach	[9]
Business Plan, Financial feasibility and Managing growth Business planning: components of Business plan- Sales plan, People plan and financial plan, Preparing a business plan. Financial Planning: Types of costs, preparing the financial plan using financial template, understanding basics of Unit economics and analyzing Growth and the financial performance	[9]
Go To Market Strategies and Funding Introduction to Go to market strategies, start-up branding and its elements, Selecting the Right Channel, creating digital presence, building customer acquisition strategy. Choosing a form of business organization specific to your venture, identifying sources of funds: Debt & Equity, Map the Start-up Lifecycle to Funding Options, Build an Investor ready pitch deck.	[9]
Total Hours:	45

Text Book(s):	
1.	Stephen Key, “One Simple Idea for Startups and Entrepreneurs: Live Your Dreams and Create Your Own Profitable Company” 1st Edition, Tata Mc Grawhill Company, New Delhi, 2013.
2.	Charles Bamford and Garry Bruton, “Entrepreneurship: The Art, Science, and Process for Success”, 2nd Edition, Tata Mc Grawhill Company, New Delhi, 2016.
Reference(s):	
1.	Philip Auerswald, “The Coming Prosperity: How Entrepreneurs Are Transforming the Global Economy”, Oxford University Press, 2012.
2.	Janet Kiholm Smith; Richard L. Smith Richard T. Bliss, “Entrepreneurial Finance: Strategy, Valuation and Deal Structure, Stanford Economics and Finance”, 2011.
3.	Edward D. Hess, “Growing an Entrepreneurial Business: Concepts and Cases”, Stanford Business Books, 2011.
4.	Ignite program, wadhwani platform, Entrepreneurship, NPTEL online course By Prof. C Bhaktavatsala Rao | IIT Madras

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Course Contents and Lecture Schedule

S. No.	Topics	No. of hours
1.0	**Introduction to Entrepreneurship & Entrepreneur**	
1.1	Meaning and concept of Entrepreneurship and the history of Entrepreneurship development	1
1.2	The Entrepreneur: Meaning, the skills required to be an entrepreneur, the entrepreneurial decision process,	1
1.3	Myths of Entrepreneurship, How to Become a Successful Entrepreneur - Dr Romesh Wadhwani (Platform on boarding)	1
1.4	Role models, Mentors and Support system- Masterclass on My Story - Joshua Salins	1
1.5	Role of Entrepreneurship in Economic Development, Agencies in Entrepreneurship Management and Future of Entrepreneurship	1
1.6	Innovation and Creativity, types of innovations, Innovations in current scenario, Concepts of Entrepreneurial Thinking, General Enterprising tendency test	1
2.0	**Problem-Opportunity Identification, Customers Discovery and competitive advantage**	
2.1	Understanding the Problem and opportunity, define problem using Design thinking principles and validate problem. Case study and Fireside chat – Desi Hangover	1
2.2	Identifying a problem for practice venture and filling Problem statement canvas (Handout week 1 - class activity)	1
2.3	Customer and markets discovery , knowing your customer and consumer, Customer segmentation and Exploring market types and estimating the market size. Case study and Fireside chat – Verloop	1
2.4	Creating customer personas & Market estimation (Handout week 2 - class activity)	1
2.5	Importance of Value Proposition, Introduce Value Proposition Canvas, Developing Problem-solution fit. Case study and Fireside chat – Honey Twigs	1
2.6	Competition analysis, Blue ocean strategy, Competitive positioning and understanding unique selling points. Case study and Fireside chat on Inzpira Fill Value Proposition Canvas (Handout week 3 - class activity) and Competition analysis framework (Handout week 5 - class activity) **Briefing on Assignment 1 - Milestone 1**	1
3.0	**Business model and Build your MVP**	
3.1	Introduction to Business model and types. Case study and Fireside chat – NUOS	1
3.2	Lean approach, 9 block lean canvas model, riskiest assumptions to Business models	1
3.3	Class Activity- Fill Lean canvas for you idea and understand revenue model (Handout week 6)	1
3.4	Prototyping, Meaning of MLP , Difference between MLP and MVP, How to build an MLP? Different types MLP that you can build. Case study and Fireside chat – KNORISH	1
3.5	Hypothesis testing and MVP Validation, MVP Iteration-Importance of Build - Measure – Learn approach	1
3.6	Class Activity- Fill MVP framework (Handout week 7) and learn validation	1
4.0	**Business Plan, Financial feasibility and Manging growth**	
4.1	Business planning: components of Business plan- Sales plan, People plan and financial plan, Preparing a business plan. Case study and Fireside chat – Bodh Gems	1
4.2	Financial Planning: Types of costs, preparing the financial plan using financial template (Handout week 9)	1
4.3	Class activity - starting up costs, COGS, Sales plan and people plan template.	1
4.4	Class activity - One year P&L projection, Breakeven Analysis, Five year projection	1
4.5	Understanding basics of Unit economics and analyzing Growth and the financial performance	1

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4.6	Class activity - Financial template - Unit economics (Handout week 12)	1
5.0	**Go To Market Strategies and Funding**	
5.1	Introduction to Go to market strategies, start-up branding and its elements, Selecting the Right Channel	1
5.2	Creating digital presence, building customer acquisition strategy.	1
5.3	Class activity: Handout week 10 - create your GTM strategy	1
5.4	Choosing a form of business organization specific to your venture	1
5.5	Identifying sources of funds: Debt & Equity, Map the Start-up Lifecycle to Funding Options	1
5.6	Class activity - Visit relevant GOI websites, other sites to help students explore funding opportunities and **briefing on final submission of the pitch deck** Build an Investor ready pitch deck, What Should You Cover in Your Pitch Deck? Art of pitching and storytelling	1

Course Designer(s)

1. Dr.N.Tiruvenkadam - tiruvenkadam@ksrct.ac.in

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60 AD 5P1	Networking Laboratory	Category	L	T	P	Credit
		PC	0	0	4	2

Objectives

- To learn the socket programming for client-server communication
- To analyse and implement flow control mechanisms
- To demonstrate the working of error control techniques
- To design unicast and multicast routing algorithms
- To acquire knowledge on application layer protocol

Pre-requisites

- Computer Networks, Basics of Java Programming

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Implement socket programming for client-server communication	Apply
CO2	Analyze and implement flow control mechanisms	Analyze
CO3	Implement error detection and correction techniques	Apply
CO4	Compare the performance of different transport layer protocols	Analyze
CO5	Implement and analyze unicast and multicast routing protocol	Apply

Mapping with Programme Outcomes

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	3	3	3	-	-	-	2	-	-	-	3	3	-
CO2	3	3	3	3	3	-	-	-	2	-	-	-	3	3	-
CO3	3	3	3	3	3	-	-	-	2	-	-	-	3	3	-
CO4	3	3	3	3	3	-	-	-	2	-	-	-	3	3	-
CO5	3	3	3	3	3	-	-	-	2	-	-	-	3	3	-
3 - Strong; 2 - Medium; 1 - Some															

Assessment Pattern

Bloom's Category	Lab Experiments Assessment (Marks)		Model Examination (Marks)	End Sem Examination (Marks)
	Lab	Activity		
Remember	-	-	-	-
Understand	-	-	-	-
Apply	25	12	100	100
Analyse	25	13	-	-
Evaluate	-	-	-	-
Create	-	-	-	-
Total	50	25	100	100

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B.Tech – Artificial Intelligence and Data Science								
60 AD 5P1 – Networking laboratory								
Semester	**Hours/Week**			**Total Hrs**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
V	0	0	4	60	2	60	40	100

List of Experiments:

1. Implementation of bit stuffing*
2. Implementation of parity checker
3. Simulation of error detection code and error correction code
4. .
    a. CISCO packet transfer
    b. IP address design, configuration
    c. Performance evaluation of unicast routing protocol
    d. Performance evaluation of multicast routing protocol
5. Simulation of transport layer Protocol and congestion control techniques
6. Implement application using TCP / UDP sockets*
    a. Echo Client and echo server
7. File transfer protocol (HTTP, FTP, DNS)**
8. NS2 - Case study
9. Design and implement application layer protocol
10. Implement a HTTP web client program to download a web page using TCP sockets*

Lab Manual

1.	"Networking laboratory Lab Manual**",** Department of Artificial Intelligence and Data Science, KSRCT.

*SDG 9 – Industry Innovation and Infrastructure

* *SDG 4 - Quality Education

Course Designer(s)

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60 AD 5P2	Machine Learning Laboratory	Category	L	T	P	Credit
		PC	0	0	4	2

Objectives

- To impart necessary knowledge on Python needed for data science
- To implement statistics measures using R
- To acquire knowledge of regression models
- To implement classification models.
- To develop programming skills required to build real-world applications

Pre-requisites

Python Programming, Probability and Statistics, Data Mining

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Predict the class of a dataset using Python programming	Apply
CO2	Implement statistics measures and visualize the data using R	Apply
CO3	Implement a regression algorithm to predict the model.	Apply
CO4	Implement classification techniques to predict the model	Apply
CO5	Implement clustering techniques to solve real-world problems	Apply

Mapping with Programme Outcomes

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	2	3	3	3	3	-	-	-	2	2	2	-	-	2	2
CO2	2	3	3	3	3	-	-	-	2	2	2	2	2	3	3
CO3	2	3	3	3	3	-	-	-	-	-	-	-	2	3	-
CO4	2	3	3	3	3	-	-	-	-	-	-	-	2	-	3
CO5	2	3	3	3	3	-	-	-	2	2	2	2	2	-	3
3 - Strong; 2 - Medium; 1 - Some															

Assessment Pattern

Bloom's Category	Lab Experiments Assessment (Marks)		Model Examination (Marks)	End Sem Examination (Marks)
	Lab	Activity		
Remember	-	-	-	-
Understand	-	-	-	-
Apply	50	25	100	100
Analyse	-	-	-	-
Evaluate	-	-	-	-
Create	-	-	-	-
Total	50	25	100	100

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B.Tech – Artificial Intelligence and Data Science								
60 AD 5P2 – Machine Learning Laboratory								
Semester	**Hours/Week**			**Total Hrs**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
V	0	0	2	60	2	60	40	100

List of Experiments:

1. Prediction of the Iris Flower Dataset Classes
2. Implementation of Statistics and Visualization
3. Implementation of Linear Regression
4. Implementation of Logistic Regression
5. Implementation of Naive Bayesian Classifier
6. Implementation of Decision Tree
7. Implementation of Clustering *
8. Implementation of Support Vector Machine
9. Implementation of Artificial Neural Network using Backpropagation
10. Implementation of Ensemble Learning using MATLAB*
11. Implementation of Self-Organizing Map (SOM) using MATLAB
12. Evaluate the Performance of Supervised and Unsupervised Learning Algorithms using Real-World Datasets**

SUGGESTED SOFTWARE TOOLS: R, MATLAB, Python, Anaconda

Lab Manual	
1.	"Machine Learning Lab Manual", Department of Artificial Intelligence and Data Science, KSRCT.

SDG:3 - **Good Health and Well-being**
****SDG:8: - Decent Work and Economic Growth**

Course Designer(s)

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60 CG 0P4	Career Skill Development IV	Category	L	T	P	Credit
		CS	0	0	2	1

Objectives

- To help learners improve their vocabulary and enable them to use words appropriately in different academic and professional contexts.
- To help learners develop strategies that could be adopted while reading texts.
- To help learners acquire the ability to speak and write effectively in English in real life and career related situations.
- Improve listening, observational skills, and problem-solving capabilities
- Develop message generating and delivery skills

Pre-requisites

- Basic knowledge of Arithmetic and Logical Reasoning

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Compare and contrast products and ideas in technical texts.	Analyze
CO2	Identify cause and effects in events, industrial processes through technical texts	Analyze
CO3	Analyze problems in order to arrive at feasible solutions and communicate them orally and in the written format.	Analyze
CO4	Report events and the processes of technical and industrial nature.	Apply
CO5	Articulate their opinions in a planned and logical manner, and draft effective résumés in context of job search.	Apply

Mapping with Programme Outcomes

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	2	2	2	3	-	3	-	-	-	2	3	3	3	-	3
CO2	3	3	3	3	-	2	-	-	-	2	3	3	3	2	3
CO3	2	2	2	2	-	3	-	-	-	2	3	3	2	-	3
CO4	3	3	3	3	-	2	-	-	-	2	3	3	3	2	3
CO5	3	3	3	3	-	2	-	-	-	2	3	3	3	-	3
3 - Strong; 2 - Medium; 1 - Some															

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Syllabus

K.S.Rangasamy College of Technology – Autonomous R2022								
B.Tech – Artificial Intelligence & Data Science								
60 CG 0P4 - Career Skill Development IV								
Semester	**Hours/Week**			**Total Hours**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
V	0	0	2	30	-	-	-	100

Verbal & Analytical Reasoning Seating Arrangements – Analytical Reasoning (PUZZELS) – Machin input and output - Coded Inequality – Eligibility Test	[6]
Quantitative Aptitude - Part – 4 Permutation and Combination - Probability - Quadratic equation - Geometry – Clock – Calendar – Logarithmic	[6]
Non-Verbal Reasoning Series Completion of Figures – Classification – Courting of figure – Figure matrix – Embedded Figure – Complete Figure – Paper Cutting and Folding – Mirror images and Water Images	[6]
Quantitative Aptitude - Part – 5 Mensuration of Area, Volume and Surface area in 2D and 3D Shapes – 2D Shapes – Square, Rectangle, Triangle, Circle, etc. - 3D Shapes – Cube, Cuboid , Sphere , Cone , etc.	[6]
Data Interpretation and Analysis Data interpretation Based on text - Data interpretation Based on Tabulation , Pie chart , Bar graph , And Line graph – Venn Diagram - Data sufficiency	[6]
Total Hours:	30

Reference(s):

1.	Aggarwal, R.S. 'A Modern Approach to Verbal and Non-verbal Reasoning', Revised Edition 2008,Reprint 2009,S.Chand & Co Ltd., New Delhi.
2.	Abhijit Guha, 'Quantitative Aptitude', McGraw Hill Education, 6th edition, 2016
3.	Dinesh Khattar, 'Quantitative Aptitude For Competitive Examinations', Pearson Education (2020)
4.	Anne Thomson, 'Critical Reasoning: A Practical Introduction' Lexicon Books, 3rd edition, 2022. Warszaw

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Course Contents and Lecture Schedule

S. No.	Topics	No. of hours
1.0	**Verbal & Analytical Reasoning**	
1.1	Seating Arrangements	2
1.2	Analytical Reasoning (PUZZELS)	1
1.3	Machin input and output	1
1.4	Coded Inequality	1
1.5	Eligibility Test	1
2.0	**Quantitative Aptitude - Part – 4**	
2.1	Permutation and Combination	2
2.2	Probability	1
2.3	Quadratic equation - Geometry	1
2.4	Clock – Calendar	1
2.5	Logarithmic	1
3.0	**Non-Verbal Reasoning**	
3.1	Series Completion of Figures – Classification	1
3.2	Courting of figure – Figure matrix	1
3.3	Embedded Figure – Complete Figure	2
3.4	Paper Cutting and Folding	1
3.5	Mirror images and Water Images	1
4.0	**Quantitative Aptitude - Part – 5**	
4.1	Mensuration of Area, Volume	1
4.2	Mensuration of Volume	1
4.3	Surface area in 2D and 3D Shapes	2
4.4	2D Shapes – Square, Rectangle, Triangle, Circle, etc.	1
4.5	3D Shapes – Cube, Cuboid , Sphere , Cone , etc.	1
5.0	**Data Interpretation and Analysis**	
5.1	Data interpretation Based on text	1
5.2	Data interpretation Based on Tabulation, Pie chart	1
5.3	Bar graph , And Line graph	1
5.4	Venn Diagram	1
5.5	Data sufficiency	2

Course Designer(s)

1. R. Poovarasan - poovarasan@ksrct.ac.in

Rev. No.3/w.e.f. 22.07.2024
Passed in BoS Meeting held on 24/05/2024
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Chairman - Board of Studies
Dept. of Artificial Intelligence and Data Science
K.S.Rangasamy College of Technology
Tiruchengode - 637 215.

K.S. RANGASAMY COLLEGE OF TECHNOLOGY, TIRUCHENGODE - 637215

(An Autonomous Institution affiliated to Anna University)

B.E. / B.Tech. Degree Programme

SCHEME OF EXAMINATIONS

(For the candidates admitted from 2022-2023 onwards)

SIXTH SEMESTER

S.No.	Course Code	Name of the Course	Duration of Internal Exam	Weightage of Marks			Minimum Marks for Pass in End Semester Exam	
				Continuous Assessment *	End Semester Exam **	Max. Marks	End Semester Exam	Total
THEORY								
1	60 HS 002	Engineering Economics and Financial Accounting	2	40	60	100	45	100
2	60 AD 601	Data Exploration and Visualization	2	40	60	100	45	100
3	60 AD 602	Deep Learning	2	40	60	100	45	100
4	60 AD 603/ 60 AD L01	Robotic Process Automation	2	50	50	100	45	100
5	60 AD E2*	Elective II	2	40	60	100	45	100
6	60 AD L**	Open Elective III	2	40	60	100	45	100
PRACTICAL								
7	60 AD 6P1	Data Visualization Laboratory	2	60	40	100	45	100
8	60 AD 6P2	Deep Learning Laboratory	2	60	40	100	45	100
9	60 AD 6P3	Mini Project	2	100	-	100	-	-
10	60 CG 0P5	Comprehensive Test	-	-	-	-	-	-
11	60 CG 0P6	Internship	-	-	-	-	-	-

* CA evaluation pattern will differ from course to course and for different tests. This will have to be declared in advance to students. The department will put a process in place to ensure that the actual test paper follow the declared pattern.

** End Semester Examination will be conducted for maximum marks of 100 and subsequently be reduced to 60 marks for the award of terminal examination marks.

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60 HS 002	Engineering Economics and Financial Accounting	Category	L	T	P	Credit
		PC	3	0	0	3

Objectives

- To know about the economic principles underlying demand, supply, and market structure
- To understand the concept related to types of business organization and types of banking
- To know about concepts in financial accounting and capital budgeting
- To understand the different methods of pricing and appraisal of projects
- To know the application of break-even analysis in engineering projects

Pre-requisites

- NIL

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Understand the basic concepts of economics, demand, supply, and market structure	Understand
CO2	Understand the forms of business organization and functions of commercial and central bank	Understand
CO3	Understand the basis of financial accounting and capital budgeting techniques	Understand
CO4	Apply different types of pricing strategies and comprehensive project feasibility in diverse business	Apply
CO5	Apply break even analysis in engineering projects and business	Apply

Mapping with Programme Outcomes

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	-	2	3	-	3	-	-	-	3	2	3	3	3
CO2	-	-	-	-	-	2	2	-	-	-	3	3	-	3	-
CO3	-	-	2	3	-	-	-	-	-	-	3	-	2	2	-
CO4	2	-	-	3	-	2	-	-	-	-	-	3	3	3	2
CO5	3	3	3	3	-	-	2	2	-	-	2	2	3	2	2

3 - Strong; 2 - Medium; 1 - Some

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		End Sem Examination (Marks)
	1	2	
Remember	25	25	35
Understand	25	25	45
Apply	10	10	20
Analyse	-	-	-
Evaluate	-	-	-
Create	-	-	-
Total	60	60	100

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Syllabus

K.S.Rangasamy College of Technology – Autonomous R2022								
Common to Civil, EEE, ECE, CSE, IT, AI&DS, AIML, CSBS, EE (VLSI D&T), BT, FT								
60 HS 002 - Engineering Economics and Financial Accounting								
Semester	**Hours/Week**			**Total Hours**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
VI	3	0	0	45	3	40	60	100

Basic Economics Definition of economics – nature and scope of economics, basic concepts of economics, factors of production -Definition of demand – law of demand, exception to law of demand, factors affecting demand, elasticity of demand – demand forecasting – Definition of supply – factors affecting supply, elasticity of supply – Market structure – perfect competition, imperfect competition – monopoly, duopoly, oligopoly, and bilateral monopoly.	[9]
Organization and Business Financing* Forms of business – sole proprietorship, partnership, joint stock company, cooperative organization, state enterprise - Mixed economy - Money and banking – kinds of banking, functions of commercial banks and central bank – Definition of monetary policy and its types – Types of financing - short term borrowing, long term borrowing - internal generation of funds – external commercial borrowings.	[9]
Financial Accounting and Capital Budgeting Forms of business – sole proprietorship, partnership, joint stock company, cooperative organization, state enterprise - Mixed economy - Money and banking – kinds of banking, functions of commercial banks and central bank – Definition of monetary policy and its types – Types of financing - short term borrowing, long term borrowing - internal generation of funds – external commercial borrowings.	[9]
Cost Analysis The Balance sheet and related concepts – The profit and loss statement and related concepts – Financial ratio analysis – Definition of Working capital – types, factors – Definition of Capital budgeting - Techniques Average rate of return, Payback period, Net present value, Profitability index method and Internal rate of return.	[9]
Break Even Analysis Basic assumptions –Break-even chart – Profit zone in break-even chart, Loss zone in break-even chart, angle of incidence – Managerial uses of break-even analysis, Applications of break-even analysis in engineering projects.	[9]
Total Hours:	**45**

Text Book(s):	
1.	Khan, M Y, Jain, “Basic Financial Management”, McGraw Hill Education, New York, 2018.
2.	Maheshwari K. L., Varshney R.L., “Managerial economics”,22nd Edition, S Chand and Co., New Delhi, ,2018.
Reference(s):	
1.	Samuelson P.A, “Economics - An Introductory”, New Age Publications, New Delhi, 2019.
2.	Barthwal R.R., “Industrial Economics - An Introductory”, New Age Publications, New Delhi, 2021.
3.	S.K.Bhattacharyya , John Deardon, “Accounting for Management Text and Cases”, S Chand Publication, New Delhi, 2018.
4.	Mote, V L, Samuel and Gupta, G S., “Managerial Economics – 110002, 1984.– Concepts and Cases”, Tata Mcgraw Hill, New Delhi, 2018.

*SDG 9 – Increase Industry Innovation and Infrastructure

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Course Contents and Lecture Schedule

S. No.	Topics	No. of hours
1	**Basic Economics**	
1.1	Definition of economics – nature and scope of economics	1
1.2	Basic concepts of economics, factors of production	1
1.3	Definition of demand – law of demand	1
1.4	Exception to law of demand	1
1.5	Factors affecting demand, elasticity of demand	1
1.6	Demand forecasting	1
1.7	Definition of supply – factors affecting supply,	1
1.8	Elasticity of supply	1
1.9	Market structure – perfect competition, imperfect competition	1
2	**Organization and Business Financing**	
2.1	Forms of business – sole proprietorship, partnership	1
2.2	Joint stock company, cooperative organization, state enterprise	1
2.3	Mixed economy - Money and banking	1
2.4	Kinds of banking	1
2.5	Functions of commercial banks and central bank	1
2.6	Definition of monetary policy and its types	1
2.7	Types of financing	1
2.8	Short term borrowing, long term borrowing	1
2.9	Internal generation of funds	1
3	**Financial Accounting and Capital Budgeting**	
3.1	The balance Sheet and related concepts	1
3.2	The profit and loss statement and related concepts	1
3.3	Financial ratio analysis	1
3.4	Definition of Working capital – types,	1
3.5	Factors	1
3.6	Definition of Capital budgeting - Techniques	1
3.7	Average rate of return, Payback period	1
3.8	Net present value, Profitability index method	1
3.9	Internal rate of return	1
4	**Cost Analysis**	
4.1	Types of costing - Traditional costing approach - activity based costing	1
4.2	Fixed Cost – variable cost – marginal cost	1
4.3	Cost output relationship in the short run and in long run	1
4.4	Pricing practice – full cost pricing	1
4.5	Marginal cost pricing, going rate pricing	1
4.6	Bid pricing – pricing for a rate of return	1
4.7	Project appraisal - appraisal process - Cost benefit analysis –	1
4.8	Feasibility reports -–– technical feasibility, economic feasibility	1
4.9	Financial feasibility, managerial feasibility, operational feasibility.	1
5	**Break Even Analysis**	
5.1	Basic assumptions – break-even chart	2
5.2	Profit zone in break-even chart, Loss zone in break-even chart	2
5.3	Angle of incidence	2
5.4	Managerial uses of break-even analysis	2

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5.5	Applications of break-even analysis in engineering projects	1

Course Designer(s)

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60 AD 601	Data Exploration and Visualization	Category	L	T	P	Credit
		PC	3	0	0	3

Objectives

- To outline an overview of exploratory data analysis.
- To implement data visualization using Matplotlib.
- To perform univariate data exploration and analysis.
- To apply bivariate data exploration and analysis.
- To use Data exploration and visualization techniques for multivariate and time series data

Pre-requisites

- Statistical concepts, Programming Language: Python and R

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Understand the fundamentals of exploratory data analysis	Understand
CO2	Implement the data visualization using Matplotlib.	Remember
CO3	Demonstrate to perform univariate data exploration and analysis.	Apply
CO4	Apply bivariate data exploration and analysis.	Apply
CO5	Use Data exploration and visualization techniques for multivariate and time series data	Understand

Mapping with Programme Outcomes

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	1	3	3	1	-	-	-	2	3	3	3	2	2	2
CO2	2	2	2	1	1	-	-	-	3	2	3	1	3	1	3
CO3	2	1	2	1	1	-	-	-	3	2	1	2	2	2	1
CO4	2	2	2	1	-	-	-	-	1	2	1	3	1	3	2
CO5	3	1	1	2	1	-	-	-	3	2	1	2	2	2	3
3 - Strong; 2 - Medium; 1 - Some															

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		End Sem Examination (Marks)
	1	2	
Remember	10	10	20
Understand	20	20	20
Apply	10	10	20
Analyse	-	-	20
Evaluate	-	-	10
Create	10	10	10
Total	60	60	100

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Syllabus

K.S.Rangasamy College of Technology – Autonomous R2022								
B.Tech-Artificial Intelligence and Data Science								
60 AD 601- Data Exploration and Visualization								
Semester	**Hours/Week**			**Total Hours**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
VI	3	0	0	45	3	40	60	100

Exploratory Data Analysis * Eda Fundamentals – Understanding Data Science – Significance of Eda – Making Sense of Data – Comparing EDA With Classical and Bayesian Analysis – Software Tools For EDA - Visual Aids for EDA- Data Transformation Techniques-Merging Database, Reshaping and Pivoting, Transformation Techniques - Grouping Datasets - Data Aggregation – Pivot Tables and Cross-Tabulations.	[9]
Visualizing Using Matplotlib * Importing Matplotlib – Simple Line Plots – Simple Scatter Plots – Visualizing Errors – Density and Contour Plots – Histograms – Legends – Colors – Subplots – Text and Annotation – Customization – Three Dimensional Plotting - Geographic Data With Basemap - Visualization With Seaborn.	[9]
Univariate Analysis * Introduction to Single Variable: Distributions and Variables - Numerical Summaries of Level and Spread - Scaling and Standardizing – Inequality - Smoothing Time Series	[9]
Bivariate Analysis * Relationships Between Two Variables - Percentage Tables - Analyzing Contingency Tables - Handling Several Batches - Scatterplots and Resistant Lines – Transformations	[9]
Multivariate And Time Series Analysis Introducing a Third Variable - Causal Explanations - Three-Variable Contingency Tables and Beyond - Longitudinal Data – Fundamentals of TSA – Characteristics of Time Series Data – Data Cleaning – Time-Based Indexing – Visualizing – Grouping – Resampling.*****	[9]
Total Hours:	**45**

Text Book(s):	
1.	Suresh Kumar Mukhiya, Usman Ahmed, “Hands-On Exploratory Data Analysis with Python”, Packt Publishing, 2020.
2.	Jake Vander Plas, "Python Data Science Handbook: Essential Tools for Working with Data", Oreilly, 1st Edition, 2016.
Reference(s):	
1.	Catherine Marsh, Jane Elliott, “Exploring Data: An Introduction to Data Analysis for Social Scientists”, Wiley Publications, 2nd Edition, 2008.
2.	Eric Pimpler, Data Visualization and Exploration with R, GeoSpatial Training service, 2017
3.	Claus O. Wilke, “Fundamentals of Data Visualization”, O’reilly publications, 2019.
4.	Matthew O. Ward, Georges Grinstein, Daniel Keim, “Interactive Data Visualization: Foundations, Techniques, and Applications”, 2nd Edition, CRC press, 2015

*SDG 4 – Quality Education

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Dept. of Artificial Intelligence and Data Science
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Tiruchengode - 637 215.

Course Contents and Lecture Schedule

S. No.	Topics	No. of hours
1	**Exploratory Data Analysis**	
1.1	EDA Fundamentals, Understanding Data Science, Significance of EDA	1
1.2	Making Sense of Data, Comparing EDA with Classical and Bayesian Analysis	1
1.3	Software Tools for EDA	1
1.4	Visual Aids for EDA	1
1.5	Data Transformation Techniques-Merging Database, Reshaping and Pivoting	1
1.6	Transformation Techniques	1
1.7	Grouping Datasets	1
1.8	Data Aggregation	1
1.9	Pivot Tables and Cross, Tabulations	1
2	**Visualizing Using Matplotlib**	
2.1	Importing Matplotlib, Simple Line Plots	1
2.2	Simple Scatter Plots, Visualizing Errors	1
2.3	Density and Contour Plots, Histograms	1
2.4	Legends, Colors	1
2.5	Subplots, Text and Annotation	1
2.6	Customization	1
2.7	Three-Dimensional Plotting	1
2.8	Geographic Data with Base Map	1
2.9	Visualization with Seaborn	1
3	**Univariate Analysis**	
3.1	Introduction to Single variable	1
3.2	Distributions and Variables	1
3.3	Numerical Summaries of Level and Spread	2
3.4	Scaling and Standardizing	2
3.5	Inequality	1
3.6	Smoothing Time Series	2
4	**Bivariate Analysis**	
4.1	Relationships between Two Variables	1
4.2	Percentage Tables	1
4.3	Analyzing Contingency Tables	1
4.4	Handling Several Batches	2
4.5	Scatterplots and Resistant Lines	2
4.6	Transformations	2
5	**Multivariate and Time Series Analysis**	
5.1	Introducing a Third Variable	1
5.2	Causal Explanations	1
5.3	Three-Variable Contingency Tables and Beyond	1
5.4	Longitudinal Data	1
5.5	Fundamentals of TSA	1
5.6	Characteristics of Time Series Data	1
5.7	Data Cleaning, Time-Based Indexing	1
5.8	Visualizing	1
5.9	Grouping – Resampling	1

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Course Designer(s)

1.Mr.S. Raja - rajas@ksrct.ac.in

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Dept. of Artificial Intelligence and Data Science
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60 AD 602	Deep Learning	Category	L	T	P	Credit
		PC	3	0	0	3

Objectives

- To impart necessary knowledge on perceptron learning
- To implement text generation using LSTM
- To acquire knowledge on CNN and RNN models
- To implement Sentiment Analysis using RNN.
- To impart knowledge on LSTM autoencoders.

Pre-requisites

- Python Programming, Data Mining, Machine Learning

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Implement of Multilayer Neural Network using Keras	Remember,
CO2	Implement Text Generation using LSTM	Understand
CO3	Reuse of a Pre-trained Model on a new problem using Transfer Learning	Understand
CO4	Implement Sentiment Analysis using RNN	Apply
CO5	Use LSTM and Autoencoders for different applications	Apply

Mapping with Programme Outcomes

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	2	3	3	3	3	-	-	-	2	2	2	-	-	2	2
CO2	2	3	3	3	3	-	-	-	2	2	2	2	2	3	3
CO3	2	3	3	3	3	-	-	-	-	-	-	-	2	3	-
CO4	2	3	3	3	3	-	-	-	-	-	-	-	2	-	3
CO5	2	3	3	3	3	-	-	-	2	2	2	2	2	-	3
3 - Strong; 2 - Medium; 1 - Some															

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		End Sem Examination (Marks)
	1	2	
Remember	10	10	20
Understand	20	20	40
Apply	30	30	40
Analyse	-	-	-
Evaluate	-	-	-
Create	-	-	-
Total	60	60	100

Syllabus

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B.Tech – Artificial Intelligence and Data Science								
60 AD 602 – Deep Learning								
Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
VI	3	0	0	45	3	40	60	100

Basics of Neural Networks Basic concept of Neurons –McCulloch Pitts Neuron, Different Learning Rules, Training of Neural Networks-Thresholding logic - Perceptron learning Algorithm – Multilayer Perceptrons	[9]
Deep Learning History of Deep learning - Feed Forward Neural Networks – Gradient Descent – Back Propagation Algorithm – Vanishing Gradient problem – Heuristics for Avoiding Bad Local Minima – Heuristics for Faster Training – Momentum-based and Nesterov Accelerated Gradient Descent – Regularization – Dropout	[9]
Convolutional Neural Networks* Convolutional Neural Networks Architectures: LeNet, AlexNet, GoogLeNet, ResNet - Convolution – Pooling Layers – Activation Function - Transfer Learning – Image Classification using Transfer Learning	[9]
Deep Learning Architectures** Long Short-Term Memory, Gated Recurrent Units, Encoder/Decoder Architectures – Autoencoders – Standard- Sparse – Denoising –Contractive- Variational Autoencoders – Adversarial Generative Networks	[9]
Applications of Deep Learning*** Image Segmentation – Object Detection – Automatic Image Captioning – Image Generation with Generative Adversarial Networks – Video to Text with LSTM Models – Attention Models for Computer Vision – Case Study: Opinion Mining using Recurrent Neural Networks – Sentence Classification using Convolutional Neural Networks	[9]
Total Hours:	**45**

Text Book(s):	
1.	Ian Good Fellow, YoshuaBengio, Aaron Courville, “Deep Learning”, MIT Press, 2017.
2.	Francois Chollet, “Deep Learning with Python”, Manning Publications, 2018.
Reference(s):	
1.	Phil Kim, “Matlab Deep Learning: With Machine Learning, Neural Networks and Artificial Intelligence”, Apress , 2017.
2.	Ragav Venkatesan, Baoxin Li, “Convolutional Neural Networks in Visual Computing”, CRC Press,2018.
3.	Navin Kumar Manaswi, “Deep Learning with Applications Using Python”, Apress, 2018.
4.	Seth Weidman, “Deep learning from scratch: Building with Python from first principles”, O’Reilly, 2019.

