Department of Computer Science and Engineering

Minutes of 6th Board of Studies Meeting
(M.Tech -Computer Science and Engineering)

Agenda of the Meeting	
Item No. : BoS / 6 / 2023 / CSE / PG /6.1	Welcome Address and to confirm the minutes of the Fifth meeting of Board of Studies held on 17.09.2022
Item No. : BoS / 6 / 2023 / CSE / PG/ 6.2	To discuss and approve the M.Tech. Degree Regulations (R-2023), Curriculum for four semesters and syllabi of first and second Semesters for the M.Tech Computer Science and Engineering students to be admitted from the academic year 2023-24
Item No. : BoS / 6 / 2023 / CSE / PG /6.3	To apprise the End Semester Results of the students admitted in the Academic Year 2021-2022 (III sem), 2022-2023 (I sem). and to discuss about Extra-Curricular and Co-Curricular activities.
Item No. : BoS / 6 / 2023 / CSE / PG /6.4	To apprise about the List of Courses for Professional Electives / Ability Enhancement Courses under R-2023 for the students admitted from the academic Year 2023-24.
Item No. : BoS / 6 / 2023 / CSE / PG /6.5	To apprise the schedule of the End Semester Examination to be conducted in the month of July/August 2023 and to discuss and recommend the panel of examiners to the Academic Council
Item No. : BoS / 6 / 2023 / CSE / PG /6.6	Any other item with the permission of chair

Minutes of the Meeting

Dr. K.Premkumar, Chairman, BoS opened the meeting by welcoming and introducing the external members, to the internal members and the meeting thereafter deliberated on agenda items that had been approved by the Chairman.

Item No. : **BoS / 6 / 2023 / CSE / PG /6.1**

Welcome Address and to confirm the minutes of the Fifth meeting of Board of Studies held on 17.09.2022

Chairman, BoS, apprised the minutes of 6th BoS, its implementation and then it is confirmed with the approval in 5th BoS meeting.

Item No. : **BoS / 6 / 2023 / CSE / PG /6.2**

To discuss and approve the M.Tech. Degree Regulations (R-2023), Curriculum for four semesters and syllabi of first and second Semesters for the M.Tech Computer Science and Engineering students to be admitted from the academic year 2023-24

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The M.Tech. Degree curriculum and syllabus approval of I and II semesters under Autonomous Regulations 2023 for the M.Tech programme and the students admitted in the AY 2023-24 were discussed and recommended with the following modifications.

S. No	Regulation	Semester	Subject Name with code	Unit	Particulars
1	R-23	I	Advanced Data structures and Algorithms (P23CSTD01)	V	Experts recommended to rename unit v name "Linear Programming" to "Dynamic Programming"
2	R-23	I	Block chain and crypto currency (P23CSE104)	I	Experts recommends to rename "Basic of Blockchain" to "Introduction to blockchain"
3	R-23	II	Advanced Operating Systems (P23CST205)	V	Experts recommended to include Tiny OS
4	R-23	II	Smart sensing for IOT (P23CSE210)	V	Experts recommended to rename "Preparing for IOT project as "IOT Projects"

The above correction was incorporated and approved by BoS members in 6th BoS meeting, and the details are enclosed in Annexure - V.

Item No. : BoS / 6 / 2023 / CSE / PG/ 6.3

To apprise the End Semester Results of the students admitted in the Academic Year 2021-2022 (III sem), 2022-2023 (I sem). and to discuss about Extra-Curricular and Co-Curricular activities

The panel discussed about Results of I and III semester and the students participation in Extra-Curricular and Co-Curricular activities

Item No. : BoS / 6 / 2023 / CSE / PG /6.4

To apprise about the List of Courses for Professional Electives / Ability Enhancement Courses under R-2023 for the students admitted from the academic Year 2023-24.

Discussed about the offering of List of Courses for Professional Electives / Ability Enhancement Courses under R-2023 for the students admitted from the academic Year 2023-24 and the same was approved by BoS members and details are enclosed in Annexure-V

Item No. : BoS / 6 / 2023 / CSE / PG/ 6.5

To apprise the schedule of the End Semester Examination to be conducted in the month of July/August 2023 and to discuss and recommend the panel of examiners to the Academic Council

The list of question paper setters and Evaluators was presented and recommended by the

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BoS members to the academic council (enclosed in Annexure-III)

Item No. : BoS / 6 / 2023 / CSE / PG/ 6.6

Any other item with the permission of chair

The panel discussed about bringing up new industry oriented topic in curriculum

Sl.No	Name of the Member with Designation and official Address	Responsibility in the BoS	Signature
1.	Dr. K.Premkumar Professor and Head, Department of Computer Science and Engineering, Sri Manakula Vinayagar Engineering College	Chairman	
2.	Mr. M. Shanmugam Associate Professor, Department of Computer Science and Engineering Sri Manakula Vinayagar Engineering College	Member Secretary	

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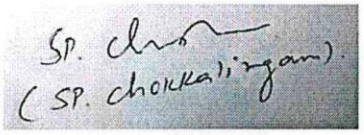
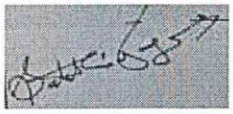
External Members			
3.	Dr. S. R. Balasundaram, Professor and Head Department of Computer Applications, National Institute of Technology, Trichy.	Subject Expert (Pondicherry University Nominee)	S. R. Balasundaram
4.	Dr. Chokkalingam Subramanian, Professor & Head, Department of Information Technology, Saveetha University, Chennai.	Subject Expert (Academic Council Nominee)	
5.	Dr.S.Udhayakumar, Professor, School of Engineering , Amrita Vishwa Vidyapeetham, Chennai .	Subject Expert (Academic Council Nominee)	
6.	S.Diwahar, M.Tech., Senior Engineer, Dell Technologies, Bangalore	Representative from Industry	S. Diwahar
7.	R.Sakthi Murugan, Director, Interjet India Pvt. Ltd., Puducherry.	Postgraduate Alumnus (nominated by the Principal)	
Internal Members			
8.	Dr. M.Ganesan Professor, Department of CSE, SMVEC.	Internal Member	M. Ganesan
9.	Dr.R.Ramachandiran Associate Professor, Department of CSE, SMVEC.	Internal Member	R. Ramachandiran
10.	Dr.J.Raja Associate Professor, Department of CSE, SMVEC	Internal Member	
11.	Dr.T.Megala Assistant Professor, Department of CSE, SMVEC	Internal Member	
Co-opted Members			
12.	Dr.M.A.Ishrath Jahan Associate Professor, Department of English, SMVEC	Internal Member	
13.	Dr.T.Jayavarthanan Professor, Department of Physics, SMVEC	Internal Member	
14.	Dr.S.Savithiri, Professor, Department of Chemistry, SMVEC	Internal Member	

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15.	Prof.K.Raja, Assistant Professor, Department of Mathematics, SMVEC	Internal Member	

Head of the department
(Dr.K.Premkumar)

Dean-Academics
(Dr.S.Anbumalar)

Director cum Principal
(Dr.V.S.K.Venkatachalapathy)

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Annexure V

(M.Tech - Curriculum and Syllabus)

2.A.3.99

SRI MANAKULA VINAYAGAR ENGINEERING COLLEGE

(An Autonomous Institution)

Puducherry

(As per UGC - 2018 Regulations and Affiliated to Pondicherry University)

PUDUCHERRY – 605107

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

M.TECH.

COMPUTER SCIENCE AND ENGINEERING

(REGULATIONS - 2023)

CURRICULUM AND SYLLABI

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COLLEGE VISION AND MISSION

VISION

To be globally recognized for excellence in quality education, innovation and research for the transformation of lives to serve the society.

MISSION

M1: Quality Education : To provide comprehensive academic system that amalgamates the cutting edge technologies with best practices.

M2: Research and Innovation : To foster value-based research and innovation in collaboration with industries and institutions globally for creating intellectuals with new avenues.

M3: Employability and Entrepreneurship : To inculcate the employability and entrepreneurial skills through value and skill based training.

M4: Ethical Values : To instill deep sense of human values by blending societal righteousness with academic professionalism for the growth of society.

DEPARTMENT VISION AND MISSION

VISION

To create a productive learning and research environment for graduates to become highly dynamic, competent, ethically responsible, professionally knowledgeable in the field of computer science and engineering to meet the industrial needs on par with global standards.

MISSION

M1: Quality Education: Empowering the students with the necessary technical skills through quality education to grow professionally.

M2: Innovative Research: Advocating the innovative research ideas by incorporating with industries for developing products and services.

M3: Placement and Entrepreneurship: Advancing the education by strengthening the Industry-academic relationship through hands-on training to seek placement in the top most industries or to develop a start-ups.

M4: Ethics and Social Responsibilities: Stimulating professional behaviour and good ethical values to improve the leadership skills and social responsibilities.

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PROGRAMME OUTCOMES (POs)

PO1: Exploration of Research:
An ability to independently carry out research/investigation and development work to solve practical problems.

PO2: Technical Skill:
An ability to write and present a substantial technical report/document.

PO3: Expertise in Academics:
Students should be able to demonstrate a degree of mastery over the area as per the specialization of the program. The mastery should be at a level higher than the requirements in the appropriate bachelor program.

PO4: Problem solving:
An ability to discriminate, analyzes, evaluate and synthesize the technologies to provide solution for multidimensional engineering problems.

PO5: Usage of Modern Tools:
Create, select, learn 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: Ethical Practices and Social Responsibility:
Acquire professional and intellectual integrity, professional code of conduct, ethics of research and scholarship, consideration of the impact of research outcomes on professional practices and an understanding of responsibility to contribute to the community for sustainable development of society.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

PEO1: Technical Knowledge: To acquire a comprehensive knowledge in computer science engineering concepts and apply them for the investigation of real world problems.

PEO2: Research and Development: To prepare graduates who will demonstrate analytical, research, design and implementation skills offering techno-commercially feasible and socially acceptable solutions.

PEO3: Leadership: To prepare graduates who will demonstrate analytical, research, design and implementation skills offering techno-commercially feasible and socially acceptable solutions

PEO4: Professional Behavior: To deliver graduates to design and implement solutions for rapidly changing computing problems and information system environments to adapt innovation.

PROGRAM SPECIFIC OUTCOMES (PSOs)

PSO1: Technical Knowledge in Computer Science and Engineering: Graduates with the ability to apply basic knowledge of Computer Science in solving the critical problems.

PSO2: Multidisciplinary Competency: Ability to convert innovative ideas into research or society oriented projects through current trending technologies.

PSO3: Employability: Acquire placement in highly reputed industries or accomplish new technical business skills with the contemporary trends in the industry.

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STRUCTURE FOR POST GRADUATE ENGINEERING PROGRAM

Sl.No	Course Category	Breakdown of Credits
1	Humanities and Social Sciences (HS)	6
2	Basic Sciences(BS)	3
3	Engineering Sciences (ES)	-
4	Professional Core (PC)	25
5	Professional Electives (PE)	18
6	Open Electives (OE)	-
7	Project Work and Internship(PA)	20
8	Ability Enhancement Courses (AEC)	-
9	Mandatory courses (MC)	-
Total		**72**

SCHEME OF CREDIT DISTRIBUTION – SUMMARY

Sl.No	Course Category	Credits per Semester				Total Credits
		I	II	III	IV	
1	Humanities and Social Sciences (HS)	4	2	-	-	6
2	Basic Sciences(BS)	3	-	-	-	3
3	Engineering Sciences (ES)	-	-	-	-	-
4	Professional Core (PC)	11	14	-	-	25
5	Professional Electives (PE)	3	6	9	-	18
6	Open Electives (OE)	-	-	-	-	-
7	Project Work and Internship(PA)			8	12	20
8	Ability Enhancement Courses (AEC)*	-	-	-	-	-
9	Mandatory Courses (MC)*	-	-	-	-	-
Total		**21**	**22**	**17**	**12**	**72**

** AEC, MC Credits are not included for CGPA calculation*

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CURRICULUM

SEMESTER – I										
Sl. No.	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	P23MAT103	Mathematical Foundation of Formal Approach	BS	2	1	0	3	40	60	100
2	P23CSTD01	Advanced Data Structures and Algorithms	PC	3	0	0	3	40	60	100
3	P23CST102	Cloud and Big Data Analytics	PC	3	0	0	3	40	60	100
4	P23CSTD02	Speech and Language Processing	PC	3	0	0	3	40	60	100
5	P23HSTC01	Research Methodology and IPR	HS	2	0	0	2	40	60	100
6	P23CSE1XX	Professional Elective – I *	PE	3	0	0	3	40	60	100
Practical										
7	P23CSP101	Advanced Data Structures and Algorithms Laboratory	PC	0	0	4	2	50	50	100
8	P23HSPC01	Technical Report Writing and Seminar	HS	0	0	4	2	100	-	100
Ability Enhancement Course										
9	P23CSC1XX	Certification Course-I #	AEC	0	0	4	-	100	-	100
10	P23ACT10X	Audit Course-I**	AEC	0	0	2	-	100	-	100
							21	590	410	1000

SEMESTER – II										
Sl. No.	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	P23CST203	Advanced Software Engineering and Testing	PC	3	0	0	3	40	60	100
2	P23CST204	Adhoc and Wireless Sensor Networks	PC	3	0	0	3	40	60	100
3	P23CST205	Advanced Operating Systems	PC	3	0	0	3	40	60	100
4	P23CST206	Advanced Python Programming	PC	3	0	0	3	40	60	100
5	P23CSE2XX	Professional Elective - II	PE	3	0	0	3	40	60	100
6	P23CSE2XX	Professional Elective - III	PE	3	0	0	3	40	60	100
Practical										
7	P23CSP202	Advanced Python Programming Laboratory	PC	0	0	4	2	50	50	100
8	P23HSPC02	Seminar on ICT a hands on approach	HS	0	0	4	2	100	-	100
Ability Enhancement Course										
9	P23CSC2XX	Certification Course-II #	AEC	0	0	4	-	100	-	100
10	P23ACT20X	Audit Course-II**	AEC	0	0	2	-	100	-	100
							22	590	410	1000

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SEMESTER – III										
Sl. No.	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	P23CSE1XX	Professional Elective – IV *	PE	3	0	0	3	40	60	100
2	P23CSE1XX	Professional Elective – V *	PE	3	0	0	3	40	60	100
3	P23CSE1XX	Professional Elective – VI *	PE	3	0	0	3	40	60	100
Project Work										
4	P23CSW301	Project Phase - I	PA	0	0	12	6	50	50	100
5	P23CSW302	Internship	PA	0	0	0	2	100	-	100
Ability Enhancement Course										
6	P23CSC301	NPTEL/SWAYAM/MOOC	AEC	0	0	0	-	100	-	100
							17	370	230	600

SEMESTER – IV										
Sl. No.	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Project Work										
1	P23CSW403	Project Phase - II	PA	0	0	24	12	50	50	100
							12	50	50	100

*** Professional Elective Courses are to be selected from the list given in Annexure I**
 # Ability Enhancement Courses are to be selected from the list given in Annexure II
**** Audit Courses are to be selected from the list given in Annexure III**

BS- Basic Sciences

PC – Professional Core

PE – Professional Elective

HS - Humanities and Social Sciences

PA - Professional Activity

CC- Common Course

AC- Audit Course

AEC - Ability Enhancement Course

CREDIT DISTRIBUTION

Semester	I	II	III	IV	Total
Credits	21	22	17	12	72

Total number of credits required to complete
M.Tech in Computer Science and Engineering : 72 credits