SDG:3 - Good Health and Well-being
**SDG:9 - Industry innovation and infrastructure
***SDG 11: Sustainable Cities and Communities

Course Contents and Lecture Schedule		
S. No.	**Topics**	**No. of hours**

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1.0	**Basics of Neural Network**	
1.1	Basic concept of Neurons	1
1.2	McCulloch Pitts Neuron, Different Learning Rules -Training of Neural Network	2
1.3	Thresholding logic	2
1.4	Perceptron learning Algorithm	2
1.5	Multilayer Perceptrons	2
2.0	**Introduction to Deep Learning**	
2.1	History of Deep learning	1
2.2	Feed Forward Neural Networks	1
2.3	Gradient Descent	1
2.4	Back Propagation Algorithm	1
2.5	Vanishing Gradient problem	1
2.6	Heuristics for Avoiding Bad Local Minima	1
2.7	Heuristics for Faster Training	1
2.8	Momentum based and Nesterov Accelerated Gradient Descent	1
2.9	Regularization, Dropout	1
3.0	**Convolutional Neural Networks**	
3.1	Convolutional Neural Networks Architectures	1
3.2	LeNet	1
3.3	AlexNet	1
3.4	GoogLeNet	1
3.5	ResNet	1
3.6	Convolution	1
3.7	Pooling Layers	1
3.8	Activation Function	1
3.9	Transfer Learning, Image Classification using Transfer Learning	1
4.0	**Deep Learning Architecture**	
4.1	Long Short-Term Memory	1
4.2	Gated Recurrent Units	1
4.3	Encoder/Decoder Architectures	1
4.4	Autoencoders	1
4.5	Standard- Sparse	1
4.6	Denoising	1
4.7	Contractive	1
4.8	Variational Autoencoders	1
4.9	Adversarial Generative Networks	1
5.0	**Applications of Deep Learning**	
5.1	Image Segmentation	1
5.2	Object Detection	1
5.3	Automatic Image Captioning	1
5.4	Image generation with Generative Adversarial Networks	1
5.5	Video to Text with LSTM Models	1
5.6	Attention Models for Computer Vision	1
5.7	Case Study: Opinion Mining using Recurrent Neural Networks	1
5.8	Sentence Classification using Convolutional Neural Networks	2

Course Designer(s)

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Approved in Academic Council Meeting held on 25/05/2024

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60 AD 603/ 60 AD L01	Robotic Process Automation	Category	L	T	P	Credit
		PC/OE	1	0	4	3

Objectives

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- To enable the students to learn how Robotic Process Automation helps organizations.
- To understand the activities supported in RPA.
- To create and use controls in UiPath RPA tools.
- To perform data manipulation with string in UiPath Studio
- To automate repeatable tasks that previously required humans to perform

Pre-requisites

- Basic Programming Knowledge

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Recognize the principles of Robotic Process Automation	Apply
CO2	Identify the key RPA tools and workflows used in intelligent automation.	Apply
CO3	Implement the functionalities of data manipulation and scrapping.	Apply
CO4	Analyzing the process of automation in documents.	Apply
CO5	Implement the concept of automation in different UI elements	Apply

Mapping with Programme Outcomes

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	1	-	-	-	-	1	-	-	-	-	3	-	3
CO2	3	3	1	3	-	-	-	-	-	-	-	-	3	2	3
CO3	3	3	1	3	-	-	-	-	-	-	-	-	3	2	3
CO4	3	3	1	-	3	-	-	-	-	-	-	1	3	2	3
CO5	3	3	2	-	3	-	-	2	-	-	-	1	3	2	3
3 - Strong; 2 - Medium; 1 - Some															

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		Model Examination (Marks)	End Sem Examination (Marks)
	1	2		
Remember	-	-	-	-
Understand	-	-	-	-
Apply	30	30	50	50
Analyse	30	30	50	50
Evaluate	-	-	-	-
Create	-	-	-	-
Total	60	60	100	100

Syllabus

K.S.Rangasamy College of Technology – Autonomous R2022
B.Tech - Artificial Intelligence and Data Science
60 AD 603/60 AD L01 - Robotic Process Automation

Chairman - Board of Studies
Dept. of Artificial Intelligence and Data Science
K.S.Rangasamy College of Technology
Tiruchengode - 637 215.

Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
VI	1	0	4	75	4	50	50	100

Introduction to Robotic Process Automation: Introduction to Robotic Process Automation - Robotic Automation Framework - Tool Installation and Setup –Workflow Designer Panels - Types of Workflows, Sequences, Flowcharts and State Machines	[3+12]
Data Manipulation and Scrapping: Data Manipulation Variables, Datatypes - Analyzing the process and aggregate datasets in the database and Usage, Managing Arguments – Data Scrapping - Debug Workflow - Error Handlings	[3+12]
Recording and Advanced UI Interaction: Introduction to Recording - Recording Types - Automatic Recording - Automatic Recording with Basic and Desktop - Automatic Recording with Web - Manual Recording - Input Methods - Screen Scraping - Data Scraping.	[3+12]
Selectors, Image and Text Automation: Introduction Selectors - Selectors with Wildcards - Full versus Partial Selectors - Explorer - About Image and Text Automation - Mouse and Keyboard Activities - Text Activities - OCR Activities - Image Activities.	[3+12]
Excel, PDF and Email Automation: Excel Activities - Data Tables Activities - Data Extraction from PDF - PDF Activities - Email Automation - Email Activities – Orchestrator UI Interface - Connecting the Local Robot to Orchestrator – Schedules - Managing Logs.	[3+12]
Total Hours:	**75**

Text Book(s):	
1.	Alok Mani Tripathi, “Learning Robotic Process Automation, 1st Edition, 2018.
2.	Vaibhav Jain, “Crisper Learning: for UiPath”, Fourth Edition, 1st Edition, 2018.
Reference(s):	
1.	https://www.uipath.com/rpa/academy/training

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Course Contents and Lecture Schedule

S. No.	Topics	No. of hours
1	**Introduction to Robotic Process Automation**	

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1.1	Introduction to Robotic Process Automation	1
1.2	UiPath's Robotic Automation Framework	1
1.3	UiPath Tool Installation and Setup	1
2	**Data Manipulation and Scrapping**	
2.1	Data Manipulation Variables, Datatypes	1
2.2	Analyzing the process and aggregate datasets in the database and Usage, Managing Arguments	1
2.3	Data Scrapping	1
3	**Recording and Advanced UI Interaction**	
3.1	Introduction to Recording	1
3.2	Recording Types	1
3.3	Automatic Recording	1
4	**Selectors, Image and Text Automation**	
4.1	Introduction Selectors	1
4.2	Selectors with Wildcards	1
4.3	Full versus Partial Selectors	1
5	**Excel, PDF and Email Automation**	
5.1	Excel Activities	1
5.2	Data Tables Activities	1
5.3	Data Extraction from PDF	1
6	**Project**	
6.1	Problem Identification	10
6.2	Solution for Problem	15
6.3	Implementation	20
6.4	Presentation	5
6.5	Report	5
6.6	Demo	5

Course Designer(s)

1. Giridharan Natarajan- giridharan@ksrct.ac.in

60 AD 6P1	Data Visualization Laboratory	Category	L	T	P	Credit
		PC	0	0	4	2

Objectives

- To impart necessary knowledge on data visualization tools
- To implement statistics measures using R
- To acquire knowledge on data preprocessing
- To create dashboards using Tableau.
- To gain knowledge on EDA and data visualization

Pre-requisites

- Statistical concepts, Programming Language: Python and R

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Implement a basic visualization technique in R programming.	Apply
CO2	Implement a statistical concept in tableau.	Apply
CO3	Implement data preprocessing to predict the model.	Apply
CO4	Analyze data visualization using different visualization tools.	Apply
CO5	Apply the various EDA and visualization techniques, and present an analysis	Apply

Mapping with Programme Outcomes

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	2	2	2	1	3	-	-	-	-	1	3	2	2	1	1
CO2	2	3	3	2	3	-	-	-	-	1	3	2	1	2	3
CO3	2	3	2	3	3	-	-	-	-	2	3	3	2	2	3
CO4	2	2	3	2	3	-	-	-	-	2	3	2	2	1	2
CO5	2	3	2	3	3	-	-	-	-	2	1	2	3	2	3

3 - Strong; 2 - Medium; 1 - Some

Assessment Pattern

Bloom's Category	Lab Experiments Assessment (Marks)		Model Examination (Marks)	End Sem Examination (Marks)
	Lab	Activity		
Remember	-	-	-	-
Understand	-	-	-	-
Apply	25	12	50	50
Analyse	25	13	50	50
Evaluate	-	-	-	-
Create	-	-	-	-
Total	50	25	100	100

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B.Tech-Artificial Intelligence and Data Science								
60 AD 6P1 -Data Visualization Laboratory								
Semester	**Hours/Week**			**Total Hrs**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
VI	0	0	4	60	2	60	40	100

List of Experiments:

1. Basic Data Visualization using R programming. *
2. Data analysis using data. table package in R programming.
3. Data Aggregation and Statistical functions in Tableau.
4. Visualization of Semi-Structured Data. *
5. Creating different types of visualizations using python (matplotlib package) programming.
6. Data analysis and visualization for COVID19 dataset.
7. Implementation of data preprocessing using MATLAB.
8. Exploratory data analysis for loan prediction dataset.
9. Implementation of data visualization using MATLAB*
10. Visual Encodings and Basic Dashboards in Tableau
11. Design Experiments:
12. Connecting to Data and preparing data for visualization in Tableau
13. Implementation of data visualization using MATLAB

Lab Manual

1.	"Data Visualization Lab Manual", Department of Artificial Intelligence and Data Science, KSRCT.

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Course Designer(s)

1.Mr.S.Raja – rajas@ksrct.ac.in

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60 AD 6P2	Deep Learning Laboratory	Category	L	T	P	Credit
		PC	0	0	4	2

Objectives

- To impart necessary knowledge on perceptron learning
- To implement text generation using LSTM
- To acquire knowledge on CNN and RNN models
- To implement sentiment Analysis using RNN
- To impart knowledge on LSTM autoencoders

Pre-requisites

Python Programming, Data Mining, Machine Learning

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Implement Multilayer Neural Network	Apply
CO2	Implement Text Generation using LSTM	Apply
CO3	Reuse a Pre-trained Model on a New Problem using Transfer Learning	Apply
CO4	Implement Sentiment Analysis using RNN	Apply
CO5	Use LSTM and Autoencoders for different Applications	Apply

Mapping with Programme Outcomes

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	2	3	3	-	-	-	-	-	2	2	2	-	-	2	2
CO2	2	3	3	-	-	-	-	-	2	2	2	2	2	3	3
CO3	2	3	3	-	-	-	-	-	-	-	-	-	2	3	-
CO4	2	3	3	-	-	-	-	-	-	-	-	-	2	-	3
CO5	2	3	3	-	-	-	-	-	2	2	2	2	2	-	3

3 - Strong; 2 - Medium; 1 - Some

Assessment Pattern

Bloom's Category	Lab Experiments Assessment (Marks)		Model Examination (Marks)	End Sem Examination (Marks)	
	Lab	Activity			
Remember	-	-	-	-	-
Understand	-	-	-	-	-
Apply	50	25	100	-	100
Analyse	-	-	-	-	-
Evaluate	-	-	-	-	-
Create	-	-	-	-	-
Total	50	25	100	-	100

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B.Tech – Artificial Intelligence and Data Science								
60 AD 6P2 – Deep Learning Laboratory								
Semester	**Hours/Week**			**Total Hrs**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
VI	0	0	3	45	1.5	60	40	100

1. Implementation of different activation functions to train Neural Networks.
2. Implementation of different Learning Rules.
3. Implementation of Perceptron Networks
4. Implementation of Multilayer Neural Network on MNIST dataset using MATLAB.
5. Implementation of Convolutional Neural Network (CNN) using real-world dataset*
6. Implementation of Transfer Learning of pre-trained models on the real-world dataset****
7. Implementation of Transfer Learning on the Plant Village dataset for Plant Disease Detection*
8. Implementation of Sentiment Analysis using Recurrent Neural Networks (RNN)**
9. Text Generation using Long Short-Term Memory (LSTM)
10. Implementation of Denoising and Dimensionality Reduction using Autoencoders
11. Implementation of Transfer Learning using MATLAB***

Suggested Libraries: Keras, TensorFlow, PyTorch

Suggested Software Tools: MATLAB, Anaconda, Weka

Lab Manual	
1.	"Deep Learning Lab Manual", Department of Artificial Intelligence and Data Science, KSRCT.

*SDG:3 - Good Health and Well-being
**SDG:8 - Decent Work and Economic Growth
***SDG:9 - Industry innovation and infrastructure
****SDG:11 - Sustainable Cities and Communities

Course Designer(s)

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K.S. RANGASAMY COLLEGE OF TECHNOLOGY, TIRUCHENGODE - 637215

(An Autonomous Institution affiliated to Anna University)

B.E. / B.Tech. Degree Programme

SCHEME OF EXAMINATIONS

(For the candidates admitted from 2022-2023 onwards)

SEVENTH SEMESTER

S. No.	Course Code	Name of the Course	Duration of Internal Exam	Weightage of Marks			Minimum Marks for Pass in End Semester Exam	
				Continuous Assessment *	End Semester Exam **	Max. Marks	End Semester Exam	Total
THEORY								
1	60 AD 701	Computer Vision	2	40	60	100	45	100
2	60 AD 702	Natural Language Processing	2	40	60	100	45	100
3	60 AD 703	Cloud Computing	2	40	60	100	45	100
4	60 AD 704	Big Data Analytics	2	40	60	100	45	100
5	60 AD E3*	Elective III	2	40	60	100	45	100
6	60 AD E4*	Elective IV	2	40	60	100	45	100
7	60 AC 001	Research Skill Development	-	-	-	100	-	100
8	60 AB 00*	NCC/NSS/NSO/YRC/RRC/ Fine Arts*	-	-	-	-	-	-
PRACTICAL								
9	60 AD 7P1	Computer Vision Laboratory	2	60	40	100	45	100
10	60 AD 7P2	Project Work – Phase I	2	100	-	100	45	100
11	60 CG 0P6	Internship	2	100	-	100	-	-

* CA evaluation pattern will differ from course to course and for different tests. This will have to be declared in advance to students. The department will put a process in place to ensure that the actual test paper follow the declared pattern.

** End Semester Examination will be conducted for maximum marks of 100 and subsequently be reduced to 60 marks for the award of terminal examination marks.

Rev. No.3/w.e.f. 22.07.2024
Passed in BoS Meeting held on 24/05/2024
Approved in Academic Council Meeting held on 25/05/2024

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60 AD 701	Computer Vision	Category	L	T	P	Credit
		PC	3	0	0	3

Objectives

- To review image processing techniques for computer vision.
- To understand various features and recognition techniques
- To learn about histograms and binary vision
- To apply three-dimensional image analysis techniques
- To study real-world applications of computer vision algorithms.

Pre-requisites

- Foundational knowledge of Machine Learning, Deep Learning

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Compare low-level processing of images and transformation techniques applied to images.	Remember.
CO2	Use the feature extraction, segmentation, and object recognition methods.	Understand.
CO3	Apply Histogram transform for detection of geometric shapes like lines, ellipses, and objects	Apply.
CO4	Analyze 3D vision process and motion estimation techniques	Analyze.
CO5	Apply vision techniques to real-time applications	Apply.

Mapping with Programme Outcomes

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	2	3	2	-	3	-	-	-	-	-	-	-	-	2	2
CO2	2	3	2	-	3	-	-	-	-	-	-	-	2	3	3
CO3	2	3	2	-	3	-	-	-	-	-	-	-	2	3	-
CO4	2	3	2	-	3	-	-	-	-	-	-	-	2	-	3
CO5	2	3	2	-	3	-	-	-	-	-	-	-	2	-	3
3 - Strong; 2 - Medium; 1 - Some															

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		End Sem Examination (Marks)
	1	2	
Remember	10	10	10
Understand	20	20	40
Apply	30	30	50
Analyse	-	-	-
Evaluate	-	-	-
Create	-	-	-
Total	60	60	100

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Syllabus

K.S.Rangasamy College of Technology – Autonomous R2022								
B.Tech – Artificial Intelligence and Data Science								
60 AD 701 – Computer Vision								
Semester	**Hours/Week**			**Total Hours**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
VII	3	0	0	45	3	40	60	100

Introduction Image Processing, Computer Vision - Low-level, Mid-level, High-level - Fundamentals of Image Formation, Transformation: Orthogonal, Euclidean, Affine, Projective, Fourier Transform, Convolution and Filtering, Image Enhancement, Restoration, Histogram Processing.	[9]
Feature Extraction and Feature Segmentation **Feature Extraction** -Edges - Canny, LOG, DOG; Line detectors (Hough Transform), Corners - Harris and Hessian Affine, Orientation Histogram, SIFT, SURF, HOG, GLOH, Scale-Space Analysis- Image Pyramids and Gaussian derivative filters, Gabor Filters and DWT. **Image Segmentation** -Region Growing, Edge Based approaches to segmentation, Graph-Cut, Mean-Shift, MRFs, Texture Segmentation.	[9]
Images, Histograms, Binary Vision Simple pinhole camera model – Sampling – Quantization – Color images – Noise – Smoothing – 1D and 3D histograms - Histogram/Image Equalization - Histogram Comparison - Back-projection - k-means Clustering – Thresholding - Threshold Detection Methods - Variations on Thresholding - Mathematical Morphology – Connectivity.	[9]
3D Vision and Motion Methods for 3D vision – projection schemes – shape from shading – photometric stereo – shape from texture – shape from focus – active range finding – surface representations – point-based representation – volumetric representations – 3D object recognition – 3D reconstruction – introduction to motion – triangulation – bundle adjustment – translational alignment – parametric motion–spline-based motion- optical flow – layered motion.	[9]
Applications* Overview of Diverse Computer Vision Applications: Document Image Analysis, Biometrics, Object Recognition, Tracking, Medical Image Analysis, Content-Based Image Retrieval, Video Data Processing, Virtual Reality and Augmented Reality	[9]
Total Hours:	**45**

Text Book(s):	
1.	D. A. Forsyth, J. Ponce, “Computer Vision: A Modern Approach”, Pearson Education, 2003.
2.	Richard Szeliski, “Computer Vision: Algorithms and Applications”, Springer Verlag London Limited, 2011.
Reference(s):	
1.	B. K. P. Horn “Robot Vision”, McGraw-Hill, 2010.
2.	Simon J. D. Prince, “Computer Vision: Models, Learning, and Inference”, Cambridge University Press, 2012.
3.	Mark Nixon and Alberto S. Aquado, “Feature Extraction & Image Processing for Computer Vision”, 3rd Edition, Academic Press, 2012.
4.	E. R. Davies, “Computer & Machine Vision”, 4th Edition, Academic Press, 2012.

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Course Contents and Lecture Schedule

S. No.	Topics	No. of hours
1.0	**Introduction**	
1.1	Image Processing, Computer Vision	1
1.2	Low-level, Mid-level, High-level	1
1.3	Fundamentals of Image Formation	1
1.4	Transformation: Orthogonal, Euclidean, Affine	1
1.5	Projective, Fourier Transform	1
1.6	Convolution and Filtering	1
1.7	Image Enhancement	1
1.8	Restoration	1
1.9	Histogram Processing	1
2.0	**Feature Extraction and Feature Segmentation**	
2.1	**Feature Extraction** -Edges - Canny	1
2.2	LOG, DOG	1
2.3	Line detectors (Hough Transform), Corners	1
2.4	Harris and Hessian Affine	1
2.5	Orientation Histogram, SIFT, SURF, HOG, GLOH	1
2.6	Scale-Space Analysis- Image Pyramids and Gaussian derivative filters, Gabor Filters and DWT	1
2.7	**Image Segmentation** -Region Growing, Edge Based approaches to segmentation	1
2.8	Graph-Cut, Mean-Shift	1
2.9	MRFs, Texture Segmentation	1
3.0	**Images, Histograms, Binary Vision**	
3.1	Simple pinhole camera model	1
3.2	Sampling – Quantization - Color images	1
3.3	Noise – Smoothing	1
3.4	1D and 3D histograms - Histogram/Image Equalization	1
3.5	Histogram Comparison - Back-projection	1
3.6	k-means Clustering – Thresholding	1
3.7	Threshold Detection Methods	1
3.8	Variations on Thresholding	1
3.9	Mathematical Morphology – Connectivity	1
4.0	**3D Vision and Motion**	
4.1	Methods for 3D vision–projection schemes	1
4.2	shape from shading – photometric stereo	1
4.3	shape from texture – shape from focus – active range finding	1
4.4	surface representations – point-based representation – volumetric representations	1
4.5	3D object recognition – 3D reconstruction	1
4.6	Introduction to motion – triangulation – bundle adjustment	1
4.7	translational alignment	1
4.8	parametric motion–spline-based motion	1
4.9	optical flow – layered motion	1
5.0	**Applications**	
5.1	Overview of Diverse Computer Vision Applications: Document Image Analysis	1
5.2	Biometrics	1
5.3	Object Recognition	1

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5.4	Tracking	1
5.5	Medical Image Analysis	1
5.6	Content-Based Image Retrieval	1
5.7	Video Data Processing	1
5.8	Virtual Reality	1
5.9	Augmented Reality	1

Course Designer(s)

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60 AD 702	Natural Language Processing	Category	L	T	P	Credit
		PC	3	0	0	3

Objectives

- To learn the fundamentals of natural language processing
- To understand the use of CFG and PCFG in NLP
- To understand the role of semantics of sentences and pragmatics
- To apply the NLP techniques to IR applications
- To learn discourses and Lexical Resources

Pre-requisites

- Data Analytics, Probability and Statistics, Python

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Understand about tag a given text with basic Language features	Understand
CO2	Implement a rule-based system to tackle morphology/syntax of a language	Apply
CO3	Design a tag set to be used for statistical processing for real-time applications.	Understand
CO4	Compare and contrast the use of different statistical approaches for different types of NLP applications	Analyse
CO5	Understand tools use to process natural language and design innovative NLP applications	Understand

Mapping with Programme Outcomes

Cos	Pos												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	2	3	-	-	3	-	-	1	-	-	-	1	3	3	1
CO2	2	3	-	-	3	-	-	1	-	-	-	1	3	3	1
CO3	2	3	2	-	3	-	-	1	-	-	-	1	3	3	1
CO4	2	3	2	-	3	-	-	1	-	-	-	1	2	3	1
CO5	2	3	3	-	3	-	-	1	-	-	-	1	1	3	1
3 – Strong; 2 – Medium; 1 – Some															

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		End Sem Examination (Marks)
	1	2	
Remember	20	20	20
Understand	20	20	20
Apply	-	-	20
Analyse	-	-	20
Evaluate	20	20	20
Create	-	-	-
Total	60	60	100

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Syllabus

K.S.Rangasamy College of Technology – Autonomous R2022								
B.Tech – Artificial Intelligence and Data Science								
60 AD 702-Natural Language Processing								
Semester	**Hours/Week**			**Total Hours**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
VII	3	0	0	45	3	40	60	100

Introduction * Origins and challenges of NLP – Language Modeling: Grammar-based LM, Statistical LM – Regular Expressions, Finite-State Automata – English Morphology, Transducers for Lexicon and Rules, Tokenization, Detecting and Correcting Spelling Errors, Minimum Edit Distance.	[9]
Word Level Analysis * Unsmoothed N-grams, Evaluating N-grams, Smoothing, Interpolation and Backoff – Word Classes, Part-of-Speech Tagging, Rule-based, Stochastic and Transformation-based tagging, Issues in PoS tagging – Hidden Markov and Maximum Entropy models. *	[9]
Syntactic Analysis * Context-Free Grammars, Grammar Rules for English, Treebanks, Normal Forms for Grammar – Dependency Grammar – Syntactic Parsing, Ambiguity, Dynamic Programming parsing – Shallow Parsing – Probabilistic CFG, Probabilistic CYK, Probabilistic Lexicalized CFGs – Feature Structures, Unification of Feature Structures. *	[9]
Semantics and Pragmatics * Requirements for Representation, First-Order Logic, Description Logics – Syntax-Driven Semantic Analysis, Semantic Attachments – Word Senses, Relations Between Senses, Thematic Roles, Selection Restrictions – Word Sense Disambiguation, WSD Using Supervised, Dictionary & Thesaurus, Bootstrapping methods – Word Similarity Using Thesaurus and Distributional Methods.	[9]
Discourse Analysis and Lexical Resources * Discourse Segmentation, Coherence – Reference Phenomena, Anaphora Resolution using Hobbs and Centering Algorithm – Coreference Resolution – Resources: Porter Stemmer, Lemmatizer, Penn Treebank, Brill's Tagger, WordNet, PropBank, FrameNet, Brown Corpus, British National Corpus (BNC),Virtualization	[9]
Total Hours:	**45**

Text Book(s):	
1.	Daniel Jurafsky, James H. Martin"Speech and Language Processing:" An Introduction to Natural Language Processing" Computational Linguistics and Speech, Pearson Publication, 2014.
2.	Steven Bird, Ewan Klein and Edward Loper, "Natural Language Processing with Python,"First Edition, OReilly Media, 2009
Reference(s):	
1.	Breck Baldwin,"Language Processing with Java and LingPipe Cookbook", Atlantic Publisher, 2015.
2.	Richard M Reese, "Natural Language Processing with Java", OReilly Media, 2015.
3.	Nitin Indurkhya and Fred J. Damerau, "Handbook of Natural Language Processing", Second Edition, Chapman and Hall/CRC Press, 2010.
4.	Tanveer Siddiqui, U.S. Tiwary, "Natural Language Processing and Information Retrieval", Oxford University Press, 2008

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Course Contents and Lecture Schedule

S. No.	Topics	No. of hours
1.0	**Introduction**	
1.1	Origins and Challenges of NLP	1
1.2	Language Modeling: Grammar-based LM	1
1.3	Statistical LM	1
1.4	Regular Expressions	1
1.5	Finite-State Automata	1
1.6	English Morphology	1
1.7	Transducers for Lexicon and Rules	1
1.8	Tokenization	1
1.9	Detecting and Correcting Spelling Errors, Minimum Edit Distance	1
2.0	**Word Level Analysis**	
2.1	Unsmoothed N-grams	1
2.2	Evaluating N-grams	1
2.3	Smoothing, Interpolation and Backoff	1
2.4	Word Classes	1
2.5	Part-of-Speech Tagging	1
2.6	Rule-based, Stochastic	1
2.7	Transformation-Based Tagging	1
2.8	Issues in PoS tagging	1
2.9	Hidden Markov and Maximum Entropy Models.	1
3.0	**Syntactic Analysis**	
3.1	Context-Free Grammars	1
3.2	Grammar Rules for English	1
3.3	Treebanks, Normal Forms for Grammar	1
3.4	Dependency Grammar	1
3.5	Syntactic Parsing	1
3.6	Ambiguity, Dynamic Programming Parsing	1
3.7	Shallow parsing, Probabilistic CFG	1
3.8	Probabilistic CYK, Feature Structures	1
3.9	Unification of Feature Structures	1
4.0	**Semantics and Pragmatics**	
4.1	Requirements for Representation, First-Order Logic, Description Logics	1
4.2	Syntax-Driven Semantic Analysis	1
4.3	Semantic Attachments	1
4.4	Word Senses, Relations Between Senses	1
4.5	Thematic Roles	1
4.6	Selection restrictions, Word Sense Disambiguation	1
4.7	WSD using Supervised, Dictionary & Thesaurus	1
4.8	Bootstrapping Methods	1
4.9	Word Similarity using Thesaurus and Distributional methods	1
5.0	**Discourse Analysis and Lexical Resources**	
5.1	Discourse Segmentation	1
5.2	Coherence – Reference Phenomena	1
5.3	Anaphora Resolution using Hobbs	1
5.4	Centering Algorithm	1

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5.5	Coreference Resolution	1
5.6	National and International Strategies on AI	1
5.7	Resources: Porter Stemmer, Lemmatize	1
5.8	Penn Treebank, Brill's Tagger	1
5.9	WordNet, PropBank, FrameNet, Brown Corpus,BNC, Virtualiztion	1

Course Designer(s)

1. Mr.S. Raja - rajas@ksrct.ac.in

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60 AD 703	Cloud Computing	Category	L	T	P	Credit
		PC	3	0	0	3

Objectives

- To understand the principles of cloud architecture, models and infrastructure
- To understand the concepts of virtualization and virtual machines
- To gain knowledge about virtualization Infrastructure
- To explore and experiment with various Cloud deployment environments
- To learn about the security issues in the cloud environment

Pre-requisites

- Basics of Networking, Security and Privacy

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Understand the basic principles of cloud.	Understand
CO2	Apply the concept of virtualization and its types.	Apply
CO3	Analyze various cloud services	Analyze
CO4	Analyze the cloud eco system	Analyze
CO5	Analyze security challenges in the cloud environment.	Analyze

Mapping with Programme Outcomes

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	-	-	-	-	-	-	-	2	2	-	-	-	-	2
CO2	3	-	-	-	-	-	-	-			-	-	-	-	2
CO3	3	-	-	-	-	-	-	-	2	2	-	-	-	-	2
CO4	3	-	-	-	-	-	-	-			-	-	-	-	2
CO5	3	-	-	-	-	-	-	-	2	2	-	2	-	-	2
3 - Strong; 2 - Medium; 1 - Some															

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		End Sem Examination (Marks)
	1	2	
Remember	20	20	34
Understand	40	40	66
Apply	-	-	-
Analyse	-	-	-
Evaluate	-	-	-
Create	-	-	-
Total	60	60	100

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Syllabus

K.S.Rangasamy College of Technology – Autonomous R2022

B.Tech – Artificial Intelligence and Data Science

60 AD 703- Cloud Computing

Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
VII	3	0	0	45	3	40	60	100

Introduction Introduction to Cloud Computing – Definition of Cloud – Evolution of Cloud Computing – Underlying Principles of Parallel and Distributed Computing – Cloud Characteristics – Elasticity in Cloud – On-demand Provisioning.	[9]
Cloud Enabling Technologies Service Oriented Architecture – REST and Systems of Systems – Web Services – Publish Subscribe Model – Basics of Virtualization – Types of Virtualizations – Implementation Levels of Virtualization – Virtualization Structures – Tools and Mechanisms – Virtualization of CPU –Memory – I/O Devices –Virtualization Support and Disaster Recovery.	[9]
Cloud Architecture, Services and Storage Layered Cloud Architecture Design – NIST Cloud Computing Reference Architecture – Public, Private and Hybrid Clouds – IaaS – PaaS – SaaS – Architectural Design Challenges – Cloud Storage – Storage-as-a-Service – Advantages of Cloud Storage – Cloud Storage Providers – S3.	[9]
Cloud Eco System* Basics of VMWare, advantages of VMware virtualization, using Vmware workstation, creating virtual machines - Hadoop – MapReduce – Virtual Box — Google App Engine – Amazon Web Services: AWS Compute, Storage, and Networking, AWS Security, Identity, and Access Management, AWS Database Options, AWS Elasticity and Management Tools	[9]
Cloud Security Virtualization System-Specific Attacks: Guest hopping – VM migration attack – hyperjacking. Data Security and Storage; Identity and Access Management (IAM) - IAM Challenges - IAM Architecture and Practice.	[9]
Total Hours:	**45**

Text Book(s):

1.	Barrie Sosinsky, “Cloud Computing Bible”, Wiley, 2011.
2.	Kai Hwang, Geoffrey C Fox, Jack G Dongarra, “Distributed and Cloud Computing, From Parallel Processing to the Internet of Things”, Morgan Kaufmann Publishers, 2012.

Reference(s):

1.	James Turnbull, “The Docker Book”, O’Reilly Publishers, 2014.
2.	Krutz, R. L., Vines, R. D, “Cloud security. A Comprehensive Guide to Secure Cloud Computing”, Wiley Publishing, 2010.
3.	James E. Smith, Ravi Nair, “Virtual Machines: Versatile Platforms for Systems and Processes”, Elsevier/Morgan Kaufmann, 2005.
4.	Tim Mather, Subra Kumaraswamy, and Shahed Latif, “Cloud Security and Privacy: an enterprise perspective on risks and compliance”, O’Reilly Media, Inc., 2009.

*SDG 9 – Industry Innovation and Infrastructure

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Course Contents and Lecture Schedule

S. No.	Topics	No. of hours
1.0	**Introduction**	
1.1	Introduction to Cloud Computing	1
1.2	Definition of Cloud	1
1.3	Evolution of Cloud Computing	1
1.4	Underlying Principles of Parallel and Distributed Computing	2
1.5	Cloud Characteristics	1
1.6	Elasticity in Cloud	2
1.7	On-demand Provisioning	1
2.0	**Cloud Enabling Technologies**	
2.1	Service Oriented Architecture	1
2.2	REST and Systems of Systems	1
2.3	Web Services	1
2.4	Publish Subscribe Model	1
2.5	Basics of Virtualization	1
2.6	Types of Virtualizations	1
2.7	Implementation Levels of Virtualization – Virtualization Structures	1
2.8	Tools and Mechanisms – Virtualization of CPU –Memory	1
2.9	I/O Devices –Virtualization Support and Disaster Recovery.	1
3.0	**Cloud Architecture, Services and Storage**	
3.1	Layered Cloud Architecture Design	1
3.2	NIST Cloud Computing Reference Architecture	2
3.3	Public, Private and Hybrid Clouds	1
3.4	laaS – PaaS – SaaS	1
3.5	Architectural Design Challenges	1
3.6	Cloud Storage – Storage-as-a-Service	1
3.7	Advantages of Cloud Storage	1
3.8	Cloud Storage Providers – S3.	1
4.0	**Cloud Eco System**	
4.1	Basics of VMWare, advantages of VMware virtualization, using Vmware workstation	1
4.2	creating virtual machines	1
4.3	Hadoop – MapReduce – Virtual Box	1
4.4	Google App Engine	1
4.5	Amazon Web Services: AWS Compute, Storage, and Networking	2
4.6	AWS Security, Identity, and Access Management	1
4.7	AWS Database Options	1
4.8	AWS Elasticity and Management Tools	1
5.0	**Cloud Eco System**	
5.1	Virtualization System	1
5.2	Specific Attacks: Guest hopping	1
5.3	VM migration attack	1
5.4	hyperjacking	2
5.5	Data Security and Storage; Identity and Access Management (IAM)	1
5.6	IAM Challenges	2
5.7	IAM Architecture and Practice	1

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Course Designer(s)

1.Dr.E.Mohanraj - mohanraj@ksrct.ac.in

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60 AD 704	Big Data Analytics	Category	L	T	P	Credit
		PC	3	0	0	3

Objectives

- To know the fundamental concepts of big data and analytics.
- To introduce big data analytics technology and tools including MapReduce and Hadoop.
- To understand the importance of mining data streams and social network graphs.
- To learn different mining algorithms and recommendation systems for large volumes of data.
- To know the concepts of data pre-processing for huge amount of data.

Pre-requisites

- Data Visualization.

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Reframe a business challenge as an analytics challenge.	Remember
CO2	Compare Hadoop, MapReduce and Locality-Sensitive Hashing for enterprise-class scalability and reliability.	Understand
CO3	Apply Clustering techniques for mining larger datasets.	Understand
CO4	Design an efficient recommendation system.	Apply
CO5	Handle large dataset using dimensionality reduction technique.	Analyse

Mapping with Programme Outcomes

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	-	-	-	3	-	-	-	-	-	-	-	-	-	-
CO2	3	2	-	-	2	-	-	-	-	-	-	1	2	1	-
CO3	3	2	-	-	2	-	-	-	-	-	-	1	3	2	3
CO4	3	2	-	-	2	-	-	-	-	-	-	3	2	2	2
CO5	3	3	-	-	2	-	-	-	-	-	-	2	2	3	2
3 - Strong; 2 - Medium; 1 - Some															

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		End Sem Examination (Marks)
	1	2	
Remember	10	10	20
Understand	20	20	30
Apply	10	10	20
Analyse	20	20	30
Evaluate	-	-	-
Create	-	-	-
Total	60	60	100

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Syllabus

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B. Tech-Artificial Intelligence and Data Science								
60 AD 704 - Big Data Analytics								
Semester	**Hours/Week**			**Total Hours**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
VII	3	0	0	45	3	40	60	100

Introduction Characteristics Of Big Data - Data in The Warehouse and Data in Hadoop – Big Data Use Cases: Patterns for Big Data Deployment – IT For IT Log Analytics - The Fraud Detection Pattern – Social Media Pattern – Risk: Patterns for Modelling and Management – Big Data and The Energy Sector.	[9]
Hadoop, MapReduce and New Software Stack The History of Hadoop – Components of Hadoop – Application Development in Hadoop - Getting Data into Hadoop - Distributed File Systems - MapReduce - Algorithms Using MapReduce - Extensions to MapReduce - The Communication Cost Model - Complexity Theory For MapReduce.	[9]
Clustering Introduction To Clustering Techniques - Hierarchical Clustering - K-Means Algorithms - The CURE Algorithm - Clustering in Non-Euclidean Spaces - Clustering for Streams and Parallelism	[9]
Recommendation Systems and Mining Social A Model for Recommendation Systems – Content Based Recommendations - Collaborative Recommendation- Hybrid Recommendation Approaches. Collaborative Filtering - Clustering of Social - Direct Discovery of Communities - Partitioning of Graphs - Finding Overlapping Communities.	[9]
Dimensionality Reduction and Large Scale Machine Learning Eigenvalues and Eigenvectors of Symmetric Matrices - Principal-Component Analysis - Singular-Value Decomposition - CUR Decomposition - The Machine: Learning Model - Perceptron's - Learning from Nearest Neighbours - Comparison of Learning Methods- Memory Databases Like Redis (Case Studies).	[9]
Total Hours:	**45**

Text Book(s):	
1.	Paul C. Zikopoulos, Chris Eaton, Dirk Deroos, Thomas Deutsch, George Lapis, "Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data", Mcgraw-Hill, 2015
2.	Anand Rajaraman And Jeffrey David Ullman, "Mining of Massive Datasets", Cambridge University Press, 2014
Reference(S):	
1.	Kim H. Pries and Robert Dunnigan, "Big Data Analytics: A Practical Guide for Managers " CRC Press, 2015.
2.	Bart Baesens, "Analytics in A Big Data World: The Essential Guide to Data Science and Its Applications", Wiley Publishers, 2015.
3.	Peter Bühlmann, Petros Drineas, Michael Kane, Mark Van Der Laan, "Handbook of Big Data", CRC Press, 2016.
4.	EMC Education Services, "Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data", Wiley Publishers, 2015

**SDG 9 – Industry Innovation and Infrastructure

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Course Contents and Lecture Schedule

S. No.	Topics	No. of hours
1.0	**Introduction**	
1.1	Characteristics Of Big Data	1
1.2	Data In the Warehouse and Data In Hadoop	1
1.3	Big Data Use Cases	2
1.4	IT For IT Log Analytics	1
1.5	The Fraud Detection Pattern	1
1.6	Social Media Pattern	1
1.7	Risk: Patterns for Modelling and Management	1
1.8	Big Data and The Energy Sector.	1
2.0	**Hadoop, MapReduce and New Software Stack**	
2.1	The History of Hadoop	1
2.2	Components of Hadoop	1
2.3	Application Development in Hadoop	1
2.4	Getting Data into Hadoop	1
2.5	Distributed File Systems	1
2.6	Algorithms Using MapReduce	1
2.7	Extensions To MapReduce	1
2.8	The Communication Cost Model	2
3.0	**Clustering**	
3.1	Introduction To Clustering Techniques	1
3.2	Hierarchical Clustering	1
3.3	K-Means Algorithms	2
3.4	CURE Algorithm	1
3.5	Euclidean Spaces	2
3.6	Clustering For Streams and Parallelism	2
4.0	**Recommendation Systems and Mining Social**	
4.1	Model for Recommendation Systems	1
4.2	Content Based Recommendations	1
4.3	Collaborative Recommendation	1
4.4	Hybrid Recommendation Approaches	1
4.5	Collaborative Filtering	1
4.6	Clustering Of Social and Partitioning of Graphs	2
4.7	Direct Discovery of Communities	1
4.8	Finding Overlapping Communities	1
5.0	**Dimensionality Reduction and Large**	
5.1	Scale Machine Learning Eigenvalues and Eigenvectors of Symmetric Matrices	2
5.2	Principal and Component Analysis	1
5.3	Singular-Value Decomposition	1
5.4	CUR Decomposition	1
5.5	Machine and its Learning Model with Perceptron’s	1
5.6	Learning from Nearest Neighbours	1
5.7	Comparison of Learning Methods	2

Course Designer(s)

1.Ms.P. Indhumathi- indhumathip@ksrct.ac.in

Rev. No.3/w.e.f. 22.07.2024
Passed in BoS Meeting held on 24/05/2024
Approved in Academic Council Meeting held on 25/05/2024

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60 AC 001	Research Skill Development	Category	L	T	P	Credit
		AC	1	0	0	0

Objectives

- To identify research problems, formulate hypotheses, collect data and test hypotheses
- To prepare and submit quality manuscripts and understand peer review process
- To utilize software tools for effective manuscript preparation and visualization of research data
- To familiarize different journal metrics and author-level quality indicators
- To protect creative works, inventions, and branding elements using IPR

Pre-requisites

- Nil

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Develop structured scientific approach to plan and execute research work	Apply
CO2	Understand the journal requirements to publish research findings effectively	Understand
CO3	Apply various software tools during the manuscript preparation	Apply
CO4	Select suitable journals to publish the work using different publication metrics	Analyse
CO5	Apply the appropriate form of IP protection to a specific invention or creation	Apply

Mapping with Programme Outcomes

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	2	2	2	2	-	2	2	3	3	3	-	3	-	-	-
CO2	-	-	-	-	-	-	-	3	3	3	-	3	-	-	-
CO3	-	-	-	-	3	-	-	3	3	3	-	3	-	-	-
CO4	-	-	-	-	-	-	-	3	3	-	-	3	-	-	-
CO5	-	-	2	2	-	-	-	3	3	3	-	3	-	-	-

3 - Strong; 2 - Medium; 1 – Some

Assessment Pattern

One review at end of the semester

Parameters	Weightage (Marks)
Research Problem Identification (Research gap, SDG, Objectives)	10
Literature Review preparation (Clarity, Number and quality of sources)	20
Patent Draft/ Manuscript Preparation (Structure, Content)	20
Use of software tools (Plagiarism, Reference Management, etc.,)	10
Journal Identification (Aim & scope of the journal, journal metrics)	10
Presentation & Viva voce	30
Total	**100**

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Syllabus

K.S.Rangasamy College of Technology – Autonomous R2022								
60 AC 001 – Research Skill Development								
Semester	**Hours/Week**			**Total Hours**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
VII	1	0	0	15	0	100	-	100

Research - Scientific Approach* Types of Research - Identification and Clarification of the problem – Problem analysis - Formulating hypothesis, Selection of sample and tools of data collection - Testing the hypothesis - Conclusion	[3]
Manuscript Preparation* Structure of a manuscript - Types of manuscript - Graphical abstract - Highlights - Literature Review - Citation - Reference style - Plagiarism – Journal selection - Peer review process	[3]
Research Toolkit* Software Tools for Writing enhancement - Literature review - Reference management - Data analysis and visualization - Drawing - Plagiarism	[3]
Research Publication Metrics* Journal Index: Scopus - Web of Science - SCI - UGC Care - Q Journal; Journal Metrics: Impact Factor, Cite Score; Quality Indicators: h-index - i-10 index - citations	[3]
Intellectual Property Rights* Patents - Industrial Designs - Copyright - Trademarks - Geographical Indications - Trade Secrets	[3]
Total Hours:	**15**

Reference(s):

1.	Kothari, C.R. and Gaurav Garg, “Research Methodology: Methods and Techniques”, New Age International Publishers, 2023
2.	Chawla H S., “Introduction to Intellectual Property Rights”, CBS Publishers and Distributors Private Limited, 2019

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Course Contents and Lecture Schedule		
S. No.	**Topics**	**No. of hours**
1	**Research - Scientific Approach**	
1.1	Types of Research - Identification and Clarification of the problem – Problem analysis - Formulating hypothesis	2
1.2	Selection of sample and tools of data collection - Testing the hypothesis - Conclusion	1
2	**Manuscript Preparation**	
2.1	Structure of a manuscript - Types of manuscript - Graphical abstract - Highlights	1
2.2	Literature Review	1
2.3	Citation - Reference style – Plagiarism, Journal selection - Peer review process	1
3	**Research Toolkit**	
3.1	Software Tools for Writing enhancement	1
3.2	Literature review, Reference management	1
3.3	Data analysis and visualization – Drawing, Plagiarism	1
4	**Research Publication Metrics**	
4.1	Journal Index: Scopus - Web of Science - SCI - UGC Care - Q Journal;	1
4.2	Journal Metrics: Impact Factor, Cite	1
4.3	ScoreQuality Indicators: h-index - i-10 index - citations	1
5	**Intellectual Property Rights**	
5.1	Patents	1
5.2	Industrial Designs - Copyright	1
5.3	Trademarks - Geographical Indications - Trade Secrets	1

Course Designer

1. Dr.M.Kathirselvam - mkathirselvam@ksrct.ac.in

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60 AD 7P1	Computer Vision Laboratory	Category	L	T	P	Credit
		PC	0	0	4	2

Objectives

- To review image processing techniques for computer vision.
- To understand various features and recognition techniques
- To learn about histograms and binary vision
- To apply three-dimensional image analysis techniques
- To study real-world applications of computer vision algorithms

Pre-requisites

- Foundational knowledge of Machine Learning, Deep learning

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Implement image handling and processing operations on the image and transformation	Apply
CO2	Apply various transformation techniques to images	Apply
CO3	Estimate the parameters of a lens and image sensor of an image or video camera.	Apply
CO4	Apply various image segmentation methods to find the boundaries of objects within images	Apply
CO5	Apply various feature descriptor techniques to images	Apply

Mapping with Programme Outcomes

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	2	3	3	3	3	-	-	-	-	-	-	-		2	2
CO2	2	3	3	3	3	-	-	-	-	-	-	-	2	3	3
CO3	2	3	3	3	3	-	-	-	-	-	-	-	2	3	-
CO4	2	3	3	3	3	-	-	-	-	-	-	-	2	-	3
CO5	2	3	3	3	3	-	-	-	-	-	-	-	2	-	3

3 - Strong; 2 - Medium; 1 - Some

Assessment Pattern

Bloom's Category	Lab Experiments Assessment (Marks)		Model Examination (Marks)	End Sem Examination (Marks)
	Lab	Activity		
Remember	-	-	-	-
Understand	-	-	-	-
Apply	50	25	100	100
Analyse	-	-	-	-
Evaluate	-	-	-	-
Create	-	-	-	-
Total	50	25	100	100

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K.S.Rangasamy College of Technology – Autonomous R2022								
B.Tech – Artificial Intelligence and Data Science								
60 AD 7P1 – Computer Vision Laboratory								
Semester	**Hours/Week**			**Total Hrs**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
VII	0	0	4	60	2	60	40	100

1. Image handling and processing operations on the image
2. Geometric Transformation
3. Compute Homography Matrix
4. Perspective Transformation
5. Camera Calibration using MATLAB*
6. Compute Fundamental Matrix
7. Edge, Line, and Corner Detection
8. SIFT Feature Descriptor
9. SURF and HOG Feature Descriptor using MATLAB
10. Calibrate a camera using AprilTags in MATLAB
11. Augmented Reality Using AprilTag Markers in MATLAB
12. 3-D Brain Tumor Segmentation using MATLAB

Suggested Software Tools: Anaconda, Spyder, MATLAB

Lab Manual	
1.	"Computer Vision Lab Manual", Department of Artificial Intelligence and Data Science, KSRCT.

*SDG:4 - Quality Education

Course Designer(s)

1.Dr.S.Sarumathi – sarumathi@ksrct.ac.in

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60 AD 7P2	Project Work – Phase I	Category	L	T	P	Credit
		CGC	0	0	4	2

Objectives

- To impart practical knowledge to the students
- To apply the gained engineering concepts in their project work
- To provide an exposure to the students to collect and review the research articles, journals, a conference proceedings relevant to their project work
- To design an innovative project work
- To implement the project with the recent IT tools

Pre-requisites

- Subjects From Semester I to VI

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Identify engineering problems relevant to the domain and perform related literature survey
CO2	Analyze and identify an appropriate methodology to solve the problem
CO3	Do experimentation / simulation / programming / fabrication, collect and interpret data
CO4	Prepare and present their technical report with relevant project work details
CO5	Demonstrate their responsibility as an individual and as a leader in a team

Mapping with Programme Outcomes

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	3	3	3	2	3	3	3	3	3	3	2	2	2
CO2	3	3	3	3	3	2	2	3	3	3	3	3	3	3	3
CO3	3	3	3	3	3	2	2	3	3	3	3	3	3	3	3
CO4	3	2	2	3	2	2	2	3	3	3	3	3	2	2	2
CO5	3	-	3	-	-	-	2	3	3	3	3	3	2	2	3
3 - Strong; 2 - Medium; 1 – Some															

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K.S.Rangasamy College of Technology – Autonomous R2022								
B.Tech – Artificial Intelligence and Data Science								
60 AD 7P2 - Project Work – Phase I								
Semester	**Hours/Week**			**Total Hrs**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
VII	0	0	4	60	2	100	-	100

Methodology:

- Project Work Phase-I shall be evaluated by the project review committee (Project coordinator, Project Guide and HOD/Subject experts in the department).
- Three reviews shall be conducted with subject expert and the student(s) shall make a presentation on the progress made by him / her / them during the reviews.
- Student(s) shall submit a project technical report comprising of title, problem statement, importance of work, modifications, proof of concept, methodology and review of literature during the 3rd review .
- The total marks obtained in the three reviews shall be reduced to 100 marks and rounded to the nearest integer.
- The schedule will be announced by the Project Coordinator and Head of the Department.

Project Work Phase I:
(Internal Assessment: 100 Marks)

Review I (R1)			**Review II (R2)**		**Review III (R3)**			**Total (R1+R2+R3)**	**Internal**
Literature Survey	Topic Identification & Justification	Work Plan	Approach	Conclusion	Demo-Existing System	Presentation	Report	Total	
10	10	10	20	20	10	10	10	100	100

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K.S. RANGASAMY COLLEGE OF TECHNOLOGY, TIRUCHENGODE - 637215

(An Autonomous Institution affiliated to Anna University)

B.E. / B.Tech. Degree Programme

SCHEME OF EXAMINATIONS

(For the candidates admitted from 2022-2023 onwards)

EIGHTH SEMESTER

S. No.	Course Code	Name of the Course	Duration of Internal Exam	Weightage of Marks			Minimum Marks for Pass in End Semester Exam	
				Continuous Assessment *	End Semester Exam **	Max. Marks	End Semester Exam	Total
THEORY								
1	60 AD E5*	Elective V	2	40	60	100	45	100
PRACTICAL								
2	60 AD 8P1	Project Work – Phase II	2	60	40	100	45	100
3	60 CG 0P6	Internship	2	100	-	100	-	-

* CA evaluation pattern will differ from course to course and for different tests. This will have to be declared in advance to students. The department will put a process in place to ensure that the actual test paper follow the declared pattern.

** End Semester Examination will be conducted for maximum marks of 100 and subsequently be reduced to 60 marks for the award of terminal examination marks.

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60 AD 8P1	Project Work – Phase II	Category	L	T	P	Credit
		CGC	0	0	16	8

Objectives

- To impart practical knowledge to the students
- To apply the gained engineering concepts in their project work
- To provide an exposure to the students to collect and review the research articles, journals, a conference proceedings relevant to their project work
- To design an innovative project work
- To implement the project with the recent IT tools

Pre-requisites

- Subjects From Semester I to VII

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Identify engineering problems relevant to the domain and perform related literature survey
CO2	Apply algorithm and design techniques in the project and experience their outcome in their own real time project scenario
CO3	Do experiment / simulate / program / fabricate, collect and interpret data
CO4	Document the results in the form of technical report / presentation
CO5	Develop the management skills to achieve the project goal by working as a team and demonstrate the technical skills acquire to provide feasible solution for real-life problems

Mapping with Programme Outcomes

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	3	3	3	2	3	3	3	3	3	3	2	2	2
CO2	3	3	3	3	3	2	2	3	3	3	3	3	3	3	3
CO3	3	3	3	3	3	2	2	3	3	3	3	3	3	3	3
CO4	3	2	2	3	2	2	2	3	3	3	3	3	2	2	2
CO5	3	-	3	-	-	-	2	3	3	3	3	3	2	2	3
3 - Strong; 2 - Medium; 1 – Some															

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B.Tech – Artificial Intelligence and Data Science								
60 AD 8P1 - Project Work - Phase II								
Semester	**Hours/Week**			**Total Hrs**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
VII	0	0	16	240	8	60	40	100

Methodology:

The objective of Project Work & Dissertation is to enable the student to extend further investigative a study on the project

- Three reviews shall be conducted by project review committee (Project coordinator, Project Guide and HOD/Subject experts in the department)
- Student(s) shall make a presentation on the progress made by him / her / them during the reviews
- Student(s) shall submit a project technical report comprising of title, problem statement, importance of work, methodology, experimental work and outcome of the work carried out during the 3rd review
- The work carried out may be either under the guidance of a supervisor from the department or jointly with a supervisor drawn from other department / academic institution / R& D laboratory / Industry
- The project reviews (R1+R2+R3+R4) shall carry a maximum of 60 marks
- The project report shall be submitted as per the approved guidelines given by the college, the viva-voce examination shall carry 40 marks
- Marks are awarded to each student of the project group based on the individual performance in the viva-voce examination.

Project Work Phase II UG:

(Internal Assessment: 60 Marks + End Semester Examination: 40 Marks)

Internal Assessment (60)					End Semester (40)
Items	**Review 1**	**Review 2**	**Review 3**	**Publication***	
Marks	**5**	**10**	**15**	**30**	**40**
	Total internal marks 60				

Note:

***Publication marks shall be awarded based on the following criteria**

1. SCI / WoS Journal = 30 Marks
2. Scopus Indexed Journal / Scopus Indexed Book Chapters/ IEEE Conference = 27 Marks
3. Journals listed in UGC Care = 25 Marks

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60 AD E11	Business Intelligence	Category	L	T	P	Credit
		PC	3	0	0	3

Objectives

- Introduce the concepts and components of Business Intelligence (BI)
- Evaluate the technologies that make up BI
- Define how BI will help an organization and whether it will help yours.
- Identify the technological architecture that makes up BI systems.
- To allow a business to make informed decisions

Pre-requisites

- A good foundation for this field includes classes in computer and information science, accounting, finance, economics, business, management, political science and government

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Differentiate between Transaction Processing and Analytical applications and the need for Business Intelligence	Analyze
CO2	Demonstrate the technology and processes associated with Business Intelligence framework	Apply
CO3	Implement Data Warehouse methodology and project life cycle in real world applications	Apply
CO4	Construct a business scenario, identify the metrics, indicators and make recommendations to achieve the business goal	Create
CO5	Design an enterprise dashboard as the key performance indicators to help in decision making.	Create

Mapping with Programme Outcomes

COs	POs												PSOs		
	1	2	3	4	5	-	-	-	-	10	11	12	1	2	3
CO1	3	2	2	1	1	-	-	-	-	-	-	-	-	1	-
CO2	3	3	2	-	-	-	-	-	-	-	-	-	-	-	2
CO3	3	2	2	1	1	-	-	-	-	2	2	2	-	-	-
CO4	2	1	2	2	3	-	-	-	-	-	-	-	-	-	1
CO5	2	1	2	1	2	-	-	-	-	-	-	-	-	-	-
3 - Strong; 2 - Medium; 1 - Some															

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		End Sem Examination (Marks)
	1	2	
Remember	20	20	34
Understand	40	40	66
Apply	-	-	-
Analyse	-	-	-
Evaluate	-	-	-
Create	-	-	-
Total	60	60	100

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B.Tech– Artificial Intelligence and Data Science								
60 AD E11- Business Intelligence								
Semester	**Hours/Week**			**Total Hours**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
V	3	0	0	45	3	40	60	100

Introduction to Business Intelligence Introduction to OLTP and OLAP, BI Definitions & Concepts, Business Applications of BI, BI Framework, Role of Data Warehousing in BI, BI Infrastructure Components – BI Process, BI Technology, BI Roles & Responsibilities*	[9]
Basics of Data Integration Information integration, Enterprise Application integration, Web Services-Management Issues- Parallelism- Granularity-Dependence, Data Enhancement-Incremental Enhancement- Batch Enhancements-Standardization.	[9]
Extraction Transformation Loading Introduction to ETL using SSIS, Data Quality-Data Cleansing-data profiling -Knowledge Discovery and Data Mining-Public Data-Unstructured Data-Data Resources-Source data transformation-Reconciliation-ETL Testing*	[9]
Introduction to Multi-Dimensional Data Modelling Introduction to data and dimension modelling, multidimensional data model, ER Modelling vs. multi-dimensional modelling, concepts of dimensions, facts, cubes, attribute, hierarchies, star and snowflake schema, introduction to business metrics and KPIs, creating cubes using SSAS*	[9]
Basics of Enterprise Reporting Introduction to enterprise reporting, concepts of dashboards, balanced scorecards, introduction to SSRS Architecture, enterprise reporting using SSRS*	[9]
Total Hours:	**45**

Text Book(s):	
1.	David Loshin and David Loshin, “Business Intelligence”, First Edition, 2003
2.	Mike Biere, “Business intelligence for the enterprise”, Pearson Publication, First Edition.
Reference(s):	
1.	Larissa Terpeluk Moss, ShakuAtre , “Business intelligence roadmap” , First Edition
2.	CindiHowson, “Successful Business Intelligence: Secretsto making Killer BI Applications” McGraw-Hill Education, Second Edition, 2013.
3.	Brain, Larson, “Delivering business intelligence with Microsoft SQL server 2008”, McGraw-Hill Education, 2008
4.	Lynn Langit, “Foundations of SQL Server 2005 Business Intelligence”, 2007

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Course Contents and Lecture Schedule

S. No.	Topics	No. of hours
1.0	**Introduction to Business Intelligence**	
1.1	Introduction to OLTP and OLAP, BI	1
1.2	Definitions & Concepts, Business Applications of BI	2
1.3	BI Framework	1
1.4	Role of Data Warehousing in BI	1
1.5	BI Infrastructure Components	1
1.6	BI Process, BI Technology	2
1.7	BI Roles & Responsibilities	1
2.0	**Basics of Data integration**	
2.1	Information integration	2
2.2	Enterprise Application integration	2
2.3	Web Services-Management Issues	1
2.4	Parallelism- Granularity-Dependence	1
2.5	Data Enhancement-Incremental Enhancement	1
2.6	Batch Enhancements-Standardization	2
3.0	**Extraction Transformation Loading**	
3.1	Introduction to ETL using SSIS	1
3.2	Data Quality-Data Cleansing -data profiling	2
3.3	Knowledge Discovery and Data Mining	1
3.4	Public Data-Unstructured Data	2
3.5	Data Resources	1
3.6	Source data transformation	1
3.7	Reconciliation-ETL Testing	1
4.0	**Introduction to Multi-Dimensional Data Modelling**	
4.1	Introduction to data and dimension modelling	2
4.2	Multidimensional data model	1
4.3	ER Modelling vs. multi-dimensional modelling	1
4.4	Concepts of dimensions, facts, cubes, attribute, hierarchies, star and snowflake schema	2
4.5	Introduction to business metrics and KPIs	2
4.6	Creating cubes using SSAS	1
5.0	**Basics of Enterprise Reporting**	
5.1	Introduction to enterprise reporting	2
5.2	Concepts of dashboards	1
5.3	Balanced scorecards	2
5.4	Introduction to SSRS Architecture	2
5.5	Enterprise reporting using SSRS	2

Course Designer(s)

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60 AD E12	Knowledge Engineering	Category	L	T	P	Credit
		PE	3	0	0	3

Objectives

- To understand the basics of Knowledge Engineering.
- To discuss methodologies and modelling for Agent Design and Development.
- To design and develop ontologies.
- To apply reasoning with ontologies and rules.
- To understand learning and rule learning.

Pre-requisites

- Career path in AI language and knowledge representation.

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Understand the basics of Knowledge Engineering.	Understand
CO2	Apply methodologies and modelling for Agent Design and Development.	Apply
CO3	Design and develop ontologies.	Analyze
CO4	Apply reasoning with ontologies and rules.	Apply
CO5	Understand learning and rule learning.	Understand

Mapping with Programme Outcomes

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	-	-	-	-	-	-	-	-	2	-	2	3	-	3
CO2	3	2	3	2	2	-	-	-	2	-	-	-	-	3	-
CO3	2	2	3	2	2	-	-	-	3	2	2	2	3	-	-
CO4	2	2	3	-	-	-	-	-	2	2	2	2	3	3	-
CO5	2	2	2	-	-	-	-	-	2	-	-	-	-	-	-

3 - Strong; 2 - Medium; 1 - Some

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		End Sem Examination (Marks)
	1	2	
Remember	20	10	10
Understand	10	20	20
Apply	20	20	40
Analyse	10	10	20
Evaluate	-	-	-
Create	-	-	10
Total	60	60	100

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B.Tech – Artificial Intelligence and Data Science								
60 AD E12 – Knowledge Engineering								
Semester	**Hours/Week**			**Total Hours**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
V	3	0	0	45	3	40	60	100

Reasoning Under Uncertainty Introduction – Abductive Reasoning – Probabilistic Reasoning: Enumerative Probabilities – Subjective Bayesian View – Belief Functions – Baconian Probability – Fuzzy Probability – Uncertainty Methods - Evidence-Based Reasoning – Intelligent Agent – Mixed-Initiative Reasoning– Knowledge Engineering.	[9]
Methodology and Modeling Conventional Design and Development – Development Tools and Reusable Ontologies – Agent Design and Development Using Learning Technology – Problem Solving Through Analysis and Synthesis – Inquiry-Driven Analysis and Synthesis – Evidence-Based Assessment – Believability Assessment – Drill-Down Analysis, Assumption-Based Reasoning and What-If Scenarios.	[9]
Design and Development Concepts and Instances – Generalization Hierarchies – Object Features – Defining Features –Representation – Transitivity – Inheritance – Concepts As Feature Values – Ontology Matching. Design and Development Methodologies – Steps In Ontology Development – Domain Understanding and Concept Elicitation – Modelling-Based Ontology Specification.	[9]
Reasoniing With Ontologies and Rules Production System Architecture – Complex Ontology-Based Concepts – Reduction and Synthesis Rules and The Inference Engine – Evidence-Based Hypothesis Analysis – Rule and Ontology Matching – Partially Learned Knowledge – Reasoning With Partially Learned Knowledge.	[9]
Learning and Rule Learning * Machine Learning – Concepts – Generalization and Specialization Rules – Types – Formal Definition Of Generalization. Modelling, Learning and Problem Solving – Rule Learning and Refinement – Overview – Rule Generation and Analysis – Hypothesis Learning.	[9]
Total Hours:	**45**

Text Book(s):	
1.	Gheorghe Tecuci, Dorin Marcu, Mihai Boicu, David A. Schum, Knowledge Engineering Building Cognitive Assistants for Evidence-based Reasoning, Cambridge University Press, First Edition, 2016. (Unit 1 – Chapter 1 / Unit 2 – Chapter 3,4 / Unit 3 – Chapter 5, 6 / Unit 4 - 7 , Unit 5 – Chapter 8, 9)
2.	Ronald J. Brachman, Hector J. Levesque: Knowledge Representation and Reasoning, Morgan Kaufmann, 2004.
Reference(s):	
1.	Ela Kumar, Knowledge Engineering, I K International Publisher House, 2018.
2.	John F. Sowa: Knowledge Representation: Logical, Philosophical, and Computational Foundations, Brooks/Cole, Thomson Learning, 2000.
3.	King , Knowledge Management and Organizational Learning , Springer, 2009.
4.	Jay Liebowitz, Knowledge Management Learning from Knowledge Engineering, 1st Edition, 2001.

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Course Contents and Lecture Schedule

S. No.	Topics	No. of hours
1.0	**Reasoning Under Uncertainty**	
1.1	Introduction	1
1.2	Abductive Reasoning	1
1.3	Probabilistic Reasoning: Enumerative Probabilities	1
1.4	Subjective Bayesian View, Belief Functions	1
1.5	Baconian Probability, Fuzzy Probability	1
1.6	Uncertainty Methods	1
1.7	Evidence-Based Reasoning	1
1.8	Intelligent Agent	1
1.9	Mixed-Initiative Reasoning– Knowledge Engineering	1
2.0	**Methodology and Modeling**	
2.1	Conventional Design and Development	1
2.2	Development Tools and Reusable Ontologies	1
2.3	Agent Design and Development Using Learning Technology	1
2.4	Problem Solving Through Analysis and Synthesis, Inquiry	1
2.5	Driven Analysis and Synthesis	1
2.6	Evidence-Based Assessment	1
2.7	Believability Assessment	1
2.8	Drill-Down Analysis	1
2.9	Assumption-Based Reasoning	1
3.0	**Ontologies – Design and Development**	
3.1	Concepts and Instances	1
3.2	Generalization Hierarchies	1
3.3	Object Features, Defining Features	1
3.4	Representation, Transitivity	1
3.5	Inheritance, Concepts as Feature Values	1
3.6	Ontology Matching. Design and Development Methodologies	1
3.7	Steps in Ontology Development	1
3.8	Domain Understanding and Concept Elicitation	1
3.9	Modelling-based Ontology Specification	1
4.0	**Reasoning With Ontologies and Rules**	
4.1	Production System Architecture	1
4.2	Complex Ontology-based Concepts	2
4.3	Reduction and Synthesis Rules and Inference Engine	2
4.4	Evidence-based hypothesis analysis	1
4.5	Rule and Ontology Matching	1
4.6	Partially Learned Knowledge	1
4.7	Reasoning with Partially Learned Knowledge	1
5.0	**Learning and Rule Learning**	
5.1	Machine Learning	1
5.2	Generalization and Specialization Rules	1
5.3	Types, Formal definition of Generalization	1
5.4	Modelling	1
5.5	Learning and Problem Solving	1
5.6	Rule learning and Refinement	1

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Passed in BoS Meeting held on 24/05/2024
Approved in Academic Council Meeting held on 25/05/2024

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5.7	Overview of Rule Learning and Refinement	1
5.8	Rule Generation and Analysis	1
5.9	Hypothesis Learning	1

Course Designer(s)

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		PE	**3**	**0**	**0**	**3**

Objectives

- To familiarize with recommender systems and their applications.
- To analyse the different approaches towards recommendation.
- To evaluate the effectiveness of recommender system.
- To design recommender system
- To analyse the capability to develop a recommender system solution

Pre-requisites

- Understand the Business and Visualize the Data

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Familiarize with recommender systems and their applications	Understand
CO2	Analyse the different approaches towards recommendation	Remember
CO3	Evaluate the effectiveness of recommender system	Apply
CO4	Design recommender system	Apply
CO5	To build up the capability to develop a recommender system solution	Understand

Mapping with Programme Outcomes

COs	**POs**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	2	1	-	3	1	-	-	-	3	-	-	-	3	2	3
CO2	2	1	-	2	2	-	-	-	2	-	-	-	1	2	3
CO3	3	2	-	1	1	-	-	-	3	-	-	-	2	1	1
CO4	2	2	-	2	-	-	-	3	2	-	-	-	3	3	1
CO5	3	1	-	2	2	-	-	-	3	-	-	-	2	2	3
3 - Strong; 2 - Medium; 1 – Some															

Assessment Pattern

Bloom's Category	**Continuous Assessment Tests (Marks)**		**End Sem Examination (Marks)**
	1	**2**	
Remember	10	10	20
Understand	20	10	30
Apply	10	20	30
Analyse	-	-	-
Evaluate	-	-	-
Create	10	10	20
Total	60	60	100

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K.S.Rangasamy College of Technology – Autonomous R2022								
B.Tech – Artificial Intelligence and Data Science								
60 AD E13 - Recommender Systems								
Semester	**Hours/Week**			**Total Hours**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
V	3	0	0	45	3	40	60	100

Linear Algebra notation Introduction: Recommender Systems Function, Applications of recommendation systems, Issues with recommender system Content-based recommendation: A High-Level Architecture of Content-based Systems, Advantages and Drawbacks of Content-based Filtering, Item Representation, Methods for Learning User Profiles. *	[9]
Collaborative Recommendation User-based nearest neighbour recommendation, Item-based nearest neighbour recommendation, model-based and pre-processing-based approaches. Attacks on collaborative recommender systems: Attack dimensions, Attack types.	[9]
Knowledge-based recommendation Introduction, Knowledge representation and reasoning, interacting with constraint-based recommenders, Interacting with case-based recommenders. Hybrid recommendation approaches, Monolithic hybridization design, Parallelized hybridization design, Pipelined hybridization design *	[9]
Evaluating recommender systems Introduction, General properties of evaluation research, Popular evaluation designs, Evaluation on historical datasets. The Collaborative Web Search System. Shared Web Search - The HeyStaks System. *	[9]
Context Sensitive Recommender Systems Context-Sensitive Recommender Systems - The Multidimensional Approach -Contextual Pre-filtering: A Reduction-Based Approach - Post-Filtering Methods - Contextual Modelling	[9]
Total Hours:	**45**

Text Book(s):	
1.	Jannach D., Zanker M. and FelFering A., Recommender Systems: An Introduction, Cambridge University Press (2011), 1st ed
2.	Ricci F., Rokach L., Shapira D., Kantor B.P., Recommender Systems Handbook, Springer (2011), 1st ed.
Reference(s):	
1.	Charu C. Aggarwal, “Recommender Systems: The Textbook”, First Ed., Springer, 2016.
2.	K. Falk, Practical recommender systems. Shelter Island, NY: Manning Publications Company,2019. (ISBN : 9781617292705)
3.	Erwin Kreyzig, Advanced Engineering Mathematics, 10th Edition, Wiley, 2011
4.	Aggarwal, C. C. Recommender Systems: The Textbook. Springer 201

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Course Contents and Lecture Schedule

S. No.	Topics	No. of hours
1.0	**Linear Algebra notation**	
1.1	Introduction	2
1.2	Recommender Systems Function	1
1.3	Applications of recommendation systems	1
1.4	Issues with recommender system	1
1.5	Content-based recommendation	1
1.6	A High-Level Architecture of Content-based Systems	2
1.7	Advantages and Drawbacks of Content-based Filtering	1
2.0	**Collaborative Recommendation**	
2.1	User-based nearest neighbour recommendation	2
2.2	Item-based nearest neighbour recommendation	2
2.3	model-based and pre-processing-based approaches	1
2.4	Attacks on collaborative recommender systems	1
2.5	Attack dimensions	1
2.6	Attack types	1
2.9	distributed collaborative filtering	1
3.0	**Knowledge-based recommendation**	
3.1	Introduction	1
3.2	Knowledge representation and reasoning	2
3.3	Interacting with constraint-based recommenders	2
3.4	Hybrid recommendation approaches:	1
3.6	Monolithic hybridization design	1
3.7	Parallelized hybridization design	1
3.8	Pipelined hybridization design	1
4.0	**Evaluating recommender systems**	
4.1	Introduction	1
4.2	General properties of evaluation research	1
4.3	Popular evaluation designs	1
4.4	Evaluation on historical datasets	1
4.5	The Collaborative Web Search System	1
4.6	Shared Web Search - The Haystacks System	2
4.7	The Haystacks Recommendation Engine.	2
5.0	**Context Sensitive Recommender Systems**	
5.1	Context-Sensitive Recommender Systems	2
5.2	The Multidimensional Approach	2
5.3	Contextual Pre-filtering	1
5.4	A Reduction-Based Approach	2
5.5	Post-Filtering Methods	1
5.6	Contextual Modelling	1

Course Designer(s)

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60 AD E14	Text and Speech Analysis	Category	L	T	P	Credit
		PE	3	0	0	3