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ANNEXURE- I

PROFESSIONAL ELECTIVE COURSES

Sl. No.	Course Code	Course Title
Professional Elective-I		
1	P23CSE101	Programming for Data Science
2	P23CSE102	Cyber Attacks Detection and Prevention Systems
3	P23CSE103	Bio-Inspired Computing
4	P23CSE104	Block Chain and Crypto currency
5	P23CSE105	IoT Applications Engineering
Professional Elective-II		
1	P23CSEC01	Information Visualization
2	P23CSE206	Malware Analysis
3	P23CSEC02	Soft Computing
4	P23BDEC01	Neural Networks
5	P23CSE207	Smart Sensing for IoT
Professional Elective-III		
1	P23CSEC03	Text, Web and Social Media Analytics
2	P23CSEC04	Data Storage Technologies and Networks
3	P23CSE208	Reinforcement Learning
4	P23CSE209	Mobile Application and Development
5	P23CSE210	Wireless Sensor Networks and IoT
Professional Elective-IV		
1	P23BDEC03	Analytics of Things
2	P23CSE311	Cloud Security and Analytics
3	P23CSE312	Pattern Recognition
4	P23CSEC05	Game Design and Augmented Reality
5	P23CSE313	IoT Security and Trust
Professional Elective-V		
1	P23CSEC06	Image and Video Analytics
2	P23CSE314	Web Application Security
3	P23CSE315	Cognitive Science
4	P23CSE316	Cloud Application Development and Management
5	P23CSE317	Intelligent Internet of Things
Professional Elective-VI		
1	P23CSE318	Big Data Technologies
2	P23CSE319	Digital Forensics
3	P23CSE320	Knowledge Engineering and Expert Systems
4	P23BDTD01	NoSQL Databases
5	P23CSE321	Industrial IoT

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ANNEXURE- II

ABILITY ENHANCEMENT COURSES

Sl. No.	Course Code	Course Title
1	P23XXCX01	Adobe Photoshop
2	P23XXCX02	Adobe Animate
3	P23XXCX03	Adobe Dreamweaver
4	P23XXCX04	Adobe After Effects
5	P23XXCX05	Adobe Illustrator
6	P23XXCX06	Adobe InDesign
7	P23XXCX07	Autodesk AutoCAD -ACU
8	P23XXCX08	Autodesk Inventor - ACU
9	P23XXCX09	Autodesk Revit - ACU
10	P23XXCX10	Autodesk Fusion 360 - ACU
11	P23XXCX11	Autodesk 3ds Max - ACU
12	P23XXCX12	Autodesk Maya - ACU
13	P23XXCX13	Cloud Security Foundations
14	P23XXCX14	Cloud Computing Architecture
15	P23XXCX15	Cloud Foundation
16	P23XXCX16	Cloud Practitioner
17	P23XXCX17	Cloud Solution Architect
18	P23XXCX18	Data Engineering
19	P23XXCX19	Machine Learning Foundation
20	P23XXCX20	Robotic Process Automation / Medical Robotics
21	P23XXCX21	Advance Programming Using C
22	P23XXCX22	Advance Programming Using C ++
23	P23XXCX23	C Programming
24	P23XXCX24	C++ Programming
25	P23XXCX25	CCNP Enterprise: Advanced Routing
26	P23XXCX26	CCNP Enterprise: Core Networking
27	P23XXCX27	Cisco Certified Network Associate - Level 2
28	P23XXCX28	Cisco Certified Network Associate- Level 1
29	P23XXCX29	Cisco Certified Network Associate- Level 3
30	P23XXCX30	Fundamentals Of Internet of Things
31	P23XXCX31	Internet Of Things / Solar and Smart Energy System with IoT
32	P23XXCX32	Java Script Programming
33	P23XXCX33	NGD Linux Essentials
34	P23XXCX34	NGD Linux I
35	P23XXCX35	NGD Linux II
36	P23XXCX36	Advance Java Programming

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37	P23XXCX37	Android Programming / Android Medical App Development
38	P23XXCX38	Angular JS
39	P23XXCX39	Catia
40	P23XXCX40	Communication Skills for Business
41	P23XXCX41	Coral Draw
42	P23XXCX42	Data Science Using R
43	P23XXCX43	Digital Marketing
44	P23XXCX44	Embedded System Using C
45	P23XXCX45	Embedded System with IOT / Arduino
46	P23XXCX46	English For IT
47	P23XXCX47	Plaxis
48	P23XXCX48	Sketch Up
49	P23XXCX49	Financial Planning, Banking and Investment Management
50	P23XXCX50	Foundation Of Stock Market Investing
51	P23XXCX51	Machine Learning / Machine Learning for Medical Diagnosis
52	P23XXCX52	IOT Using Python
53	P23XXCX53	Creo (Modelling & Simulation)
54	P23XXCX54	Soft Skills, Verbal, Aptitude
55	P23XXCX55	Software Testing
56	P23XXCX56	MX-Road
57	P23XXCX57	CLO 3D
58	P23XXCX58	Solid works
59	P23XXCX59	Staad Pro
60	P23XXCX60	Total Station
61	P23XXCX61	Hydraulic Automation
62	P23XXCX62	Industrial Automation
63	P23XXCX63	Pneumatics Automation
64	P23XXCX64	Agile Methodologies
65	P23XXCX65	Block Chain
66	P23XXCX66	Devops
67	P23XXCX67	Artificial Intelligence
68	P23XXCX68	Cloud Computing
69	P23XXCX69	Computational Thinking
70	P23XXCX70	Cyber Security
71	P23XXCX71	Data Analytics
72	P23XXCX72	Databases
73	P23XXCX73	Java Programming
74	P23XXCX74	Networking
75	P23XXCX75	Python Programming

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76	P23XXCX76	Web Application Development (HTML, CSS, JS)
77	P23XXCX77	Network Security
78	P23XXCX78	MATLAB
79	P23XXCX79	Azure Fundamentals
80	P23XXCX80	Azure AI (AI-900)
81	P23XXCX81	Azure Data (DP -900)
82	P23XXCX82	Microsoft 365 Fundamentals (SS-900)
83	P23XXCX83	Microsoft Security, Compliance and Identity (SC-900)
84	P23XXCX84	Microsoft Power Platform (PI-900)
85	P23XXCX85	Microsoft Dynamics Fundamentals 365 – CRM
86	P23XXCX86	Microsoft Excel
87	P23XXCX87	Microsoft Excel Expert
88	P23XXCX88	Securities Market Foundation
89	P23XXCX89	Derivatives Equinity
90	P23XXCX90	Research Analyst
91	P23XXCX91	Portfolio Management Services
92	P23XXCX92	Cyber Security
93	P23XXCX93	Cloud Security
94	P23XXCX94	PMI – Ready
95	P23XXCX95	Tally – GST & TDS
96	P23XXCX96	Advance Tally
97	P23XXCX97	Associate Artist
98	P23XXCX98	Certified Unity Programming
99	P23XXCX99	VR Development

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ANNEXURE-III

AUDIT COURSES
(Common to all M.Tech Programme)

Sl. No.	Course Code	Course Title
1	P23ACTX01	English for Research Paper Writing
2	P23ACTX02	Disaster Management
3	P23ACTX03	Sanskrit for Technical Knowledge
4	P23ACTX04	Value Education
5	P23ACTX05	Constitution of India
6	P23ACTX06	Pedagogy Studies
7	P23ACTX07	Stress Management by Yoga
8	P23ACTX08	Personality Development Through Life Enlightenment Skills
9	P23ACTX09	Unnat Bharat Abhiyan

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Department	Computer Science and Engineering	Programme: **M.Tech.**						
Semester	I	Course Category : **BS**			*End Semester Exam Type: **TE**			
Course Code	**P23MAT103**	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Mathematical Foundation of Formal Approach**	**2**	**1**	**-**	**3**	**40**	**60**	**100**

Prerequisite	Basic Mathematics	
Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Basic knowledge of matrix, Set theory, functions and relations concepts needed for designing and solving problems.	**K2**
	CO2 Logical operations and predicate calculus needed for computing skill.	**K3**
	CO3 Design and solve Boolean functions for defined problems.	**K3**
	CO4 Apply the acquired knowledge of formal languages to engineering areas like Compiler Design.	**K3**
	CO5 Apply the acquired knowledge of finite automata theory and to design discrete problems to solve by Computers.	**K3**

UNIT-I	**Matrix Algebra**	**Periods: 9**
Matrices - Rank of a matrix - Solving system of equations – Eigen values and Eigenvectors - Cayley - Hamilton theorem - Inverse of a matrix.		**CO1**
UNIT-II	**Basic Set Theory**	**Periods: 9**
Basic definitions - Venn diagrams and set operations - Laws of set theory - Principle of inclusion and exclusion – Partitions - Permutation and combination – Relations - Properties of relations - Matrices of relations - Closure operations on relations - Functions - Injective, subjective and objective functions.		**CO2**
UNIT-III	**Mathematical Logic**	**Periods: 9**
Propositions and logical operators - Truth table - Propositions generated by a set - Equivalence and implication - Basic laws - Some more connectives - Functionally complete set of connectives - Normal forms - Proofs in propositional calculus - Predicate calculus.		**CO3**
UNIT-IV	**Formal Languages**	**Periods: 9**
Languages and grammars - Phrase structure grammar - Classification of grammars -Pumping lemma for regular languages - Context free languages.		**CO4**
UNIT-V	**Finite State Automata**	**Periods: 9**
Finite state automata - Deterministic finite state automata (DFA) - Non deterministic finite state automata (NFA) - Equivalence of DFA and NFA - Equivalence of NFA and Regular Languages.		**CO5**

Lecture Periods: 30	**Tutorial Periods: 15**	**Practical Periods: -**	**Total Periods: 45**

Text Books

1. David Makinson, "Sets, Logic and Maths for Computing", Springer Indian Reprint, 2011.
2. Grimaldi, R.P and Ramana, B.V. "Discrete and Combinatorial Mathematics", Pearson Education, Fifth Edition, 2006.
3. Hopcroft J.E and Ullman,J.D, "Introduction to Automata Theory, Languages and Computation", Narosa Publishing House, Delhi, 2002.
C W. Evans, "Engineering Mathematics", A Programmed Approach, 3rd Edition, 2019.

Reference Books

1. Kenneth H. Rosen, "Discrete Mathematics and Its Applications", Tata McGraw Hill, 4th Edition, 2002.
2. Sengadir, T. "Discrete Mathematics and Combinatorics" Pearson Education, New Delhi, 2009.
3. Trembley, J.P. and Manohar, R, "Discrete Mathematical Structures with Applications to Computer Science", Tata McGraw Hill, New Delhi, 2007.
4. Venkataraman, M.K., "Engineering Mathematics", Volume-II, National Publishing Company, Second Edition, 1989.
5. Dr. A. Singaravelu, "Engineering Mathematics - I", Meenakshi publications, Tamil Nadu, 2019.

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2. https://csd.cs.cmu.edu/course-profiles/15-151-Mathematical-Foundations-for-Computer-Science
3. https://www.coursera.org/learn/mathematics-for-computer-science
4. https://www.cse.iitb.ac.in/~supratik/courses/cs719/index.html
5. https://www.irif.fr/~jep/PDF/MPRI/MPRI.pd

* TE – Theory Exam, LE – Lab Exam

2. A. 3. 117

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)						Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
1	2	1	-	-	-	1	1	2	1
2	3	2	1	1	-	1	2	2	1
3	3	2	1	1	-	1	2	2	1
4	3	2	1	1	-	-	2	2	1
5	3	2	1	1	-	-	2	2	1

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	10		15	10	5	60	100

*Application Oriented /Problem solving/Design/Analytical in content beyond the syllabus to be given from Unit-5

2.A.3.118

Department	Computer Science and Engineering	Programme: M.Tech.						
Semester	I	Course Category : PC			*End Semester Exam Type: TE			
Course Code	P23CSTD01	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	Advanced Data Structures and Algorithms	3	-	-	3	40	60	100

Prerequisite	Basics of Data Structures and Algorithms	
Course Outcomes	On completion of the course, the students will be able to	BT Mapping (Highest Level)
	CO1 Demonstrate various algorithm notations and algorithm correctness.	K2
	CO2 Construct various applications based on sorting and tree data structure.	K2
	CO3 Experiment with the performance of various Text Processing operations.	K3
	CO4 Apply graph data structures to the real time applications	K3
	CO5 Illustrate the performance of the polynomial time algorithm.	K2

UNIT-I	Algorithm Notations And Representations	Periods: 9
Mathematical Induction - Asymptotic Notations – Algorithm Analysis - NP-Hard and NP-Completeness – Recurrence Equations – Solving Recurrence Equations – Memory Representation of Multi-dimensional Arrays – Time-Space Tradeoffs.		CO1

UNIT-II	Sorting and Trees	Periods: 9
Heapsort – Quicksort – Topological sort - Sorting in Linear Time – Elementary Data Structures – Hash Tables – Hash Functions- Binary Search Trees – AVL Trees – Red Black trees – Multi-way Search Trees –B-Trees- Fibonacci Heaps – van Emde Boas Trees – Data Structures for Disjoint Sets.		CO2

UNIT-III	Text Processing Operations	Periods: 9
Text Processing: String Operations - Brute-Force Pattern Matching - The Boyer-Moore Algorithm - The Knuth-Morris-Pratt Algorithm - Standard Tries - Compressed Tries - Suffix Tries - The Huffman Coding Algorithm - The Longest Common Subsequence Problem (LCS) - Applying Dynamic Programming to the LCS Problem.		CO3

UNIT-IV	Graph Algorithms	Periods: 9
Elementary graph Algorithms – Minimum Spanning Trees – Single Source Shortest Paths- All Pairs Shortest Paths – Maximum Flow - Multithreaded Algorithms – Matrix Operations.		CO4

UNIT-V	Dynamic Programming	Periods: 9
Linear programming – Polynomials and Fast Fourier Transform – Number Theoretic Algorithms – Computational Geometry –NP-Completeness – Approximation Algorithms.		CO5

Lecture Periods: 45	Tutorial Periods: -	Practical Periods: -	Total Periods: 45

Text Books

1. Thomas H. Coreman, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein, "Introduction to Algorithms", PHI, Third Edition, 2016
2. Mark Allen Weiss, Data Structures and Algorithm Analysis in C++, Pearson Education, Second Edition, 2004.
3. Mark de Berg, Otfried Cheong, Marc van Kreveld, Mark Overmars, Computational Geometry: Algorithms and Applications, Springer, Third edition, 2008.

Reference Books

1. Alfred V. Aho, Jeffrey D. Ullman, John E. Hopcroft, "Data Structures and Algorithms", Addison Wesley, Fifth Edition, 2017.
2. Algorithms, Data Structures, and Problem Solving with C++", Illustrated Edition by Mark Allen Weiss, Addison-Wesley Publishing Company, Sixth Edition, 2016.
3. Narasimha karumanchi, Data Structures and algorithms made easy, Fifth Edition, 2017.
4. E. Horowitz, S.Sahni and Dinesh Mehta, "Fundamentals of Data structures in C++", University Press, Fourth Edition, 2007.
5. M T Goodrich, Roberto Tamassia, Algorithm Design, John Wiley, Second Edition, 2002.

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1. https://www.javatpoint.com/data-structure-tutorial/
2. https://www.studytonight.com/data-structures/
3. https://www.tutorialspoint.com/data_structures_algorithms/
4. https://www.w3schools.in/data-structures-tutorial/intro/
5. https://www.geeksforgeeks.org/data-structures

* TE – Theory Exam, LE – Lab Exam

2.A.3.119

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)						Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
1	2	2	2	1	2	2	3	2	2
2	1	2	2	2	2	2	3	2	2
3	2	3	3	1	3	3	3	3	3
4	2	3	3	1	3	3	3	3	3
5	2	3	3	1	3	3	3	3	3

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	10		15	10	5	60	100

*Application Oriented /Problem solving/Design/Analytical in content beyond the syllabus to be given from Unit-5

2. A. 3. 620

Department	Computer Science and Engineering	Programme: **M.Tech.**					
Semester	I	Course Category : **PC**			*End Semester Exam Type: **TE**		
Course Code	P23CST102	Periods / Week			Credit	Maximum Marks	
		L	T	P	C	CAM	ESE	TM
Course Name	**Cloud and Big Data Analytics**	**3**	**-**	**-**	**3**	**40**	**60**	**100**

Prerequisite	Basics of Cloud computing	
Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Explain the core concepts of the cloud computing paradigm.	**K3**
	CO2 Apply fundamental concepts in cloud infrastructures.	**K4**
	CO3 Illustrate the fundamental concepts of network virtualization and geo-distributed cloud.	**K4**
	CO4 Identify Big Data and its Business Implications.	**K3**
	CO5 List the components of Hadoop and Hadoop Eco-System, Access and Process Data on Distributed File System.	**K4**

UNIT-I	**Introduction**	**Periods: 9**	
Introduction to Cloud Computing- The Evolution of Cloud Computing – Hardware Evolution – Internet Software Evolution – Server Virtualization - Cloud Services - Cloud Service Administration - Cloud Data Management.			**CO1**
UNIT-II	**Cloud Infrastructure**	**Periods: 9**	
Cloud Infrastructure: Introduction - Advancing towards a Utility Model – Evolving IT infrastructure – Evolving Software Applications – Continuum of Utilities- Standards and Working Groups - Standards Bodies and Working Groups – Service Oriented Architecture – Business Process Execution Language – Interoperability Standards for Data Center Management - Utility Computing Technology – Virtualization – Hyper Threading – Blade Servers - Automated Provisioning - Policy Based Automation – Application Management – Evaluating Utility Management Technology - Virtual Test and development Environment - Data Center Challenges and Solutions - Automating the Data Center.			**CO2**
UNIT-III	**Network Virtualization and Geo-Distributed Cloud**	**Periods: 9**	
Cloud computing and server virtualization-networking of virtual machines inside hypervisor – Docker – software defined network – Network virtualization in multi-tenant data centers - VL2 - NVP – Geo distributed cloud data centers			**CO3**
UNIT-IV	**Introduction To Big Data and Hadoop**	**Periods: 9**	
Types of Digital Data - Introduction to Big Data - Big Data Analytics - History of Hadoop - Apache Hadoop - Analysing Data with Unix tools - Analyzing Data with Hadoop - Hadoop Streaming - Hadoop Echo System - IBM Big Data Strategy - Introduction to Ionosphere Big Insights and Big Sheets.			**CO4**
UNIT-V	**HDFS (Hadoop Distributed File System) and Map Reduce**	**Periods: 9**	
The Design of HDFS - HDFS Concepts - Command Line Interface - Hadoop file system interfaces - Data flow - Data Ingest with Flume and Scoop and Hadoop archives - Hadoop I/O: Compression – Serialization Avro and File-Based Data structures. Anatomy of a Map Reduce Job Run – Failures - Job Scheduling - Shuffle and Sort - Task Execution - Map Reduce Types and Formats - Map Reduce Features.			**CO5**

Lecture Periods: 45	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods: 45**

Text Books

1. RajivMisra, Yashwant singh patel, "Cloud and Distributed Computing: Algorithm and systems", Wiley, First edition, 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.
3. Ritting house, John W., and James F. Ransome, Cloud Computing: Implementation, Management and Security, CRC Press, 2017.

Reference Books

1. John W. Rittinghouse and James F. Ransome, "Cloud Computing Implementation, Management and Security", CRC Press, Taylor & Francis Group, Boca Raton London New York, 2010.
2. Alfredo Mendoza, "Utility Computing Technologies, Standards, and Strategies", Artech House INC, 2007.
3. Bunker and Darren Thomson, "Delivering Utility Computing", John Wiley & Sons Ltd, 2006.
4. Tom White, "Hadoop : The Definitive Guide", O'reily Media, Third Edition, 2012.
5. Pete Warden, "Big Data Glossary", O'Reily, 2011

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1. www.coltdatacentres.net/Cloud Technology
2. www.redhat.com/en/topics/cloud-computing/what-is-cloud-infrastructure
3. www.digitalocean.com/community/tutorials/an-introduction-to-big-data-concepts-and-terminology
4. https://www.zdnet.com/article/what-is-cloud-computing-everything-you-need-to-know-about-the-cloud/
5. https://www.tutorialspoint.com/hadoop/hadoop_big_data_overview.htm

* TE – Theory Exam, LE – Lab Exam

L. A. 3. 121

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)						Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
1	2	1	2	2	1	-	1	3	-
2	1	1	2	2	1	2	1	-	3
3	2	1	1	2	1	2	1	3	-
4	3	1	2	1	-	1	-	3	1
5	3	1	1	2	-	-	-	-	1

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	10		15	10	5	60	100

*Application Oriented /Problem solving/Design/Analytical in content beyond the syllabus to be given from Unit-5

2.A.3.122

Department	Computer Science and Engineering	Programme : **M.Tech.**					
Semester	I	Course Category :**PC**			*End SemesterExamType:**TE**		
Course Code	**P23CSTD02**	Periods/Week			Credit	MaximumMarks	
		L	T	P	C	CAM	ESE	TM
Course Name	**Speech and Language Processing**	**3**	**0**	**0**	**3**	**40**	**60**	**100**

Prerequisite	No prerequisite needed	
Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Understand the basics of NLP	**K3**
	CO2 Apply the basic ML and DL techniques for NLP	**K3**
	CO3 Understand and realize the advanced NLP Techniques.	**K2**
	CO4 Make use of Language understanding, Generation and Information Retrieval	**K3**
	CO5 Apply ethics to be followed while building NLP Applications and how to use NLP Libraries	**K3**

UNIT – I	**Introduction**	**Periods:9**
Phases of NLP, Text Preprocessing: Tokenization, Stemming and Lemmatization, Pos Tagging, Named Entity Recognition. NLP Feature Engineering, Word Count Vector, Word Sense Disambiguation		**CO1**
UNIT – II	**Language Modelling**	**Periods:9**
N -gram Models, Hidden Markov Models, Maximum Likelihood Estimation. Supervised, Unsupervised and Semi Supervised Learning. Text Classification and Sentiment Analysis, Topic Modelling and Clustering, Word Embeddings, RNN & LSTMs for NLP, CNN for NLP.		**CO2**
UNIT – III	**Advanced NLP Techniques**	**Periods:9**
Sequence- to -Sequence Models, Attention Mechanisms, Transformer Architecture: BERT, GPT		**CO3**
UNIT – IV	**Language Understanding and Generation, Information Retrieval**	**Periods:9**
Text Generation, Question Answering, Dialogue Systems and Chatbots. Machine Translation, Cross Lingual Transfer Learning. Text Indexing and Search, Text Summarization.		**CO4**
UNIT – V	**NLP Tools, Libraries, Applications, Ethics**	**Periods:9**
Bias and Fairness in NLP, Privacy Concerns in NLP Applications. NP libraries: NLTK, Spacy, Tensor Flow, Pytorch. NLP Applications: Sentiment Analysis, Named Entity Recognition in Real World Data Sets, Text Classification for Various Domains.		**CO5**

LecturePeriods:45	**TutorialPeriods:0**	**PracticalPeriods:-0**	**TotalPeriods:45**

Text Books

1. Christopher D. Manning and Hinrich Schutze, " Foundations of Natural Language Processing" ,13th Edition, The MIT Press Cambridge, Massachusetts London, England, 2018
2. Daniel Jurafsky and James H. Martin "Speech and Language Processing", 16th edition, Prentice Hall, 2021.
3. Rajesh Arumugam, Rajalingappa Shanmugamani "Hands-on natural language processing with python: A practical guide to applying deep learning architectures to your NLP application".PACKT publisher, 2018

Reference Books

1. NitinIndurkhya, Fred J. Damerau "Handbook of Natural Language Processing", Second Edition, CRC Press, 2010.
2. James Allen "Natural Language Understanding", Pearson Publication 8th Edition. 2012.
3. Chris Manning and HinrichSchütze, "Foundations of Statistical Natural Language Processing", 2nd edition, MITPress Cambridge, MA, 2003.
4. Hobson lane, Cole Howard, Hannes Hapke, "Natural language processing in action" MANNING Publications, 2019.
5. Alexander Clark, Chris Fox, Shalom Lappin, "The Handbook of Computational Linguistics and Natural Language Processing", Wiley-Blackwell, 2012

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1. https://www.udemy.com/course/chatbot/
2. https://gtuematerial.in/natural-language-processing-3170723/
3. https://chatbotsmagazine.com/understanding-the-need-for-nlp-in-your-chatbot-78ef2651de84?gi=ecca664b642a
4. https://www.ultimate.ai/blog/ai-automation/how-nlp-text-based-chatbots-work
5. https://www.javatpoint.com/nlp

* TE – Theory Exam, LE – Lab Exam

2. A. 3. 123

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)						Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
1	2	2	2	3	3	2	2	2	2
2	2	3	3	3	2	1	2	2	1
3	2	3	3	2	1	-	2	2	1
4	2	2	3	2	3	2	2	3	1
5	3	2	2	3	3	1	2	2	2

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	10		15	10	5	60	100

*Application Oriented /Problem solving/Design/Analytical in content beyond the syllabus to be given from Unit-5

2.A-3-124

Department	Computer Science and Engineering			Programme: **M.Tech.**			
Semester	I			Course Category : **HS**		*End Semester Exam Type: **TE**	
Course Code	**P23HSTC01**	Periods / Week			Credit	Maximum Marks	
		L	T	P	C	CAM	ESE	TM
Course Name	**Research Methodology and IPR**	**2**	**-**	**-**	**2**	**40**	**60**	**100**
(Common to all M.Tech Courses)								
Prerequisite	No prerequisite needed							

Course Outcomes	On completion of the course, the students will be able to	BT Mapping (Highest Level)
CO1	Gain Knowledge to formulate the research problem.	K2
CO2	Understand the concepts to carry out the literature review, ethics and research analysis.	K2
CO3	Explain the way of writing technical paper and presentation methods.	K2
CO4	Ability to understand that today's world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity.	K2
CO5	Ability to understand about IPR and filing patents in R & D.	K3

UNIT-I	**Research Problem Formulation**	**Periods: 6**	
Meaning of research problem- Sources of research problem - criteria characteristics of a good research problem - errors in selecting a research problem - scope and objectives of research problem. Approaches of investigation of solutions for research problem - data collection – analysis – interpretation - necessary instrumentations.			**CO1**
UNIT-II	**Literature Review**	**Periods: 6**	
Effective literature studies approaches – analysis – plagiarism and research ethics			**CO2**
UNIT-III	**Technical Writing /Presentation**	**Periods: 6**	
Effective technical writing - how to write report – paper - developing a research proposal - format of research proposal - Presentation and assessment by a review committee.			**CO3**
UNIT-IV	**Introduction To Intellectual Property Rights (IPR)**	**Periods: 6**	
Nature of Intellectual Property: Patents – Designs - Trade and Copyright. Process of Patenting and Development: Technological research – innovation – patenting - development. International Scenario: International cooperation on Intellectual Property - Procedure for grants of patents - Patenting under PCT.			**CO4**
UNIT-V	**Intellectual Property Rights (IPR)**	**Periods: 6**	
Patent Rights: Scope of Patent Rights - Licensing and transfer of technology - Patent information and databases - Geographical Indications - New Developments in IPR - Administration of Patent System - IPR of Biological Systems - Computer Software etc. Traditional knowledge Case Studies - IPR and IITs.			**CO5**

Lecture Periods: 30	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods: 30**

Text Books

1. Stuart Melville and Wayne Goddard, "Research methodology: An introduction for science & Engineering students', Kenwyn Publisher, 1996.
2. Wayne Goddard and Stuart Melville, "Research Methodology: An Introduction", Lansdowne Publisher, Second Edition, 2001.
3. C.R. Kothari, Gaurav Garg, "Research Methodology: Methods and Techniques", New Age International, Fourth Edition, 2018.

Reference Books

1. Halbert, "Resisting Intellectual Property", Taylor & Francis Limited, 2007.
2. Ranjit Kumar, "Research Methodology: A Step by Step Guide for beginners", Second Edition, 2010.
3. Trochim, "Research Methods: The concise knowledge base", Atomic Dog Publishing, 2005.
4. Fink A, "Conducting Research Literature Reviews: From the Internet to Paper", Sage Publications, 2009.

Web References

1. https://www.scribd.com/document/427419672/Research-Methodology-and-Ipr
2. https://www.isical.ac.in/~palash/research-methodology/RM-lec9.pdf
3. https://www.wipo.int/edocs/pubdocs/en/intproperty/958/wipo_pub_958_3.pdf
4. https://lecturenotes.in/m/21513-research-methodology
5. https://iare.ac.in/sites/default/files/MTECH-CAD.CAM-R18-RM-IP-NOTES.pd

* TE – Theory Exam, LE – Lab Exam

2.A.3.125

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)						Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
1	3	2	1	1	2	1	3	3	2
2	3	2	1	1	2	1	3	2	2
3	3	2	1	1	2	1	3	2	2
4	3	2	1	1	3	1	3	2	3
5	3	2	1	1	2	1	3	2	2

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	10		15	10	5	60	100

*Application Oriented /Problem solving/Design/Analytical in content beyond the syllabus to be given from Unit-5

2. A. 3. 126

Department	**Computer Science and Engineering**	Programme: **M.Tech.**						
Semester	**I**	Course Category : **PC**			*End Semester Exam Type: **LE**			
Course Code	**P23CSP101**	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Advanced Data Structures and Algorithms Laboratory**	**-**	**-**	**4**	**2**	**50**	**50**	**100**

Prerequisite	Knowledge about Data Structures and Algorithms	
Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Evaluate the algorithm's / program's efficiency in terms of time and space complexity.	**K4**
	CO2 Solve the given problem by identifying the appropriate Data Structure.	**K3**
	CO3 Construct various applications based on sorting and tree data structure.	**K2**
	CO4 Apply graph data structures to solve real time applications such as network flow and linear programming.	**K3**
	CO5 Illustrate the performance of the polynomial time algorithm.	**K2**

List of Experiments:

1. Implementation of the following Heap Structures.
   a. Min Heap (Insertion, Delete Min, Delete Max)
   b. Skew Heap(Priority Queue operations)
   c. Fibonacci Heap (Priority Queue operations).
2. Implementation of the following Search Structures
   a. AVL Trees (Insertion, Deletion and Search)
   b. Splay Trees (Insertion, Deletion and Search)
   c. B-Trees (Insertion, Deletion and Search) d. Red- Black Trees.
3. Implementation of Convex Hull.
4. Implementation of Topological sort.
5. Implementation of Graph search algorithms.
6. Implementation of Randomized algorithms.
7. Implementation and application of network flow and linear programming problems.
8. Implementation of algorithms using the hill climbing and dynamic programming design techniques.
9. Implementation of recursive backtracking algorithms.
10. Implementation of Branch and Bound Algorithms.

Lecture Periods: -	**Tutorial Periods: -**	**Practical Periods: 4 5**	**Total Periods: 45**

Reference Books

1. E. Horowitz, S.Sahni and Dinesh Mehta, "Fundamentals of Data structures in C++", University Press, Fifth Edition, 2007.
2. T.H.Cormen, C.E.Leiserson, R.L.Rivest, and C.Stein, Introduction to Algorithms, PHI/Pearson Education, Third Edition, 2009.
3. Michael T. Goodrich and Roberto Tamassia, Algorithm Design: Foundations, Analysis and Internet Examples, Wiley India, Second Edition, 2006.
4. Thomas H. Coreman, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein, "Introduction to Algorithms", PHI, Third Edition, 2016.
5. Michael T. Goodrich, Roberto Tamassia, David M. Mount," Data Structures and Algorithms in C++",Wiley, Second Edition, 2011.