Objectives

- To analyse the Fundamental concepts of speech production
- To analyse the fundamental concepts of speech perception
- To evaluate the Mathematical foundations of signal processing
- To understand the pattern recognition
- Computational methods for speech analysis, recognition, synthesis, and modification

Pre-requisites

- Basic concepts of text analytics and perform natural language

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Manipulate, visualize, and analyse speech signals	Understand
CO2	Perform various decompositions, codifications, and modifications of speech signals	Remember
CO3	Build a complete speech recognition system using state of the art tools	Understand
CO4	Template matching and Hidden Markov models	Understand
CO5	The HTK speech recognition system and Speaker recognition	Analyse

Mapping with Programme Outcomes

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	2	3	3	-	2	-	-	-	-	-	-	-	3	1	1
CO2	3	2	1	-	1	-	-	-	-	-	-	-	2	2	3
CO3	2	1	2	-	3	-	-	-	-	-	-	-	3	1	2
CO4	2	1	2	-	2	-	-	-	-	-	-	-	1	1	2
CO5	3	1	1	-	3	-	-	-	-	-	-	-	1	2	3
3 - Strong; 2 - Medium; 1 - Some															

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		End Sem Examination (Marks)
	1	2	
Remember	20	20	34
Understand	40	40	66
Apply	-	-	-
Analyse	-	10	-
Evaluate	-	-	-
Create	-	-	-
Total	60	60	100

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K.S.Rangasamy College of Technology – Autonomous R2022

B.Tech – Artificial Intelligence and Data Science

60 AD E14- Text and Speech Analysis

Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
V	3	0	0	45	3	40	60	100

Basic Concepts Speech Fundamentals: Articulatory Phonetics – Production and Classification of Speech Sounds; Acoustic Phonetics – acoustics of speech production; Review of Digital Signal Processing concepts; Short-Time Fourier Transform, Filter-Bank and LPC Methods *	[9]
Speech Analysis Features, Feature Extraction and Pattern Comparison Techniques: Speech distortion measures – mathematical and perceptual – Log Spectral Distance, Cepstral Distances, Weighted Cepstral Distances and Filtering, Likelihood Distortions, Spectral Distortion using a Warped Frequency Scale, LPC, PLP and MFCC Coefficients, Time Alignment and Normalization – Dynamic Time Warping, Multiple Time – Alignment Paths *****	[9]
Speech Modelling Hidden Markov Models: Markov Processes, HMMs – Evaluation, Optimal State Sequence – Viterbi Search, Baum-Welch Parameter Re-estimation, Implementation issue	[9]
Speech Recognition Large Vocabulary Continuous Speech Recognition: Architecture of a large vocabulary continuous speech recognition system – acoustics and language models, context dependent sub-word units; Applications and present status *****	[9]
Speech Synthesis Text-to-Speech Synthesis: Concatenative and waveform synthesis methods, subword units for TTS, intelligibility and naturalness – role of prosody, Applications and present status*	[9]
Total Hours:	**45**

Text Book(s):	
1.	Lawrence Rabinerand Biing-Hwang Juang, “Fundamentals of Speech Recognition”, Pearson Education, 2003.
2.	Daniel Jurafsky and James H Martin, “Speech and Language Processing – An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition”, Pearson Education
Reference(s):	
1.	Steven W. Smith, “The Scientist and Engineer’s Guide to Digital Signal Processing”, California Technical Publishing
2.	Thomas F Quatieri, “Discrete-Time Speech Signal Processing – Principles and Practice”, Pearson Education.
3.	Processing, Computational Linguistics, and Speech Recognition”, Third Edition, 2022
4.	Dipanjan Sarkar, “Text Analytics with Python: A Practical Real-World approach to Gaining Actionable insights

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Course Contents and Lecture Schedule

S. No.	Topics	No. of hours
1.0	**Basic Concepts**	
1.1	Speech Fundamentals: Articulatory Phonetics	1
1.2	Articulatory Phonetics	1
1.3	Production and Classification of Speech Sounds;	1
1.4	Acoustic Phonetics	2
1.5	Review of Digital Signal Processing concepts	2
1.6	Short-Time Fourier Transform, Filter-Bank and LPC Methods	2
2.0	**Speech Analysis**	
2.1	Features, Feature Extraction and Pattern Comparison Techniques	1
2.2	Speech distortion measures	
2.3	Mathematical and perceptual – Log Spectral Distance	2
2.4	Cepstral Distances, Weighted Cepstral Distances and Filtering,	2
2.5	Likelihood Distortions, Spectral Distortion using a Warped Frequency Scale	1
2.6	LPC, PLP and MFCC Coefficients,	1
2.7	Time Alignment and Normalization	1
2.8	Dynamic Time Warping, Multiple Time Alignment Paths	2
3.0	**Speech Modelling**	
3.1	Hidden Markov Models	1
3.2	Markov Processes	1
3.3	Evaluation, Optimal State Sequence	2
3.4	Viterbi Search	1
3.5	Baum-Welch Parameter Re-estimation	1
3.6	Implementation issue	1
4.0	**Speech Recognition**	
4.1	Large Vocabulary Continuous Speech Recognition	2
4.2	Architecture of a large vocabulary continuous speech recognition system	2
4.3	Acoustics and language models	2
4.4	Context dependent sub-word units	1
4.5	Applications and present status	2
5.0	**Speech Synthesis**	
5.1	Text-to-Speech Synthesis	1
5.2	Concatenative and waveform synthesis methods	1
5.3	Sub word units for TTS	2
5.4	Intelligibility and naturalness	1
5.5	Role of prosody	2
5.6	Applications and present status	2

Course Designer(s)

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60 AD E15	Image and Video Analytics	Category	L	T	P	Credit
		PE	3	0	0	3

Objectives

- To understand the basics of image processing techniques for computer vision
- To learn the techniques used for image pre-processing
- To discuss the various object detection techniques.
- To understand the various Object recognition mechanisms
- To elaborate on the video analytics techniques.

Pre-requisites

- Image Processing and Basic programming skills

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Understand the basics of image processing techniques for computer vision and video analysis.	Understand
CO2	Explain the techniques used for image pre-processing.	Analyse
CO3	Develop various object detection techniques.	Apply
CO4	Understand the various face recognition mechanisms.	Understand
CO5	Elaborate on deep learning-based video analytics.	Analyse

Mapping with Programme Outcomes

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	2	-	2	-	-	-	-	-	-	-	-	-	2
CO2	2	2	3	-	3	-	-	-	-	-	-	-	-	-	2
CO3	2	2	2	-	3	-	-	-	-	-	-	2	2	3	2
CO4	2	2	3	-	3	-	-	-	-	-	-	3	2	3	2
CO5	3	2	3	-	2	-	-	-	-	-	-	2	2	3	2
3 - Strong; 2 - Medium; 1 - Some															

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		End Sem Examination (Marks)
	1	2	
Remember	10	10	20
Understand	20	20	30
Apply	10	10	20
Analyse	20	20	30
Evaluate	-	-	-
Create	-	-	-
Total	60	60	100

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Syllabus

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B. Tech-Artificial Intelligence and Data Science								
60 AD E15 - Image and Video Analytics								
Semester	**Hours/Week**			**Total Hours**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
V	3	0	0	45	3	40	60	100

Introduction Computer Vision – Image Representation and Image Analysis Tasks - Image Representations – Digitization – Properties – Color Images – Data Structures for Image Analysis - Levels of Image Data Representation - Traditional and Hierarchical Image Data Structures.	[9]
Image Pre-Processing Local Pre-Processing - Image Smoothing - Edge Detectors - Zero-Crossings of The Second Derivative - Scale in Image Processing - Canny Edge Detection - Parametric Edge Models - Edges in Multi - Local Pre-Processing in The Frequency Domain - Line Detection by Local Pre-Processing Operators - Image Restoration.	[9]
Object Detection Using Machine Learning Object Detection– Object Detection Methods – Deep Learning Framework for Object Detection– Bounding Box Approach-Intersection Over Union (Iou) –Deep Learning Architectures-R-CNN-Faster R-CNN-You Only Look Once (Yolo)-Salient Features-Loss Functions.	[9]
Face Recognition and Gesture Recognition Face Recognition-Introduction-Applications of Face Recognition-Process of Face Recognition- Deep Face Solution by Facebook-FaceNet for Face Recognition-Implementation Using Face Net- Gesture Recognition.	[9]
Video Analytics Video Processing – Use Cases of Video Analytics-Vanishing Gradient and Exploding Gradient Problem-Restnet Architecture-RestNet and Skip Connections-Inception Network-GoogleNet Architecture-Improvement in Inception V2-Video Analytics-Restnet.	[9]
Total Hours:	**45**

Text Book(s):	
1.	Milan Sonka, Vaclav Hlavac, Roger Boyle, “Image Processing, Analysis, and Machine Vision”, 4nd edition, Thomson Learning, 2013.
2.	Vaibhav Verdhan, (2021, Computer Vision Using Deep Learning Neural Network Architectures with Python and Keras,Apress 2021.
Reference(s):	
1.	Richard Szeliski, “Computer Vision: Algorithms and Applications”, Springer Verlag London Limited,2011.
2.	Caifeng Shan, FatihPorikli, Tao Xiang, Shaogang Gong, “Video Analytics for Business Intelligence”, Springer, 2012.
3.	D. A. Forsyth, J. Ponce, “Computer Vision: A Modern Approach”, Pearson Education, 2013.

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Course Contents and Lecture Schedule

S. No.	Topics	No. of hours
1.0	**Introduction**	
1.1	Computer Vision	1
1.2	Image representation and image analysis tasks	1
1.3	Image representations	1
1.4	Digitization – properties	1
1.5	Color images	1
1.6	Data structures for Image Analysis	1
1.7	Levels of image data representation	1
1.8	Traditional image data structures and Hierarchical image data structures	2
2.0	**Image Pre-Processing**	
2.1	Local pre-processing	2
2.2	Image smoothing and Edge detectors	2
2.3	Zero-crossings of the second derivative	1
2.4	Scale in image processing	1
2.5	Canny edge detection - Parametric edge models	1
2.6	Local pre-processing in the frequency domain and Line detection by local pre-processing operators	2
2.7	Image restoration	
3.0	**Object Detection Using Machine Learning**	
3.1	Object detection methods	2
3.2	Deep Learning framework for Object detection	1
3.3	Bounding box approach	2
3.4	Intersection over Union (IoU)	1
3.5	Deep Learning Architectures-R-CNN-Faster R-CNN	1
3.6	Loss Functions	1
4.0	**Face Recognition and Gesture Recognition**	
4.1	Face Recognition	1
4.2	Applications of Face Recognition	1
4.3	Process of Face Recognition	1
4.4	Deep Face solution by Facebook	1
4.5	FaceNet for Face Recognition	1
4.6	Implementation using Face Net	1
4.7	Gesture Recognition	1
5.0	**Video Analytics**	
5.1	Video Processing	1
5.2	Use cases of video analytics	1
5.3	Vanishing Gradient and exploding gradient problem	1
5.4	Rest Net architecture	1
5.5	RestNet and skip connections	1
5.6	Inception Network	1
5.7	GoogleNet architecture	1
5.8	Improvement in Inception v2	1
5.9	Video analytics-RestNet and Inception v3	1

Course Designer(s)

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60 AD E16	Healthcare Analytics	Category	L	T	P	Credit
		PE	3	0	0	3

Objectives

- Understand the health data formats, health care policy and standards.
- Learn the significance and need of data analysis and data visualization.
- Understand the health data management frameworks.
- Learn the use of machine learning and deep learning algorithms in healthcare.
- Apply healthcare analytics for critical care applications.

Pre-requisites

- Artificial Intelligence, Data Mining, Machine Learning

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Use machine learning and deep learning algorithms for health data analysis	Understand
CO2	Apply the data management techniques for healthcare data	Apply
CO3	Evaluate the need of healthcare data analysis in e-healthcare, telemedicine and other critical care applications	Apply
CO4	Design health data analytics for real time applications	Analyse
CO5	Design emergency care system using health data analysis	Understand

Mapping with Programme Outcomes

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	-	-	-	-	-	-	-	-	-	-	3	-	3
CO2	3	-	-	-	-	-	-	-	-	-	3	-	3	-	-
CO3	2	-	2	-	-	-	-	-	-	-	-	3	3	-	3
CO4	2	2	3	-	-	-	-	-	-	-	-	2	-	-	3
CO5	-	2	2	-	-	-	-	-	-	-	3	2	3	-	-

3 – Strong; 2 – Medium; 1 – Some

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		End Sem Examination (Marks)
	1	2	
Remember	20	20	20
Understand	20	20	20
Apply	20	20	50
Analyse	-	-	-
Evaluate	-	-	-
Create	-	-	10
Total	60	60	100

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Syllabus

K.S.Rangasamy College of Technology – Autonomous R2022								
B.Tech-Artificial Intelligence and Data Science								
60 AD E16 – HealthCare Analytics								
Semester	**Hours/Week**			**Total Hours**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
V	3	0	0	45	3	40	60	100

Introduction to Healthcare Analysis History of Healthcare Analysis Parameters on Medical Care Systems- Health Care Policy- Standardized Code Sets – Data Formats – Machine Learning Foundations: Tree Like Reasoning, Probabilistic Reasoning and Bayes Theorem, Weighted Sum Approach.	[9]
Analytics on Machine Learning Machine Learning Pipeline – Pre-Processing –Visualization – Feature Selection – Training Model Parameter – Evaluation Model: Sensitivity, Specificity, PPV, NPV, FPR, Accuracy, Roc, Precision Recall Curves, Valued Target Variables –Python: Variables and Types, Data Structures and Containers, Pandas Data Frame: Operations – Scikit –Learn: Pre-Processing, Feature Selection	[9]
Health Care Management IOT- **Smart Sensors***– Migration of Healthcare Relational Database to NOSQL Cloud Database –Decision Support System – Matrix Block Cipher System – Semantic Framework Analysis – Histogram Bin Shifting and Rc6 Encryption – Clinical Prediction Models – Visual Analytics for Healthcare.	[9]
Healthcare and Deep Learning* Introduction on Deep Learning – DFF Network CNN- RNN for Sequences – Biomedical Image and Signal Analysis – Natural Language Processing and Data Mining for Clinical Data – Mobile Imaging and Analytics – Clinical Decision Support System.	[9]
Case Studies Classify Fetal Health in Order to Prevent Child and Maternal Mortality – Covid-19 MRNA Vaccine Degradation Prediction	[9]
Total Hours:	**45**

Text Book(s):	
1.	Chandan K.Reddy, Charu C. Aggarwal, “Health Care data Analysis”, First edition, CRC, 2015.
Reference(s):	
1.	Vikas Kumar, “Health Care Analysis Made Simple”, Packt Publishing, 2018.
2.	Nilanjan Dey, Amira Ashour , Simon James Fong, Chintan Bhatl, “Health Care Data Analysis and Management, First Edition, Academic Press, 2018.
3.	Hui Jang, Eva K.Lee, “HealthCare Analysis : From Data to Knowledge to Healthcare Improvement”, First Edition, Wiley, 2016.
4.	Kulkarni , Siarry, Singh ,Abraham, Zhang, Zomaya , Baki, “Big Data Analytics in HealthCare”, Springer, 2020.

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Course Contents and Lecture Schedule

S.No.	Topic	No.of Hours
1	**Introduction to Healthcare Analysis**	
1.1	History of Healthcare Analysis Parameters on Medical Care Systems	1
1.2	Health Care Policy	1
1.3	Standardized Code Sets	1
1.4	Data Formats	1
1.5	Machine Learning Foundations: Tree Like Reasoning	2
1.6	Probabilistic Reasoning and Bayes Theorem	2
1.7	Weighted Sum Approach	1
2	**Analytics on Machine Learning**	
2.1	Machine Learning Pipeline	1
2.2	Pre-Processing, Visualization	1
2.3	Feature Selection, Training Model Parameter	1
2.4	Evaluation Model: Sensitivity	1
2.5	Specificity, PPV, NPV, FPR	1
2.6	Accuracy, Roc, Precision Recall Curves	1
2.7	Valued Target Variables	1
2.8	Python: Variables and Types, Data Structures and Containers, Pandas	1
2.9	Data Frame: Operations – Scikit –Learn: Pre-Processing, Feature Selection	1
3	**HealthCare Management**	
3.1	IOT	1
3.2	Smart Sensors	1
3.3	Migration of Healthcare Relational database to NoSQL Cloud Database	1
3.4	Decision Support System	1
3.5	Matrix block Cipher System	1
3.6	Semantic Framework Analysis	1
3.7	Histogram bin Shifting and Rc6 Encryption	1
3.8	Clinical Prediction Models	1
3.9	Visual Analytics for Healthcare	1
4	**Healthcare and Deep Learning**	
4.1	Introduction on Deep Learning	1
4.2	DFF network CNN	1
4.3	RNN for Sequences	1
4.4	Biomedical Image and Signal Analysis	2
4.5	Natural Language Processing and Data Mining for Clinical Data	2
4.6	Mobile Imaging and Analytics	1
4.7	Clinical Decision Support System	1
5	**Case Studies**	
5.1	Classify fetal health in order to prevent child and maternal mortality	5
5.2	COVID-19 mRNA Vaccine Degradation Prediction	**4**

Course Designer(s)

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60 AD E21	Data Analytics	Category	L	T	P	Credit
		PE	2	0	2	3

Objectives

- To be exposed to big data process and tools.
- To learn the different ways of data analytical models.
- To be familiar with data streams.
- To explore the concepts of mining and clustering techniques.
- To acquire the Hadoop frameworks and visualization.

Pre-requisites

- Career path in Data Analytics and Big data tools.

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Apply the statistical analysis methods on big data	Understand
CO2	Compare and contrast various soft computing models	Apply
CO3	Design distributed file systems	Apply
CO4	Apply clustering techniques on big data	Apply
CO5	Demonstrate different visualizations techniques	Apply

Mapping with Programme Outcomes

COs	Pos												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	-	-	2	-	-	-	-	-	-	2	3	3	3
CO2	3	2	-	-	2	-	-	-	-	-	-	2	3	3	3
CO3	3	2	-	-	2	-	-	-	-	-	-	2	3	3	3
CO4	3	3	-	-	2	-	-	-	-	-	-	2	3	3	3
CO5	3	3	-	-	2	-	-	-	-	-	-	2	3	3	3
3 - Strong; 2 - Medium; 1 – Some															

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)				Model Examination (Marks)		End Sem Examination (Marks)	
	Test 1		Test 2					
	Theory	Lab	Theory	Lab	Theory	Lab	Theory	Lab
Remember	10	50	10	-	10	-	10	-
Understand	20	50	20	50	20	50	20	50
Apply	30	-	30	50	60	50	60	50
Analyse	-	-	-	-	-	-	-	-
Evaluate	-	-	-	-	-	-	-	-
Create	-	-	-	-	10	-	10	-
Total	60	100	60	100	100	100	100	100

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Syllabus

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B.Tech-Artificial Intelligence and Data Science								
60 AD E21 – Data Analytics								
Semester	**Hours / Week**			**Total Hours**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
VI	2	0	2	60	3	50	50	100

Introduction Introduction to Big Data Platform – Challenges of Conventional Systems - Web Data – Evolution of Analytic Scalability-Modern Data Analytic Tools- Statistical Concepts: Sampling Distributions, Resampling	[6]
Data Analysis Regression Modelling, Multivariate Analysis, Bayesian Modelling, Inference and Bayesian Networks, Support Vector and Kernel Methods	[6]
Mining Data Streams Introduction to Streams Concepts – Stream Data Model and Architecture - Stream Computing, Sampling Data in A Stream – Filtering Streams – Counting Distinct Elements in a Stream.	[6]
Frequent Itemsets and Clustering Mining Frequent Itemsets - Market Based Model – Apriori Algorithm – Handling Large Data Sets in Main Memory – K- Means – Clustering High Dimensional Data	[6]
Frameworks and Visualization* MapReduce – Hadoop, Hive, Mapr – Sharding – NOSQL Databases - Hadoop Distributed File Systems	[6]
Practical: 1. Install, configure and run python, numPy and Pandas. 2. Install, configure and run Hadoop and HDFS. 3. Visualize data using basic plotting techniques in Python. 4. Implement NoSQL Database Operations: CRUD operations, Arrays using MongoDB. 5. Implement Functions: Count – Sort – Limit – Skip – Aggregate using MongoDB. 6. Implement word count / frequency programs using MapReduce. 7. Implement a MapReduce program that processes a dataset. 8. Implement clustering techniques using SPARK. 9. Implement an application that stores big data in MongoDB / Pig using Hadoop / R. **Tools used: MATLAB / ALTAIR / Open Source - Scilab**	[30]
Total Hours: (Lecture - 30; Practical - 30)	**60**

Text Book(s):	
1.	Michael Berthold, David J. Hand, “Intelligent Data Analysis”, Springer, 2007.
2.	AnandRajaraman and Jeffrey David Ullman, “Mining of Massive Datasets”,Cambridge University Press, 2012.
Reference(s):	
1.	Bill Franks, “Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with advanced analystics”, John Wiley & sons, 2012.
2.	Pete Warden, “Big Data Glossary”, O’Reilly, 2011.
3.	Jiawei Han, MichelineKamber “Data Mining Concepts and Techniques”, 2nd Edition, Elsevier, Reprinted 2008.
4.	Donald Miner, “Map Reduce Design Patterns: Building Effective Algorithms and Analytics for Hadoop and Other Systems”, O'Reilly Media, 2012

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Course Contents and Lecture Schedule		
S. No.	**Topics**	**No. of Hours**
1	**Introduction**	
1.1	Introduction to Big Data Platform	1
1.2	Challenges of Conventional Systems	1
1.3	Web Data	1
1.4	Evolution of Analytic Scalability	1
1.5	Modern Data Analytic Tools	1
1.6	Statistical Concepts: Sampling Distributions, Resampling	1
2	**Data Analysis**	
2.1	Regression Modelling	1
2.2	Multivariate Analysis	1
2.3	Bayesian Modelling	1
2.4	Inference and Bayesian Networks	1
2.5	Support Vector and Kernel Methods	2
3	**Mining Data Streams**	
3.1	Introduction to Streams Concepts	1
3.2	Stream Data Model and Architecture	1
3.3	Stream Computing	1
3.4	Sampling Data in A Stream	1
3.5	Filtering Streams	1
3.6	Counting Distinct Elements in a Stream	1
4	**Frequent Itemsets and Clustering**	
4.1	Mining Frequent Itemsets	1
4.2	Market Based Model	1
4.3	Apriori Algorithm	1
4.4	Handling Large Data Sets in Main Memory	1
4.5	K- Means	1
4.6	Clustering High Dimensional Data	1
5	**Frameworks and Visualization***	
5.1	MapReduce	1
5.2	Hadoop	1
5.3	Hive	1
5.4	Sharding	1
5.5	NOSQL Databases	1
5.6	Hadoop Distributed File Systems	1
Practical:		
1.	Install, configure and run python, numPy and Pandas.	2
2.	Install, configure and run Hadoop and HDFS.	4
3.	Visualize data using basic plotting techniques in Python.	4
4.	Implement NoSQL Database Operations: CRUD operations, Arrays using MongoDB.	2
5.	Implement Functions: Count – Sort – Limit – Skip – Aggregate using MongoDB.	2
6.	Implement word count / frequency programs using MapReduce.	4
7.	Implement a MapReduce program that processes a dataset.	5
8.	Implement clustering techniques using SPARK.	2
9.	Implement an application that stores big data in MongoDB / Pig using Hadoop / R	5

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60 AD E22	App Development	Category	L	T	P	Credit
		PE	2	0	2	3

Objectives

- To gain the fundamental skills in Kotlin programming Language
- To understand the concepts of the Android and its platform
- To create and use controls in Android Studio.
- To enhance the knowledge in consuming Webservices from Kotlin
- To enable the students to learn how to deploy Application in store

Pre-requisites

- Programming Knowledge

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Understanding the Android Development KIT	Understand
CO2	Using Android Studio to develop Android Application	Analyse
CO3	Creating Android Apps using Kotlin Code base	Apply
CO4	Understanding to design the UI for Android	Apply
CO5	Writing Platform Specific Code and invoke Native elements	Apply

Mapping with Programme Outcomes

COs	Pos												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	-	-	-	-	-	-	-	2	2	-	-	-	-	2
CO2	3	-	-	3	-	3	-	-	-	-	-	-	-	-	2
CO3	3	-	-	3	-	3	-	-	2	2	-	-	-	-	2
CO4	3	-	-	3	-	3	-	-			-	-	-	-	2
CO5	3	-	-	-	-	3	-	-	2	2		2	-	-	2
3 - Strong; 2 - Medium; 1 – Some															

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)				Model Examination (Marks)		End Sem Examination (Marks)	
	Test 1		Test 2					
	Theory	Lab	Theory	Lab	Theory	Lab	Theory	Lab
Remember	20	-	20	-	34	-	34	-
Understand	40	-	40	-	66	-	66	-
Apply	-	50	-	50	-	50	-	50
Analyse	-	50	-	50	-	50	-	50
Evaluate	-	-	-	-	-	-	-	-
Create	-	-	-	-	-	-	-	-
Total	60	100	60	100	100	100	100	100

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Syllabus

K.S.Rangasamy College of Technology – Autonomous R2022								
.Tech-Artificial Intelligence and Data Science								
60 AD E22- App Development								
Semester	**Hours / Week**			**Total Hours**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
VI	2	0	2	60	3	50	50	100

Introducing Kotlin: Introduction Kotlin, Data Type, Variable, Operator Input/Output, Control Flow, Function, Collections, Array, Exception Handling, Regular Expressions, Class and Objects	[6]
Layout and Elements: Basics of Android, Designer Tools, Layout, Views, ListViews, Adapters, TextView, Images, Buttons, Views, and Layouts, Lists, Data Binding.	[6]
App Navigation and Activity: Introduction to Android Activity, Android Activity Lifecycle, Understanding of Lifecycles, Life Cycle, RecyclerView - ViewModel and LiveData.	[6]
Google Vision: Introduction to Google Vision, Creating Camera Activity, Detecting Objects, Scanning Barcodes, Recognizing Test, Google Maps - Creating Map Activity, Showing Live Location.	[6]
SQLite and Webservices* Introduction SQLite – Creating and Processing Data, Introduction Webservies, REST API - HTTP, Consuming RESTful Service, JSON, and Cloud services.	[6]
Practical: 1. Develop an application that uses Layout Managers. 2. Develop an application that uses event listeners. 3. Develop an application that uses Adapters, Toast. 4. Develop an application that makes use of database. 5. Develop an application that makes use of RSS Feed.	[30]
Total Hours: (Lecture - 30; Practical - 30)	**60**

Text Book(s):	
1.	Hardik Trivedi, “Android Application Development with Kotlin”, BPB, 2020.
2.	Aleksei Sedunov, “Kotlin In-Depth A Comprehensive Guide to Modern Multi-Paradigm Language”, Vol 1, BPB, 2020.
Reference(s):	
1.	https://developer.android.com/guide

*SDG 9 – Industry Innovation and Infrastructure

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Dept. of Artificial Intelligence and Data Science
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Tiruchengode - 637 215.

Course Contents and Lecture Schedule

S. No.	Topics	No. of Hours
1	**Introduction Kotlin**	
1.1	Data Type, Variable	1
1.2	Operator Input/Output	1
1.3	Control Flow, Function	1
1.4	Collections, Array, Exception Handling	1
1.5	Regular Expressions	1
1.6	Class and Objects	1
2	**Data Manipulation and Scrapping**	
2.1	Layout and Elements	1
2.2	Basics of Android, Designer Tools	1
2.3	Layout, Views	1
2.4	ListViews, Adapters	1
2.5	TextView, Images	1
2.6	Buttons, Views and Layouts	1
3	**App Navigation and Activity**	
3.1	Introduction to Android Activity	1
3.2	Android Activity Lifecycle	1
3.3	Understanding of Lifecycles	1
3.4	Life Cycle,	1
3.5	RecyclerView	1
3.6	ViewModel and LiveData	1
4	**Google Vision**	
4.1	Introduction to Google Vision	1
4.2	Creating Camera Activity	1
4.3	Detecting Objects	1
4.4	Scanning Barcodes,Recognizing Test	1
4.5	Google Maps - Creating Map Activity	1
4.6	Showing Live Location	1
5	**SQLite and Webservices**	
5.1	Introduction SQLite – Creating and Processing Data	1
5.2	Introduction Webservies	1
5.3	REST API – HTTP	1
5.4	Consuming RESTful Service	1
5.5	JSON	1
5.6	Cloud services	1
Practical:		
10.	Develop an application that uses Layout Managers.	6
11.	Develop an application that uses event listeners.	6
12.	Develop an application that uses Adapters, Toast.	6
13.	Develop an application that makes use of database.	6
14.	Develop an application that makes use of RSS Feed	6

Course Designer(s)

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60 AD E23	Cloud Services Management	Category	L	T	P	Credit
		PE	2	0	2	3

Objectives

- To Introduce cloud service management terminology, definition and concepts
- To Compare and contrast cloud service management with traditional it services management
- To Identify strategies to reduce risk and eliminate issues associated with adoption of cloud services
- To Select appropriate structures for designing, deploying and running cloud-based services in a business environment
- To Illustrate the benefits and drive the adoption of cloud-based services in a business problem.

Pre-requisites

- Computer Networks, Cloud Computing

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Learn and remember basics of cloud service management	Remember
CO2	Analyze the strategies for cloud services among the IT services	Analyse
CO3	Explore the cloud service management with lifecycle, benchmark of services, capacity and about the service architecture,	Analyse
CO4	Explore the concepts of cloud service economics with the cost models and charging in cloud	Apply
CO5	Learn the governance of cloud and analyze the value of the cloud services	Understand

Mapping with Programme Outcomes

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	1	1	1	-	-	-	2	1	3	2	2	1	3
CO2	3	1	2	3	2	-	-	-	1	2	3	1	2	2	2
CO3	1	1	3	1	3	-	-	-	3	3	1	1	3	2	1
CO4	1	1	1	2	3	-	-	-	2	3	3	1	1	1	1
CO5	1	3	3	2	2	-	-	-	1	3	1	2	1	3	2
3 - Strong; 2 - Medium; 1 - Some															

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)				Model Examination (Marks)		End Sem Examination (Marks)	
	Test 1		Test 2					
	Theory	Lab	Theory	Lab	Theory	Lab	Theory	Lab
Remember	20	-	20	-	34	-	34	-
Understand	40	-	40	-	66	-	66	-
Apply	-	50	-	50	-	50	-	50
Analyse	-	50	-	50	-	50	-	50
Evaluate	-	-	-	-	-	-	-	-
Create	-	-	-	-	-	-	-	-
Total	60	100	60	100	100	100	100	100

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Syllabus

K.S.Rangasamy College of Technology – Autonomous R2022								
B.Tech- Artificial Intelligence and Data Science								
60 AD E23 – Cloud Services Management								
Semester	**Hours / Week**			**Total Hours**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
VI	2	0	2	60	3	50	50	100

Cloud Service Management Fundamentals* Cloud Ecosystem, The Essential Characteristics, Basics of Information Technology Service Management and Cloud Service Management, Service Perspectives, Cloud Service Models, Cloud Service Deployment Models	[6]
Cloud Services Strategy Cloud Strategy Fundamentals, Cloud Strategy Management Framework, Cloud Policy, Key Driver for Adoption, Risk Management, IT Capacity and Utilization, Demand and Capacity matching, Demand Queueing, Change Management, Cloud Service Architecture	[6]
Cloud Service Management* Cloud Service Reference Model, Cloud Service Life Cycle, Basics of Cloud Service Design, Dealing with Legacy Systems and Services, Benchmarking of Cloud Services, Cloud Service Capacity Planning, Cloud Service Deployment and Migration, Cloud Marketplace, Cloud Service Operations Management	[6]
Cloud Service Economics** Pricing models for Cloud Services, Freemium, Pay Per Reservation, Pay per User, Subscription based Charging, Procurement of Cloud-based Services, Capex vs Opex Shift, Cloud service Charging, Cloud Cost Models	[6]
Cloud Service Governance & Value IT Governance Definition, Cloud Governance Definition, Cloud Governance Framework, Cloud Governance Structure, Cloud Governance Considerations, Cloud Service Model Risk Matrix, Understanding Value of Cloud Services, Measuring the value of Cloud Services, Balanced Scorecard, Total Cost of Ownership	[6]
Practical: 1. Create a Cloud Organization in AWS/Google Cloud/or any equivalent Open-Source cloud softwares like Openstack, Eucalyptus, OpenNebula with Role-based access control 2. Create a Cost-model for a web application using various services and do Cost-benefit analysis 3. Create alerts for usage of Cloud resources **4.** Create Billing alerts for your Cloud Organization **5.** Compare Cloud cost for a simple web application across AWS, Azure and GCP and suggest the best one **Tools used: AWS Cloud Service**	[30]
Total Hours: (Lecture - 30; Practical - 30)	**60**

Text Book(s):	
1.	Cloud Service Management and Governance: Smart Service Management in Cloud Era by Enamul Haque, Enel Publications
2.	Cloud Computing: Concepts, Technology & Architecture by Thomas Erl, Ricardo Puttini, Zalgham Mohammad, 2013

Reference(s):	
1.	Cloud Computing Design Patterns by Thomas Erl, Robert Cope, Amin Naserpour
2.	Economics of Cloud Computing by Praveen Ayyappa, LAP Lambert Academic Publishing
3.	Mastering Cloud Computing Foundations and Applications Programming Rajkumar Buyya, Christian Vechhiola, S. Thamarai Selvi

*SDG 9 – Industry Innovation and Infrastructure
**SDG 7 – Affordable and Clean Energy

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Course Contents and Lecture Schedule

S. No.	Topics	No. of Hours
1	**Cloud Service Management Fundamentals**	
1.1	Cloud Ecosystem, The Essential Characteristics	1
1.2	Basics of Information Technology Service Management	1
1.3	Cloud Service Management and Service Perspectives	2
1.4	Cloud Service Models	1
1.5	Cloud Service Deployment Models	1
1.6	Cloud Ecosystem, The Essential Characteristics	1
2	**Cloud Services Strategy**	
2.1	Cloud Strategy Fundamentals, Cloud Strategy Management Framework	1
2.2	Cloud Policy, Key Driver for Adoption	1
2.3	Risk Management, IT Capacity and Utilization	1
2.4	Demand and Capacity matching, Demand Queueing	1
2.5	Change Management	1
2.6	Cloud Service Architecture	1
3	**Cloud Service Management**	
3.1	Cloud Service Reference Model, Cloud Service LifeCycle	1
3.2	Basics of Cloud Service Design, Dealing with Legacy Systems and Services	1
3.3	Benchmarking of Cloud Services	1
3.4	Cloud Service Capacity Planning	1
3.5	Cloud Service Deployment and Migration, Cloud Marketplace	1
3.6	Cloud Service Operations Management	1
4	**Cloud Service Economics**	
4.1	Pricing models for Cloud Services, Freemium	1
4.2	Pay Per Reservation, Pay per User	1
4.3	Subscription based Charging	1
4.4	Procurement of Cloud-based Services	1
4.5	Capex vs Opex Shift, Cloud service Charging	1
4.6	Cloud Cost Models	1
5	**Cloud Service Governance & Value**	
5.1	IT Governance Definition, Cloud Governance Definition	1
5.2	Cloud Governance Framework and Structure	1
5.3	Cloud Governance Considerations, Cloud Service Model Risk Matrix	1
5.4	Understanding Value of Cloud Services	1
5.5	Measuring the value of Cloud Services	1
5.6	Balanced Scorecard, Total Cost of Ownership	1
Practical:		
1	Create a Cloud Organization in AWS/Google Cloud/or any equivalent Open-Source cloud softwares like Openstack, Eucalyptus, OpenNebula with Role-based access control	6
2	Create a Cost-model for a web application using various services and do Cost-benefit analysis	4
3	Create alerts for usage of Cloud resources	4
4	Create Billing alerts for your Cloud Organization	4
5	Compare Cloud cost for a simple web application across AWS, Azure and GCP and suggest the best one	6

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Course Designer(s)

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60 AD E24	UI and UX design	Category	L	T	P	Credit
		PE	2	0	2	3

Objectives

- To understand the basics of UI/UX development process.
- To learn all stages of the UI/UX process.
- To Experiment with various visual design aspects.
- To understand theme the visual look and feel of user experiences.
- To create effective and compelling screen-based experiences.