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1. https://www.javatpoint.com/data-structure-tutorial/
2. https://www.studytonight.com/data-structures/
3. https://www.tutorialspoint.com/data_structures_algorithms/
4. https://www.w3schools.in/data-structures-tutorial/intro/
5. https://www.geeksforgeeks.org/data-structures/

* TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)						Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
1	2	2	2	3	2	2	3	2	2
2	1	2	2	2	2	2	3	2	2
3	1	3	3	3	3	3	3	3	3
4	2	3	3	3	3	3	3	3	3
5	1	3	3	3	3	3	3	3	3

Correlation Level: 1 - Low, 2 - Medium, 3 – High

2.A.3.127

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	Performance in practical classes			Model Practical Examination	Attendance		
	Conduction of practical	Record work	viva				
Marks	15	5	5	15	10	50	100

2.A.3.128

Department	Computer Science and Engineering			Programme: **M.Tech.**				
Semester	I			Course Category : **HS**		*End Semester Exam Type: **LE**		
Course Code	P23HSPC01	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Technical Report Writing and Seminar**	-	-	4	2	100	-	100
(Common to all M.Tech Programme)								
Prerequisite								

Course Outcomes	On completion of the course, the students will be able to	BT Mapping (Highest Level)
CO1	Select a subject, narrowing the subject into a topic.	K2
CO2	State an objective and collecting the relevant bibliography (at least 15 journal papers).	K2
CO3	Study the papers and understanding the author's contributions and critically analyzing each paper.	K3
CO4	Prepare a working outline and linking the papers and preparing a draft of the paper.	K2
CO5	Prepare a working outline and linking the papers and preparing a draft of the paper.	K2

List of Experiments:

Activity	Instructions	Submission week	Evaluation
Selection of area of interest and Topic	Select an area of interest, topic and state an objective	2nd week	3 % Based on clarity of thought, current relevance and clarity in writing
Stating an Objective			
Collecting Information about area & topic	1. List 1 Special Interest Groups or professional society 2. List 2 journals 3. List 2 conferences, symposia or workshops 4. List 1 thesis title 5. List 3 web presences (mailing lists, forums, news sites) 6. List 3 authors who publish regularly in your area 7. Attach a call for papers (CFP) from your area.	3rd week	3% (the selected information must be area specific and of international and national standard)
Collection of Journal papers in the topic in the context of the objective – collect 20 & then filte	• provide a complete list of references you will be using- Based on your objective -Search various digital libraries and Google Scholar • When picking papers to read - try to: - Pick papers that are related to each other in some ways and/or that are in the same field so that you can write a meaningful survey out of them. - Favour papers from well-known journals and conferences, in the field (as indicated in other Favour more recent papers, - Pick a recent survey of the field so you can quickly gain an overview, Find relationships with respect to each other and to your topic area(classification scheme/categorization) - Mark in the hard copy of papers whether complete work or section/sections of the paper are being considered	4th week	6% (the list of standard papers and reason for selection)
Reading and notes for first 5 papers	Reading Paper Process For each paper form a Table answering the following questions: • What is the main topic of the article? • What was/were the main issue(s) the author said they want to discuss? • Why did the author claim it was important? • What simplifying assumptions does the author claim to be making? • What did the author do? • How did the author claim they were going to evaluate their work and compare it to others? • What did the author say were the limitations of their research? • What did the author say were the important directions for future research? • Conclude with limitations/issues not addressed by the paper (from the perspective of survey)	6th week	8% (The table given should indicate your understanding of the paper and the evaluation is based on your conclusions about each paper)

Reading and notes for next 5 papers	Repeat Reading Paper Process	7 th week	8% (the table given should indicate your understanding of the paper and the evaluation is based on your conclusions about each paper
Draft outline 1 and Linking papers	Prepare a draft Outline, your survey goals, along with a classification / categorization diagram	8 th week	8% (this component will be evaluated based on the linking and classification among the papers)
Abstract	Prepare a draft abstract and give a presentation	9 th week	6%(Clarity, purpose and conclusion) 6% Presentation & Viva Voce
Introduction Background	Write an introduction and background sections	10th week	5% (clarity)
Sections of the paper	Write the sections of your paper based on the classification / categorization diagram in keeping with the goals of your survey	11th week	10% (this component will be evaluated based on the linking and classification among the papers)
Conclusions	Write your conclusions and future work	12th week	5% (conclusions)
Final Draft	Complete the final draft of your paper	13th week	10% (formatting, English, Clarity and linking) 4% Plagiarism Check Repor
Seminar	A brief 15 slides on your paper	14th & 15th week	10% (based on presentation and Vivavoce)
Lecture Periods: -	**Tutorial Periods: -**	**Practical Periods: 4 5**	**Total Periods: 45**

* TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)						Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
1	2	3	3	1	3	3	2	1	2
2	2	3	2	1	3	2	2	1	2
3	2	3	2	1	3	2	2	1	2
4	2	3	2	1	3	2	2	1	2
5	2	3	2	1	3	2	2	1	2

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)				Attendance	End Semester Examination (ESE) Marks	Total Marks
	Weekly Progress	Seminar	Record work	Viva			
Marks	40	30	10	10	10	-	100

2.A.3.130

Department	Computer Science and Engineering	Programme: **M.Tech.**						
Semester	I	Course Category : **AEC**				*End Semester Exam Type: -		
Course Code	P23CSC1XX	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Ability Enhancement Courses**	-	-	4	-	100	-	100

Students shall choose an International certification course offered by the reputed organizations like Google, Microsoft, IBM, Texas Instruments, Bentley, Autodesk, Eplan and CISCO, etc. The duration of the course is 40-50 hours specified in the curriculum, which will be offered through Centre of Excellence.

Pass /Fail will be determined on the basis of participation, attendance, performance and completion of the course. If a candidate fails, he/she has to repeat the course in the subsequent years. Pass in this course is mandatory for the award of degree.

2.A.3.131

Department	Computer Science and Engineering	Programme: **M.Tech.**					
Semester	II	Course Category : **PC**			*End Semester Exam Type: **TE**		
Course Code	**P23CST203**	Periods / Week			Credit	Maximum Marks	
		L	T	P	C	CAM	ESE	TM
Course Name	**Advanced Software Engineering and Testing**	**3**	**-**	**-**	**3**	**40**	**60**	**100**

Prerequisite	Basics of Software Engineering	
Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Illustrate Software Engineering Lifecycle Models	**K3**
	CO2 Perform Project management and cost estimation	**K3**
	CO3 Make use of the System Analysis and Design concepts	**K4**
	CO4 Illustrate different testing techniques.	**K3**
	CO5 Make use of different levels of testing in their software.	**K4**

UNIT-I	**Introduction**	**Periods: 9**
Software engineering concepts – Development activities – Software lifecycle models - Classical Waterfall - Iterative waterfall – Prototyping – Evolutionary - Spiral – Software project management – Project planning – Estimation – Scheduling – Risk management – Software configuration management.		**CO1**
UNIT-II	**Software Requirement Specification**	**Periods: 9**
Requirement analysis and specification – Requirements gathering and analysis – Software Requirement Specification – Formal system specification – Finite State Machines – Petrinets – Object modelling using UML – Use case Model – Class diagrams – Interaction diagrams – Activity diagrams – State chart diagrams – Functional modelling – Data Flow Diagram		**CO2**
UNIT-III	**Architecture and Design**	**Periods: 9**
Software design – Design process – Design concepts – Coupling – Cohesion – Functional independence – Design patterns – Model-view-controller – Publish-subscribe – Adapter – Command– Strategy – Observer – Proxy – Facade – Architectural styles – Layered - Client-server - Tiered -Pipe and filter.- User interface design		**CO3**
UNIT-IV	**Testing Techniques and Testing Tools**	**Periods: 9**
Testing Techniques – Verification vs Validation – Software Testing Methodologies – White Box, Black Box and Grey Box – Static and Dynamic Techniques – Informal Reviews, Walkthroughs, Technical Reviews, Inspection – Structural Techniques, Black Box Techniques, Experienced Based Techniques. Testing Tools: Selenium – Jmeter		**CO4**
UNIT-V	**Levels of Testing**	**Periods: 9**
Levels of Testing – Test Case Design – Building Test Cases – Test data mining – Test execution – Test reporting – Functional Testing – Unit, Integration, System, Acceptance, Regression, Retest – Non Functional Testing – Performance, Memory, Scalability, Compatibility, Security, Cookie, Session, Recovery, Adhoc, Risk Based Testing.		**CO5**

Lecture Periods: 45	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods: 45**

Text Books

1. Glenford J Myers, Corey Sandler, Tom Badgett," The Art of Software Testing", Wiley, 3rd Edition 2015.
2. Rajib Mall, "Fundamentals of Software Engineering", PHI Learning, 3rd Edition, 2013.
3. Ian Sommerville, "Software Engineering", Pearson Education, 8th Edition, 2008.

Reference Books

1. Bernd Bruegge, Alan H Dutoit, Object-Oriented Software Engineering, 2nd edition, Pearson Education, 2004.
2. Carlo Ghezzi, Mehdi Jazayeri, Dino Mandrioli, Fundamentals of Software Engineering, 2nd edition, PHI Learning Pvt. Ltd., 2010.
3. Craig Larman, Applying UML and Patterns, 3rd ed, Pearson Education, 2005.
4. Len Bass, Ingo Weber and Liming Zhu, —DevOps: A Software Architect's Perspectivell, Pearson Education, 2016
5. Stephen Schach, Software Engineering 7th ed, McGraw-Hill, 2007

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https://nptel.ac.in/courses/106/105/106105150/
https://onlinecourses.nptel.ac.in/noc19_cs71/preview
https://www.coursera.org/lecture/introduction-software-testing/stages-of-software-testing-process-UMOpe
https://cosmolearning.org/courses/introduction-to-software-engineering/video-lectures/
https://freevideolectures.com/course/2318/software-engineering

* TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)						Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
1	3	3	3	2	-	-	3	1	1
2	3	3	3	2	-	-	3	1	1
3	3	3	3	2	2	-	3	1	1
4	3	3	3	2	2	-	3	1	1
5	3	3	3	2	2	-	3	1	1

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	10		15	10	5	60	100

*Application Oriented /Problem solving/Design/Analytical in content beyond the syllabus to be given from Unit-5

2.A.3.134

Department	Computer Science and Engineering	Programme: **M.Tech.**						
Semester	II	Course Category : **PC**			*End Semester Exam Type: **TE**			
Course Code	**P23CST204**	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Adhoc and Wireless Sensor Networks**	**3**	**-**	**-**	**3**	**40**	**60**	**100**

Prerequisite	Basics of Wireless Network	
Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Identify different issues in wireless ad hoc and sensor networks.	**K1**
	CO2 Analyze protocols developed for ad hoc and sensor networks.	**K4**
	CO3 Identify and understand security issues in ad hoc and sensor networks.	**K1**
	CO4 Build the routing mechanism and improving QoS.	**K3**
	CO5 Apply Channel allocation strategy to improve the connectivity in Ad-Hoc Networks.	**K3**

UNIT-I	**Introduction**	**Periods: 9**
Fundamentals of Wireless Communication Technology – The Electromagnetic Spectrum – Radio propagation Mechanisms – Characteristics of the Wireless Channel - mobile ad hoc networks (MANETs) and wireless sensor networks (WSNs): concepts and architectures. Applications of Ad Hoc and Sensor networks. Design Challenges in Ad hoc and Sensor Networks.		**CO1**
UNIT-II	**MAC Protocols for Ad Hoc Wireless Networks**	**Periods: 9**
Issues in designing a MAC Protocol - Classification of MAC Protocols - Contention based protocols - Contention based protocols with Reservation Mechanism - Contention based protocols with Scheduling Mechanisms – Multi channel MAC - IEEE 802.11.		**CO2**
UNIT-III	**Routing Protocols Transport Layer in Ad hoc Networks**	**Periods: 9**
Issues in designing a routing and Transport Layer protocol for Ad hoc networks - proactive routing, reactive routing (on-demand) - hybrid routing - Classification of Transport Layer solutions -TCP over Ad hoc wireless Networks.		**CO3**
UNIT-IV	**Wireless Sensor Networks (WSNS) and MAC Protocols**	**Periods: 9**
Single node architecture: hardware and software components of a sensor node – WSN Network architecture: typical network architectures-data relaying and aggregation strategies - MAC layer protocols: self-organizing, Hybrid TDMA/FDMA and CSMA based MAC - IEEE 802.15.4.		**CO4**
UNIT-V	**WSN Routing, Localization and QOS**	**Periods: 9**
Issues in WSN routing – OLSR - Localization – Indoor and Sensor Network Localization - absolute and relative localization, triangulation - QOS in WSN - Energy Efficient Design – Synchronization - Transport Layer issues		**CO5**

Lecture Periods: 45	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods: 45**

Text Books

1. C. Siva Ram Murthy, and B. S. Manoj, "Ad Hoc Wireless Networks: Architectures and Protocols ", Prentice Hall Professional Technical Reference, Third Edition, 2008.
2. Thomas Krag and Sebastin Buettrich, "Wireless Mesh Networking", O'Reilly Publishers, First Edition, 2007.
3. Al-Sakib Khan Pathan, Shafiullah Khan, Nabil Ali Alrajeh, "Wireless Sensor Networks Current Status and Future Trends", CRC Press, 2016.

Reference Books

1. Carlos De Morais Cordeiro, Dharma Prakash Agrawal "Ad Hoc & Sensor Networks: Theory and Applications", World Scientific Publishing Company, Second Edition, 2006.
2. Feng Zhao and Leonides Guibas, "Wireless Sensor Networks", Elsevier Publication – 2002.
3. Holger Karl and Andreas Willig "Protocols and Architectures for Wireless Sensor Networks", Wiley, Third Edition, 2005. 4. Kazem Sohraby, Daniel Minoli, & Taieb Znati, "Wireless Sensor Networks-Technology, Protocols, and Applications", John Wiley, Fourth Edition, 2007.
5. Anna Hac, "Wireless Sensor Network Designs", John Wiley, Second Edition,2003.

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1. https://nptel.ac.in/courses/106105160/
2. https://en.wikipedia.org/wiki/Wireless_ad_hoc_network
3. https://shodhganga.inflibnet.ac.in/bitstream/10603/77730/12/12_chapter_02.pdf

* TE – Theory Exam, LE – Lab Exam

2. A. 3. 135

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)						Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
1	2	2	-	-	-	-	-	-	-
2	3	2	3	3	-	1	-	2	-
3	3	1	3	3	-	1	2	2	-
4	1	1	2	3	3	1	-	2	-
5	2	1	2	3	2	3	2	-	-

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	10		15	10	5	60	100

*Application Oriented /Problem solving/Design/Analytical in content beyond the syllabus to be given from Unit-5

2.A.3.136

Department	Computer Science and Engineering	Programme: **M.Tech.**						
Semester	II	Course Category : **PC**			*End Semester Exam Type: **TE**			
Course Code	P23CST205	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Advanced Operating Systems**	3	-	-	3	40	60	100

Prerequisite	Basics of Operating Systems	
Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Explain the functionality of an operating system by reading its internal source.	**K2**
	CO2 Revise any algorithm present in an internal system namely system calls.	**K1**
	CO3 Describe the implementation of inter process communication.	**K2**
	CO4 Modify and use the data structures of the windows operating system.	**K3**
	CO5 Identify the different features of real time and mobile operating systems.	**K3**

UNIT-I	**Introduction to Kernel**	**Periods: 9**
Introduction to Kernel - Architecture of the UNIX operating system - System concepts - Data structures. Buffer Cache: Buffer header - Structure of Buffer pool - Reading and writing disk blocks. Files INODES - Structure of a regular file - Directories- Super block- Inode assignment.		**CO1**
UNIT-II	**System Calls**	**Periods: 9**
System calls: OPEN-Read – Close – Write – Create – CHMOD – CHOWN – Pipes - Mounting and Unmounting. Process: Layout the system memory – Context - Process control - process creation – signals - Process scheduling – time - clock.		**CO2**
UNIT-III	**Inter- Process Communications**	**Periods: 9**
Inter-Process Communications: Process tracing- System V IPC-Shared Memory - Semaphores. Network Communications: Socket programming – Sockets – descriptors – Connections - Socket elements - Stream and Datagram Sockets.		**CO3**
UNIT-IV	**Windows Operating System**	**Periods: 9**
Windows Operating system: versions - Concepts and tools - Windows internals - System Architecture - Requirements and design goals - Operating system mode l- Architecture overview - Key system components. System mechanisms: Trap dispatching - object manager – Synchronization - System worker threads -Windows global flags - Local procedural calls - Kernel event tracing.		**CO4**
UNIT-V	**Real Time and Mobile Operating Systems**	**Periods: 9**
Basic Model of Real Time Systems – Characteristics - Applications of Real Time Systems – Real Time Task Scheduling - Handling Resource Sharing - Mobile Operating Systems - Micro Kernel Design - Client Server Resource Access - Processes and Threads -Memory Management - File system – TinyOS – Architecture - Applications		**CO5**

Lecture Periods: 45	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods: 45**

Text Books

1. Maurice J. Bach, "The Design of the Unix Operating System", Prentice Hall of India, First Edition 1991.
2. Brian Catlin, Jamie Hanrahan, Mark E. Russinovich, David A. Solomon and Alex Ionescu "Windows Internals, Book 1 – User Mode 7ed (Developer Reference)", Microsoft Press, Seventh Edition, 2014.
3. William Stallings, "Operating Systems: Internals and Design Principles", Pearson Education, Fifth Edition, 2019.