Pre-requisites

- Understanding the psychology of human-computer interaction and knowledge of web design.

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Understand the principles of UI/UX Design in order.	Understand
CO2	Achieve an entire life-cycle of design purpose and tools in UI/UX.	Apply
CO3	Learn the various visual design aspects.	Understand
CO4	Discover the industry standard tools and project deliverables in UI/UX.	Apply
CO5	Create effective and compelling screen-based experiences.	Apply

Mapping with Programme Outcomes

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	2	2	2	-	-	-	-	-	2		2	2	2
CO2	2	2	2	3	2	-	-	-	-	-	2	2	2	2	2
CO3	2	2	2	2	3	-	-	-	-	-	2	2	2	2	2
CO4	2	2	3	2	3	-	-	-	-	-	2	3	2	3	2
CO5	3	2	3	3	2	-	-	-	-	-	2	3	2	3	2
3 - Strong; 2 - Medium; 1 - Some															

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)				Model Examination (Marks)		End Sem Examination (Marks)	
	Test 1		Test 2					
	Theory	Lab	Theory	Lab	Theory	Lab	Theory	Lab
Remember	10	20	20	20	20	20	20	20
Understand	20	30	30	30	30	30	30	30
Apply	20	30	30	30	30	30	30	30
Analyse	-	-	-	-	-	-	-	-
Evaluate	-	-	-	-	-	-	-	-
Create	10	20	10	20	20	20	20	20
Total	60	100	60	100	100	100	100	100

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Syllabus

K.S. Rangasamy College of Technology – Autonomous R2022								
B. Tech-Artificial Intelligence and Data Science								
60 AD E24 - UI and UX Design								
Semester	**Hours / Week**			**Total Hours**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
VI	2	0	2	60	3	50	50	100

Foundational Elements Of UI/UX The Relationship Between UI/UX-Roles In UI/UX- Core Stages of Design Thinking – Divergent and Convergent Thinking -Brainstorming and Game Storming – Observational Empathy.	[6]
User Experience Design Foundations Ideation, Articulation, Development-Planning, Testing, Researching, Mapping-Mapping Content-Mapping Interaction-Non-Visual Paper Prototyping and Visual User Testing-Look and Feel/Visual Research-Getting real.	[6]
Foundations Of UX Design Understanding User Experience – Defining the UX Design Process and Its Methodology – Research in User Experience Design – Tools and Method Used for Research – User Needs and Its Goals.	[6]
Strategies And Information Architecture The User Experience Process-User -Centric Design-The UX Phases-Waterfall Vs Agile-Web Vs App. Determining Strategy-The Sitemap: Treejack Analysis.	[6]
Wire Frames to Prototypes Responsive Design: Primary Navigation-Secondary and Utility Navigation-Related Content, Inline Links, Index's and Search-Wayfinding-Wireframing Tools. Mock-up Phase and Web Typography: Creating Visual Mock-ups.	[6]
Practical: 1. Designing A Responsive Layout for a Societal Application. 2. Exploring Various UI Interaction Patterns. 3. Developing an Interface with Proper UI Style Guides. 4. Developing Wire flow Diagram for Application Using Open-Source Software. 5. Exploring Various Open-Source Collaborative Interface Platform. 6.Exploring Navigation Systems, Common Design Patterns, Design Principles/Whitespace, Web Typography. 7. Create A Generic Prototype of Any Application Both in Web Vs. App. **Software Requirements:** • Adobe Experience Design • UI Path	[30]
Total Hours: (Lecture - 30; Practical - 30)	**60**

Text Book(s):	
1.	Buxton. B., Sketching User Exeriences: Getting the Design Right and the Right Design. Morgan Kaufmann, (2007).
2.	Jon Yablonski, Laws of UX using Psychology to Design Better Product & Services OReilly 2021.
Reference(s):	
1.	Russ Unger, Carolyn Chander, A Project Guide to UX Design: For User Experience Designers in the Field or in the Making, New Riders;2nd edition,2012.
2.	Don Norman, The Design of Everyday Things, Basic Books;2nd edition,2013.
3.	Everett N. McKay, UI is Communication: How to Design Intuitive, User Centered Interfaces by Focusing on Effective Communication, Morgan Kaufmann; Illustrated edition,2013.
WEB REFERENCES	
	https://www.coursera.org/specializations/ui-ux-design
	https://learnux.io.

**SDG 9 – Industry Innovation and Infrastructure.

***SDG 8 - Create Decent Work and Economic Growth.

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Course Contents and Lecture Schedule

S. No.	Topics	No. of Hours
1.0	**Foundational Elements Of UI/UX**	
1.1	The Relationship Between UI/UX.	1
1.2	Roles in UI/UX.	1
1.3	Core Stages of Design Thinking.	1
1.4	Divergent and Convergent Thinking.	1
1.5	Brainstorming and Game storming.	1
1.6	Observational Empathy.	1
2.0	**User Experience Design Foundations**	
2.1	Ideation, Articulation, Development.	1
2.2	Planning, Testing, Researching.	1
2.3	Mapping-Mapping Content.	1
2.4	Mapping Interaction.	1
2.5	Non-Visual Paper Prototyping and Visual User Testing.	1
2.6	Look and feel/Visual Research and Getting real.	1
3.0	**Foundations Of UX Design**	
3.1	Understanding User Experience.	1
3.2	Defining the UX Design Process and its Methodology.	1
3.3	Research in User Experience Design.	1
3.4	Tools and Method used for Research.	2
3.5	User Needs and its Goals.	1
4.0	**Strategies And Information Architecture**	
4.1	The user Experience Process.	1
4.2	The UX Phases.	1
4.3	Waterfall vs Agile vs Web vs App.	1
4.4	Determining Strategy.	1
4.5	The Sitemap: Treejack Analysis.	1
5.0	**Wire Frames to Prototypes**	
5.1	Responsive Design: Primary Navigation.	1
5.2	Secondary and Utility Navigation.	1
5.3	Related Content, Inline Links, Index's and Search.	1
5.4	Wayfinding-Wireframing Tools.	1
5.5	Mock-up Phase and Web Typography.	1
5.6	Creating Visual Mock-ups.	1
Practical:		
15.	Designing a Responsive layout for a societal application.	4
16.	Exploring various UI Interaction Patterns.	4
17.	Developing an interface with proper UI Style Guides.	4
18.	Developing Wire flow diagram for application using open-source software.	4
19.	Exploring various open-source collaborative interface Platform.	4
20.	Exploring Navigation Systems, Common Design Patterns, Design Principles/Whitespace, Web Typography.	5
21.	Create A Generic Prototype of Any Application Both in Web Vs. App.	5

Course Designer(s)

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60 AD E25	Software Testing and Automation	Category	L	T	P	Credit
		PE	2	0	0	2

Objectives

- To understand the basics of software testing principles.
- To learn the design of test cases.
- To learn levels of testing.
- To understanding organization structures in test management.
- To gain knowledge about automation testing tools.

Pre-requisites

- Knowledge in engineering ,Math,Computer Science

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Understand the basic concepts and need of software testing principles.	Understand
CO2	Identify suitable tests design strategies.	Understand
CO3	Apply to multiple levels of software testing.	Apply
CO4	Acquire knowledge about the role of tester in test management	Remember
CO5	Apply an knowledge in Automation software testing using Selenium and TestNG	Apply

Mapping with Programme Outcomes

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	2	1	2	-	-	-	1	1	3	2	3	2	3
CO2	2	3	1	1	1	-	-	-	2	2	1	2	1	2	3
CO3	2	2	1	3	1	-	-	-	1	3	1	2	1	3	2
CO4	2	1	3	2	1	-	-	-	1	1	1	2	1	1	2
CO5	2	2	1	3	1	-	-	-	1	3	2	1	2	1	3
3 - Strong; 2 - Medium; 1 - Some															

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)				Model Examination (Marks)		End Sem Examination (Marks)	
	Test 1		Test 2					
	Theory	Lab	Theory	Lab	Theory	Lab	Theory	Lab
Remember	20	-	20	-	20	-	20	-
Understand	20	-	20	-	20	-	20	-
Apply	-	50	-	50	20	50	20	50
Analyse	-	50	-	50	20	50	20	50
Evaluate	20	-	20	-	-	-	-	-
Create	20	-	20	-	20	-	20	-
Total	60	100	60	100	100	100	100	100

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Syllabus

K.S.Rangasamy College of Technology – Autonomous R2022

B.Tech - Artificial Intelligence and Data Science

60 AD E25- Software Testing and Automation

Semester	Hours / Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
VI	2	0	2	60	3	50	50	100

Introduction * Testing as an Engineering Activity – Testing as a Process – Testing Maturity Model- Testing Axioms – Basic Definitions – Software Testing Principles – The Tester 's Role in a Software Development Organization – Origins of Defects – Cost of Defects – Defect Classes – The Defect Repository and Test Design.	[6]
Test Case Design Strategies * Test case Design Strategies – Using Black Box Approach to Test Case Design – Boundary Value Analysis – Equivalence Class Partitioning – State Based Testing – Cause-Effect Graphing – Compatibility Testing – User Documentation Testing – Domain Testing - Random Testing – Requirements Based Testing .	[6]
Levels of Testing * The Need for Levels of Testing – Unit Test – Unit Test Planning – Designing the Unit Tests – The Test Harness – Running the Unit Tests and Recording Results – Integration Tests – Designing Integration Tests – Integration Test Planning – Scenario Testing – Acceptance Testing – Performance Testing – Regression Testing *****	[6]
Test Management ** People and Organizational Issues in Testing – Organization Structures for Testing Teams – Testing Services – Test Planning – Test Plan Components – Test Plan Attachments – Locating Test Items – Test Management – Test Process – Reporting Test Results	[6]
Test Automation ** Software Test Automation - Requirements for a Test Tool - Selenium: Overview of Selenium- Components of Selenium- Selenium IDE-Selenium RC- Selenium Web driver-Selenium GRID, Cucumber Testing- BDD Framework using Cucumber -DevOps -DevOps Lifecycle-DevOps Testing Tools-Testing Types in DevOps- DevOps Test Automation-TestNG	[6]
Practical: 1.Develop the test plan for testing an e-commerce web/mobile application (www.amazon.in). 2.Design the test cases for testing the e-commerce application 3.Test the e-commerce application and report the defects in it. 4.Develop the test plan and design the test cases for an inventory control system. 5.Execute the test cases against a client server or desktop application and identify the defects. 6.Test the performance of the e-commerce application. 7.Automate the testing of e-commerce applications using Selenium. 8.Integrate TestNG with the above test automation. 9.Develop to build data driven frame using selenium and TestNG 0.Develop to page object model using selenium and TestNG **ools used:**Selenium, TestNG	[30]
Total Hours: (Lecture - 30; Practical - 30)	**60**

Text Book(s):

1.	Srinivasan Desikan and Gopalaswamy Ramesh, "Software Testing – Principles and Practices", Pearson Education, 2006.
2.	Ron Patton,"Software Testing", Second Edition, Sams Publishing, Pearson Education, 2007. AU Library.com

Reference(s):

1.	Glenford J. Myers, Corey Sandler, Tom Badgett, "The Art of Software Testing", 3rd Edition, 2012, John Wiley & Sons, Inc.
2.	Paul C. Jorgensen, "Software Testing: A Craftsman's Approach", Fourth Edition, 2014, Taylor & Francis Group.
3.	Edward Kit, "Software Testing in the Real World Improving the Process", Pearson Education, 1995.
4.	Aditya P. Mathur, "Foundations of Software Testing Fundamental Algorithms and Techniques", Dorling Kindersley (India) Pvt. Ltd., Pearson Education, 2008

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*** SDG4: Quality Education**
****SDG9: Industry, Innovation and Infrastructure**

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Course Contents and Lecture Schedule

S. No.	Topics	No. of Hours
1	**Introduction**	
1.1	Testing as an Engineering Activity	1
1.2	Testing as a Process	1
1.3	Testing Maturity Model	1
1.4	Testing axioms – Basic definitions – Software Testing Principles	1
1.5	The Tester‘s Role in a Software Development Organization, Origins of Defects	1
1.6	Cost of defects, Defect Classes, The Defect Repository and Test Design	1
2	**Test Case Design Strategies**	
2.1	Test case Design Strategies , Using Black Box Approach to Test Case Design	1
2.2	Boundary Value Analysis, Equivalence Class Partitioning	1
2.3	State based testing, Cause-effect graphing	1
2.4	Compatibility testing – user documentation testing	1
2.5	Domain testing - Random Testing	1
2.6	Requirements based testing	1
3	**Levels of Testing**	
3.1	The need for Levels of Testing	1
3.2	Unit Test – Unit Test Planning –	1
3.3	Designing the Unit Tests – The Test Harness –	1
3.4	Running the Unit tests and Recording results – Integration tests –	1
3.5	Designing Integration Tests – Integration Test Planning –	1
3.6	Scenario testing – Acceptance testing – Performance testing – Regression Testing	1
4	**Test Management**	
4.1	People and Organizational Issues in Testing	1
4.2	Organization Structures for Testing Teams	1
4.3	Testing Services – Test Planning – Test Plan Components	1
4.4	Test Plan Attachments – Locating Test Items	1
4.5	Test management – Test Process	1
4.6	Reporting Test Results	1
5	**Test Automation**	
5.1	Software Test Automation	1
5.2	Requirements for a test tool -Selenium: Overview of Selenium	1
5.3	Components of Selenium- Selenium IDE	1
5.4	Selenium RC- selenium Web driver- selenium GRID	1
5.5	Cucumber testing- BDD framework using cucumber, DevOps -DevOps Lifecycle	1
5.6	DevOps testing tools, Testing Types in DevOps, DevOps Test Automation-TestNG	1
Practical:		
1.	Develop the Test Plan for Testing an E-Commerce Web/Mobile Application (www.amazon.in).	3
2.	Design the Test Cases for Testing the E-Commerce Application	3
3.	Test the E-Commerce Application and Report the Defects in it.	3
4.	Develop the Test Plan and Design the Test Cases for an Inventory Control System	3

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5.	Execute the Test Cases against a Client Server or Desktop Application and Identify the Defects.	3
6.	Test the Performance of the E-Commerce Application.	3
7.	Automate the Testing of E-Commerce Applications Using Selenium.	3
8.	Integrate TestNG with the above Test Automation	3
9.	Develop to Build Data Driven Frame Using Selenium and TestNG	3
10.	Develop to Page Object Model Using Selenium and TestNG	3

Course Designer

1.Mr.S. Raja - rajas@ksrct.ac.in

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60 AD E26	Web Application Security	Category	L	T	P	Credit
		PE	2	0	2	3

Objectives

- To understand the fundamentals of web application security
- To focus on wide aspects of secure development and deployment of web applications
- To learn how to build secure APIs
- To learn the basics of vulnerability assessment and penetration testing
- To get an insight into hacking techniques and tools

Pre-requisites

- Thermal Engineering

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Compare the security threats and the diverse security layers	Understand
CO2	Find and fix vulnerabilities to reduce security risks and an organization's overall attack surface	Understand
CO3	Design and develop secure web applications that use secure APIs	Understand
CO4	Perform vulnerability assessment and penetration	Apply
CO5	Develop hacker skills and use hacker tool sets	Apply

Mapping with Programme Outcomes

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	2	2		2	3	-	-	-	-	-	2	-	-	2	2
CO2	2	-	3	2	2	-	-	-	3	2	2	3	2	3	3
CO3	2	2	2	-	2	-	-	-	-	-		-	2	3	-
CO4	-	3	-	-	3	-	-	-	-	-	3	2	-	-	2
CO5	-	-	3	-	3	-	-	-	2	-	2	-	2	-	3
3 - Strong; 2 - Medium; 1 - Some															

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)				Model Examination (Marks)		End Sem Examination (Marks)	
	Test 1		Test 2					
	Theory	Lab	Theory	Lab	Theory	Lab	Theory	Lab
Remember	20	-	20	-	34	-	34	-
Understand	20	-	20	-	46	-	46	-
Apply	20	50	20	50	20	50	20	50
Analyse	-	50	-	50	-	50	-	50
Evaluate	-	-	-	-	-	-	-	-
Create	-	-	-	-	-	-	-	-
Total	60	100	60	100	100	100	100	100

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B.Tech – Artificial Intelligence and Data Science								
60 AD E26 – Web Application Security								
Semester	**Hours / Week**			**Total Hours**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
VI	2	0	2	60	3	50	50	100

Fundamentals of Web Application Security The history of Software Security-Recognizing Web Application Security Threats, Web Application Security, Authentication and Authorization, Secure Socket layer, Transport layer Security, Session Management-Input Validation	[6]
Secure Development and Deployment Web Applications Security - Security Testing, Security Incident Response Planning, The Microsoft Security Development Lifecycle (SDL), OWASP Comprehensive Lightweight Application Security Process (CLASP), The Software Assurance Maturity Model (SAMM)	[6]
Secure API Development API Security- Session Cookies, Token Based Authentication, Securing Natter APIs: Addressing threats with Security Controls, Rate Limiting for Availability, Encryption, Audit logging, Securing service-to-service APIs: API Keys, OAuth2, Securing Microservice APIs: Service Mesh, Locking Down Network Connections, Securing Incoming Requests.	[6]
Vulnerability Assessment and Penetration Testing Vulnerability Assessment Lifecycle, Vulnerability Assessment Tools: Cloud-based vulnerability scanners, Host-based vulnerability scanners, Network-based vulnerability scanners, Database-based vulnerability scanners, Types of Penetration Tests: External Testing, Web Application Testing, Internal Penetration Testing, SSID or Wireless Testing, Mobile Application Testing	[6]
Hacking Techniques and Tools**** Social Engineering, Injection, Cross-Site Scripting (XSS), Broken Authentication and Session Management, Cross-Site Request Forgery, Security Misconfiguration, Insecure Cryptographic Storage, Failure to Restrict URL Access, Tools: Comodo, OpenVAS, Nexpose, Nikto, Burp Suite, etc.	[6]
Lab Exercises: 1. Install Wireshark and explore the various protocols 2. Analyze the difference between HTTP vs HTTPS 3. Capturing a bulk TCP transfer from your computer to a remote server 4. Identify the vulnerabilities using the OWASP ZAP tool 5. Demonstrate system hacking using the OWASP ZAP tool 6. Create a simple REST API using Python for the following operation GET PUSH POST DELETE 7. Diagnose and resolve common problems for the REST API 8. Install Burp Suite to do the following vulnerabilities: SQL injection Cross-site scripting (XSS) Attack the website using the Social Engineering method 9. Demonstrate XML external entity (XXE) injection 10. Implement Vulnerability Scanning with OpenVAS **Suggested Software Tools:** Wireshark, OWASP ZAP, Anaconda, Burp Suite	[30]
Total Hours: (Lecture - 30; Practical - 30)	**60**

Text Book(s):

1.	Andrew Hoffman, "Web Application Security: Exploitation and Countermeasures for Modern Web Applications", Ist Edition, OReilly Media, Inc, 2020.
2.	Bryan Sullivan, Vincent Liu, "Web Application Security: A Beginners Guide", The McGraw-Hill Companies, 2012.

Reference(s):

1.	John M Wargo, "Apache Cordova 4 Programming", 2015.
2.	John Horton, "Android Programming for Beginners", Packt Publishing, 2nd Edition, 2018.
3.	Shaun Lewis, Mike Dunn, "Native Mobile Development", 2019.
4.	Pawan Lingras, Matt Triff, Rucha Lingra, "Building Cross-Platform Mobile and Web Apps for Engineers and Scientists: An Active Learning Approach", 2016.

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Approved in Academic Council Meeting held on 25/05/2024

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*SDG:10 - Reduced Inequality
**SDG:11 - Sustainable Cities and Communities
***SDG:15 - Life on Land
****SDG:17 - Partnerships to Achieve the Goal

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Course Contents and Lecture Schedule

S. No.	Topics	No. of Hours
1.0	**Fundamentals of Web Application Security**	
1.1	The history of Software Security	1
1.2	Recognizing Web Application Security Threats	1
1.3	Web Application Security	1
1.4	Authentication and Authorization	1
1.5	Secure Socket layer	2
1.6	Transport layer Security	1
1.7	Session Management-Input Validation	2
2.0	**Secure Development and Deployment**	
2.1	Web Applications Security	1
2.2	Security Testing	1
2.3	Security Incident Response Planning	1
2.4	The Microsoft Security Development Lifecycle (SDL)	2
2.5	OWASP Comprehensive Lightweight Application Security Process (CLASP)	2
2.6	The Software Assurance Maturity Model (SAMM)	2
3.0	**Secure API Development**	
3.1	API Security- Session Cookies	1
3.2	Token Based Authentication	1
3.3	Securing Natter APIs: Addressing threats with Security Controls, Rate Limiting for Availability	1
3.4	Encryption, Audit logging	1
3.5	Securing service-to-service APIs: API Keys, OAuth2	1
3.6	Securing Microservice APIs: Service Mesh	1
3.7	Locking Down Network Connections	1
3.8	Securing Incoming Requests	1
3.9	non-parametric regression	1
4.0	**Vulnerability Assessment and Penetration Testing**	
4.1	Vulnerability Assessment Lifecycle	1
4.2	Vulnerability Assessment Tools: Cloud-based vulnerability scanners	1
4.3	Host-based vulnerability scanners	1
4.4	Network-based vulnerability scanners	1
4.5	Database-based vulnerability scanners	1
4.6	Types of Penetration Tests: External Testing	1
4.7	Web Application Testing, Internal Penetration Testing	1
4.8	SSID or Wireless Testing	1
4.9	Mobile Application Testing	1
5.0	**Hacking Techniques and Tools**	
5.1	Social Engineering, Injection	1
5.2	Cross-Site Scripting (XSS)	1
5.3	Broken Authentication and Session Management	1
5.4	Cross-Site Request Forgery, Security Misconfiguration	1
5.5	Insecure Cryptographic Storage	1
5.6	Failure to Restrict URL Access	1
5.7	Tools: Comodo, OpenVAS	1

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5.8	Nexpose, Nikto	1
5.9	Burp Suite, etc	1
Practical:		
1.	Install Wireshark and explore the various protocols	2
2.	Analyze the difference between HTTP vs HTTPS	4
3.	Capturing a bulk TCP transfer from your computer to a remote server	4
4.	Identify the vulnerabilities using the OWASP ZAP tool	2
5.	Demonstrate system hacking using the OWASP ZAP tool	2
6.	Create a simple REST API using Python for the following operation GET PUSH POST DELETE	4
7.	Diagnose and resolve common problems for the REST API	4
8.	Install Burp Suite to do the following vulnerabilities: SQL injection Cross-site scripting (XSS) Attack the website using the Social Engineering method	4
9.	Demonstrate XML external entity (XXE) injection	2
10	Implement Vulnerability Scanning with OpenVAS	2

Course Designer(s)

1.Dr.S.Sarumathi - sarumathi@ksrct.ac.in

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60 AD E31	Virtualization	Category	L	T	P	Credit
		PE	3	0	0	3

Objectives

- To Learn the basics and types of Virtualizations.
- To understand the Hypervisors and its types.
- To Explore the Virtualization Solutions.
- To Experiment the virtualization platforms.
- To learn with the VM with various software.

Pre-requisites

- Nil

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Analyse the virtualization concepts and Hypervisor	Remember
CO2	Apply the server and desktop level virtualization.	Understand
CO3	Apply network virtualization and its various tools.	Analyse
CO4	Understand and apply the concept of storage virtualization	Apply
CO5	Experiment with the VM with various software	Apply

Mapping with Programme Outcomes

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	1	3	1	-	2	-	-	-	-	-	-	1	2	3	2
CO2	3	2	2	-	2	-	-	-	-	-	-	3	3	2	1
CO3	3	2	1	-	1	-	-	-	-	-	-	3	3	3	2
CO4	1	1	2	-	3	-	-	-	-	-	-	1	3	2	2
CO5	1	3	2	-	1	-	-	-	-	-	-	3	1	1	2
3 - Strong; 2 - Medium; 1 - Some															

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		End Sem Examination (Marks)
	1	2	
Remember	10	10	20
Understand	20	20	30
Apply	10	10	20
Analyse	20	20	30
Evaluate	-	-	-
Create	-	-	-
Total	60	60	100

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B. Tech-Artificial Intelligence and Data Science								
60 AD E31 - Virtualization								
Semester	**Hours/Week**			**Total Hours**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
VII	3	0	0	45	3	40	60	100

Introduction To Virtualization Virtualization And Cloud Computing - Need of Virtualization – Cost, Administration, Fast Deployment, Reduce Infrastructure Cost – Limitations- Types of Hardware Virtualization: Full Virtualization – Partial Virtualization - Paravirtualization-Types of Hypervisors	[9]
Server And Desktop Virtualization Virtual Machine Basics- Types of Virtual Machines- Understanding Server Virtualization- Types of Server Virtualization- Business Cases for Server Virtualization – Uses of Virtual Server Consolidation – Selecting Server Virtualization Platform-Desktop Virtualization- Types Of Desktop Virtualization	[9]
Network Virtualization Introduction To Network Virtualization-Advantages- Functions-Tools for Network Virtualization- VLAN-WAN Architecture-Wan Virtualization	[9]
Storage Virtualization Memory Virtualization-Types of Storage Virtualization-Block, File-Address Space Remapping-Risks of Storage Virtualization-SAN-NAS-RAID.	[9]
Virtualization Tools VMware-Amazon Aws-Microsoft HyperV- Oracle Vm Virtual Box – IBM PowerVM- Google Virtualization- Case Study.	[9]
Total Hours:	**45**

Text Book(s):	
1.	Cloud computing a practical approach - Anthony T.Velte , Toby J. Velte Robert Elsenpeter, TATA McGraw- Hill , New Delhi – 2010
2.	Cloud Computing (Principles and Paradigms), Edited by Rajkumar Buyya, James Broberg, Andrzej Goscinski, John Wiley & Sons, Inc. 2011
Reference(s):	
1.	David Marshall, Wade A. Reynolds, Advanced Server Virtualization: VMware and Microsoft Platform in the Virtual Data Center, Auerbach
2.	Chris Wolf, Erick M. Halter, “Virtualization: From the Desktop to the Enterprise”, a Press, 2005.
3.	James E. Smith, Ravi Nair, “Virtual Machines: Versatile Platforms for Systems and Processes”, Elsevier/Morgan Kaufmann, 2005.
4.	David Marshall, Wade A. Reynolds, “Advanced Server Virtualization: VMware and Microsoft Platform in the Virtual Data Center”, Auerbach Publications, 2006.

*SDG 9 – Industry Innovation and Infrastructure

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Course Contents and Lecture Schedule		
S. No.	**Topics**	**No. of hours**
1.0	**Introduction To Virtualization**	
1.1	Virtualization and cloud computing - Need of virtualization	1
1.2	cost, administration, fast deployment	1
1.3	reduce infrastructure cos	1
1.4	limitations- Types of hardware virtualization	2
1.5	Full virtualization	1
1.6	partial virtualization	2
1.7	Paravirtualization	1
1.8	Types of Hypervisors	1
2.0	**Server And Desktop Virtualization**	
2.1	Virtual machine basics- Types of virtual machines	1
2.2	Understanding Server Virtualization	1
2.3	types of server virtualization	1
2.4	Business Cases for Server Virtualization	1
2.5	Uses of Virtual Server Consolidation	2
2.6	Selecting Server Virtualization Platform	1
2.7	Desktop Virtualization	1
2.8	Types of Desktop Virtualization	1
3.0	**Network Virtualization**	
3.1	Introduction to Network Virtualization	1
3.2	Advantages of network virtualization	1
3.3	Functions of network virtualization	1
3.4	Tools for Network Virtualization	2
3.5	VLAN Architecture	1
3.6	WAN Architecture	1
3.7	WAN Virtualization	1
4.0	**Storage Virtualization**	
4.1	Memory Virtualization	1
4.2	Types of Storage Virtualization	1
4.3	Block - Address space Remapping	1
4.4	File - Address space Remapping	2
4.5	Risks of Storage Virtualization	2
4.6	SAN	1
4.7	NAS, RAID	2
5.0	**Virtualization Tools**	
5.1	VMWare	1
5.2	Amazon AWS	2
5.3	Microsoft HyperV	1
5.4	Oracle VM Virtual Box	1
5.5	IBM PowerVM	2
5.6	Google Virtualization	2

1.Mrs.I.Kalaimani, AP/ AI&DS, kalaimani@ksrct.ac.in

60 AD E32	Data Warehousing	Category	L	T	P	Credit
		PC	3	0	0	3

Objectives

- To know the details of data warehouse Architecture
- To understand the OLAP Technology
- To understand the partitioning strategy
- To differentiate various schema
- To understand the roles of process manager & system manager

Pre-requisites

- Knowledge of Database Management Systems

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Design data warehouse architecture for various Problems	Design
CO2	Apply the OLAP Technology	Apply
CO3	Analyse the partitioning strategy	Analyze
CO4	Critically analyze the differentiation of various schema for given problem	Analyze
CO5	Frame roles of process manager & system manager	Apply

Mapping with Programme Outcomes

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	-	3	3	-	-	-	-	-	-	-	-	-	-	2
CO2	3	-	3	3	-	-	-	-	-	-	-	-	-	-	2
CO3	3	-	3	3	-	-	-	-	-	-	-	-	-	-	2
CO4	3	-	3	3	-	-	-	-	-	-	-	-	-	-	2
CO5	3	-	3	3	-	-	-	-	-	-	-	-	-	-	2
3 - Strong; 2 - Medium; 1 - Some															

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		End Sem Examination (Marks)
	1	2	
Remember	10	10	10
Understand	20	20	40
Apply	30	30	40
Analyse	-	-	10
Evaluate	-	-	-
Create	-	-	-
Total	60	60	100

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Syllabus

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B.Tech- Artificial Intelligence and Data Science								
60 AD E32- Data Warehousing								
Semester	**Hours/Week**			**Total Hours**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
V	3	0	0	45	3	40	60	100

Introduction to Data Warehouse Data warehouse Introduction - Data warehouse components- operational database Vs data warehouse – Data warehouse Architecture – Three-tier Data Warehouse Architecture - Autonomous Data Warehouse- Autonomous Data Warehouse Vs Snowflake - Modern Data Warehouse	[9]
ETL and OLAP Technology What is ETL – ETL Vs ELT – Types of Data warehouses - Data warehouse Design and Modeling - Delivery Process - Online Analytical Processing (OLAP) - Characteristics of OLAP - Online Transaction Processing (OLTP) Vs OLAP - OLAP operations- Types of OLAP- ROLAP Vs MOLAP Vs HOLAP.	[9]
Meta Data, Data Mart and Partition Strategy Meta Data – Categories of Metadata – Role of Metadata – Metadata Repository – Challenges for Meta Management - Data Mart – Need of Data Mart- Cost Effective Data Mart- Designing Data Marts- Cost of Data Marts- Partitioning Strategy – Vertical partition – Normalization – Row Splitting – Horizontal Partition	[9]
Dimensional Modeling and Schema Dimensional Modeling- Multi-Dimensional Data Modeling – Data Cube- Star Schema- Snowflake schema- Star Vs Snowflake schema- Fact constellation Schema- Schema Definition - Process Architecture- Types of Data Base Parallelism – Datawarehouse Tools	[9]
System & Process Managers Data Warehousing System Managers: System Configuration Manager- System Scheduling Manager - System Event Manager - System Database Manager - System Backup Recovery Manager - Data Warehousing Process Managers: Load Manager – Warehouse Manager- Query Manager – Tuning – Testing	[9]
Total Hours:	**45**

Text Book(s):	
1.	Alex Berson and Stephen J. Smith “Data Warehousing, Data Mining & OLAP”, Tata McGraw – Hill Edition, Thirteenth Reprint 2008.
2.	Ralph Kimball, “The Data Warehouse Toolkit: The Complete Guide to Dimensional Modeling”, Third edition, 2013.
Reference(s):	
1.	Paul Raj Ponniah, “Data warehousing fundamentals for IT Professionals”, 2012.
2.	K.P. Soman, ShyamDiwakar and V. Ajay “Insight into Data mining Theory and Practice”, Easter Economy Edition, Prentice Hall of India, 2006.
3.	Jiawei Han, Micheline Kamber Data Mining, Prentice Hall, 1st edition
4.	Michael J. Corey, Michael Abbey, Ben Taub, Ian Abramson Oracle 8i Data Warehousing McGraw-Hill Osborne Media, 2nd edition

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Course Contents and Lecture Schedule

S.No.	Topic	No.of Hours
1	**Introduction to Data Warehouse**	
1.1	Data warehouse Introduction	2
1.2	Data warehouse components	2
1.3	Operational Database Vs Data Warehouse	1
1.4	Data warehouse Architecture, Three-tier Data Warehouse Architecture	1
1.5	Autonomous Data Warehouse	1
1.6	Autonomous Data Warehouse Vs Snowflake - Modern Data Warehouse	2
2	**ETL and OLAP Technology**	
2.1	What is ETL ,ETL Vs ELT	1
2.2	Types of Data warehouses, Data warehouse Design and Modeling	1
2.3	Delivery Process	1
2.4	Online Analytical Processing (OLAP)	1
2.5	Characteristics of OLAP	1
2.6	Online Transaction Processing (OLTP) Vs OLAP	1
2.7	OLAP operations	1
2.8	Types of OLAP	1
2.9	ROLAP Vs MOLAP Vs HOLAP	1
3	**Meta Data, Data Mart and Partition Strategy**	
3.1	Meta Data, Categories of Metadata	1
3.2	Role of Metadata, Metadata Repository	1
3.3	Challenges for Meta Management, Data Mart	1
3.4	Need of Data Mart, Cost Effective Data Mart	1
3.5	Designing Data Marts	1
3.6	Cost of Data Marts	1
3.7	Partitioning Strategy	1
3.8	Vertical partition, Normalization	1
3.9	Row Splitting, Horizontal Partition	1
4	**Dimensional Modeling and Schema**	
4.1	Dimensional Modeling	1
4.2	Multi-Dimensional Data Modeling	1
4.3	Data Cube- Star Schema-	1
4.4	Snowflake schema	1
4.5	Star Vs Snowflake schema- Fact constellation Schema	1
4.6	Schema Definition	1
4.7	Process Architecture	1
4.8	Types of Data Base Parallelism	1
4.9	Datawarehouse Tools	1
5	**System & Process Managers**	
5.1	Data Warehousing System Managers: System Configuration Manager	1
5.2	System Scheduling Manager, System Event Manager	1
5.3	System Database Manager, System Backup Recovery Manager	1
5.4	Data Warehousing Process Managers: Load Manager	1

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5.5	Warehouse Manager, Query Manager	1
5.6	Tuning	2
5.7	Testing	2

Course Designer(s)

1. S. Gayathri – gayathris@ksrct.ac.in

60 AD E33	Storage Technologies	Category	L	T	P	Credit
		PE	3	0	0	3

Objectives

- To Characterize the functionalities of logical and physical components of storage
- To describe various storage networking technologies
- To identify different storage virtualization technologies
- To discuss the different backup and recovery strategies
- To Understand common storage management activities and solutions

Pre-requisites

- Environmentally friendly storage

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Demonstrate the fundamentals of information storage management and various models of Cloud infrastructure services and deployment	Understand
CO2	Illustrate the usage of advanced intelligent storage systems and RAID	Remember
CO3	Interpret various storage networking architectures - SAN, including storage subsystems and virtualization	Understand
CO4	Examine the different role in providing disaster recovery and remote replication technologies	Understand
CO5	Infer the security needs and security measures to be employed in information storage management	Understand

Mapping with Programme Outcomes

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	1	2	1	-	-	-	-	-	-	-	-	-	1	2	1
CO2	3	1	2	-	-	-	-	-	-	-	-	-	2	3	1
CO3	1	1	3	-	-	-	-	-	-	-	-	-	2	3	3
CO4	3	2	1	-	-	-	-	-	-	-	-	-	3	2	1
CO5	1	3	2	-	-	-	-	-	-	-	-	-	3	2	1
3 - Strong; 2 - Medium; 1 - Some															

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		End Sem Examination (Marks)
	1	2	
Remember	20	20	20
Understand	20	20	30
Apply	-	-	-
Analyse	10	10	20
Evaluate	10	10	30
Create	-	-	-
Total	60	60	100

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Syllabus

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B.Tech - Artificial Intelligence and Data Science								
60 AD E33 - Storage Technologies								
Semester	**Hours/Week**			**Total Hours**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
VII	3	0	0	45	3	40	60	100

Storage Systems * Introduction to Information Storage: Digital Data and its Types, Information Storage, Key Characteristics of Data Center and Evolution of Computing Platforms. Information Life Cycle Management. Third Platform Technologies: Cloud Computing and its Essential Characteristics, Cloud Services and Cloud Deployment Models, Big Data Analytics, Social Networking and Mobile Computing, Characteristics of Third Platform Infrastructure and Imperatives for Third Platform Transformation.	[9]
Intelligent Storage Systems and RAID * Components of an intelligent Storage System, Components, Addressing, and Performance of Hard Disk Drives and solid-State Drives, RAID, Types of Intelligent Storage Systems, Scale-Up and Scale-Out Storage Architecture.	[9]
Storage Networking Technologies and Virtualization * Block-Based Storage System, File-Based Storage System, Object-Based and Unified Storage. Fiber Channel SAN: Software-defined Networking, FC SAN Components and Architecture, FC SAN Topologies, Link Aggregation, and Zoning, Virtualization in FC SAN Environment..	[9]
Backup, Archive and Replication* Introduction to Business Continuity, Backup architecture, Backup Targets and Methods, Data Deduplication, Cloud-Based And Mobile Device Backup, Data archive, Uses of Replication and its Characteristics, Compute Based, Storage-Based, and Network-Based Replication, Data Migration, Disaster Recovery as a Service.	[9]
Securing Storage Infrastructure * Information Security Goals, Storage Security Domains, Threats to a Storage Infrastructure, Security Controls to Protect a Storage Infrastructure, Governance, Risk, and Compliance, Storage Infrastructure Management Functions, Storage Infrastructure Management Processes.	[9]
Total Hours:	**45**

Text Book(s):	
1.	Jon Tate, Pall Beck, Hector Hugo Ibarra, Shanmuganathan Kumaravel and Libor Miklas, “Introduction to Storage Area Networks”, Ninth Edition, IBM - Redbooks, December 2017
2.	Ulf Troppens, Rainer Erkens, Wolfgang Mueller-Friedt, Rainer Wolafka, Nils Haustein ,”Storage Networks “, Second Edition, Wiley, 2009
Reference(s):	
1.	EMC Corporation, “Information Storage and Management”, Wiley, India
2.	Marc Farley “Storage Networking Fundamentals: An Introduction to Storage Devices, Subsystems, Applications, Management, and Filing Systems", Cisco Press ,2003
3.	Tom Clark "Storage Virtualization: Technologies for Simplifying Data Storage and Management", Addison-Wesley Professional ,2008.
4.	Christopher Poelker and Alex Nikitin "Storage Area Networks For Dummies", Dummies , 2009.