Reference Books

1. Daniel P. Bovet and Marco Cesati, "Understanding the Linux Kernel", O'Reilly Publications, Third Edition, 2005.
2. Harold Abelson, Gerald Jay Sussman and Julie Sussman, "Structure and Interpretation of Computer Programs", Universities Press, Second Edition, 2013.
3. Michael Beck, Harald Bohme, MirkoDziadzka, Ulrich Kunitz, Robert Magnus, Dirk Verworner, "Linux Kernel Internals", Addison-Wesley, Third Edition, 2017.
4. Robert Love, "Linux Kernel Development", Addison-Wesley, Third Edition, 2010.
5. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, Operating System concepts, John Wiley & Sons, Tenth Edition (kindle edition), 2018.

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1. http://www.softpanorama.org/Internals/index.shtml
2. https://www.udemy.com/course/understanding-the-internals-of-the-unix-kernel-architecture/
3. https://www.britannica.com/technology/Windows-OS
4. https://www.tutorialspoint.com/operating_system/index.htm
5. https://www.geeksforgeeks.org/operating-systems/

* TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)						Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
1	2	2	-	-	-	-	2	3	2
2	2	2	3	3	2	-	3	3	2
3	2	2	3	3	2	-	2	1	1
4	2	2	3	3	2	-	1	1	2
5	2	2	3	3	2	3	2	1	2

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	10		15	10	5	60	100

*Application Oriented /Problem solving/Design/Analytical in content beyond the syllabus to be given from Unit-5

2. A. 3. 138

Department	Computer Science and Engineering	Programme: **M.Tech.**						
Semester	II	Course Category : **PC**			*End Semester Exam Type: **TE**			
Course Code	P23CST206	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Advanced Python Programming**	3	-	-	3	40	60	100

Prerequisite	Basics of Python Programming	
Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Interpret Object Oriented Concepts using Python.	**K2**
	CO2 Implement Graphical User Interface using Tkinter Package.	**K3**
	CO3 Paraphrase Python and MySQL connectivity and manipulations.	**K2**
	CO4 Demonstrate Network Programming with Python.	**K3**
	CO5 Implement Web Application Development using Django.	**K4**

UNIT-I	**OOPS in Python**	**Periods: 9**	
Classes and Objects - Constructor - Encapsulation - Inheritance. Polymorphism: Method Overloading - Method Overriding - Operator Overloading. Static Methods and Class Methods - Abstraction - Composition - Aggregation - Association			**CO1**
UNIT-II	**GUI in Python (TKINTER)**	**Periods: 9**	
Introduction to Tkinter: Canvas - Widgets - Layout Management - Dialogs and Message Boxes - Frames and Containers - Menus. Event Handling: Event-driven Programming. Customizing Widgets - Building Multi-window Applications			**CO2**
UNIT-III	**Python Database Connectivity**	**Periods: 9**	
Installing MySQL Connector - Connecting to MySQL Database - Prepared Statements - Parameterized Queries - Fetching Data - Transactions - CRUD Processes			**CO3**
UNIT-IV	**Network Programming**	**Periods: 9**	
Socket Programming - Networking with Sockets - TCP/IP Communication - UDP Communication - HTTP Requests - WebSocket Programming - Networking Protocols - DNS Resolution - Network Monitoring.			**CO4**
UNIT-V	**Web Application Development (DJANGO)**	**Periods: 9**	
Django Basics - Forms and Form Handling - Django Admin - User Authentication and Authorization - Static Files and Media Handling - Middleware - Working with APIs - Session Management.			**CO5**

Lecture Periods: 45	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods: 45**

Text Books

1. Eric Matthes, "Python Crash Course: A Hands-On, Project-Based Introduction to Programming", No Starch Press, 2nd Edition, 2019.
2. Alan D. Moore, "Python GUI Programming with Tkinter: Develop responsive and powerful GUI applications with Tkinter", Packt Publishing, 1st Edition, 2018.
3. Brandon Rhodes and John Goerzen, "Foundations of Python Network Programming", Apress, 3rd Edition, 2014.
4. William S. Vincent, "Django for Beginners: Build websites with Python and Django", Leanpub, 3rd Edition, 2021.

Reference Books

1. John Zelle, Franklin, "Python Programming: An Introduction to Computer Science", Beedle & Associates Inc., 3rd Edition, 2016.
2. Albert Lukaszewski, "MySQL for Python", Packt Publishing, 1st Edition, 2010.
3. Abhishek Ratan, "Python Network Programming: Conquer all your networking challenges with the powerful Python language", Packt Publishing, 2nd Edition, 2017.
4. Burkhard Meier,"Python GUI Programming Cookbook: Develop functional and responsive user interfaces with tkinter and PyQt5", Packt Publishing, 1st Edition, 2019.
5. Mark Lutz, "Learning Python: Powerful Object-Oriented Programming", O'Reilly Media, 5th Edition, 2013.

Web References

https://docs.python.org/3/tutorial/classes.html
https://www.tutorialspoint.com/python3/python_gui_programming.htm
https://dev.mysql.com/doc/connector-python/en/
https://www.tutorialspoint.com/python3/python_networking.htm
https://docs.djangoproject.com/

* TE – Theory Exam, LE – Lab Exam

2.A.3.139

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)						Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
1	3	3	3	3	2	3	3	3	2
2	3	2	2	2	1	2	2	2	1
3	3	1	1	1	2	1	1	1	2
4	3	1	1	2	2	1	2	1	2
5	3	2	2	2	3	2	2	2	3

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	10		15	10	5	60	100

*Application Oriented /Problem solving/Design/Analytical in content beyond the syllabus to be given from Unit-5

2. A-3. 140

Department	Computer Science and Engineering	Programme: **M.Tech.**						
Semester	II	Course Category : **PC**			*End Semester Exam Type: **LE**			
Course Code	**P23CSP202**	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Advanced Python Programming Laboratory**	-	-	4	2	50	50	100

Prerequisite	Basics of Python Programming	
Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Interpret Object Oriented Concepts using Python.	**K2**
	CO2 Implement Graphical User Interface using Tkinter Package.	**K3**
	CO3 Paraphrase Python and MySQL connectivity and manipulations.	**K2**
	CO4 Demonstrate Network Programming with Python.	**K3**
	CO5 Implement Web Application Development using Django.	**K4**

List of Experiments:

1. Create classes for BankAccount, SavingsAccount, and CheckingAccount and implement methods for deposit, withdrawal, balance inquiry, and interest calculation.
2. Create classes for Employee, Payroll, and Salary and implement methods for calculating employee salaries, generating pay slips and managing payroll records using Inheritance.
3. Create a graphical calculator with buttons for numeric input, arithmetic operations, and a display to show the result.
4. Develop a GUI-based to-do list application where users can add, delete, and manage their tasks.
5. Develop a Python program to fetch the records from a table in MySQL and display in python console.
6. Develop a CRUD program using Python-MySql connectivity.
7. Create a client-server based chat application where multiple clients can connect to a server and exchange messages.
8. Build a network port scanner program that scans a given IP address or range of IP addresses to detect open ports on remote machines.
9. Create a fully functional blogging platform where users can register, create blog posts, add comments, and browse through published posts.
10. Develop an e-commerce store application with features like product listings, user authentication, shopping cart management, and secure payment integration.

Lecture Periods: -	**Tutorial Periods: -**	**Practical Periods: 4 5**	**Total Periods: 45**

Reference Books

1. Eric Matthes, "Python Crash Course: A Hands-On, Project-Based Introduction to Programming", No Starch Press, 2nd Edition, 2019.
2. Alan D. Moore, "Python GUI Programming with Tkinter: Develop responsive and powerful GUI applications with Tkinter", Packt Publishing, 1st Edition, 2018.
3. Brandon Rhodes and John Goerzen, "Foundations of Python Network Programming", Apress, 3rd Edition, 2014..
4. Burkhard Meier,"Python GUI Programming Cookbook: Develop functional and responsive user interfaces with tkinter and PyQt5", Packt Publishing, 1st Edition, 2019.
5. Mark Lutz, "Learning Python: Powerful Object-Oriented Programming", O'Reilly Media, 5th Edition, 2013.

Web References

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https://www.tutorialspoint.com/python3/python_gui_programming.htm
https://dev.mysql.com/doc/connector-python/en/
https://www.tutorialspoint.com/python3/python_networking.htm
https://docs.djangoproject.com/

* TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)						Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
1	3	3	3	3	2	3	3	3	2
2	3	2	2	2	1	2	2	2	1
3	3	1	1	1	2	1	1	1	2
4	3	1	1	2	2	1	2	1	2
5	3	2	2	2	3	2	2	2	3

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	Performance in practical classes			Model Practical Examination	Attendance		
	Conduction of practical	Record work	viva				
Marks	15	5	5	15	10	50	100

2.A.3.142

Department	Computer Science and Engineering			Programme: **M.Tech.**				
Semester	II			Course Category : **HS**		*End Semester Exam Type: **LE**		
Course Code	**P23HSPC02**	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Seminar on ICT: A Hands-On Approach**	-	-	4	2	100	-	100
(Common to all M.Tech Programmes)								
Prerequisite	No Prerequisite needed							

Course Outcomes	On completion of the course, the students will be able to	BT Mapping (Highest Level)
CO1	Select a topic, narrowing the topic into presentation.	K2
CO2	State an objective and use the relevant ICT tools to make the presentation effective.	K3
CO3	Study the topic and understanding the contributions and prepare report.	K2
CO4	Prepare a working demo.	K3
CO5	Prepare conclusions based on the reading of the topic and giving final Presentation.	K4

List of Experiments:

The methodology used is "learning by doing", a hands-on approach, enabling the students to follow their own pace. The teacher, after explaining the project, became a tutor, answering questions and helping students on their learning experience.

ICT skills
- Understand ICT workflow in the respective domain choosed.
- Manage multitasking.
- Deal with main issues using tech in class.
- Record, edit and deliver audio and video.
- Automate assessments and results.

Scope
- Perspective in order to design activities in class.
- Understand the process of creating audiovisuals.

Teaching tools
- Different ways to create audiovisual activities.
- Handle audiovisual editors.
- Collaborative working.
- Individualize learning experience.
- Get instant feedback from students.

Each one of the students will be assigned an ICT Topic and the student has to conduct a detailed study on the assigned topic and prepare a report, running to 30 or 40 pages for which a demo to be performed followed by a brief question and answer session. The demo will be evaluated by the internal assessment committee (comprising of the Head of the Department and two faculty members) for a total of 100 marks.

Lecture Periods: -	Tutorial Periods: -	Practical Periods: 45	Total Periods: 45

* TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)						Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
1	-	3	1	1	3	3	3	2	1
2	-	3	1	1	3	2	3	2	1
3	-	3	1	1	3	2	3	2	1
4	-	3	1	1	3	2	3	2	1
5	-	3	1	1	3	2	3	2	1

Correlation Level: 1 - Low, 2 - Medium, 3 – High

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Evaluation Method

Assessment	Continuous Assessment Marks (CAM)				End Semester Examination (ESE) Marks	Total Marks
	Performance in practical classes			Attendance		
	Presentation using ICT	Report	viva			
Marks	50	30	10	10	-	100

Department	**Computer Science and Engineering**	Programme: **M.Tech.**						
Semester	**II**	Course Category : **AEC**			*End Semester Exam Type: **-**			
Course Code	**P23CSC2XX**	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Ability Enhancement Courses**	**-**	**-**	**4**	**-**	**100**	**-**	**100**

Students shall choose an International certification course offered by the reputed organizations like Google, Microsoft, IBM, Texas Instruments, Bentley, Autodesk, Eplan and CISCO, etc. The duration of the course is 40-50 hours specified in the curriculum, which will be offered through Centre of Excellence.

Pass /Fail will be determined on the basis of participation, attendance, performance and completion of the course. If a candidate fails, he/she has to repeat the course in the subsequent years. Pass in this course is mandatory for the award of degree.

2. A. 3. 145

Department	Computer Science and Engineering	Programme: **M.Tech.**						
Semester	I	Course Category : **PE**			*End Semester Exam Type: **TE**			
Course Code	P23CSE101	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	Programming for Data Science	3	-	-	3	40	60	100

Prerequisite	Basics of Data Science	
Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Identify the need for data science and solve basic problems using Python built-in data types and their methods.	**K2**
	CO2 Employ efficient storage and data operations using NumPy arrays.	**K3**
	CO3 Apply powerful data manipulations using Pandas	**K3**
	CO4 Identify and execute basic syntax and programs in R	**K2**
	CO5 Exploit the graph using ggplot2	**K3**

UNIT-I	**Introduction to Data Science and Python Programming**	**Periods: 9**
Introduction to Data Science - Why Python? - Essential Python libraries - Python Introduction- Features, Identifiers, Reserved words, Indentation, Comments, Built-in Data types and their Methods: Strings, List, Tuples, Dictionary, Set - Type Conversion- Operators. Decision Making- Looping- Loop Control statement- Math and Random number functions. User defined functions - function arguments & its types.		**CO1**
UNIT-II	**Introduction to NumPy**	**Periods: 9**
NumPy Basics: Arrays and Vectorized Computation- The NumPy ndarray- Creating ndarrays- Data Types for ndarrays- Arithmetic with NumPy Arrays- Basic Indexing and Slicing - Boolean Indexing-Transposing Arrays and Swapping Axes. Universal Functions: Fast Element-Wise Array Functions- Mathematical and Statistical Methods-SortingUnique and Other Set Logic		**CO2**
UNIT-III	**Data Manipulation with Pandas**	**Periods: 9**
Introduction to pandas Data Structures: Series, DataFrame, Essential Functionality: Dropping Entries -Indexing, Selection, and Filtering- Function Application and Mapping- Sorting and Ranking. Summarizing and Computing Descriptive Statistics- Unique Values, Value Counts, and Membership. Reading and Writing Data in Text Format.		**CO3**
UNIT-IV	**Introduction to Data Science and R Programming**	**Periods: 9**
R for Basic Math- Arithmetic- Logarithms and ExponentialsE-Notation- Assigning Objects- Vectors- Creating a Vector- Sequences, Repetition, Sorting, and Lengths- Subsetting and Element Extraction- Vector-Oriented Behaviour		**CO4**
UNIT-V	**Basic Plotting**	**Periods: 9**
Using plot with Coordinate Vectors-Graphical Parameters-Automatic Plot Types-Title and Axis LabelsColor-Line and Point Appearances-Plotting Region Limits-Adding Points, Lines, and Text to an Existing Plot-ggplot2 Package-Quick Plot with qplot-Setting Appearance Constants with Geoms-- READING AND WRITING FILES- R-Ready Data Sets- Contributed Data Sets-Reading in External Data Files- Writing Out Data Files and Plots- Ad Hoc Object Read/Write Operations		**CO5**

Lecture Periods: 45	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods: 45**

Text Books

1. Tilman M.Davies,"The Book of R - A First Programming and Statistics" Library of Congress Cataloging-in-Publication Data,2016.
2. Bruce, Peter, and Andrew Bruce. Practical statistics for data scientists: 50 essential concepts. " O'Reilly Media, Inc.", 2017.
3. Steven Keller, "R Programming for Beginners", CreateSpace Independent Publishing Platform 2016.

Reference Books

1. Roger D. Peng,"R Programming for Data Science"Lean Publishing, 2016.
2. Hadley Wickham, Garrett Grolemund," R for Data Science",OREILLY Publication,2017
3. Kun Ren ,"Learning R Programming", Packt Publishing,2016
4. Dodge, Yadolah, ed. Statistical data analysis and inference. Elsevier, 2014.
5. Ismay, Chester, and Albert Y. Kim. Statistical Inference via Data Science: A Modern Dive into R and the Tidyverse. CRC Press, 2019.