* SDG4: Quality Education

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Dept. of Artificial Intelligence and Data Science
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Tiruchengode - 637 215.

Course Contents and Lecture Schedule

S. No.	Topics	No. of hours
1.0	**Storage Systems**	
1.1	Introduction to Information Storage: Digital Data and Its Types, Information Storage	1
1.2	Key characteristics of data center and Evolution of computing platforms	1
1.3	Information Lifecycle Management	1
1.4	Third Platform Technologies: Cloud Computing and Its Essential Characteristics	1
1.5	Cloud Services And Cloud Deployment Models	1
1.6	Big Data Analytics,	1
1.7	Social Networking	1
1.8	Mobile Computing	
1.9	Characteristics of Third Platform Infrastructure and Imperatives for Third Platform Transformation	1
2.0	**Intelligent Storage Systems and Raid**	
2.1	Components of an intelligent storage system	1
2.2	Components	1
2.3	Addressing	1
2.4	Performance of Hard Disk Drives	1
2.5	Solid-State Drives	1
2.6	Raid,	1
2.7	Types of Intelligent Storage Systems	1
2.8	Scale-Up	1
2.9	Scale-Out Storage Architecture	1
3.0	**Storage Networking Technologies and Virtualization**	
3.1	Block-Based Storage System, File-Based Storage System	1
3.2	Object-Based and Unified Storage	1
3.3	Fiber Channel San: Software-Defined Networking	2
3.4	FC San Components and Architecture, FC San Topologies	2
3.5	Link Aggregation, and Zoning, Virtualization In FC San Environment	3
4.0	**Backup, Archive and Replication**	
4.1	Introduction to Business Continuity	1
4.2	Backup Architecture, Backup Targets and Methods	1
4.3	Data Deduplication, Cloud-Based and Mobile Device Backup	1
4.4	Data Archive,	1
4.5	Uses of Replication and its Characteristics,	1
4.6	Compute Based, Storage-Based	1
4.7	Network-Based Replication	1
4.8	Data Migration,	1
4.9	Disaster Recovery As a Service	1
5.0	**Securing Storage Infrastructure**	
5.1	Information Security Goals	1
5.2	Storage Security Domains	1
5.3	Threats to a Storage Infrastructure	1
5.4	Security Controls to Protect a Storage Infrastructure	1
5.5	Governance, Risk, and Compliance	1
5.6	Storage Infrastructure Management Functions	2
5.7	Storage Infrastructure Management Processes	2

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Course Designer(s)

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60 AD E34	Software Defined Networks	Category	L	T	P	Credit
		PE	3	0	0	3

Objectives

- To develop knowledge in networking fundamentals
- To gain conceptual understanding of Software Defined Networks (SDN)
- To study industrial deployment use-cases of SDN
- To Apply and evaluate security challenges in the SDN paradigm.
- To Evaluate the emerging SDN application

Pre-requisites

- Data management tools, structure and Network System

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Examine the challenges and opportunities associated with adopting SDN compared to traditional approaches to networking	Remember
CO2	Understand Advanced and Emerging Networking Technologies SDN Networks.	Understand
CO3	Obtain Skills to do SDN Networking Research and Programming.	Analyse
CO4	Design and create an SDN network consisting of SDN switches and a centralized controller.	Apply
CO5	Analyze the performance of the SDN network by using verification and troubleshooting techniques.	Analyse

Mapping with Programme Outcomes

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	-	-	-	2	-	-	-	-	-	-	-	-	-	-
CO2	3	-	2	-	3	-	-	-	-	-	-	-	-	-	-
CO3	3	2	2	-	3	-	-	-	-	-	-	2	3	3	2
CO4	3	3	2	-	3	-	-	-	-	-	-	3	2	3	2
CO5	3	2	2	3	3	-	-	-	-	-	-	2	3	3	2

3 - Strong; 2 - Medium; 1 - Some

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		End Sem Examination (Marks)
	1	2	
Remember	10	10	20
Understand	20	10	30
Apply	10	20	30
Analyse	20	20	20
Evaluate	-	-	-
Create	-	-	-
Total	60	60	100

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Syllabus

K.S. Rangasamy College of Technology – Autonomous R2022								
B. Tech-Artificial Intelligence and Data Science								
60 AD E34- Software Defined Networks								
Semester	**Hours/Week**			**Total Hours**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
VII	3	0	0	45	3	40	60	100

Introducing SDN SDN Origins and Evolution – Introduction – Architecture of SDN - Centralized and Distributed Control and Data Planes - The Genesis Of SDN- ODL, Floodlight 3 Click.	[9]
SDN Abstractions SDN Works - The OpenFlow Protocol - SDN Controllers: Introduction - General Concepts – VM ware - Nicira – VM ware/Nicira - OpenFlow-Related - Mininet - Nox/Pox - Trema - Ryu - Big Switch Networks/Floodlight - Layer 3 Centric - Plexxi - Cisco OnePK.	[9]
Programming SDN's Network Programmability - Network Function Virtualization - NetApp Development, Network Slicing- OnOS, Northbound- Southbound Interfacing.	[9]
SDN Applications and Use Cases SDN In the Data Centre - SDN In Other Environments - SDN Applications - SDN Use Cases –The Open Network Operating System.	[9]
SDN's Future and Perspectives SDN Open Source - SDN Futures - Final Thoughts and Conclusions- OnOS Deployment OnOS – OpnFy – SDN Application Development.	[9]
Total Hours:	**45**

Text Book(s):	
1.	Software Defined Networks: A Comprehensive Approach by Paul Goransson and Chuck Black, Morgan Kaufmann Publications, 2014.
2.	SDN - Software Defined Networks by Thomas D. Nadeau & Ken Gray, O'Reilly, 2013.
Reference(s):	
1.	SDN - Software Defined Networks by Thomas D. Nadeau & Ken Gray, O'Reilly, 2013.
2.	Feamster, Nick, Jennifer Rexford, And Ellen Zegura. "The Road To SDN: An Intellectual History of Programmable Networks." ACM SIGCOMM Computer Communication Review 44.2 (2014): 87-98.
3.	Kreutz, Diego, et al. "Software-Defined Networking: A Comprehensive Survey." Proceedings Of the IEEE 103.1 (2015): 14-76.
4.	Nunes, Bruno AA, Et Al. "A Survey of Software-Defined Networking: Past, Present, And Future of Programmable Networks." Communications Surveys & Tutorials, IEEE 16.3 (2014): 1617-1634.

**SDG 9 – Industry Innovation and Infrastructure

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Course Contents and Lecture Schedule

S. No.	Topics	No. of hours
1.0	**Introducing SDN**	
1.1	SDN Origins and Evolution	1
1.2	Introduction	1
1.3	Architecture of SDN	1
1.4	Centralized And Distributed Control	2
1.5	Data Planes	1
1.6	The Genesis Of SDN	1
1.7	ODL and Floodlight 3 Click	2
2.0	**SDN Abstractions**	
2.1	SDN Works	1
2.2	The OpenFlow Protocol	1
2.3	SDN Controllers Introduction	1
2.4	VM ware and Nicira	1
2.5	OpenFlow Related	1
2.6	Mininet and Nox/Pox	1
2.7	Big Switch Networks/Floodlight	2
2.8	Plexxi and Cisco OnePk	1
3.0	**Programming SDN's**	
3.1	Network Programmability	2
3.2	Network Function Virtualization	2
3.3	NetApp Development	2
3.4	Network Slicing	1
3.5	OnOS	1
3.6	Northbound and Southbound Interfacing	1
4.0	**SDN Applications and Use Cases**	
4.1	SDN In the Data Centre	2
4.2	SDN In Other Environments	1
4.3	SDN Applications	2
4.4	SDN Use Cases	2
4.5	The Open Network Operating System	2
5.0	**SDN's Future and Perspectives**	
5.1	SDN Open Source	1
5.2	SDN Futures	1
5.3	Final Thoughts and Conclusions	2
5.4	Onos Deployment	2
5.5	OpnFy	1
5.6	SDN Application Development	2

Course Designer(s)

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60 AD E35	Stream Processing	Category	L	T	P	Credit
		PE	3	0	0	3

Objectives

- To introduce data processing terminology, definition & concepts
- To define different types of data processing
- To explain the concepts of real-time data processing
- To select appropriate structures for designing and running real-time data services in a business environment
- To illustrate the benefits and drive the adoption of real-time data services to solve real-world problems.

Pre-requisites

- Fundamentals of programming language, Database Management Systems

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Analyze the applicability and utility of different streaming algorithms.	Remember
CO2	Apply current research trends in data-stream processing.	Understand
CO3	Analyze the suitability of stream mining algorithms for data stream systems.	Apply
CO4	Program and build stream processing systems, services, and applications.	Remember
CO5	Solve problems in real-world applications that process data streams	Understand

Mapping with Programme Outcomes

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	2	2	2	-	3	-	-	-	-	-	-	-	2	-	-
CO2	2	2	2	-	3	-	-	-	-	-	-	-	2	3	2
CO3	2	2	2	-	3	-	-	-	-	-	-	-	-	3	3
CO4	2	2	2	-	3	-	-	-	-	-	-	-	-	3	-
CO5	2	2	2	-	3	-	-	-	-	-	-	-	-	-	-
3 - Strong; 2 - Medium; 1 - Some															

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		End Sem Examination (Marks)
	1	2	
Remember	10	10	10
Understand	20	20	30
Apply	30	30	60
Analyse	00	00	00
Evaluate	00	00	00
Create	00	00	00
Total	60	60	100

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Syllabus

K.S.Rangasamy College of Technology – Autonomous R2022								
B.Tech – Artificial Intelligence and Data Science								
60 AD E35 – Stream Processing								
Semester	**Hours/Week**			**Total Hours**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
VII	3	0	0	45	3	40	60	100

Foundations of Data Systems Introduction to Data Processing, Stages of Data processing, Data Analytics, Batch Processing, Stream Processing, Statistical approximation to the streaming data, Data Migration, Transactional Data processing, Data Mining, Data Management Strategy, Storage, Processing, Integration, Analytics, Benefits of Data as a Service, Challenges	[9]
Real-Time Data Processing Introduction to Big data, Big data infrastructure, Real-time Analytics, Near real-time solution, Lambda architecture, Kappa Architecture, Stream Processing, Understanding Data Streams, Message Broker, Stream Processor, Batch & Real-time ETL tools, Streaming Data Storage	[9]
Data Models and Query Languages Relational Model, Document Model, Key-Value Pairs, NoSQL, Object-Relational Mismatch, Many-to-One and Many-to-Many Relationships, Network data models, Schema Flexibility, Structured Query Language, Data Locality for Queries, Declarative Queries, Graph Data models, Cypher Query Language, Graph Queries in SQL, The Semantic Web, CODASYL, SPARQL	[9]
Event Processing with Apache Kafka* Apache Kafka, Kafka as Event Streaming platform, Events, Producers, Consumers, Topics, Partitions, Brokers, Kafka APIs, Admin API, Producer API, Consumer API, Kafka Streams API, Kafka Connect API	[9]
Real-Time Processing using Spark Streaming Structured Streaming, Basic Concepts, Handling Event-time and Late Data, Fault-tolerant Semantics, Exactly-once Semantics, Creating Streaming Datasets, Schema Inference, Partitioning of Streaming datasets, Operations on Streaming Data, Selection, Aggregation, Projection, Watermarking, Window operations, Types of Time windows, Join Operations, Deduplication	[9]
Total Hours:	**45**
Text Book(s):	

1.	Tyler Akidau, Slava Chemyak, Reuven Lax, “Streaming Systems: The What, Where, When and How of Large-Scale Data Processing”, O’Reilly publication
2.	Martin Kleppmann, “Designing Data-Intensive Applications”, O’Reilly Media
Reference(s):	
1.	Gupta Saurabh and Shilpi Saxena, “Practical Real-time Data Processing and Analytics: Distributed Computing and Event Processing using Apache Spark, Flink, Storm and Kafka”, Packt Publishing
2.	https://spark.apache.org/docs/latest/streaming-programming-guide.html
3.	Kafka.apache.org
4.	Andrade HCM, Gedik B, Turaga DS, “Fundamentals of Stream Processing: Application Design, Systems, and Analytics”, Cambridge University Press; 2014.

**SDG: 9 - Industry, Innovation and Infrastructure

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Course Contents and Lecture Schedule

S. No.	Topics	No. of hours
1.0	**Foundations of Data Systems**	
1.1	Introduction to Data Processing	1
1.2	Stages of Data processing, Data Analytics	1
1.3	Batch Processing, Stream processing, Statistical approximation to the streaming data	1
1.4	Data Migration, Transactional Data processing	1
1.5	Data Mining, Data Management Strategy	1
1.6	Storage, Processing	1
1.7	Integration	1
1.8	Analytics	1
1.9	Benefits of Data as a Service, Challenges	1
2.0	**Real-Time Data Processing**	
2.1	Introduction to Big Data	1
2.2	Big data infrastructure	1
2.3	Real-time Analytics	1
2.4	Near real-time solution	1
2.5	Lambda architecture	1
2.6	Kappa Architecture	1
2.7	Stream Processing, Understanding Data Streams	1
2.8	Message Broker, Stream Processor	1
2.9	Batch & Real-time ETL tools, Streaming Data Storage	1
3.0	**Data Models and Query Languages**	
3.1	Relational Model, Document Model, Key-Value Pairs	1
3.2	NoSQL, Object-Relational Mismatch, Many-to-One and Many-to-Many Relationships	1
3.3	Network data models, Schema Flexibility, Structured Query Language	1
3.4	Data Locality for Queries, Declarative Queries	1
3.5	Graph Data models, Cypher Query Language	1
3.6	Graph Queries in SQL	1
3.7	The Semantic Web	1
3.8	CODASYL	1
3.9	SPARQL	1
4.0	**Event Processing with Apache Kafka***	
4.1	Apache Kafka	1
4.2	Kafka as Event Streaming platform	1
4.3	Events, Producers	1
4.4	Consumers, Topics, Partitions	1
4.5	Brokers, Kafka APIs	1
4.6	Admin API, Producer API	1
4.7	Consumer API	1
4.8	Kafka Streams API	1
4.9	Kafka Connect API	1
5.0	**Real-Time Processing using Spark Streaming**	
5.1	Structured Streaming, Basic Concepts	1
5.2	Handling Event-time and Late Data	1
5.3	Fault-tolerant Semantics, Exactly-once Semantics	1

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5.4	Creating Streaming Datasets, Schema Inference	1
5.5	Partitioning of Streaming datasets	1
5.6	Operations on Streaming Data	1
5.7	Selection, Aggregation, Projection	1
5.8	Watermarking, Window operations, Types of Time windows	1
5.9	Join Operations, Deduplication	1

Course Designer(s)

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60 AD E36	Security and Privacy in Cloud	Category	L	T	P	Credit
		PE	3	0	0	3

Objectives

- To Introduce Cloud Computing terminology, definition & concepts
- To understand the security design and architectural considerations for Cloud
- To understand the Identity, Access control in Cloud
- To follow best practices for Cloud security using various design patterns
- To be able to monitor and audit cloud applications for security

Pre-requisites

- Digital Logic and Microprocessors, Data structures, C Programming

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Understand the cloud concepts and fundamentals	Understand
CO2	Explain the security challenges in the cloud.	Analyse
CO3	Define cloud policy and Identity and Access Management.	Analyse
CO4	Understand various risks and audit and monitoring mechanisms in the cloud.	Understand
CO5	Define the various architectural and design considerations for security in the cloud.	Understand

Mapping with Programme Outcomes

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	3	1	2	-	-	-	1	1	1	3	3	1	2
CO2	1	3	2	3	1	-	-	-	2	2	3	2	3	1	2
CO3	3	2	2	3	2	-	-	-	3	1	1	2	2	3	1
CO4	2	1	2	3	3	-	-	-	3	1	3	3	1	1	2
CO5	1	3	3	1	1	-	-	-	1	3	3	2	2	3	2
3 - Strong; 2 - Medium; 1 - Some															

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		End Sem Examination (Marks)
	1	2	
Remember	20	20	34
Understand	40	40	66
Apply	-	-	-
Analyse	-	-	-
Evaluate	-	-	-
Create	-	-	-
Total	60	60	100

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Syllabus

K.S.Rangasamy College of Technology – Autonomous R2022								
B.Tech- Artificial Intelligence and Data Science								
60 AD E36 - Security and Privacy in Cloud								
Semester	**Hours/Week**			**Total Hours**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
VII	3	0	0	45	3	40	60	100

Fundamentals Of Cloud Security Concepts* Overview of cloud security- Security Services - Confidentiality, Integrity, Authentication, Nonrepudiation, Access Control - Basic of cryptography - Conventional and public-key cryptography, hash functions, authentication, and digital signatures	[9]
Security Design And Architecture For Cloud* Security design principles for Cloud Computing - Comprehensive data protection - End-to-end access control - Common attack vectors and threats - Network and Storage - Secure Isolation Strategies - Virtualization strategies - Inter-tenant network segmentation strategies - Data Protection strategies: Data retention, deletion and archiving procedures for tenant data, Encryption, Data Redaction, Tokenization, Obfuscation, PKI and Key	[9]
Access Control And Identity Management* Access control requirements for Cloud infrastructure - User Identification - Authentication and Authorization - Roles-based Access Control - Multi-factor authentication - Single Sign-on, Identity Federation - Identity providers and service consumers - Storage and network access control options - OS Hardening and minimization - Verified and measured boot - Intruder Detection and prevention	[9]
Cloud Security Design Patterns* Introduction to Design Patterns, Cloud bursting, Geo-tagging, Secure Cloud Interfaces, Cloud Resource Access Control, Secure On-Premise Internet Access, Secure External Cloud	[9]
Monitoring, Auditing And Management* Proactive activity monitoring - Incident Response, Monitoring for unauthorized access, malicious traffic, abuse of system privileges - Events and alerts - Auditing – Record generation, Reporting and Management, Tamper-proofing audit logs, Quality of Services, Secure Management, User management, Identity management, Security Information and Event Management	[9]
Total Hours:	**45**
Text Book(s):	

1.	Raj Kumar Buyya , James Broberg, andrzejGoscinski, • gCloud Computing:., Wiley 2013
2.	Dave shackleford, • gVirtualization Security., SYBEX a wiley Brand 2013.
3.	Mather, Kumaraswamy and Latif, • gCloud Security and Privacy., OREILLY 2011
4.	Mark C. Chu-Carroll • gCode in the Cloud.,CRC Press, 2011
5.	Mastering Cloud Computing Foundations and Applications Programming RajkumarBuyya, Christian Vechhiola, S. ThamaraiSelvi

*SDG 9 – Industry Innovation and Infrastructure

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Course Contents and Lecture Schedule

S. No.	Topics	No. of hours
1.0	**Fundamentals Of Cloud Security Concepts**	
1.1	Overview of cloud security- Security Services	1
1.2	Confidentiality, Integrity, Authentication	1
1.3	Nonrepudiation, Access Control	1
1.4	Basic of cryptography	1
1.5	Conventional and public-key cryptography	2
1.6	hash functions	1
1.7	Authentication	1
1.8	digital signatures	1
2.0	**Security Design And Architecture For Cloud**	
2.1	Security design principles for Cloud Computing - Comprehensive data protection	1
2.2	End-to-end access control - Common attack vectors and threats	1
2.3	Network and Storage	1
2.4	Secure Isolation Strategies - Virtualization strategies	1
2.5	Inter-tenant network segmentation strategies	1
2.6	Data Protection strategies: Data retention, deletion	1
2.7	Data Protection strategies: archiving procedures for tenant data, Encryption	1
2.8	Data Redaction, Tokenization, Obfuscation	1
2.9	PKI and Key	1
3.0	**Access Control and Identity Management**	
3.1	Access control requirements for Cloud infrastructure - User Identification	1
3.2	Authentication and Authorization - Roles-based Access Control	1
3.3	Multi-factor authentication - Single Sign-on, Identity Federation	1
3.4	Identity providers and service consumers	1
3.5	Storage and network access control options	1
3.6	OS Hardening and minimization	1
3.7	Verified and measured boot	1
3.8	Intruder Detection and prevention	1
3.9	Access control requirements for Cloud infrastructure - User Identification	1
4.0	**Cloud Security Design Patterns**	
4.1	Introduction to Design Patterns	1
4.2	Cloud bursting	1
4.3	Geo-tagging	2
4.4	Secure Cloud Interfaces	1
4.5	Cloud Resource Access Control	1
4.6	Secure On-Premise Internet Access	1
4.7	Secure External Cloud	1
5.0	**Monitoring, Auditing And Management**	
5.1	Proactive activity monitoring - Incident Response	1
5.2	Monitoring for unauthorized access, malicious traffic	1
5.3	abuse of system privileges - Events and alerts	1
5.4	Auditing – Record generation, Reporting and Management	1
5.5	Tamper-proofing audit logs, Quality of Services	1
5.6	Secure Management, User management	1
5.7	Identity management	1

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5.8	Security Information and Event Management	1
5.9	Proactive activity monitoring - Incident Response	1

Course Designer(s)

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60 AD E41	Ethical Hacking	Category	L	T	P	Credit
		PE	3	0	0	3

Objectives

- To understand the basics of computer-based vulnerabilities
- To explore different foot printing, reconnaissance and scanning methods
- To expose the enumeration and vulnerability analysis methods
- To understand hacking options available in Web and wireless applications
- To explore the options for network protection

Pre-requisites

- Computer Networks

Course Outcomes

On the successful completion of the course, students will be able to

CO1	To express knowledge on basics of computer-based vulnerabilities	Understand
CO2	To gain understanding on different foot printing, reconnaissance and scanning methods	Understand
CO3	To demonstrate the enumeration and vulnerability analysis methods	Apply
CO4	To gain knowledge on hacking options available in Web and wireless applications	Understand
CO5	To acquire knowledge on the options for network protection.	Apply

Mapping with Programme Outcomes

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	2	2	-	-	-	-	-	-	-	-	-	-	1	2	3
CO2	1	2	-	-	-	-	-	-	-	-	-	-	1	2	2
CO3	2	2	-	-	-	-	-	-	-	-	-	-	2	3	1
CO4	2	1	-	-	-	-	-	-	-	-	-	-	3	2	1
CO5	2	3	-	-	-	-	-	-	-	-	-	-	1	1	3
3 - Strong; 2 - Medium; 1 - Some															

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		End Sem Examination (Marks)
	1	2	
Remember	20	10	10
Understand	10	20	30
Apply	30	30	30
Analyse	-	-	-
Evaluate	-	-	-
Create	-	-	-
Total	60	60	100

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Syllabus

K.S.Rangasamy College of Technology – Autonomous R2022								
B.Tech-Artificial Intelligence and Data Science								
60 AD E41-Ethical Hacking								
Semester	**Hours/Week**			**Total Hours**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
VII	3	0	0	45	3	40	60	100

Introduction Ethical Hacking Overview - Role of Security and Penetration Testers - Penetration-Testing Methodologies- Laws of the Land - Overview of TCP/IP- The Application Layer - The Transport Layer - The Internet Layer - IP Addressing- Network and Computer Attacks - Malware - Protecting Against Malware Attacks- Intruder Attacks - Addressing Physical Security.	[9]
Foot Printing, Reconnaissance and Scanning Networks Footprinting Concepts - Footprinting through Search Engines, Web Services, Social Networking Sites, Website, Email - Competitive Intelligence - Footprinting through Social Engineering - Footprinting Tools - Network Scanning Concepts - Port-Scanning Tools - Scanning Techniques - Scanning Beyond IDS and Firewall.	[9]
Enumeration and Vulnerability Analysis* Enumeration Concepts - NetBIOS Enumeration – SNMP, LDAP, NTP, SMTP and DNS Enumeration - Vulnerability Assessment Concepts - Desktop and Server OS Vulnerabilities - Windows OS Vulnerabilities - Tools for Identifying Vulnerabilities in Windows- Linux OS Vulnerabilities- Vulnerabilities of Embedded Oss.	[9]
System Hacking Hacking Web Servers - Web Application Components- Vulnerabilities - Tools for Web Attackers and Security Testers Hacking Wireless Networks - Components of a Wireless Network – Wardriving- Wireless Hacking - Tools of the Trade.	[9]
Network Protection Systems Access Control Lists. - Cisco Adaptive Security Appliance Firewall - Configuration and Risk Analysis Tools for Firewalls and Routers - Intrusion Detection and Prevention Systems - Network-Based and Host-Based IDSs and IPSs - Web Filtering - Security Incident Response Teams – Honeypots.	[9]
Total Hours:	**45**

Text Book(s):	
1.	Michael T. Simpson, Kent Backman, and James E. Corley, Hands-On Ethical Hacking and Network Defense, Course Technology, Delmar Cengage Learning, 2010.
2.	The Basics of Hacking and Penetration Testing - Patrick Engebretson, SYNGRESS, Elsevier, 2013.
Reference(s):	
1.	The Web Application Hacker's Handbook: Finding and Exploiting Security Flaws, Dafydd Stuttard and Marcus Pinto, 2011.
2.	Black Hat Python: Python Programming for Hackers and Pentesters, Justin Seitz , 2014.
3.	**Nptel Course – Ethical Hacking**

*SDG 9 – Industry Innovation and Infrastructure

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Course Contents and Lecture Schedule

S.No.	Topic	No.of Hours
1	**Introduction**	**9**
1.1	Ethical Hacking Overview	1
1.2	Role of Security and Penetration Testers	1
1.3	Penetration, Testing Methodologies	1
1.4	Laws of the Land, Overview of TCP/IP	1
1.5	The Application Layer, The Transport Layer	1
1.6	The Internet Layer, IP Addressing	1
1.7	Network and Computer Attacks, Malware	1
1.8	Protecting Against Malware Attacks, Intruder Attacks	1
1.9	Addressing Physical Security	1
2	**Foot Printing, Reconnaissance and Scanning Networks**	**9**
2.1	Footprinting Concepts, Footprinting through Search Engines	1
2.2	Web Services	1
2.3	Social Networking Sites, Website	1
2.4	Competitive Intelligence	1
2.5	Footprinting through Social Engineering	1
2.6	Footprinting Tools, Network Scanning Concepts	1
2.7	Port-Scanning Tools	1
2.8	Scanning Techniques	1
2.9	Scanning Beyond IDS and Firewall	1
3	**Enumeration and Vulnerability Analysis**	**9**
3.1	Enumeration Concepts	1
3.2	NetBIOS Enumeration	1
3.3	SNMP, LDAP, NTP, SMTP and DNS Enumeration	1
3.4	Vulnerability Assessment Concepts	1
3.5	Desktop and Server OS Vulnerabilities	1
3.6	Windows OS Vulnerabilities	1
3.7	Tools for Identifying Vulnerabilities in Windows	1
3.8	Linux OS Vulnerabilities	1
3.9	Vulnerabilities of Embedded Oss	1
4	**System Hacking**	**9**
4.1	Hacking Web Servers	1
4.2	Web Application Components	1
4.3	Vulnerabilities	1
4.4	Tools for Web Attackers	1
4.5	Security Testers Hacking Wireless Networks	1
4.6	Components of a Wireless Network	1
4.7	Wardriving	1
4.8	Wireless Hacking	1
4.9	Tools of the Trade	1
5	**Network Protection Systems**	**9**
5.1	Access Control Lists	1
5.2	Cisco Adaptive Security Appliance Firewall	1

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5.3	Configuration and Risk Analysis Tools for Firewalls and Routers	2
5.4	Intrusion Detection and Prevention Systems	1
5.5	Network-Based and Host-Based IDSs and IPSs	1
5.6	Web Filtering	1
5.7	Security Incident Response Teams	1
5.8	Honeypots	1

Course Designer(s)

1. S. Gayathri – gayathris@ksrct.ac.in

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60 AD E42	Digital And Mobile Forensics	Category	L	T	P	Credit
		PE	3	0	0	3

Objectives

- To Describe basic principles of digital forensics and identify the unique challenges involved in mobile forensics
- To Describe mobile ecosystem security mechanisms and risks
- To Conduct the logical acquisition and physical acquisition to extract data from mobile device such as iPhone and android phones
- To Analyse the extracted data to identify and examine important case data such as contacts, call logs, SMS, images, audio and video files, web history, passwords, application data.
- To Apply industry best practices to evidence collection and analysis with hands-on exercises using current tools.

Pre-requisites

- Operating Systems and Programming Languages.

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Understand basic digital forensics and techniques	Remember
CO2	Understand digital crime and investigation.	Understand
CO3	Obtain and prepared for digital forensic readiness.	Analyse
CO4	Learn how to use forensics tools for iOS devices	Analyse
CO5	Expand upon use forensics tools for Android devices.	Analyse

Mapping with Programme Outcomes

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	-	-	-	2	-	2	-	-	-	-	-	-	2
CO2	3	2	-	2	-	2	-	2	-	-	-	-	2	2	2
CO3	3	2	3	2	2	2	-	2	-	-	-	2	2	2	2
CO4	3	2	2	2	2	2	-	2	-	-	-	2	2	2	2
CO5	3	2	3	3	2	2	-	2	-	-	-	3	2	2	2
3 - Strong; 2 - Medium; 1 - Some															

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		End Sem Examination (Marks)
	1	2	
Remember	10	10	20
Understand	20	20	30
Apply	-	-	-
Analyse	30	30	40
Evaluate	-	-	-
Create	-	-	-
Total	60	60	100

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B. Tech-Artificial Intelligence and Data Science								
60 AD E42- Digital and Mobile Forensics								
Semester	**Hours/Week**			**Total Hours**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
VII	3	0	0	45	3	40	60	100

Introduction To Digital Forensics Forensic Science- Digital Forensics-Digital Evidence-Digital Forensics Process-Introduction: The Identification Phase-The Collection Phase-The Examination Phase-The Analysis Phase-The Presentation Phase.	[9]
Digital Crime and Investigation Digital Crime-Substantive Criminal Law-General Conditions -Offenses-Investigation Methods for Collecting Digital Evidence-International Cooperation to Collect Digital Evidence.	[9]
Digital Forensics Readiness Introduction -Law Enforcement Versus Enterprise Digital Forensic Readiness-Rational for Digital Forensic Readiness-Frameworks, Standards and Methodologies-Enterprise Digital Forensic Readiness-Challenges in Digital Forensics.	[9]
iOS Forensics Mobile Hardware and Operating Systems -iOS Fundamentals-Jailbreaking-File System-Hardware -iPhone Security-iOS Forensic-Procedures-Procedures and Processes-Tools-Oxygen Forensics-Mobil Edit-iCloud.	[9]
Android Forensics Android Basics-Key Codes -ADB-Rooting Android-Boot Process-File Systems-Security-Tools-Android Forensics-Forensic Procedures-ADB-Android Only Tools-Due Use Tools-Oxygen Forensics-Mobil Edit-Android App Decompiling.	[9]
Total Hours:	**45**

Text Book(s):	
1.	Andre Arnes—Digital Forensics, Wiley, 2018.
2.	Chuck Easttom, —An In-Depth Guide to Mobile Device Forensics‖, First Edition, CRC Press, 2022.
Reference(S):	
1.	Vacca, J, Computer Forensics, Computer Crime Scene Investigation, 2nd Ed, Charlesriver Media, 2005, ISBN: 1-58450-389.

**SDG 9 – Industry Innovation and Infrastructure

***SDG 16 - Guarantee Peace, Justice, And Strong Institutions

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Course Contents and Lecture Schedule

S. No.	Topics	No. of hours
1.0	**Introduction To Digital Forensics**	
1.1	Forensic Science	1
1.2	Digital Forensics	1
1.3	Digital Evidence	1
1.4	Digital Forensics Process	2
1.5	The Identification Phase	1
1.6	The Collection Phase	1
1.7	The Examination Phase	1
1.8	The Analysis Phase and Presentation Phase.	1
2.0	**Digital Crime and Investigation**	
2.1	Digital Crime	1
2.2	Substantive Criminal Law	2
2.3	General Conditions	1
2.4	Offenses	1
2.5	Investigation Methods for Collecting Digital Evidence	2
2.6	International Cooperation to Collect Digital Evidence.	2
3.0	**Digital Forensics Readiness**	
3.1	Law Enforcement Vs Enterprise Digital Forensic Readiness	2
3.2	Rational For Digital Forensic Readiness	1
3.3	Frameworks	1
3.4	Standards And Methodologies	2
3.5	Enterprise Digital Forensic Readiness	2
3.6	Challenges In Digital Forensics	1
4.0	**iOS Forensics**	
4.1	Mobile Hardware and Operating Systems	1
4.2	iOS Fundamentals	1
4.3	Jailbreaking	1
4.4	File System	1
4.5	iPhone Security	1
4.6	iOS Forensic Procedures	2
4.7	Oxygen Forensics	1
4.8	Mobil Edit And iCloud	1
5.0	**Android Forensics**	
5.1	Android Basics	1
5.2	Key Codes	1
5.3	Rooting Android-Boot Process	1
5.4	File Systems and Security	2
5.5	Forensic Procedures ADB and Android Only Tools	1
5.6	Android Only Tools	2
5.7	Due Use Tools and Android App Decompiling	1

Course Designer(s)

1.Ms.P. Indhumathi - indhumathip@ksrct.ac.in

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60 AD E43	Social Network Security	Category	L	T	P	Credit
		PE	3	0	0	3

Objectives

- To understand the need of security in social data and its risks.
- To learn the techniques about browser's risks.
- To Understand how to secure different web browser
- To about Social Networking, Understand the risks while using social media guidelines for social networking
- Understand how an e-mail works, learn threats involved using an email communication, safety measures while using e-mail

Pre-requisites

- Analysing dynamic social network data for security

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Understand the need of security in social data	Understand
CO2	Apply the concept of virtualization and its types	Apply
CO3	Learn the secure web browser to secure the contents	Analyse
CO4	Apply the safety measures for social media for security concepts	Apply
CO5	Learn threats involved in content management	Understand

Mapping with Programme Outcomes

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	-	-	-	2	-	-	-	-	-	-	-	2	-	2
CO2	2	1	-	-	-	-	-	-	-	-	-	-	-	-	2
CO3	2	-	2	-	4	-	-	-	-	-	-	3	-	-	2
CO4	3	-	-	-	-	-	-	-	-	-	-	-	3	-	2
CO5	4	-	-	-	-	-	-	-	-	-	-	2	-	-	2
3 - Strong; 2 - Medium; 1 - Some															

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		End Sem Examination (Marks)
	1	2	
Remember	-	-	-
Understand	20	20	66
Apply	20	20	-
Analyse	20	20	34
Evaluate	-	-	-
Create	-	-	-
Total	60	60	100

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B.Tech – Artificial Intelligence and Data Science								
60 AD E43- Social Network Security								
Semester	**Hours/Week**			**Total Hours**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
VII	3	0	0	45	3	40	60	100

Introduction to Social Media Introduction to social media, understanding social media, Different Types and Classifications, Cutting Edge Versus Bleeding Edge, The Problems That Come with social media	[9]
Social Engineering and Cyber Stalking Dark side Cybercrime, Social Engineering, Hacked accounts, cyberstalking, cyberbullying, predators, phishing, hackers*	[9]
Social Media Campaigns and Management Being bold versus being overlooked Good social media campaigns, Bad social media campaigns, The human factor, Content management, Promotion of social media*	[9]
Public Embarrassment and False Information Risks of Social media Introduction Public embarrassment, Once it's out there, Information leakage, Retention and archiving, Loss of data and equipment	[9]
Policies and Awareness Policies and Privacy Blocking users controlling app privacy, Location awareness, Security Fake accounts passwords, privacy and information sharing *	[9]
Total Hours:	**45**

Text Book(s):	
1.	Interdisciplinary Impact Analysis of Privacy in Social Networks, Recognizing Your Digital Friends, Encryption for Peer-to-Peer Social Networks Crowd sourcing and Ethics, Authors: Altshuler Y, EloviciY, Cremers A.B, Aharony N, Pentland A. (Eds.).
2.	Social media security https://www.sciencedirect.com/science/article/pii/B9781597499866
Reference(s):	
1.	Michael Cross, Social Media Security Leveraging Social Networking While Mitigating Risk.
2.	Online Social Networks Security, Brij B. Gupta, Somya Ranjan Sahoo, Principles, Algorithm, Applications, and Perspectives, CRC press
3.	https://www.concordia.ca/
4.	https://docs.google.com/spreadsheets/d/1mIbc4go4CK1DUkWyEJhJuWnAfYPsVtAjMRg5pQDXBws/edit?usp=sharing

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Course Contents and Lecture Schedule

S. No.	Topics	No. of hours
1.0	**Introduction to Social Media**	
1.1	Introduction to social media	2
1.2	Understanding social media	1
1.3	Different Types and Classifications	2
1.4	Cutting Edge Versus Bleeding Edge	2
1.5	The Problems That Come with social media	2
2.0	**Social Engineering and Cyber Stalking**	
2.1	Dark side Cybercrime	2
2.2	Social Engineering	2
2.3	Hacked accounts	2
2.4	cyberstalking, cyberbullying	1
2.5	predators	1
2.6	phishing, hackers	1
3.0	**Social Media Campaigns and Management**	
3.1	Being bold versus being overlooked Good social media campaigns	2
3.2	Bad social media campaigns	2
3.3	The human factor	2
3.4	Content management	2
3.5	Promotion of social media.	1
4.0	**Public Embarrassment and False Information**	
4.1	Risks of social media	2
4.2	Introduction Public embarrassment	2
4.3	Once it’s out there, Information leakage	2
4.4	Retention and archiving	2
4.5	Loss of data and equipment	1
5.0	**Policies and Awareness**	
5.1	Policies and Privacy Blocking,	2
5.2	users controlling app privacy Security	2
5.3	Location awareness,	2
5.4	Fake accounts passwords	2
5.5	privacy and information sharing	1

Course Designer(s)

1.S.Sripriya - sripriya@ksrct.ac.in

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60 AD E44	Modern Cryptography	Category	L	T	P	Credit
		PE	3	0	0	3

Objectives

- To learn about Modern Cryptography.
- To focus on how cryptographic algorithms and protocols work and how to use them.
- To build a Pseudorandom permutation.
- To construct Basic cryptanalytic techniques
- To provide instruction on how to use the concepts of block ciphers and message authentication codes.

Pre-requisites

- Computer Networks, Cryptography and Network Security

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Interpret the basic principles of cryptography and general cryptanalysis.	Understand
CO2	Determine the concepts of symmetric encryption and authentication.	Understand
CO3	Identify the use of public key encryption, digital signatures, and key establishment	Understand
CO4	Articulate the cryptographic algorithms to compose, build and analyze simple cryptographic solutions.	Analyse
CO5	Express the use of Message Authentication Codes.	Analyse

Mapping with Programme Outcomes

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	2	3	2	3	2	-	-	-	2	1	2	2	2	2	1
CO2	2	2	2	3	3	-	-	-	2	1	2	2	1	2	1
CO3	1	2	2	2	1	-	-	-	1	1	2	1	2	2	1
CO4	2	3	2	2	2	-	-	-	2	1	2	2	2	2	1
CO5	2	1	2	2	3	-	-	-	2	1	1	2	2	1	2
3 - Strong; 2 - Medium; 1 - Some															

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		End Sem Examination (Marks)
	1	2	
Remember	10	10	10
Understand	20	20	20
Apply	30	30	60
Analyse	-	-	10
Evaluate	-	-	-
Create	-	-	-
Total	60	60	100

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K.S.Rangasamy College of Technology – Autonomous R2022								
B.Tech – Artificial Intelligence and Data Science								
60 AD E44 – Modern Cryptography								
Semester	**Hours/Week**			**Total Hours**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
VII	3	0	0	45	3	40	60	100

Need of Software Security And Low-Level Attacks* Software Assurance and Software Security - Threats to software security - Sources of software insecurity - Benefits of Detecting Software Security - Properties of Secure Software – Memory- Based Attacks: Low-Level Attacks Against Heap and Stack - Defense Against Memory-Based Attacks	[9]
Secure Software Design** Requirements Engineering for secure software - SQUARE process Model – Requirements elicitation and prioritization- Isolating The Effects of Untrusted Executable Content – Stack Inspection – Policy Specification Languages – Vulnerability Trends – Buffer Overflow – Code Injection - Session Hijacking. Secure Design - Threat Modeling and Security Design Principles	[9]
Security Risk Management Risk Management Life Cycle – Risk Profiling – Risk Exposure Factors – Risk Evaluation and Mitigation – Risk Assessment Techniques – Threat and Vulnerability Management	[9]
Security Testing Traditional Software Testing – Comparison - Secure Software Development Life Cycle – Risk Based Security Testing – Prioritizing Security Testing With Threat Modeling – Penetration Testing Planning and Scoping - Enumeration – Remote Exploitation – Web Application Exploitation -Exploits and Client Side Attacks – Post Exploitation – Bypassing Firewalls and Avoiding Detection - Tools for Penetration Testing	[9]
Secure Project Management Governance and security - Adopting an enterprise software security framework - Security and project management - Maturity of Practice	[9]
Total Hours:	**45**

Text Book(s):	
1.	Julia H. Allen, “Software Security Engineering”, Pearson Education, 2008
2.	Evan Wheeler, “Security Risk Management: Building an Information Security Risk Management Program from the Ground Up”, First edition, Syngress Publishing, 2011
Reference(s):	
1.	Chris Wysopal, Lucas Nelson, Dino Dai Zovi, and Elfriede Dustin, “The Art of Software Security Testing: Identifying Software Security Flaws (Symantec Press)”, Addison-Wesley Professional, 2006
2.	Robert C. Seacord, “Secure Coding in C and C++ (SEI Series in Software Engineering)”, Addison-Wesley Professional, 2005.
3.	Jon Erickson, “Hacking: The Art of Exploitation”, 2nd Edition, No Starch Press, 2008
4.	Mike Shema, “Hacking Web Apps: Detecting and Preventing Web Application Security Problems”, First edition, Syngress Publishing, 2012

*SDG 9 – Industry Innovation and Infrastructure

**SDG 3 – Good Health and Well Being

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Course Contents and Lecture Schedule

S. No.	Topics	No. of hours
1.0	**Need of Software Security And Low-Level Attacks**	
1.1	Software Assurance and Software Security	1
1.2	Threats to software security	1
1.3	Sources of software insecurity	1
1.4	Benefits of Detecting Software Security	1
1.5	Properties of Secure Software	1
1.6	Memory- Based Attacks	2
1.7	Low-Level Attacks Against Heap and Stack	1
1.8	Defense Against Memory-Based Attacks	1
2.0	**Secure Software Design**	
2.1	Requirements Engineering for secure software - SQUARE process Model	1
2.2	Requirements elicitation and prioritization	1
2.3	Isolating The Effects of Untrusted Executable Content	1
2.4	Stack Inspection – Policy Specification Languages	1
2.5	Vulnerability Trends – Buffer Overflow	1
2.6	Code Injection	2
2.7	Session Hijacking - Secure Design	1
2.8	Threat Modeling and Security Design Principles	1
3.0	**Security Risk Management**	
3.1	Risk Management Life Cycle	1
3.2	Risk Profiling	1
3.3	Risk Exposure Factors	1
3.4	Risk Evaluation	1
3.5	Risk Mitigation	1
3.6	Risk Assessment Techniques	2
3.7	Threat and Vulnerability Management	2
4.0	**Security Testing**	
4.1	Traditional Software Testing – Comparison	1
4.2	Secure Software Development Life Cycle – Risk Based Security Testing	1
4.3	Prioritizing Security Testing With Threat Modeling	1
4.4	Penetration Testing Planning and Scoping	1
4.5	Enumeration – Remote Exploitation	1
4.6	Web Application Exploitation -Exploits and Client Side Attacks	1
4.7	Post Exploitation	1
4.8	Bypassing Firewalls and Avoiding Detection	2
4.9	Tools for Penetration Testing	1
5.0	**Secure Project Management**	
5.1	Governance and security	2
5.2	Adopting an enterprise software security framework	2
5.3	Security and project management	2
5.4	Maturity of Practice	2

Course Designer(s)

1. Mrs.I.Kalaimani- kalaimani@ksrct.ac.in

Rev. No.3/w.e.f. 22.07.2024
Passed in BoS Meeting held on 24/05/2024
Approved in Academic Council Meeting held on 25/05/2024

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60 AD E45	Cryptocurrency and Blockchain Technologies	Category	L	T	P	Credit
		PE	3	0	0	3

Objectives

- To introduce the cryptocurrency concepts and techniques used in business transactions
- To provide skills and knowledge about operations and management in cryptocurrency.
- Understand why current implementations work
- To understand building blocks of Blockchain
- To significance of Distributed Ledger Technology and Smart Contract.

Pre-requisites

- Basics of computer science, information technology and information security

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Understand the evolution, principles and benefits of cryptocurrencies	Understand
CO2	Assess existing technologies to choose an appropriate technology that meets business needs	Analyse
CO3	Recognize the underlying technology of transactions, blocks and proof-of-work	Analyse
CO4	Gain a deep insight into Bitcoin network, Bitcoin miners and Bitcoin transactions	Understand
CO5	Design and explore the applications of Blockchain	Apply

Mapping with Programme Outcomes

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	-	-	-	-	-	-	-	-	-	-	-	-	-	2
CO2	3	2	-	-	-	-	-	-	-	-	-	-	-	1	-
CO3	3	-	-	-	-	-	-	-	-	-	-	-	-	-	2
CO4	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-
CO5	3	-	-	-	-	-	-	-	-	-	-	-	-	-	2
3 - Strong; 2 - Medium; 1 - Some															

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		End Sem Examination (Marks)
	1	2	
Remember	-	-	-
Understand	20	20	-
Apply	20	20	34
Analyse	20	20	66
Evaluate	-	-	-
Create	-	-	-
Total	60	60	100

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Syllabus

K.S.Rangasamy College of Technology – Autonomous R2022								
B.Tech– Artificial Intelligence and Data Science								
60 AD E45- Cryptocurrency and Blockchain Technologies								
Semester	**Hours/Week**			**Total Hours**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
VII	3	0	0	45	3	40	60	100

Fundamentals of Cryptocurrency Cryptocurrency - Origin and Importance - Legal Status - Usage of Cryptocurrency - Blockchain Structure - Interaction between Blockchain and Cryptocurrencies - Importance and uses of Cryptocurrency - Hardware and Software requirements of Block chain*	[9]
Functional Aspects of Cryptocurrency Bitcoin and other Cryptocurrencies - Distributed consensus and atomic broadcast - Byzantine fault-tolerant consensus methods - Blockchain based cryptocurrency and its applications - Technologies borrowed in Blockchain*	[9]
Foundations of Blockchain Blockchain Architecture – Challenges – Applications – Blockchain Design Principles -The Blockchain Ecosystem - The consensus problem - Asynchronous Byzantine Agreement - AAP protocol and its analysis - peer-to-peer network – Abstract Models - GARAY model	[9]
Types of Blockchain Ecosystem One-Leader Ecosystem - Joint Venture or Consortia Ecosystems - Regulatory Blockchain Ecosystems - Components in Blockchain Ecosystem: Leaders, Core Group, Active Participants, Users, Third-Party Service Providers - Governance for Blockchain Ecosystems.*	[9]
Blockchain Protocols Ethereum tokens – Augur - Golem - Understanding Ethereum tokens - App Coins and Protocol Tokens - Blockchain Token Securities Law Framework - Token Economy - Token sale structure - Ethereum Subreddit	[9]
Total Hours:	**45**

Text Book(s):	
1.	Daskalakis, Nikos, and Panagiotis Georgitseas. An Introduction to Cryptocurrencies: The Crypto Market Ecosystem, 2020, 1st Edition, Routledge, New York.
2.	Dhillon, V., Metcalf, D., and Hooper, M, Blockchain enabled applications, 2017, 1st Edition, CA: Apress, Berkeley
Reference(s):	
1.	Grabowski, Mark. Cryptocurrencies: A Primer on Digital Money, 2019, 1st Edition, Routledge, New York.
2.	Narayanan, Arvind, et al. Bitcoin and cryptocurrency technologies: a comprehensive introduction, 2016, 1st Edition, Princeton University Press, New Jersey
3.	Diedrich, H., Ethereum: Blockchains, digital assets, smart contracts, decentralized autonomous organizations, 2016, 1st Edition, Wildfire publishing, Sydney
4.	Wattenhofer, R. P, Distributed Ledger Technology: The Science of the Blockchain (Inverted Forest Publishing), 2017, 2nd Edition, Createspace Independent Pub, Scotts Valley, California, US.

*SDG 9 – Industry Innovation and Infrastructure

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Course Contents and Lecture Schedule

S. No.	Topics	No. of hours
1.0	**Fundamentals of Cryptocurrency**	
1.1	Cryptocurrency - Origin and Importance	2
1.2	Legal Status	1
1.3	Usage of Cryptocurrency	1
1.4	Blockchain Structure	1
1.5	Interaction between Blockchain and Cryptocurrencies	1
1.6	Importance and uses of Cryptocurrency	2
1.7	Hardware and Software requirements of Block chain	1
2.0	**Functional Aspects of Cryptocurrency**	
2.1	Bitcoin and other Cryptocurrencies	2
2.2	Distributed consensus and atomic broadcast	2
2.3	Byzantine fault-tolerant consensus methods	2
2.4	Blockchain based cryptocurrency and its applications	1
2.5	Technologies borrowed in Blockchain	1
3.0	**Foundations of Blockchain**	
3.1	Blockchain Architecture – Challenges – Applications	2
3.2	Blockchain Design Principles	1
3.3	The Blockchain Ecosystem - The consensus problem	2
3.4	Asynchronous Byzantine Agreement	2
3.5	peer-to-peer network	1
3.6	Abstract Models - GARAY model	1
4.0	**Types of Blockchain Ecosystem**	
4.1	One-Leader Ecosystem - Joint Venture or Consortia Ecosystems	2
4.2	Regulatory Blockchain Ecosystems	2
4.3	Components in Blockchain Ecosystem: Leaders	2
4.4	Users, Third-Party Service Providers	2
4.5	Governance for Blockchain Ecosystems	2
5.0	**Blockchain Protocols**	
5.1	Ethereum tokens – Augur - Golem	2
5.2	App Coins and Protocol Tokens	1
5.3	Blockchain Token Securities Law Framework	2
5.4	Token Economy	1
5.5	Token sale structure	1
5.6	Ethereum Subreddit	1

Course Designer(s)

1.S.Sripriya-sripriya@ksrct.ac.in

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60 AD E46	Network Security	Category	L	T	P	Credit
		PE	3	0	3	3

Objectives

- To learn the Network Models and data link layer functions.
- To understand routing in the Network Layer
- To explore methods of communication and congestion control by the Transport Layer
- To study the Network Security Mechanisms
- To learn various hardware security attacks and their countermeasure

Pre-requisites

- Security information and Event management

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Understand the Network Models, layers and functions	Understand
CO2	Categorize and classify the routing protocols	Remember
CO3	List the functions of the transport and application layer	Understand
CO4	Evaluate and choose the network security mechanisms	Understand
CO5	Understand the hardware security attacks and countermeasures	Understand

Mapping with Programme Outcomes

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	1	-	-	-	-	-	-	-	-	-	-	2	2	2
CO2	2	2	-	-	-	-	-	-	-	-	-	-	3	1	3
CO3	2	1	-	-	-	-	-	-	-	-	-	-	2	2	1
CO4	2	2	-	-	-	-	-	-	-	-	-	-	1	3	2
CO5	3	1	-	-	-	-	-	-	-	-	-	-	2	2	3

3 - Strong; 2 - Medium; 1 - Some

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		End Sem Examination (Marks)
	1	2	
Remember	20	20	20
Understand	20	20	20
Apply	-	-	20
Analyse	10	10	20
Evaluate	10	10	20
Create	-	-	-
Total	60	60	100

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Syllabus

K.S.Rangasamy College of Technology – Autonomous R2022								
B.Tech - Artificial Intelligence and Data Science								
60 AD E46- Network Security								
Semester	**Hours/Week**			**Total Hours**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
VII	3	0	0	45	3	40	60	100

Introduction of Network Models * Overview of Networks and its Attributes – Network Models – OSI, TCP/IP, Addressing – Introduction to Datalink Layer – Error Detection and Correction – Ethernet (802.3)- Wireless LAN – IEEE 802.11, Bluetooth – Flow and Error Control Protocols – HDLC – PPP	[9]
Network Layer Protocols * Network Layer – IPv4 Addressing – Network Layer Protocols (IP, ICMP and Mobile IP) Unicast and Multicast Routing – Intradomain and Interdomain Routing Protocols – IPv6 Addresses – IPv6 – Datagram Format - Transition from IPv4 to IPv6	[9]
Transport and Application Layers * Transport Layer Protocols – UDP and TCP Connection and State Transition Diagram - Congestion Control and Avoidance (DEC bit, RED)- QoS - Application Layer Paradigms – Client – Server Programming – Domain Name System – World Wide Web, HTTP, Electronic Mail	[9]
Network Security * OSI Security Architecture – Attacks – Security Services and Mechanisms – Encryption – Advanced Encryption Standard – Public Key Cryptosystems – RSA Algorithm – Hash Functions – Secure Hash Algorithm – Digital Signature Algorithm	[9]
Hardware Security * Introduction to hardware security, Hardware Trojans, Side – Channel Attacks – Physical Attacks and Countermeasures – Design for Security. Introduction to Blockchain Technology	[9]
Total Hours:	**45**

Text Book(s):	
1.	Behrouz.A.Forouzan, Data Communication and Networking, Fifth Edition, TMH, 2017.
2.	William Stallings, Cryptography and Network Security, Seventh Edition, Pearson Education, 2017
Reference(s):	
1.	Bhunia Swarup, Hardware Security –A Hands On Approach, Morgan Kaufmann, First edition, 2018
2.	James.F.Kurose and Keith.W.Ross, Computer Networking – A Top – Down Approach, Sixth Edition, Pearson, 2017
3.	Doughlas .E.Comer, Computer Networks and Internets with Internet Applications, Fourth Edition, Pearson Education, 2008.

* SDG4: Quality Education

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Course Contents and Lecture Schedule

S. No.	Topics	No. of hours
1.0	**Introduction of Network Models**	
1.1	Overview of Networks and its Attributes	1
1.2	Network Models	1
1.3	OSI, TCP/IP, Addressing	1
1.4	Introduction to Datalink Layer	1
1.5	Error Detection and Correction	1
1.6	Ethernet (802.3)	1
1.7	Wireless LAN	1
1.8	IEEE 802.11, Bluetooth	1
1.9	Flow and Error Control Protocols – HDLC – PPP	1
2.0	**Network Layer Protocols**	
2.1	Network Layer	1
2.2	IPv4 Addressing – Network Layer Protocols	1
2.3	Unicast and Multicast Routing	1
2.4	Intradomain and Interdomain Routing Protocols	1
2.5	IPv6 Addresses	1
2.6	IPv6	1
2.7	Datagram Format	1
2.8	Transition from IPv4 to IPv6	2
3.0	**Transport and Application Layers**	
3.1	Transport Layer Protocols	1
3.2	UDP and TCP Connection and State Transition Diagram	1
3.3	Congestion Control and Avoidance (DEC bit, RED)	1
3.4	QoS	1
3.5	Application Layer Paradigms	1
3.6	Client – Server Programming	1
3.7	Domain Name System	1
3.8	World Wide Web, HTTP	1
3.9	Electronic Mail	1
4.0	**Network Security**	
4.1	OSI Security Architecture	1
4.2	Attacks	1
4.3	Security Services and Mechanisms	1
4.4	Encryption –Advanced Encryption Standard	1
4.5	Public Key Cryptosystems	1
4.6	RSA Algorithm	1
4.7	Hash Functions	1
4.8	Secure Hash Algorithm	1
4.9	Digital Signature Algorithm	1
5.0	**Hardware Security**	
5.1	Introduction to hardware security, Hardware Trojans, Side	1
5.2	Channel Attacks	2
5.3	Physical Attacks and Countermeasures	2
5.4	Design for Security	2

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5.5	Introduction to Blockchain Technology	2

Course Designer(s)

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60 AD E51	Blockchain Technologies	Category	L	T	P	Credit
		PE	3	0	0	3

Objectives

- To understand the basics of Blockchain
- To learn Different protocols and consensus algorithms in Blockchain
- To learn the Blockchain implementation frameworks
- To understand the Blockchain Applications
- To experiment the Hyperledger Fabric, Ethereum networks

Pre-requisites

- Cryptography

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Understanding the basics of Blockchain	Understand
CO2	Analyse the different protocols ans consensus algorithms in Blockchain	Analyse
CO3	Implements the Blockchain frameworks	Analyse
CO4	Understand the Blockchain applications	Apply
CO5	Apply the Hyperledger Fabric, Ethereum networks	Understand

Mapping with Programme Outcomes

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	-	-	-	-	-	-	1	-	-	2	3	1	1
CO2	3	3	-	-	-	-	-	-	2	-	-	2	1	2	1
CO3	3	3	-	-	-	-	-	-	3	-	-	2	2	3	3
CO4	3	2	-	-	-	-	-	-	3	-	-	2	2	2	3
CO5	3	2	-	-	-	-	-	-	3	-	-	2	2	2	3
3 - Strong; 2 - Medium; 1 - Some															

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		End Sem Examination (Marks)
	1	2	
Remember	10	10	10
Understand	20	20	20
Apply	30	30	60
Analyse	-	-	-
Evaluate	-	-	-
Create	-	-	10
Total	60	60	100

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K.S.Rangasamy College of Technology – Autonomous R2022

B.Tech- Artificial Intelligence and Data Science

60 AD E51 – Blockchain Technologies

Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
VIII	3	0	0	45	3	40	60	100

Introduction To Blockchain* Blockchain- Public Ledgers, Blockchain as Public Ledgers - Block in a Blockchain, Transactions-v The Chain and the Longest Chain - Permissioned Model of Blockchain, Cryptographic -Hash Function, Properties of a hash function-Hash pointer and Merkle tree	[9]
Bitcoin And Cryptocurrency A basic crypto currency, Creation of coins, Payments and double spending, FORTH – the precursor for Bitcoin scripting, Bitcoin Scripts , Bitcoin P2P Network, Transaction in Bitcoin Network, Block Mining, Block propagation and block relay	[9]
Bitcoin Consensus Bitcoin Consensus, Proof of Work (PoW)- Hashcash PoW , Bitcoin PoW, Attacks on PoW ,monopoly problem- Proof of Stake- Proof of Burn - Proof of Elapsed Time - Bitcoin Miner, Mining Difficulty, Mining Pool-Permissioned model and use cases	[9]
Hyperledger Fabric & Ethereum* Architecture of Hyperledger fabric v1.1- chain code- Ethereum: Ethereum network, EVM, Transaction fee, Mist Browser, Ether, Gas, Solidity.	[9]
Blockchain Applications Smart contracts, Truffle Design and issue- DApps- NFT. Blockchain Applications in Supply Chain Management, Logistics, Smart Cities, Finance and Banking, Insurance,etc- Case Study.	[9]
Total Hours:	**45**

Text Book(s):	
1.	Bashir and Imran, Mastering Blockchain: Deeper insights into decentralization, cryptography, Bitcoin, and popular Blockchain frameworks, 2017.
2.	Andreas Antonopoulos, “Mastering Bitcoin: Unlocking Digital Cryptocurrencies”, O’Reilly, 2014.
Reference(s):	
1.	Daniel Drescher, “Blockchain Basics”, First Edition, Apress, 2017.
2.	Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, and Steven Goldfeder. Bitcoin and cryptocurrency technologies: a comprehensive introduction. Princeton University Press, 2016.
3.	Melanie Swan, “Blockchain: Blueprint for a New Economy”, O’Reilly, 2015
4.	Ritesh Modi, “Solidity Programming Essentials: A Beginner’s Guide to Build Smart Contracts for Ethereum and Blockchain”, Packt Publishing

*SDG 9 – Industry Innovation and Infrastructure

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Course Contents and Lecture Schedule		
S. No.	**Topics**	**No. of hours**
1.0	**Introduction To Blockchain**	
1.1	Blockchain- Public Ledgers	1
1.2	Blockchain as Public Ledgers	1
1.3	Block in a Blockchain, Transactions	1
1.4	The Chain and the Longest Chain	1
1.5	Permissioned Model of Blockchain	1
1.6	Cryptographic -Hash Function	2
1.7	Properties of a hash function	1
1.8	Hash pointer and Merkle tree	1
2.0	**Bitcoin And Cryptocurrency**	
2.1	A basic crypto currency, Creation of coins	1
2.2	Payments and double spending	2
2.3	FORTH – the precursor for Bitcoin scripting	1
2.4	Bitcoin Scripts	1
2.5	Bitcoin P2P Network	1
2.6	Transaction in Bitcoin Network	1
2.7	Block Mining	1
2.8	Block propagation and block relay	1
3.0	**Bitcoin Consensus**	
3.1	Bitcoin Consensus, Proof of Work (PoW)	1
3.2	Hashcash PoW	1
3.3	Bitcoin PoW, Attacks on PoW	1
3.4	monopoly problem	2
3.5	Proof of Stake- Proof of Burn	1
3.6	Proof of Elapsed Time - Bitcoin Miner	1
3.7	Mining Difficulty, Mining Pool	1
3.8	Permissioned model and use cases	1
4.0	**Hyperledger Fabric & Ethereum**	
4.1	Architecture of Hyperledger fabric v1.1	1
4.2	chain code	1
4.3	Ethereum: Ethereum network	1
4.4	EVM	2
4.5	Transaction fee	1
4.6	Mist Browser	1
4.7	Ether, Gas, Solidity	2
5.0	**Blockchain Applications**	
5.1	Smart contracts, Truffle Design and issue	1
5.2	DApps	1
5.3	NFT	1
5.4	Blockchain Applications in Supply Chain Management	2
5.5	Logistics, Smart Cities	1
5.6	Finance and Banking	1
5.7	Insurance, etc	1
5.8	Case Study	1

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Course Designer(s)

1. Mrs.I.Kalaimani- kalaimani@ksrct.ac.in

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60 AD E52	Artificial Neural Networks	Category	L	T	P	Credit
		PE	3	0	0	3

Objectives

- To Understand the context of neural networks and deep learning.
- To understanding how CNN and RNN works with publicly available datasets.
- To study the working principle of intelligent decisions with limited human assistance.
- To explain the construction, model the relationships between input and output data that are nonlinear and complex.
- To study the concepts of Deep Learning image by using a CNN.

Pre-requisites

- Basics of Programming, Statistics, Linear algebra and Data Science

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Understand the basics in deep learning and neural networks.	Remember
CO2	Understand the basics of associative memory and unsupervised learning networks.	Understand
CO3	Understand building blocks of Neural Networks.	Analyse
CO4	Analyse the key computations underlying deep learning Develop neural network models.	Apply
CO5	Design and develop applications using neural networks.	Apply

Mapping with Programme Outcomes

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	-	-	-	-	-	-	-	-	-	-	-	-	2
CO2	3	2	-	-	2	-	-	-	-	-	-	-	3	3	2
CO3	3	2	3	-	2	-	-	-	-	-	-	2	3	2	2
CO4	3	2	2	-	2	-	-	-	-	-	-	2	2	3	2
CO5	3	2	3	-	2	-	-	-	-	-	-	2	3	3	2
3 - Strong; 2 - Medium; 1 - Some															

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		End Sem Examination (Marks)
	1	2	
Remember	10	10	20
Understand	20	20	30
Apply	10	10	20
Analyse	20	20	30
Evaluate	-	-	-
Create	-	-	-
Total	60	60	100

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K.S. Rangasamy College of Technology – Autonomous R2022								
B. Tech-Artificial Intelligence and Data Science								
60 AD E52- Artificial Neural Networks								
Semester	**Hours/Week**			**Total Hours**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
VIII	3	0	0	45	3	40	60	100

Introduction to Neural Networks Neural Networks-Application Scope of Neural Networks -Artificial Neural Network: An Introduction -Evolution of Neral Networks-Basic Models of Artificial Neural Network-Important Terminologies of Anns-Supervised Learning Network.	[9]
Unsupervised Learning Networks Training Algorithms for Pattern Association-Auto Associative Memory Network-Hetero Associative Memory Networks-Iterative Auto Associative Memory Networks-Temporal Associative Memory Network-Fixed Weight Competitive Nets- Learning Vector Quantization-Counter Propagation Networks.	[9]
Third-Generation Neural Networks Spiking Neural Networks-Convolutional Neural Networks-Deep Learning Neural Networks-Extreme Learning Machine Model-Convolutional Neural Networks: The Convolution Function-Structured Outputs-Data Types-Efficient Convolution Algorithms-Neuroscientific Basis-Applications: Computer Vision, Image Generation, Image Compression.	[9]
Recurrent Neural Networks Introduction-Recursive Neural Networks-Bidirectional RNNS-Deep Recurrent Networks-Applications: Image Generation, Image Compression, Natural Language Processing. Complete Auto Encoder, Regularized Autoencoder, Stochastic Encoders and Decoders, Contractive Encoders.	[9]
Applications Adaptive Filtering- Adaptive Noise Cancellation- Forecasting – Neural control applications - Character recognition. Simple Associative Networks- Unsupervised Hebb Rule- Hebb Rule with Decay-Instar Rule-Outstar Rule- Kohonen Rule.	[9]
Total Hours:	**45**
Text Book(s):	

1.	Goodfellow, I., Bengio,Y., and Courville, A., “Deep Learning”, MIT Press, 2016.
2.	Bishop, C. ,M., “Pattern Recognition and Machine Learning”, Springer, 2016.
Reference(s):	
1.	Yegnanarayana, B., Artificial Neural Networks PHI Learning Pvt. Ltd, 2019.
2.	Golub, G., H., and Van Loan,C.,F., Matrix Computations, JHU Press,2013.
3.	Kreutz, Diego, et al. "Software-defined networking: A comprehensive survey." 2015.