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https://docs.python.org/3/tutorial/classes.html
https://www.tutorialspoint.com/python3/python_gui_programming.htm
https://dev.mysql.com/doc/connector-python/en/
https://www.tutorialspoint.com/python3/python_networking.htm

* TE – Theory Exam, LE – Lab Exam

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COs/POs/PSOs Mapping

COs	Program Outcomes (POs)						Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
1	3	3	3	3	2	3	3	3	2
2	3	2	2	2	1	2	2	2	1
3	3	1	1	1	2	1	1	1	2
4	3	1	1	2	2	1	2	1	2
5	3	2	2	2	3	2	2	2	3

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	10		15	10	5	60	100

*Application Oriented /Problem solving/Design/Analytical in content beyond the syllabus to be given from Unit-5

Department	Computer Science and Engineering	Programme: **M.Tech.**						
Semester	I	Course Category : **PE**			*End Semester Exam Type: **TE**			
Course Code	P23CSE102	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Cyber Attack Detection and Prevention Systems**	**3**	**-**	**-**	**3**	**40**	**60**	**100**

Prerequisite			
Course Outcomes	**On completion of the course, the students will be able to**		BT Mapping (Highest Level)
	CO1	Understand Intrusion Detection and Prevention System	**K2**
	CO2	Illustrate Network Intrusion Detection and Prevention System	**K3**
	CO3	Make use of Network behavior analysis	**K3**
	CO4	Exploit SNORT IDS	**K4**
	CO5	Make use of IDPS Technologies	**K3**

UNIT-I	**Introduction to IDPS**	**Periods: 9**
IDPS Technologies, Components and Architecture Implementation Uses of IDPS Technologies, Key Functions, Common Detection Methodologies Signature, Anomaly and Stateful Protocol Analysis, Types of IDPS Technologies		**CO1**
UNIT-II	**Host and Network IDPS**	**Periods: 9**
Application, Transport, Network and Hardware Layer attacks, Sniffing Network Traffic, Replay Attacks,Command Injection, Internet Control Message Protocol Redirect, DDoS, Dangers and defenses with Man-in the Middle, Secure Socket Layer attacks, DNS Spoofing, Defense- in-Depth Approach, Port Security, Use Encrypted Protocols		**CO2**
UNIT-III	**Network Behaviour Analysis**	**Periods: 9**
Components and Architecture Typical, Network Architecture, Sensor Locations. Honeynets- Gen I, II and III, Honeymole, Detecting the Attack - Intrusion Detection, Network Traffic Capture, Monitoring on the box, Setting up the Realistic Environment.		**CO3**
UNIT-IV	**Working with Snort IDS**	**Periods: 9**
Introduction to Snort, Snort Alert Modes and Format, Working with Snort Rules, Rule Headers, Rule Options,The Snort Configuration File etc, Plugins, Preprocessors and Output Modules, Using Snort with MySQL.		**CO4**
UNIT-V	**Multiple IDPS Technologies**	**Periods: 9**
Need for multiple IDPS Technologies, Integrating Different IDPS Technologies -Direct and Indirect,Firewalls, Routers and Honeypots, IPS using IP Trace back - Probabilistic and De- terministic Packet Marking, Marking WLAN Standards, WLAN Components, Threats against WLANs, 802.11 Wireless Infrastruc- ture Attacks,WEP Attacks, Wireless Client Attacks, Bluetooth Attacks, Cellphones, Personal Digital Assistance and OtherHybrid Devices Attack Detection, Jailbreaking.		**CO5**

Lecture Periods: 45	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods: 45**

Text Books

1.Shui Yu, "Distributed Denial of Service Attack and Defense", Springer, 2014
2.Bradd Lhotsky, "OOSEC Host based Intrusion detection", PACKT Publication, 2013
3.John Hoopes, "Virtualization for Security: Including Sandboxing, Disaster Recovery, High Availability, Forensic Analysis, and Honeypotting", Syngress,2009.

Reference Books

1. Karen Scarfone and Peter Mell, "Guide to Intrusion Detection and Prevention Systems (IDPS)", NIST Special Publication 800-94, 2007
2. Padmavathi Ganapathi,"Cyber Security : Fundamentals, Attacks and Threats, Intrusion Detection and Prevention Systems",2021
3. Mano Paul P, Ravi R, Diana Jeba Jingle," Prevention of Cyber Attacks Using Email Spam Detection and Mitigation",2021.
4. Yuri Diogenes, Erdal Ozkaya, Dr. Erdal Ozkaya," Cybersecurity - Attack and Defense Strategies",2022.
5. Alessandro Parisi,"Hands-On Artificial Intelligence for Cybersecurity", 2019.

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https://www.simplilearn.com/tutorials/cyber-security-tutorial/types-of-cyber-attacks
https://www.mygreatlearning.com/blog/types-of-cyber-attacks/
https://cybersecurityguide.org/resources/coding-for-cybersecurity/
https://www.codingninjas.com/studio/library/cyber-attacks-and-their-types

* TE – Theory Exam, LE – Lab Exam

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COs/POs/PSOs Mapping

COs	Program Outcomes (POs)						Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
1	2	2	-	-	-	-	2	3	2
2	2	2	3	3	2	-	3	3	2
3	2	2	3	3	2	-	2	1	1
4	2	2	3	3	2	-	1	1	2
5	2	2	3	3	2	3	2	1	2

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	10		15	10	5	60	100

*Application Oriented /Problem solving/Design/Analytical in content beyond the syllabus to be given from Unit-5

2.A.3.150

Department	Computer Science and Engineering	Programme: M.Tech.						
Semester	I	Course Category : PE			*End Semester Exam Type: TE			
Course Code	P23CSE103	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	Bio-Inspired Computing	3	-	-	3	40	60	100

Prerequisite	No Prerequisite needed	
Course Outcomes	On completion of the course, the students will be able to	BT Mapping (Highest Level)
CO1	Understand basic concepts of evolutionary algorithm	K2
CO2	Understand the basic features of neural and immune systems and able to build the neural model.	K2
CO3	Make use of complex and functional high-level phenomena can emerge from low-level interactions.	K3
CO4	Illustrate computational processes derived from neural models.	K2
CO5	Implement simple bio-inspired algorithms like genetic and Particle Swarm Optimization	K3

UNIT-I	Introduction to Evolutionary Algorithm	Periods: 9
Evolutionary algorithm, components of evolutionary algorithm representation (definition of individuals), Evaluation function (Fitness function), Population, parent selection Mechanism, Variation Operators, Survivor Selection Mechanism (Replacement), Initialization, Termination Condition, evolutionary algorithm case study Cellular systems, cellular automata, modeling with cellular systems, other cellular systems, computation with cellular systems, artificial life: analysis and synthesis of cellular systems.		CO1
UNIT-II	**Neural Systems**	**Periods: 9**
Biological nervous systems, artificial neural networks, neuron models, architecture, signal encoding ,synaptic plasticity, unsupervised learning, supervised learning, reinforcement learning, evolution of neural networks, hybrid neural systems, case study		CO2
UNIT-III	**Developmental and Immune Systems**	**Periods: 9**
Rewriting system, synthesis of developmental system, evolutionary rewriting systems, evolutionary developmental programs, biological immune systems, lessons for artificial immune systems, algorithms and applications, shape space, negative selection algorithm, clonal selection algorithm		CO3
UNIT-IV	**Behavioral Systems**	**Periods: 9**
Behavior in cognitive science, behavior in AI, behavior based robotics, biological inspiration for robots, robots as biological models, robot learning, evolution of behavioral systems, learning in behavioral systems, co-evolution of body and control, towards self-reproduction, simulation and reality		CO4
UNIT-V	**Genetic Algorithms**	**Periods: 9**
Representation of Individuals, Mutation, Recombination, Population Models, Parent Selection, Survivor Selection, Example Application: Solving a Job Shop Scheduling Problem		CO5

Lecture Periods: 45	Tutorial Periods: -	Practical Periods: -	Total Periods: 45

Text Books

1. D. Floreano and C. Mattiussi, "Bio-Inspired Artificial Intelligence", MIT Press, 2008.
2. Tao Song, Pan Zheng, Mou Ling Dennis Wong, Xun Wang, "Bio-Inspired Computing Models and Algorithms", world scientific, 2019
3. F. Neumann and C. Witt, "Bioinspired Computation in combinatorial optimization: Algorithms and their computational complexity", Springer, 2010.

Reference Books

1. D. E. Goldberg, "Genetic algorithms in search, optimization, and machine learning", Addison- Wesley, 1989.
2. Simon O. Haykin, "Neural Networks and Learning Machines", Third Edition, Prentice Hall, 2008.
3. M. Dorigo and T. Stutzle, "Ant Colony Optimization", A Bradford Book, 2004.
4. R. C. Ebelhart, "Swarm Intelligence", Morgan Kaufmann, 2001.
5. Xin-She Yang,Zhihua Cui Renbin Xiao Amir HosseinGandomi Mehmet Karamanoglu "Swarm Intelligence and Bio-Inspired Computation", 1st Edition, Elsevier, 2013.

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https://tutorials.one/bio-inspired-computing-approach-in-artificial-intelligence/
https://pythonhosted.org/inspyred/
https://pdfs.semanticscholar.org ›
https://www.frontiersin.org/research-topics/25088/bio-inspired-computation-and-its-applications
https://www.sciencegate.app/source/1398722893

* TE – Theory Exam, LE – Lab Exam

2. A. 3. 151

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)						Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
1	2	2	-	-	-	-	2	3	2
2	2	2	3	3	2	-	3	3	2
3	2	2	3	3	2	-	2	1	1
4	2	2	3	3	2	-	1	1	2
5	2	2	3	3	2	3	2	1	2

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	10		15	10	5	60	100

*Application Oriented /Problem solving/Design/Analytical in content beyond the syllabus to be given from Unit-5

2. A - 3 - 152

Department	Computer Science and Engineering	Programme: M.Tech.						
Semester	I	Course Category: PE			*End Semester Exam Type: TE			
Course Code	P23CSE104	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	Block Chain and Crypto Currency	3	-	-	3	40	60	100

Prerequisite	Basics of Cryptography	
Course Outcomes	On completion of the course, the students will be able to	BT Mapping (Highest Level)
	CO1 Understand the Design principles of Bitcoin and Ethereum.	K2
	CO2 Make use of the Simplified Payment Verification protocol.	K3
	CO3 Understand about Cryptocurrency	K3
	CO4 Illustrate the Cryptocurrency Regulation	K3
	CO5 Implement Blockchain Applications	K3

UNIT-I	Introduction	Periods: 9
Distributed Database, Two General Problem, Byzantine General problem and Fault Tolerance, Hadoop Distributed File System, Distributed Hash Table, ASIC resistance, Turing Complete. Cryptography: Hash function, Digital Signature - ECDSA, Memory Hard Algorithm, Zero Knowledge Proof.		CO1
UNIT-II	**Blockchain**	**Periods: 9**
Introduction, Advantage over conventional distributed database, Blockchain Network, Mining Mechanism, Distributed Consensus, Merkle Patricia Tree, Gas Limit, Transactions and Fee, Anonymity, Reward, Chain Policy, Life of Blockchain application, Soft & Hard Fork, Private and Public blockchain.		CO2
UNIT-III	**Cryptocurrency**	**Periods: 9**
History, Distributed Ledger, Bitcoin protocols - Mining strategy and rewards, Ethereum - Construction, DAO, Smart Contract, GHOST, Vulnerability, Attacks, Sidechain, Namecoin.		CO3
UNIT-IV	**Cryptocurrency Regulation**	**Periods: 9**
Stakeholders, Roots of Bit coin, Legal Aspects-Crypto currency Exchange, Black Market and Global Economy. Applications: Internet of Things, Medical Record Management System, Domain Name Service and future of Block chain.		CO4
UNIT-V	**Blockchain Applications**	**Periods: 9**
Internet of Things, Medical Record Management System, Domain Name Service and future of Blockchain.		CO5

Lecture Periods: 45	Tutorial Periods: -	Practical Periods: -	Total Periods: 45

Text Books

1. Douglas Robert Stinson and Maura Paterson, "Cryptography: Theory and Practice", CRC press, 2018.
2. Imran Bashir, "Mastering Blockchain: Deeper insights into decentralization, cryptography", Packet Publishing Ltd, Kindle Edition, 2017.
3. Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Goldfeder, "Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction", Princeton University Press, Kindle Edition, 2016.

Reference Books

1. Imran Bashir, "Mastering Blockchain: A deep dive into distributed ledgers, consensus protocols, smart contracts,DApps, cryptocurrencies, Ethereum, and more", Packt Publishing Limited, 3rd Edition,2020.
2. Andreas M. Antonopoulos,"Mastering Bitcoin: Unlocking Digital Cryptocurrencies", O'Reilly Media,2nd Edition 2017.
3. Keith M.Martin ,"Everyday Cryptography: Fundamental Principles & Applications",Oxford University Press, First edition 2016.
4. Dr.Gavin Wood, "ETHEREUM: A Secure Decentralized Transaction Ledger," Yellow paper.2014.
5. Dr. T R Padmanabhan C K Shyamala, N Harini , "Cryptography and Security", Wiley,1st Edition,2011.

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2. https://bitcoin.org/bitcoin.pdf
3. https://www.geeksforgeeks.org/introduction-to-crypto-terminologies
4. https://complyadvantage.com/knowledgebase/crypto-regulations/cryptocurrency-regulations-india
5. https://www.proofpoint.com/us/threat-reference/encryption

* TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)						Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
1	1	1	3	3	3	3	3	3	3
2	2	2	2	2	-	2	2	2	-
3	3	3	3	3	3	3	3	3	3
4	2	2	2	2	-	2	2	2	-
5	2	2	2	2	-	2	2	2	-

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	10		15	10	5	60	100

*Application Oriented /Problem solving/Design/Analytical in content beyond the syllabus to be given from Unit-5

2.A.3.154

Department	Computer Science and Engineering	Programme: **M.Tech.**						
Semester	I	Course Category : **PE**			*End Semester Exam Type: **TE**			
Course Code	P23CSE105	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	IOT Applications Engineering	3	-	-	3	40	60	100

Prerequisite	Basics of IoT	
Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Identify the IoT networking components with respect to OSI layer.	**K2**
	CO2 Build schematic for IoT solutions	**K3**
	CO3 Make use of Cloud computation and Bigdata Analytics	**K3**
	CO4 Illustrate IoT Security	**K3**
	CO5 Make use of IoT Applications	**K3**

UNIT-I	**Introduction**	**Periods: 9**
Characteristics IoT sensor nodes, Edge computer, cloud and peripheral cloud, single board computers, open source hardwares, Examples of IoT infrastructure,		**CO1**
UNIT-II	**IOT Protocols and Softwares**	**Periods: 9**
MQTT, UDP, MQTT brokers, publish subscribe modes, HTTP, COAP,XMPP and gateway protocols, IoT Communication Pattern, IoT protocol Architecture, Selection of Wireless technologies -6LoWPAN, Zigbee, WIFI, BT, BLE,SIG,NFC, LORA, LiFi, WiDi		**CO2**
UNIT-III	**Cloud Computation and BigData Analytics**	**Periods: 9**
Evolution of Cloud Computation, Commercial clouds and their features, open source IoT platforms, cloud dashboards, Introduction to big data analytics and Hadoop.		**CO3**
UNIT-IV	**IOT Security**	**Periods: 9**
Need for encryption, standard encryption protocol, light weight cryptography, Quadruple Trust Model for IoT-A – Threat Analysis and model for IoT-A, Cloud security		**CO4**
UNIT-V	**IOT Applications**	**Periods: 9**
Case studies: IoT for smart cities, health care, agriculture, smart meters.M2M, Web of things, Cellular IoT, Industrial IoT, Industry 4.0		**CO5**

Lecture Periods: 45	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods: 45**

Text Books

1. Alessandro Bassi, Martin Bauer, Martin Fiedler, Thorsten Kramp, Rob van Kranenburg, Sebastian Lange, Stefan Meissner, "Enabling things to talk – Designing IoT solutions with the IoT Architecture Reference Model", Springer Open, 2016.
2. Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stamatis Karnouskos, Stefan Avesand, David Boyle, "From Machine to Machine to Internet of Things", Elsevier Publications, 2014
3. LuYan, Yan Zhang, Laurence T. Yang, Huansheng Ning, The Internet of Things: From RFID to the Next-Generation Pervasive Network, Aurbach publications, March,2008.

Reference Books

1. Vijay Madisetti , Arshdeep Bahga, Adrian McEwen (Author), Hakim Cassimally "Internet of Things A Hands-on-Approach" Arshdeep Bahga & Vijay Madisetti, 2014.
2. Asoke K Talukder and Roopa R Yavagal, "Mobile Computing," Tata McGraw Hill, 2010.
3. Barrie Sosinsky, "Cloud Computing Bible", Wiley-India, 2010
4. RonaldL. Krutz, Russell Dean Vines,Cloud Security: A Comprehensive Guide to Secure Cloud Computing,Wiley-India, 2010
5. Jonathan Follett, "Designing for Emerging - UX for Genomics, Robotics, and the Internet of Things Technologies", O'Reilly, 2014.

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https://www.i-scoop.eu/internet-of-things-guide/edge-computing-iot/
https://digimat.in/nptel/courses/video/106105166/L02.html

* TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)						Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
1	1	2	1	2	2	3	3	1	3
2	1	2	1	2	2	3	3	3	2
3	1	2	1	2	2	3	2	1	3
4	2	2	2	3	2	3	1	1	2
5	3	1	2	3	2	3	2	2	1

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	10		15	10	5	60	100

*Application Oriented /Problem solving/Design/Analytical in content beyond the syllabus to be given from Unit-5

2.A.3.156

Department	Computer Science and Engineering	Programme: M.Tech.						
Semester	II	Course Category : PE			*End Semester Exam Type: TE			
Course Code	P23CSEC01	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	Information Visualization	3	-	-	3	40	60	100

Prerequisite	No Prerequisite needed	
Course Outcomes	On completion of the course, the students will be able to	BT Mapping (Highest Level)
	CO1 Analyze the different data types, visualization types to bring out the insight.	K3
	CO2 Make use of Visualization Techniques	K3
	CO3 Illustrate different Visual Analytics	K2
	CO4 Make use of Data Visualization Tools	K3
	CO5 Demonstrate Visualization dashboard creations	K2

UNIT-I	Introduction	Periods: 9	
Overview of data visualization - Data Abstraction - Task Abstraction - Dimensions and Measures - Analysis:Four Levels for Validation. Statistical charts (Bar Chart - stacked bar chart – Line Chart - Histogram - Pie chart- Frequency Polygon - Box plot - Scatter plot - Regression curves			CO1
UNIT-II	**Visualization Techniques**	**Periods: 9**	
Introduction to various data visualization tools - Scalar and point techniques - vector visualization techniques -multidimensional techniques - visualizing cluster analysis – K-means and Hierarchical Cluster techniques.			CO2
UNIT-III	**Data Visualization and Visual Analytics**	**Periods: 9**	
Time Series data visualization – Text data visualization – Spatial Data Visualization - Networks and Trees - Heat Map – Tree Map - Map Color and Other Channels Manipulate View – Visual Attributes - Multivariate data visualization – Geometric projection techniques - Icon-based techniques - Pixel-oriented techniques - Hierarchical techniques - Scatterplot matrix - Hyper box - Trellis display - Parallel coordinates			CO3
UNIT-IV	**Data Visualization Tools**	**Periods: 9**	
Tableau functions and logics: Marks and Channels-Arrange Tables- Arrange Spatial Data- Facets into multiple views			CO4
UNIT-V	**Visualization Dashboard Creations**	**Periods: 9**	
Data Dashboard- Taxonomies- User Interaction- Organizational Functions-Dashboard Design – Worksheets - Workbooks – Workbook Optimization - Protection and common mistakes. Dashboard creation using visualization tool use cases: Finance-marketing-insurance-healthcare			CO5

Lecture Periods: 45	Tutorial Periods: -	Practical Periods: -	Total Periods: 45

Text Books

1. Tamara Munzer, Visualization Analysis and Design, 1st edition, CRC Press, United States, 2015.
2. Michael Fry, Jeffrey Ohlmann, Jeffrey Camm, James Cochran, Data Visualization: Exploring and Explaining with Data, South-Western College Publishing, 2021
3. Dr. Chun-hauh Chen, W. K. Hardle, A. Unwin, Handbook of Data Visualization, 1st edition, Springer publication, Germany, 2008.

Reference Books

1. Ben Fry, Visualizing Data, 1st edition, O'Reilly Media, United States, 2008.
2. Avril Coghlan, A little book of R for multivariate analysis, 1st edition, Welcome Trust Sanger Institute,United Kingdom, 2013.
3. Colin Ware,Information Visualization Perception for Design,2 nd Edition ,Elsevier Science,2019
4. Riccardo Mazza,Introduction to Information Visualization,1st EditionSpringer London,2009
5. Claus O. Wilke,undamentals of Data Visualization,O'Reilly MediaInc,2019

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https://www.sciencedirect.com/science/article/pii/S2452414X19300573
https://study.com/academy/lesson/information-visualization-tools-techniques.html
https://www.youtube.com/watch?v=_YfHDbADy4s
https://www.nobledesktop.com/learn/data-visualization/video-tutorials

* TE – Theory Exam, LE – Lab Exam

2.A.3.157

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)						Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
1	1	2	1	2	2	3	3	1	3
2	1	2	1	2	2	3	3	3	2
3	1	2	1	2	2	3	2	1	3
4	2	2	2	3	2	3	1	1	2
5	3	1	2	3	2	3	2	2	1

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	10		15	10	5	60	100

*Application Oriented /Problem solving/Design/Analytical in content beyond the syllabus to be given from Unit-5

2.A.3.158

Department	**Computer Science and Engineering**	Programme: **M.Tech.**						
Semester	**II**	Course Category : **PE**			*End Semester Exam Type: **TE**			
Course Code	**P23CSE206**	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Malware Analysis**	**3**	**-**	**-**	**3**	**40**	**60**	**100**

Prerequisite	No Prerequisite needed	
Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Understand basics of Malware	**K2**
	CO2 Make use of Basic Analysis	**K3**
	CO3 Illustrate Static and Dynamic Analysis	**K3**
	CO4 Apply Malware functionalities	**K4**
	CO5 Illustrate Anti reverse Engineering	**K3**

UNIT-I	**Malware Basics**	**Periods: 9**	
General Aspect of Computer infection program , Non Self Reproducing Malware, How does Virus Operate?, Virus Nomenclature, Worm Nomenclature, Recent Malware Case Studies			**CO1**
UNIT-II	**Basic Analysis**	**Periods: 9**	
Antivirus Scanning, x86 Disassembly, Hashing, Finding Strings, Packed Malware, PE File Format, Linked Libraries & Functions, PE Header File & Section			**CO2**
UNIT-III	**Advanced Static and Dynamic Analysis**	**Periods: 9**	
IDA Pro, Recognizing C code constructs, Analyzing malicious windows program, Debugging, OllyDbg, Kernel Debugging with WinDbg, Malware Focused Network Signatures			**CO3**
UNIT-IV	**Malware Functionalities**	**Periods: 9**	
Malware Behavior, Covert Malware Launch, Data Encoding, Shellcode Analysis			**CO4**
UNIT-V	**Anti-Reverse Engineering**	**Periods: 9**	
Anti-Disassembly, Anti-Debugging, Anti-virtual machine techniques, Packers and Unpacking			**CO5**

Lecture Periods: 45	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods: 45**

Text Books

1. Michael Sikorski, Andrew Honig, "Practical Malware Analysis: The Hands-On Guide to Dissecting Malicious Software", 2012
2. Monnappa K A "Learning Malware Analysis: Explore the Concepts, Tools, and Techniques to Analyze and Investigate Windows Malware" 2018
3. Alexey Kleymenov and Amr Thabet," Mastering Malware Analysis: The Complete Malware Analyst's Guide to Combating Malicious Software, APT, Cybercrime, and IoT Attacks",2019

Reference Books

1. Dylan Barker, "Malware Analysis Techniques: Tricks for the triage of adversarial software", Packt Publishing, Limited, 2021.
2. Abhijit Mohanta and Anoop Saldanha, "Malware Analysis and Detection Engineering: A Comprehensive Approach to Detect and Analyze Modern Malware" Apress, 2020
3. Michael Ligh, Blake Hartstein, Steven Adair, Matthew Richard, "Malware Analyst's Cookbook and DVD: Tools and Techniques for Fighting Malicious Code"2010
4. Victor Marak,"Windows Malware Analysis Essentials", 2015
5. Mihai Christodorescu, Somesh Jha, Douglas Maughan, Dawn Song, Cliff Wang, "Malware Detection", Springer Science & Business Media, 2007.

Web References

http://www.malware-analyzer.com
http://resources.infosecinstitute.com/malware-analysis-basic-dynamic-techniques/
http://www.remux.org
https://www.youtube.com/watch?v=qA0YcYMRWyI
https://perception-point.io/guides/malware/malware-detection-7-methods-and-security-solutions-that-use-them/

* TE – Theory Exam, LE – Lab Exam

2.A.3.159

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)						Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
1	1	2	1	2	2	3	3	1	3
2	1	2	1	2	2	3	3	3	2
3	1	2	1	2	2	3	2	1	3
4	2	2	2	3	2	3	1	1	2
5	3	1	2	3	2	3	2	2	1

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	10		15	10	5	60	100

*Application Oriented /Problem solving/Design/Analytical in content beyond the syllabus to be given from Unit-5

2. A. 3. 160

Department	Computer Science and Engineering	Programme: M.Tech.						
Semester	II	Course Category : PE			*End Semester Exam Type: TE			
Course Code	P23CSEC02	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	Soft Computing	3	-	-	3	40	60	100

Prerequisite	No Prerequisite needed	
Course Outcomes	On completion of the course, the students will be able to	BT Mapping (Highest Level)
	CO1 Apply neural networks, bidirectional associative memories and adaptive resonancetheory for solving different engineering problems	K2
	CO2 Identify and describe soft computing techniques and build supervised learning and unsupervised learning networks	K3
	CO3 Apply fuzzy logic and reasoning to handle uncertainty and solve various engineeringproblems	K2
	CO4 Apply genetic algorithms to combinatorial optimization problems.	K2
	CO5 Evaluate and compare solutions by various soft computing approaches for a given problem	K3

UNIT-I	Introduction to Soft Computing	Periods: 9
Soft computing vs. hard computing, evolution of soft computing, features and types of softcomputing, applications of soft computing, basics of machine learning.		CO1
UNIT-II	**Neural Networks and Back PropagationNetworks**	**Periods: 9**
Basic concepts of Neural Networks, Model of Artificial Neuron, Neural Network Architectures, Characteristics of neural networks, Learning Methods, Early neural network architectures, Application domains. Back propagation network (BPN), Back propagation Learning, Applications of BPN, Parameter selection, Variations of Back propagation Algorithms		CO2
UNIT-III	**Associative Memory Networks**	**Periods: 9**
Auto correlators, hetero correlators: Kosko's discrete Bi-direction associative memory (BAM), Exponential BAM, Application of Character Recognition		CO3
UNIT-IV	**Unsupervised Learning: Adaptive Resonance Theory**	**Periods: 9**
Adaptive Resonance Theory (ART), Classical ART Networks, Simplifies ART Architecture, Features, algorithms and Illustration of ART1 and ART2 model, Related Applications		CO4
UNIT-V	**Fuzzy Sets and Fuzzy Relations**	**Periods: 9**
Fuzzy versus Crisp, Crisp Sets, Fuzzy sets, Membership functions, fuzzy set operations, properties of Fuzzy sets, Crisp Relations, Fuzzy relations – Fuzzy Cartesian product, Operations of Fuzzy Relations		CO5

Lecture Periods: 45	Tutorial Periods: -	Practical Periods: -	Total Periods: 45

Text Books

1. S, Rajasekaran& G.A. VijayalakshmiPai, "Neural Networks, Fuzzy systems and evolutionary algorithms: Synthesis and Applications", PHI Publication, 2nd Ed. 2017
2. Timothy J. Ross, "Fuzzy Logic with Engineering Applications", John Wiley and Sons, 3rd ed, 2011.
3. S.N. Sivanandam& S.N. Deepa, "Principles of Soft Computing", Wiley Publications, 3rd ed,2018.

Reference Books

1. Jang, Jyh-Shing Roger, Chuen-Tsai Sun, and EijiMizutani. "Neuro-fuzzy and soft computing- a computational approach to learning and machine intelligence" Pearson, 1997.
2. Kosko, B., Neural Networks and Fuzzy Systems: A Dynamical Systems Approach toMachine Intelligence, PHI Publication, 1994.
3. George J. Klir,Fuzzy Sets and Fuzzy Logic: Theory and Applications, Prentice Hall, 2015
4. Rich E andKnight K, Artificial Intelligence, McGraw Hill Education; 3rd ed, 2017.
5. Haykin, "Neural Networks and Learning Machines", Pearson Education Inc., 3rd Ed 2008.

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1. https://digitalthinkerhelp.com/what-is-soft-computing-and-its-applications-and-techniques/
2. https://www.includehelp.com/soft-computing/
3. https://www.educba.com/soft-computing-techniques/
4. https://nptel.ac.in/courses/106105173
5. https://www.youtube.com/watch?v=a63JT0OFeys

* TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)						Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
1	1	2	1	2	2	3	3	1	3
2	1	2	1	2	2	3	3	3	2
3	1	2	1	2	2	3	2	1	3
4	2	2	2	3	2	3	1	1	2
5	3	1	2	3	2	3	2	2	1

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	10		15	10	5	60	100

*Application Oriented /Problem solving/Design/Analytical in content beyond the syllabus to be given from Unit-5

2.A.3.162

Department	Computer Science and Engineering	Programme: **M.Tech.**					
Semester	II	Course Category : **PE**			*End Semester Exam Type: **TE**		
Course Code	P23BDEC01	Periods / Week			Credit	Maximum Marks	
		L	T	P	C	CAM	ESE	TM
Course Name	**Neural Networks**	**3**	**-**	**-**	**3**	**40**	**60**	**100**

Prerequisite	Basic Physics	
Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Describe the basics of ANN and comparison with Human brain.	**K3**
	CO2 Understand the role of neural networks in engineering, artificia intelligence, and cognitive modelling.	**K2**
	CO3 Understand the concepts and techniques of neural networks throughthe study of the most important neural network models.	**K3**
	CO4 Evaluate whether neural networks are appropriate to a particular application.	**K2**
	CO5 Apply neural networks to particular application, and to know whatsteps to take to improve performance.	**K2**

UNIT-I	**Introduction**	**Periods: 9**
A Neural Network-Human Brain- Models of a Neuron-Neural Networks viewed as Directed Graphs-Network Architectures-Knowledge Representation-Artificial Intelligence and Neural Networks. Learning Process: Error Correction Learning- Memory Based Learning-Hebbian Learning, Competitive- Boltzmann Learning-Credit Assignment Problem- Memory- Adaption- Statistical Natureof the Learning Process.		**CO1**
UNIT-II	**Single Layer Perceptrons**	**Periods: 9**
Adaptive Filtering Problem- Unconstrained Organization Techniques- Linear Least Square Filters- Least Mean Square Algorithm-Learning Curves- Learning Rate Annealing Techniques- Perceptron –Convergence Theorem- Relation Between Perceptron and Bayes Classifier for a Gaussian Environment. Multilayer Perceptron: Back Propagation Algorithm XOR Problem- Heuristics-Output Representation and Decision Rule-Computer Experiment- Feature Detection		**CO2**
UNIT-III	**Back Propagation**	**Periods: 9**
Back Propagation and Differentiation- Hessian Matrix- Generalization- Cross Validation- NetworkPruning Techniques-Virtues and Limitations of Back Propagation Learning- Accelerated Convergence-Supervised Learning.		**CO3**
UNIT-IV	**Self-Organization Maps (SOM)**	**Periods: 9**
Two Basic Feature Mapping Models, Self-Organization Map, SOM Algorithm, Properties of FeatureMap, Computer Simulations, Learning Vector Quantization, Adaptive Patter Classification.		**CO4**
UNIT-V	**NEURO DYNAMICS**	**Periods: 9**
Dynamical Systems-Stability of Equilibrium States, Attractors-Neuro Dynamical Models - Manipulation of Attractors as a Recurrent Network Paradigm Hopfield Models – Hopfield Models- restricted boltzmen machine.		**CO5**

Lecture Periods: 45	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods: 45**

Text Books

1. Neural Networks a Comprehensive Foundations, Simon S Haykin, PHI Ed.
2. Introduction to Artificial Neural Systems Jacek M. Zurada, JAICO Publishing House Ed. 2006.
3. Neural Networks A Classroom Approach -Satish Kumar, McGraw Hill Education (India) Pvt. Ltd, Second Edition.