**SDG 9 – Industry Innovation and Infrastructure.

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Course Contents and Lecture Schedule

S. No.	Topics	No. of hours
1.0	**Introduction**	
1.1	Neural Networks.	1
1.2	Application Scope of Neural Networks.	2
1.3	Artificial Neural Network.	1
1.4	Important Terminologies of Anns.	1
1.5	Evolution of Neral Networks.	2
1.6	Supervised Learning Network.	1
2.0	**Unsupervised Learning Networks**	
2.1	Training Algorithms for Pattern Association.	1
2.2	Auto Associative Memory Network.	1
2.3	Hetero Associative Memory Networks.	1
2.4	Iterative Auto Associative Memory Networks.	2
2.5	Temporal Associative Memory Network.	2
2.6	Fixed Weight Competitive Nets.	1
2.7	Counter Propagation Networks.	1
3.0	**Third-Generation Neural Networks**	
3.1	Spiking Neural Networks.	1
3.2	Convolutional Neural Networks.	1
3.3	Deep Learning Neural Networks and Extreme Learning Machine Model.	2
3.4	The Convolution Function, Structured Outputs and Data Types.	2
3.5	Neuroscientific Basis.	1
3.6	Applications: Computer Vision.	1
3.7	Image Generation, Image Compression.	1
4.0	**Recurrent Neural Networks**	
4.1	Introduction.	1
4.2	Recursive Neural Networks.	1
4.3	Bidirectional RNNS.	2
4.4	Deep Recurrent Networks.	1
4.5	Applications: Image Generation, Image Compression, Natural Language Processing.	2
4.6	Complete Auto Encoder, Regularized Autoencoder.	1
4.7	Stochastic Encoders and Decoders, Contractive Encoders.	1
5.0	**Applications**	
5.1	Adaptive Filtering.	1
5.2	Adaptive Noise Cancellation.	1
5.3	Forecasting & Neural control applications.	2
5.4	Simple Associative Networks.	1
5.5	Unsupervised Hebb Rule.	2
5.6	Hebb Rule with Decay.	1
5.7	Instar Rule , Outstar Rule & Kohonen Rule.	1

Course Designer(s)

1.Ms. P. Indhumathi – indhumathip@ksrct.ac.in

Rev. No.3/w.e.f. 22.07.2024
Passed in BoS Meeting held on 24/05/2024
Approved in Academic Council Meeting held on 25/05/2024

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60 AD E53	Cyber Security	Category	L	T	P	Credit
		PE	3	0	0	3

Objectives

- Learn the foundations of Cyber security and threat landscape.
- To develop skills in students that can help them plan, implement, and monitor cyber security mechanisms to ensure the protection of information technology assets.
- To expose students to governance, regulatory, legal, economic, environmental, social and ethical contexts of cyber security
- To systematically educate the necessity to understand the impact of cyber-crimes and threats with solutions in a global and societal context.
- To select suitable ethical principles and commit to professional responsibilities and human values and contribute value and wealth for the benefit of the society

Pre-requisites

- Basic Data Analysis, Basic Scripting or Introductory Programming

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Understand the cyber security threat landscape	Understand
CO2	Develop a deeper understanding and familiarity with various types of cyberattacks, cybercrimes, vulnerabilities	Understand
CO3	Analyse and evaluate existing legal framework and laws on cyber security	Analyse
CO4	Analyse and evaluate the digital payment system security and remedial measures against digital payment fraud	Analyse
CO5	Analyse and evaluate the importance of personal data its privacy and security	Analyse

Mapping with Programme Outcomes

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	-	-	-	2	-	-	-	-	-	-	-	-	3	2
CO2	3	2	2	-	2	-	-	-	-		-	-	-	-	2
CO3	3	-	2	-	2	-	-	-	-	2	-	-	-	3	2
CO4	3	3	-	-	-	-	-	-	-	-	-	-	-	-	2
CO5	3	-	3	-	-	-	-	-	-	-	-	2	-	-	2
3 - Strong; 2 - Medium; 1 - Some															

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		End Sem Examination (Marks)
	1	2	
Remember	-	-	-
Understand	40	40	66
Apply	-	-	-
Analyse	20	20	34
Evaluate	-	-	-
Create	-	-	-
Total	60	60	100

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Syllabus

K.S.Rangasamy College of Technology – Autonomous R2022								
B.Tech – Artificial Intelligence and Data Science								
60 AD E53 - Cyber Security								
Semester	**Hours/Week**			**Total Hours**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
VIII	3	0	0	45	3	40	60	100

Introduction to Cyber security Defining Cyberspace and Overview of Computer and Web-technology, Architecture of cyberspace, Communication and web technology, Internet infrastructure for data transfer and governance, Regulation of cyberspace, Concept of cyber security, Issues and challenges of cyber security*	[9]
Cybercrime and Cyber law Classification of cybercrimes, malware and ransomware attacks, reporting of cybercrimes, Remedial and mitigation measures, Legal perspective of cybercrime, Cybercrime and offences, Organizations dealing with Cybercrime and Cyber security in India.	[9]
Social Media Overview and Security Introduction to Social networks. Types of social media and its platforms, social media monitoring, social media privacy, Challenges, opportunities and pitfalls in online social network, Security issues related to social media, Flagging and reporting of inappropriate content*	[9]
E - Commerce and Digital Payments Definition of E- Commerce, Main components of E-Commerce, Elements of E-Commerce security, E-Commerce threats, Introduction to digital payments, Components of digital payment and stake holders, Unified Payment Interface (UPI), Aadhar enabled payments, Digital payments related common frauds and preventive measures*	[9]
Digital Devices Security, Tools and Technologies for Cyber Security Mobile phone security, Password policy, Security patch management, Data backup, Downloading and management of third-party software, Significance of host firewall and Ant-virus, Management of host firewall and Anti-virus, Wi-Fi security.	[9]
Total Hours:	**45**

Text Book(s):	
1.	R. C Mishra, “Cyber Crime Impact in the New Millennium”, Author Press, 2010.
2.	Sumit Belapure and Nina Godbole, “Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives”, Wiley India Pvt. Ltd., 2011.
1.	Henry A. Oliver, “Security in the Digital Age: Social Media Security Threats and Vulnerabilities”, Create Space Independent Publishing Platform, Pearson, 2001.
2.	Kumar K, “Cyber Laws: Intellectual Property & E-Commerce Security”, Dominant Publishers.
3.	Electronic Commerce by Elias M. Awad, Prentice Hall of India Pvt Ltd
4.	Eric Cole, Ronald Krutz, James W. Conley, “Network Security Bible”, 2nd Edition, Wiley India Pvt. Ltd.

*SDG 9 – Industry Innovation and Infrastructure

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Dept. of Artificial Intelligence and Data Science
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Tiruchengode - 637 215.

Course Contents and Lecture Schedule

S. No.	Topics	No. of hours
1.0	**Introduction to Cyber security**	
1.1	Defining Cyberspace and Overview of Computer and Web-technology	2
1.2	Architecture of cyberspace, Communication and web technology	2
1.3	Internet infrastructure for data transfer and governance	2
1.4	Regulation of cyberspace	1
1.5	Concept of cyber security	1
1.6	Issues and challenges of cyber security	1
2.0	**Cybercrime and Cyber law**	
2.1	Classification of cybercrimes, malware and ransomware attacks	2
2.2	Reporting of cybercrimes	1
2.3	Remedial and mitigation measures	1
2.4	Legal perspective of cybercrime	1
2.5	Cybercrime and offences	2
2.6	Organizations dealing with Cybercrime and Cyber security in India	2
3.0	**Social Media Overview and Security**	
3.1	Introduction to Social networks	2
3.2	Types of social media and its platforms	1
3.3	social media monitoring,	1
3.4	social media privacy	2
3.5	Challenges, opportunities and pitfalls in online social network	1
3.6	Security issues related to social media	1
3.7	Flagging and reporting of inappropriate content	1
4.0	**E - Commerce and Digital Payments**	
4.1	Definition of E- Commerce, Main components of E-Commerce	1
4.2	Elements of E-Commerce security, E-Commerce threats	2
4.3	Introduction to digital payments, Components of digital payment and stake holders	2
4.4	Unified Payment Interface (UPI)	1
4.5	Aadhar enabled payments	1
4.6	Digital payments related common frauds and preventive measures	2
5.0	**Digital Devices Security, Tools and Technologies for Cyber Security**,	
5.1	Mobile phone security	1
5.2	Password policy	1
5.3	Security patch management	2
5.4	Data backup, Downloading and management of third-party software	2
5.5	Significance of host firewall and Ant-virus	1
5.6	Management of host firewall and Anti-virus, Wi-Fi security	2

Course Designer(s)

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60 AD E54	Quantum Computing	Category	L	T	P	Credit
		PE	3	0	0	3

Objectives

- To understand the implications of quantum computing on cryptography and security
- To understand the quantum computing paradigm
- To understand the power and limitation of quantum computers
- To state the four postulates of quantum mechanics and their application to computation
- To understand the principles of quantum information and quantum communication

Pre-requisites

- Linear Algebra, Physics for Technology

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Understand the underlying power of quantum mechanics for computation	Understand
CO2	Understand the fundamental limitations of quantum algorithms	Understand
CO3	Hack the RSA cryptosystem via a quantum computer	Analyse
CO4	Use quantum mechanics to obtain a monetary scheme.	Apply
CO5	Analyze fundamental quantum algorithms.	Analyze

Mapping with Programme Outcomes

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	-	-	-	-	-	-	-	-	-	-	-	-	2
CO2	3	3	-	-	-	-	-	-	-	-	-	-	-	-	2
CO3	3	3	-	-	-	-	-	-	-	-	-	-	-	-	2
CO4	3	3	-	-	-	-	-	-	-	-	-	-	-	-	2
CO5	3	3	-	-	-	-	-	-	-	-	-	2	-	-	2
3 - Strong; 2 - Medium; 1 - Some															

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		End Sem Examination (Marks)
	1	2	
Remember	20	20	34
Understand	20	20	20
Apply	20	20	46
Analyse	-	-	-
Evaluate	-	-	-
Create	-	-	-
Total	60	60	100

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Syllabus

K.S.Rangasamy College of Technology – Autonomous R2022								
B.Tech – Artificial Intelligence and Data Science								
60 AD E54 - Quantum Computing								
Semester	**Hours/Week**			**Total Hours**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
VIII	3	0	0	45	3	40	60	100

Introduction foundations, and prominent applications, Review of linear algebra in the context of quantum information, Dirac's bracket notation, limitation of classical algorithms	[9]
Basic quantum algorithms I Deutsch's algorithm, analyzing quantum algorithms, and implementing quantum circuits via QISKIT.	[9]
Basic quantum algorithms II Simon's problem and the Bernstein -V-azirani algorithm, Grover's quantum search algorithm, the BBBV Theorem, and applications of Grover's algorithm	[9]
Quantum Cryptography RSA, and Shor's integer factorization algorithm, Introduction to quantum cryptography, post-quantum security, quantum key distribution	[9]
Quantum Information * Introduction to quantum information, superdense coding, nocloning theorem, quantum teleportation, Applications, quantum money, the Elitzur-Vaidman bomb	[9]
Total Hours:	**45**

Text Book(s):	
1.	Chris Bernhardt, "Quantum Computing for Everyone", The MIT Press,Cambridge, 2020
2.	Kai Hwang, Geoffrey C Fox, Jack G Dongarra, "Distributed and Cloud Computing, From Parallel Processing to the Internet of Things", Morgan Kaufmann Publishers, 2012.
Reference(s):	
1.	M. A. Nielsen, I.Chuang, "Quantum Computation and Quantum Information", University Press, 2013.
2.	Eleanor G. Rieffel and Wolfgang H. Polak, "Quantum Computing, A Gentle Introduction", MIT press.

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Course Contents and Lecture Schedule

S. No.	Topics	No. of hours
1.0	**Introduction**	
1.1	foundations, and prominent applications	2
1.2	Review of linear algebra in the context of quantum information	3
1.3	Dirac's bracket notation	2
1.4	limitation of classical algorithms	2
2.0	**Basic quantum algorithms I**	
2.1	Deutsch's algorithm, , and.	3
2.2	analyzing quantum algorithms	3
2.3	implementing quantum circuits via QISKIT	3
3.0	**Basic quantum algorithms II**	
3.1	Simon's problem and the Bernstein -V-azirani algorithm	2
3.2	Grover's quantum search algorithm,	2
3.3	BBBV Theorem	2
3.4	applications of Grover's algorithm	3
4.0	**Quantum Cryptography**	
4.1	RSA,	1
4.2	Shor's integer factorization algorithm	2
4.3	Introduction to quantum cryptography	2
4.4	post-quantum security	2
4.5	quantum key distribution	2
5.0	**Quantum Information**	
5.1	Introduction to quantum information	1
5.2	superdense coding	1
5.3	nocloning theorem	1
5.4	quantum teleportation	2
5.5	Applications	1
5.6	quantum money	2
5.7	Elitzur-Vaidman bomb	1

Course Designer(s)

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Passed in BoS Meeting held on 24/05/2024
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60 AD E55	Game Development	Category	L	T	P	Credit
		PE	3	0	0	3

Objectives

- To understand the foundation game design and development
- To build games and simulations using Unity
- To design and develop games from scratch.
- To create own 3D models using Unity
- To understand the different roles, responsibilities, and practices of the game development industry

Pre-requisites

- Basics of Programming Knowledge

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Use Unity to create 2D and 3D games and simulations.	Remember
CO2	Write clean and efficient Object-Oriented C# code.	Understand
CO3	Design and implement new features and game mechanics.	Analyse
CO4	Identify and follow industry standard best practices.	Apply
CO5	Create game ready 3D models using Blender 3D.	Create

Mapping with Programme Outcomes

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	-	-	-	-	-	-	-	2	2	-	-	-	-	2
CO2	3	-	-	3	-	-	-	-			-	-	-	-	2
CO3	3	-	-	3	-	-	-	-	2	2	-	-	-	-	2
CO4	3	-	-	-	-	-	3	-			-	-	-	-	2
CO5	3	-	-	-	-	-	3	-	2	2	-	2	-	-	2
3 - Strong; 2 - Medium; 1 - Some															

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		End Sem Examination (Marks)
	1	2	
Remember	20	20	34
Understand	40	40	66
Apply	-	-	-
Analyse	-	-	-
Evaluate	-	-	-
Create	-	-	-
Total	60	60	100

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Syllabus

K.S.Rangasamy College of Technology – Autonomous R2022								
B.Tech – Artificial Intelligence and Data Science								
60 AD E55- Game Development								
Semester	**Hours/Week**			**Total Hours**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
VIII	3	0	0	45	3	40	60	100

Unity Interface Introduction to Unity, Unity Interface, Game Objects, Prefabs, Components, Camera Components, 3D Models, Neighborhood Scene, Script Components, Collision Detection, Physics, Materials and Textures, Rigid bodies, Physic Materials, Collectibles, Trigger Colliders, Particle Systems, Animating Game Objects	[9]
Introduction to C# Variables and Operators, Variables and Assignment, Operators, Conditionals, Nested Conditionals, Loops, Arrays, and Iteration While Loops, For Loops, Arrays, Arrays, Object-Oriented Programming, Methods, Classes and Objects, Object Oriented Programming	[9]
Unity Scripting API API Application, Programming Interface, Mono Behaviour, Vectors, User Input, Rigid body API, Projectiles, Instantiate, Animation State Machine, Explosions, Game Mechanics, Find Object of Type User Interfaces, Load Scene, Terrain and Level Design	[9]
Unity 2D 2D Game Development, Sprites and Sprite, Renderers, Sprite Sheets, Physics 2D, OnCollisionEnter2D, Spawning, Program Structure and Design, Static Modifier, Parallax Layers Player Health, Design Patterns: Singleton, Enumeration Types, Sprite Animations, Animation Events, Player UI, Buttons, Polish and Performance, Score PlayerPrefs, Object Pooling, Game Feel	[9]
Unity Events, Interactions and Data Structures* Level Design, Player Interactions, Player Controller, Player Objectives, Data Structures, Game Genre and Mechanics	[9]
Total Hours:	**45**

Text Book(s):	
1.	Paris Buttfield Addison, Jon Manning & Tim Nugent, “Unity Development Cookbook”, O'Reilly Media, 2023.
2.	Anthony Davis, Travis M W Baptiste, Russell Craig, Ryan Stunkel – “Unity Game Development Learn how to design beautiful games from the team at Unity”, Packt Publishing.
Reference(s):	
1.	https://learn.unity.com/tutorials
2.	https://www.javatpoint.com/unity

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Course Contents and Lecture Schedule

S. No.	Topics	No. of hours
1.0	**Unity Interface**	
1.1	Introduction to Unity	1
1.2	Unity Interface	1
1.3	Game Objects	1
1.4	Prefabs	1
1.5	Components, Camera Components	1
1.6	3D Models, Neighborhood Scene	1
1.7	Script Components, Collision Detection	1
1.8	Physics, Materials and Textures, Rigid bodies	1
1.9	Physic Materials, Collectibles, Trigger Colliders, Particle Systems, Animating Game Objects	1
2.0	**Introduction to C#**	
2.1	Variables and Operators	1
2.2	Variables and Assignment	2
2.3	Operators, Conditionals, Nested Conditionals	1
2.4	Loops, Arrays, and Iteration While Loops	1
2.5	For Loops, Arrays, Arrays	1
2.6	Object-Oriented Programming	2
2.7	Methods, Classes and Objects, Object Oriented Programming	1
3.0	**Unity Scripting API**	
3.1	API Application	1
3.2	Programming Interface, MonoBehaviour, Vectors	1
3.3	User Input, Rigid body API, Projectiles	1
3.4	Instantiate, Animation State Machine	2
3.5	Explosions	1
3.6	Game Mechanics	1
3.7	FindObjectOfType User Interfaces	1
3.8	Load Scene, Terrain and Level Design	1
4.0	**Unity 2D**	
4.1	2D Game Development	1
4.2	Sprites and Sprite, Renderers, Sprite Sheets	1
4.3	Physics 2D, OnCollisionEnter2D, Spawning, Program Structure and Design	2
4.4	Static Modifier, Parallax Layers Player Health	1
4.5	Design Patterns: Singleton, Enumeration Types, Sprite Animations, Animation Events	2
4.6	Player UI, Buttons, Polish and Performance	1
4.7	Game Feel	1
5.0	**Unity Events, Interactions and Data Structures**	
5.1	Level Design	1
5.2	Player Interactions	2
5.3	Player Controller	1
5.4	Player Objectives	2
5.5	Data Structures	1
5.6	Game Genre and Mechanics	2

Course Designer(s)

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60 AD E56	Cognitive Science	Category	L	T	P	Credit
		PE	3	0	0	3

Objectives

- To explain cognitive computing and design principles.
- To distinguish between NLP and cognitive computing.
- To apply advanced analytics to cognitive computing.
- To discuss the application of cognitive computing in business.
- To illustrate various applications of cognitive computing.

Pre-requisites

- Foundation of Analytics, Natural Language Processing

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Use cognitive computing and design principles.	Remember, Understand
CO2	Apply natural language technologies to business problems.	Remember, Understand, Apply
CO3	Apply advanced analytics to cognitive computing.	Remember, Understand, Apply
CO4	Use the application of cognitive computing in business.	Remember, Understand
CO5	Demonstrate the various applications of cognitive computing.	Remember, Understand, Apply

Mapping with Programme Outcomes

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	2	2	2	-	-	-	-	-	-	-	-	-	2	3	
CO2	2	2	2	-	-	-	-	-	-	-	-	-	2	3	3
CO3	2	2	2	-	-	-	-	-	-	-	-	-	-	3	3
CO4	2	2	2	-	-	-	-	-	-	-	-	-	-	-	-
CO5	2	2	2	-	-	-	-	-	-	-	-	-	-	-	-

3 - Strong; 2 - Medium; 1 - Some

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		End Sem Examination (Marks)
	1	2	
Remember	10	10	10
Understand	20	20	40
Apply	30	30	50
Analyse	-	-	-
Evaluate	-	-	-
Create	-	-	-
Total	60	60	100

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Syllabus

K.S.Rangasamy College of Technology – Autonomous R2022

B.Tech – Artificial Intelligence and Data Science

60 AD E56 - Cognitive Science

Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
VIII	3	0	0	45	3	40	60	100

Foundation and Design Principles **Foundation of Cognitive Computing**: cognitive computing as a new generation, the uses of cognitive systems, system cognitive, gaining insights from data, Artificial Intelligence as the foundation of cognitive computing, understanding cognition. **Design Principles for Cognitive Systems**: Components of a cognitive system, building the corpus, bringing data into cognitive systems, machine learning, hypotheses generation and scoring, presentation, and visualization services	[9]
NLP in Cognitive System **Natural Language Processing in support of a Cognitive System**: Role of NLP in a cognitive system, semantic web, Applying Natural language technologies to Business problems. **Representing knowledge in Taxonomies and Ontologies**: Representing knowledge, Defining Taxonomies and Ontologies, knowledge representation, models for knowledge representation, implementation considerations.	[9]
Big Data vs Cognitive Computing **Relationship between Big Data and Cognitive Computing:** Dealing with human-generated data, defining big data, architectural foundation, analytical data warehouses, Hadoop, data in motion and streaming data, and integration of big data with traditional data. **Applying Advanced Analytics to Cognitive Computing:** Advanced Analytics is on a path to cognitive computing, Key capabilities in advanced analytics, using advanced analytics to create value, Impact of open source tools on advanced analytics, Clickstream data analysis, Google analytics	[9]
Cognitive Computing in Business* **The Business Implications of Cognitive Computing**: Preparing for change, advantages of new disruptive models, knowledge meaning to business, difference with cognitive systems approach, meshing data together differently, using business knowledge to plan for the future, answering business questions in new ways, building business-specific solutions, making cognitive computing a reality, cognitive application changing the market- IBM Watson as a cognitive system	[9]
Applications** The process of building a cognitive application: Emerging cognitive platform, defining the objective, defining the domain, understanding the intended users and their attributes, questions and exploring insights, training and testing-Connectionism- Building a cognitive health care application- Smarter cities-Cognitive Computing in Government.	[9]
Total Hours:	**45**

Text Book(s):

1. Judith H Hurwitz, Marcia Kaufman, Adrian Bowles, “Cognitive computing and Big Data Analytics” , Wiley, 2015.
2. Vijay Raghvan, Venu Govindaraju, C.R. Rao, Cognitive Computing: Theory and Applications", by Elsevier publications, North Holland Publication, 1st Edition, 2016.

Reference(s):

1. Bernadette Sharp, Florence Sedes, Wieslaw Lubaszewski, “Cognitive Approach to Natural Language Processing Hardcover”, 1st Edition, 2017.
2. Arun Kumar Sangaiah, Arunkumar Thangavelu, et al., “Cognitive Computing for Big Data Systems Over IoT: Frameworks, Tools and Applications”. Lecture Notes on Data Engineering and Communications Technologies, 1st edition, 2018
3. Min Chen and Kai Hwang, “Big-Data Analytics for Cloud, IoT and Cognitive Computing”, Wiley Publication, 1st Edition, 2017.
4. Mallick, Pradeep Kumar, Borah, Samarjeet, "Emerging Trends and Applications in Cognitive Computing”, IGI Global Publishers, 2019.

SDG: 9 - Industry, Innovation and Infrastructure

**SDG: 11 - Sustainable Cities and Communities

Rev. No.3/w.e.f. 22.07.2024

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Dept. of Artificial Intelligence and Data Science
K.S.Rangasamy College of Technology
Tiruchengode - 637 215.

Course Contents and Lecture Schedule

S. No.	Topics	No. of hours
1.0	**Foundation and Design Principles**	
1.1	**Foundation of Cognitive Computing**: cognitive computing as a new generation	1
1.2	the uses of cognitive systems, system cognitive	1
1.3	gaining insights from data	1
1.4	Artificial Intelligence as the foundation of cognitive computing, understanding cognition.	1
1.5	**Design Principles for Cognitive Systems**: Components of a cognitive system, building the corpus	1
1.6	bringing data into cognitive systems	1
1.7	machine learning	1
1.8	hypotheses generation and scoring	1
1.9	presentation, and visualization services	1
2.0	**NLP in Cognitive System**	
2.1	**Natural Language Processing in support of a Cognitive System**: Role of NLP in a cognitive system	1
2.2	semantic web	1
2.3	Applying Natural language technologies to Business problems	2
2.4	**Representing knowledge in Taxonomies and Ontologies**: Representing knowledge	1
2.5	Defining Taxonomies and Ontologies	1
2.6	knowledge representation	1
2.7	models for knowledge representation	1
2.8	implementation considerations	1
3.0	**Big Data vs Cognitive Computing**	
3.1	**Relationship between Big Data and Cognitive Computing:** Dealing with human-generated data	1
3.2	defining big data	1
3.3	architectural foundation, analytical data warehouses	1
3.4	Hadoop	1
3.5	data in motion and streaming data, and integration of big data with traditional data.	1
3.6	Applying Advanced Analytics to Cognitive Computing: Advanced Analytics is on a path to cognitive computing	1
3.7	Key capabilities in advanced analytics	1
3.8	using advanced analytics to create value	1
3.9	Impact of open source tools on advanced analytics, Clickstream data analysis, Google analytics	1
4.0	**Cognitive Computing in Business**	
4.1	**The Business Implications of Cognitive Computing**: Preparing for change, advantages of new disruptive models	1
4.2	knowledge meaning to business	1
4.3	difference with the cognitive systems approach	1
4.4	meshing data together differently	1
4.5	using business knowledge to plan for the future	1
4.6	answering business questions in new ways, building business-specific solutions	1
4.7	making cognitive computing a reality	1
4.8	cognitive application changing the market	1
4.9	IBM Watson as a cognitive system	1

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5.0	**Applications**	
5.1	The process of building a cognitive application: Emerging cognitive platform	1
5.2	defining the objective	1
5.3	defining the domain	1
5.4	understanding the intended users and their attributes	1
5.5	questions and exploring insights	1
5.6	training and testing, Connectionism	1
5.7	Building a cognitive health care application	1
5.8	Smarter cities	1
5.9	Cognitive Computing in Government	1

Course Designer(s)

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60 AD 603/ 60 AD L01	Robotic Process Automation	Category	L	T	P	Credit
		PC/OE	1	0	4	3

Objectives

- To enable the students to learn how Robotic Process Automation helps organizations.
- To understand the activities supported in RPA.
- To create and use controls in UiPath RPA tools.
- To perform data manipulation with string in UiPath Studio
- To automate repeatable tasks that previously required humans to perform

Pre-requisites

- Basic Programming Knowledge

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Recognize the principles of Robotic Process Automation	Apply
CO2	Identify the key RPA tools and workflows used in intelligent automation.	Apply
CO3	Implement the functionalities of data manipulation and scrapping.	Apply
CO4	Analyzing the process of automation in documents.	Apply
CO5	Implement the concept of automation in different UI elements	Apply

Mapping with Programme Outcomes

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	1	-	-	-	-	1	-	-	-	-	3		3
CO2	3	3	1	3	-	-	-	-	-	-	-	-	3	2	3
CO3	3	3	1	3	-	-	-	-	-	-	-	-	3	2	3
CO4	3	3	1	-	3	-	-	-	-	-	-	1	3	2	3
CO5	3	3	2	-	3	-	-	2	-	-	-	1	3	2	3
3 - Strong; 2 - Medium; 1 - Some															

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		Model Examination (Marks)	End Sem Examination (Marks)
	1	2		
Remember	-	-	-	-
Understand	-	-	-	-
Apply	30	30	50	50
Analyse	30	30	50	50
Evaluate	-	-	-	-
Create	-	-	-	-
Total	60	60	100	100

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Syllabus

K.S.Rangasamy College of Technology – Autonomous R2022								
B.Tech - Artificial Intelligence and Data Science								
60 AD 603/60 AD L01 - Robotic Process Automation								
Semester	**Hours/Week**			**Total Hours**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
	1	0	6	75	4	50	50	100

Introduction to Robotic Process Automation: Introduction to Robotic Process Automation - Robotic Automation Framework - Tool Installation and Setup –Workflow Designer Panels - Types of Workflows, Sequences, Flowcharts and State Machines	[3+12]
Data Manipulation and Scrapping: Data Manipulation Variables, Datatypes - Analyzing the process and aggregate datasets in the database and Usage, Managing Arguments – Data Scrapping - Debug Workflow - Error Handlings	[3+12]
Recording and Advanced UI Interaction: Introduction to Recording - Recording Types - Automatic Recording - Automatic Recording with Basic and Desktop - Automatic Recording with Web - Manual Recording - Input Methods - Screen Scraping - Data Scraping.	[3+12]
Selectors, Image and Text Automation: Introduction Selectors - Selectors with Wildcards - Full versus Partial Selectors - Explorer - About Image and Text Automation - Mouse and Keyboard Activities - Text Activities - OCR Activities - Image Activities.	[3+12]
Excel, PDF and Email Automation: Excel Activities - Data Tables Activities - Data Extraction from PDF - PDF Activities - Email Automation - Email Activities – Orchestrator UI Interface - Connecting the Local Robot to Orchestrator – Schedules - Managing Logs.	[3+12]
Total Hours:	**75**

Text Book(s):	
1.	Alok Mani Tripathi, “Learning Robotic Process Automation, 1st Edition, 2018.
2.	Vaibhav Jain, “Crisper Learning: for UiPath”, Fourth Edition, 1st Edition, 2018.
Reference(s):	
1.	https://www.uipath.com/rpa/academy/training

*** SDG4: Quality Education**

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Course Contents and Lecture Schedule

S. No.	Topics	No. of hours
1	**Introduction to Robotic Process Automation**	
1.1	Introduction to Robotic Process Automation	1
1.2	UiPath's Robotic Automation Framework	1
1.3	UiPath Tool Installation and Setup	1
2	**Data Manipulation and Scrapping**	
2.1	Data Manipulation Variables, Datatypes	1
2.2	Analyzing the process and aggregate datasets in the database and Usage, Managing Arguments	1
2.3	Data Scrapping	1
3	**Recording and Advanced UI Interaction**	
3.1	Introduction to Recording	1
3.2	Recording Types	1
3.3	Automatic Recording	1
4	**Selectors, Image and Text Automation**	
4.1	Introduction Selectors	1
4.2	Selectors with Wildcards	1
4.3	Full versus Partial Selectors	1
5	**Excel, PDF and Email Automation**	
5.1	Excel Activities	1
5.2	Data Tables Activities	1
5.3	Data Extraction from PDF	1
6	**Project**	
6.1	Problem Identification	10
6.2	Solution for Problem	15
6.3	Implementation	20
6.4	Presentation	5
6.5	Report	5
6.6	Demo	5

Course Designer(s)

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60 AD L02	Visualization Tools	Category	L	T	P	Credit
		OE	1	0	4	3

Objectives

- Understand the basic concepts of Data base and data visualization tool
- Be familiar with Microsoft Data Analytics and knowledge about visual analytics
- Develop a Data modelling with a tool
- Apply Sematic Model in visualization tool and familiar with basic constructs of DAX formulas
- Learn some important DAX Formulas and apply in case study

Pre-requisites

Basics of Data Analytics.

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Understand the basics concepts of data visualization and its tool	Understand
CO2	Understand the Microsoft Data Analytics and Visual Analytics	Understand
CO3	Apply Data Model	Apply
CO4	Build And Modify Semantic Model and apply the basic knowledge about DAX formulas	Remember
CO5	Understand the DAX Formulas and apply in some key areas.	Understand

Mapping with Programme Outcomes

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	3	-	-	-	2	2	-	2	-	1	3	-	-
CO2	3	2	3	-	-	-	2	2	-	2	-	1	3	-	-
CO3	3	2	2	-	-	-	2	1	-	2	-	1	3	-	-
CO4	3	2	2	-	-	-	2	1	-	2	-	1	3	-	-
CO5	3	2	2	-	-	-	2	1	-	2	-	1	3	-	-
3 - Strong; 2 - Medium; 1 - Some															

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		Model Examination (Marks)	End Sem Examination (Marks)
	1	2		
Remember	-	-	-	-
Understand	-	-	-	-
Apply	30	30	50	50
Analyse	30	30	50	50
Evaluate	-	-	-	-
Create	-	-	-	-
Total	60	60	100	100

Syllabus

K.S.Rangasamy College of Technology – Autonomous R2022								
B.Tech – Artificial Intelligence and Data Science								
60 AD L02– Visualization Tools								
Semester	**Hours/Week**			**Total Hours**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
-	1	0	4	75	3	50	50	100

Introduction Data -Data Analysis-Microsoft EXCEL -Power BI-Business Intelligence (BI)- Power BI Desktop (Power Query, Power Pivot, Power View)- Power BI Service- Power BI Mobile Flow - Overview of data visualization - Data Abstraction	[3+12]
Microsoft Data Analytics and Visual Analytics Discover data analysis-Overview of data analysis- Roles in data- Tasks of a data analyst-Building with Power BI - Use Power BI-Building blocks of Power BI- Tour and use the Power BI service - Networks and Trees – Heat Map - Map Color.	[3+12]
Modelling Data* Power BI Desktop models- Star schema design - Analytic queries -Configure report visuals - Power BI model framework- Power BI model fundamentals -develop an import model - develop a Direct Query model- develop a composite model -model framework.	[3+12]
Semantic Model and Dax Formulas Work with tables -Create a date table - Work with dimensions - Data granularity - Work with relationships and cardinality - Model data in Power BI Desktop –DAX Formulas-datatypes-functions-operators-variables.	[3+12]
Dax Formulas Application and Case Study Create simple measures- Create compound measures - Create quick measures calculated columns with measures – Casestudy : Integration of Data Visualization with Hadoop - Visualization Dashboard Creations for Finance.	[3+12]
Total Hours:	**75**

Text Book(s):	
1.	Michael Berthold, David J. Hand, “Intelligent Data Analysis”, Springer, 2007.
2.	Anand Rajaraman and Jeffrey David Ullman, “Mining of Massive Datasets”, Cambridge University Press, 2012.
Reference(s):	
1.	Bill Franks, “Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with advanced analystics”, John Wiley & sons, 2012.
2.	Pete Warden, “Big Data Glossary”, O’Reilly, 2011.
3.	Jiawei Han, Micheline Kamber “Data Mining Concepts and Techniques”, 2nd Edition, Elsevier, Reprinted 2008.
4.	Donald Miner, “Map Reduce Design Patterns: Building Effective Algorithms and Analytics for Hadoop and Other Systems”, O'Reilly Media, 2012.

*SDG 9 – Industry Innovation and Infrastructure

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Course Contents and Lecture Schedule

S. No.	Topics	No. of hours
1	**Introduction**	
1.1	Data -Data Analysis-Microsoft EXCEL -Power BI-Business Intelligence (BI)	1
1.2	Power BI Desktop (Power Query, Power Pivot, Power View)- Power BI Service	1
1.3	Power BI Mobile Flow - Overview of data visualization - Data Abstraction	1
2	**Microsoft Data Analytics and Visual Analytics**	
2.1	Discover data analysis-Overview of data analysis- Roles in data- Tasks of a data analyst	1
2.2	Building with Power BI - Use Power BI-Building blocks of Power BI	1
2.3	Tour and use the Power BI service - Networks and Trees – Heat Map - Map Color.	1
3	**Modelling Data**	
3.1	Power BI Desktop models- Star schema design - Analytic queries -Configure report visuals - -	1
3.2	Power BI model framework- Power BI model fundamentals -develop an import model	1
3.3	Develop a Direct Query model- develop a composite model -model framework.	1
4	**Semantic Model and Dax Formulas**	
4.1	Work with tables -Create a date table - Work with dimensions	1
4.2	Work with relationships and cardinality - Model data in Power BI Desktop	1
4.3	Data granularity -–DAX Formulas-data types-functions-operators-variables.	1
5	**Dax Formulas Application and Case Study**	
5.1	Create simple measures- Create compound measures	1
5.2	Create quick measures calculated columns with measures	1
5.3	Case Study : Integration of Data Visualization with Hadoop -Visualization Dashboard Creations for Finance	1
6	**Project**	
6.1	Problem Identification	10
6.2	Solution for Problem	15
6.3	Implementation	20
6.4	Presentation	5
6.5	Report	5
6.6	Demo	5

Course Designer(s)

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