Reference Books

1. Neural Networks in Computer Inteligance, Li Min Fu TMH 2003
2. Neural Networks -James A Freeman David M S Kapura Pearson Ed., 2004.
3. Artificial Neural Networks – B. Vegnanarayana Prentice Hall of India P Ltd 2005
4. Introduction to Artificial Neural Systems - J.M. Zurada, Jaico Publications 1994.
5. Artificial Neural Networks- B. Yegnanarayana, Pill, New Delhi 1998.

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https://www.cs.rit.edu/~lr/courses/nn/main.html
https://www.inspirenignite.com/up/neural-network
https://www.investopedia.com/terms/n/neuralnetwork.asp
https://www.mygreatlearning.com/blog/types-of-neural-networks/
https://link.springer.com/10.1007/978-3-642-20617-7_6563

* TE – Theory Exam, LE – Lab Exam

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)						Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
1	3	3	2	1			-	1	3
2	3	3	2	1			-	1	3
3	3	3	2	1			-	1	3
4	3	3	2	1			-	1	3
5	3	3	2	1			-	1	3

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	10		15	10	5	60	100

*Application Oriented /Problem solving/Design/Analytical in content beyond the syllabus to be given from Unit-5

2. A. 3. 164

Department	Computer Science and Engineering			Programme: **M.Tech.**			
Semester	II			Course Category : **PE**		*End Semester Exam Type: **TE**	
Course Code	P23CSE207	Periods / Week			Credit	Maximum Marks	
		L	T	P	C	CAM	ESE	TM
Course Name	**Smart Sensing for IOT**	**3**	**-**	**-**	**3**	**40**	**60**	**100**

			BT Mapping (Highest Level)
Prerequisite	Basics of sensor and IoT		
Course Outcome	**On completion of the course, the students will be able to**		BT Mapping (Highest Level)
	CO1	Understanding of IoT value chain structure (device, data cloud), application areas and technologies involved	**K1**
	CO2	Make use of IoT sensors and technological challenges faced by IoT devices, with a focus on wireless, energy, power, RF and sensing	**K3**
	CO3	Market forecast for IoT devices with a focus on sensors	**K2**
	CO4	Make use of IoT Developments	**K3**
	CO5	Explore and learn about Internet of Things with the help of preparing projects designed for Raspberry Pi	**K4**

UNIT-I	**Introduction**	**Periods: 9**	
Internet of Things Promises–Definition– Scope–Sensors for IoT Applications–Structure of IoT– IoT Map Device			**CO1**
UNIT-II	**Seven Generations of IOT Sensors to Appear**	**Periods: 9**	
Industrial sensors – Description & Characteristics–First Generation – Description & Characteristics–Advanced Generation – Description & Characteristics–Integrated IoT Sensors – Description & Characteristics–Polytronics Systems – Description & Characteristics–Sensors' Swarm – Description & Characteristics–Printed Electronics – Description & Characteristics–IoT Generation Roadmap			**CO2**
UNIT-III	**Technological Analysis**	**Periods: 9**	
Wireless Sensor Structure–Energy Storage Module–Power Management Module–RF Module–Sensing Module			**CO3**
UNIT-IV	**IOT Development Examples**	**Periods: 9**	
ACOEM Eagle – EnOcean Push Button – NEST Sensor – Ninja Blocks -Focus on Wearable Electronics			**CO4**
UNIT-V	**IOT Projects**	**Periods: 9**	
Creating the sensor project - Preparing Raspberry Pi - Clayster libraries - Hardware- Interacting with the hardware - Interfacing the hardware- Internal representation of sensor values - Persisting data - External representation of sensor values - Exporting sensor data - Creating the actuator project- Hardware - Interfacing the hardware - Creating a controller - Representing sensor values - Parsing sensor data - Calculating control states - Creating a camera - Hardware -Accessing the serial port on Raspberry Pi - Interfacing the hardware - Creating persistent default settings - Adding configurable properties - Persisting the settings - Working with the current settings - Initializing the camera			**CO5**

Lecture Periods: 45	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods: 45**

Text Books

1. Dr. Guillaume Girardin , Antoine Bonnabel, Dr. Eric Mounier, 'Technologies & Sensors for the Internet of Things Businesses & Market Trends 2014 - 2024',Yole Développement Copyrights ,2014
2. Peter Waher, 'Learning Internet of Things', Packt Publishing, 2015
3. OvidiuVermesan Peter Friess,'Internet of Things – From Research and Innovation to Market Deployment', River Publishers, 2014

Reference Books

1. N. Ida, Sensors, Actuators and Their Interfaces, Scitech Publishers, 2014
2. Charalampos Doukas, "Building Internet of Things with the Arduino", Create space Publishers, 2012.
3. Donald Norris, "The Internet of Things: Do-It-Yourself at Home Projects for Arduino, Raspberry Pi and Beagle Bone Black", Mc.Graw Hill, First Edition, 2015.
4. Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stamatis, Karnouskos, Stefan Avesand. David Boyle, "From Machine-to-Machine to the Internet of Thing – Introduction to a New Age of Intelligence", Elsevier, 2014.
5. Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), "Architecting the Internet of Things", Springer, 2011.

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1. https://www.wired.co.uk/article/internet-of-things-what-is-explained-iot
2. https://www.ibm.com/blogs/internet-of-things/what-is-the-iot/
3. https://www.geeksforgeeks.org/edge-computing/
4. https://www.i-scoop.eu/internet-of-things-guide/edge-computing-iot
5. https://www.techtarget.com/iotagenda/definition/smart-sensor

* TE – Theory Exam, LE – Lab Exam

2.A.3.165

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)						Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
1	2	2	-	-	1	-	1	1	1
2	2	2	2	3	2	-	1	2	1
3	1	1	2	2	-	-	1	2	1
4	1	1	-	3	2	-	1	2	1
5	3	2	2	2	2	3	1	2	1

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	10		15	10	5	60	100

*Application Oriented /Problem solving/Design/Analytical in content beyond the syllabus to be given from Unit-5

2. A. 3. 166

Department	Computer Science and Engineering			Programme: **M.Tech.**			
Semester	II			Course Category : **PE**		*End Semester Exam Type: **TE**	
Course Code	P23CSEC03	Periods / Week			Credit	Maximum Marks	
		L	T	P	C	CAM	ESE	TM
Course Name	**Text, Web and Social Media Analytics**	**3**	**-**	**-**	**3**	**40**	**60**	**100**
Prerequisite								

Course Outcomes		On completion of the course, the students will be able to	BT Mapping (Highest Level)
	CO1	Understand Text Mining	K2
	CO2	Illustrate Web Mining	K3
	CO3	Make use of Social Network Analysis	K2
	CO4	Exploit Social Media Mining	K3
	CO5	Make use of Sentimental Mining	K3

UNIT-I	Introduction to Text Mining	Periods: 9	
Text Representation- tokenization, stemming, stop words, TF-IDF, Feature Vector Representation, NER, N-gram modeling. Text Clustering, Text Classification, Topic Modeling-LDA,HDP			CO1
UNIT-II	**Introduction to Web-Mining**	**Periods: 9**	
Inverted indices and Boolean queries. PLSI, Query optimization, page ranking. Web Crawling-Crawler Algorithms, Implementation Issues, Evaluation, Session & visitor Analysis, Visitor Segmentation, Analysis of Sequential & Navigational Patterns, Predictions based on web user transactions.			CO2
UNIT-III	**Fundamentals of Social Network Analysis**	**Periods: 9**	
Social Network Perspective, Fundamentals concepts in Network Analysis: Sociogram, Sociometry. Social Network Data: Types of Networks: One-Mode, Two-Mode, Affiliation, Ego-centered and Special Dyadic Networks, Network Data, Measurement and Collection, Notations for Social Network Data: Graphs, Directed, Singed, Valued graphs, Multigraph, Relations and Matrices			CO3
UNIT-IV	**Social Media Mining**	**Periods: 9**	
Introduction to Social Media Network Essentials of Social graphs, Social Networks, Models, Information Diffusion in Social Media. Behavioral Analytics, Influence and Homophily, Recommendation in Social Media			CO4
UNIT-V	**Sentimental Mining**	**Periods: 9**	
Sentiment classification feature based opinion mining, comparative sentence and relational mining, Opinion spam			CO5

Lecture Periods: 45	Tutorial Periods: -	Practical Periods: -	Total Periods: 45

Text Books

1.Bing Liu, "Web Data Mining-Exploring Hyperlinks, Contents, and Usage Data", Springer, Second Edition, 2011.
2.Reza Zafarani, Mohammad Ali Abbasi and Huan Liu, "Social Media Mining – An Introduction", Cambridge University Press, 2014.
3.Bing Liu, "Sentiment Analysis and Opinion Mining", Morgan & Claypool Publishers, 2012.

Reference Books

1. Nitin Indurkhya, Fred J Damerau, "Handbook of Natural Language Process", 2nd Edition, CRC Press, 2010.
2. Matthew A.Russell, "Mining the social web", 2nd edition- O'Reilly Media, 2013.

Web References

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2. https://towardsdatascience.com/a-guide-text-analysis-text-analytics-text-mining-f62df7b78747
3. https://www.tutorialspoint.com/web_analytics/index.html
4. https://www.tutorialspoint.com/social_media_marketing/social_media_analysis.htm
5. https://www.simplilearn.com/web-analytics-guide-for-newbies-article

* TE – Theory Exam, LE – Lab Exam

2. A. 3. 167

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)						Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
1	2	2	-	-	1	-	1	1	1
2	2	2	2	3	2	-	1	2	1
3	1	1	2	2	-	-	1	2	1
4	1	1	-	3	2	-	1	2	1
5	3	2	2	2	2	3	1	2	1

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	10		15	10	5	60	100

*Application Oriented /Problem solving/Design/Analytical in content beyond the syllabus to be given from Unit-5

2. A. 3. 168

Department	Computer Science and Engineering	Programme: M.Tech.						
Semester	II	Course Category : PE			*End Semester Exam Type: TE			
Course Code	P23CSEC04	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	Data Storage Technologies and Networks	3	-	-	3	40	60	100

Prerequisite		
Course Outcomes	On completion of the course, the students will be able to	BT Mapping (Highest Level)
	CO1 Understand the basic concepts of Storage Technologies. (K2)	K1
	CO2 Identify the Storage Items and its Operations. (K2)	K3
	CO3 Understand the Networked Storage like DAS, SAN and NAS. (K3)	K4
	CO4 Learn the concepts related to Information Availability. (K3)	K3
	CO5 Ability to describe Storage Security and Virtualization. (K3)	K3

UNIT-I	Introduction to Storage Technology	Periods: 9	
Data Proliferation and the varying value of data with time and usage - Sources of data and states of data creation - Data center requirements and Evolution to accommodate storage needs - Overview of basic storage management skills and activities - The Five Pillars of Technology - Overview of Storage Infrastructure Components - Evolution of storage - Information Lifecycle Management concept - Data Categorization within an Enterprise - Storage and Regulations.			CO1
UNIT-II	**STORAGE SYSTEMS ARCHITECTURE**	**Periods: 9**	
Intelligent disk subsystems overview - Contrast of integrated vs. modular arrays - Component architecture of intelligent disk subsystems - Disk physical structure components – properties - performance and specifications - Logical partitioning of disks - RAID and parity algorithms - hot sparing - Physical vs. logical disk organization - protection and back end management - Array caching properties and algorithms - Front end connectivity and queuing properties - Front end to host storage provisioning - mapping and operation - Interaction of file systems with storage - Storage system connectivity protocols.			CO2
UNIT-III	**NETWORKED STORAGE**	**Periods: 9**	
JBOD – DAS – SAN - NAS and CAS evolution - Direct Attached Storage (DAS) environments: elements - connectivity and management. Storage Area Networks (SAN): Elements and Connectivity - Fiber Channel principles - Standards and Network management principles - SAN management principles. Network Attached Storage (NAS): elements - connectivity options - connectivity protocols (NFS, CIFS, FTP) and management principles - IP SAN elements - Standards (iSCSI, FCIP, iFCP) - connectivity principles - security and management principles. Content Addressable Storage (CAS): elements, connectivity options – Standards and management principles.			CO3
UNIT-IV	**INFORMATION AVAILABILITY**	**Periods: 9**	
Business Continuity and Disaster Recovery Basics - Local business continuity techniques - Remote business continuity techniques - Disaster Recovery principles and techniques Managing and Monitoring Management philosophies (holistic vs. system and component) - Industry management standards (SNMP, SMI-S, CIM) - Standard framework applications - Key Management Metrics (thresholds, availability, capacity, security, performance) - Metric Analysis Methodologies and Trend Analysis - Provisioning and Configuration change planning - Problem reporting - prioritization and handling techniques.			CO4
UNIT-V	**SECURING STORAGE AND STORAGE VIRTUALIZATION**	**Periods: 9**	
Define storage security - List the critical security attributes for information systems - Describe the elements of a shared storage model and security extensions - Define storage security domains - List and analyze the common threats in each domain - Identify different virtualization technologies - Describe block-level and file level virtualization technologies and processes.			CO5

Lecture Periods: 45	Tutorial Periods: -	Practical Periods: -	Total Periods: 45

Text Books

1. Marc Farley Osborne, "Building Storage Networks", Tata Mcgraw Hill, 2006.
2. EMC, Hopkinton and Massachusetts, "Information Storage and Management Storing, Managing, and Protecting Digital Information", Wiley, 2008.
3. Robert Spalding, "Storage Networks: The Complete Reference", Tata Mcgraw Hill, 2002.

Reference Books

1. Gerald J Kowalski, Mark T Maybury, "Information Storage and Retrieval Systems - Theory and Implementation", BS Publications, 2006.
2. Thejendra BS, "Disaster Recovery & Business Continuity", Shroff Publishers & Distributors, 2008.
3. Barb Goldworm, Anne Skamarock, "Blade Servers & Virtualization", Wiley India.
4. Meeta Gupta, "Storage Area Network Fundamentals", Pearson Education Limited, 2006.
5. John Chirillo, Scott Blaul, "Storage Security Protecting SANs, NAS and DAS", Wiley, 2003.

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1. https://www.youtube.com/watch?v=bzEaDPu09vY
2. https://www.snia.org/education/storage_networking_primer/san/what_san
3. http://www.ittoday.info/ITPerformanceImprovement/Articles/2013-01Schulz.html
4. https://www.igi-global.com/dictionary/information-availability/14353
5. https://searchstorage.techtarget.com/definition/storage-virtualization

* TE – Theory Exam, LE – Lab Exam

2. A. 3. 169

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)						Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
1	2	2	2	3	2	2	3	2	2
2	3	2	2	2	2	2	3	2	2
3	3	3	3	3	3	3	3	3	3
4	3	3	3	3	3	3	3	3	3
5	3	3	3	3	3	3	3	3	3

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	10		15	10	5	60	100

*Application Oriented /Problem solving/Design/Analytical in content beyond the syllabus to be given from Unit-5

2. A. 3. 170

Department	Computer Science and Engineering	Programme: M.Tech.						
Semester	II	Course Category : PE			*End Semester Exam Type: TE			
Course Code	P23CSE208	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	Reinforcement Learning	3	-	-	3	40	60	100

Prerequisite	No Prerequisite needed	
Course Outcomes	On completion of the course, the students will be able to	BT Mapping (Highest Level)
	CO1 Implement in-code common algorithms following code standards and libraries used in RL	K3
	CO2 Understand and work with approximate solutions.	K1
	CO3 Explore imitation learning tasks and solutions.	K3
	CO4 Learn how to define RL tasks and the core principals behind the RL, including policies, value functions.	K3
	CO5 Understand and work with tabular methods to solve classical control problems.	K3

UNIT-I	Reinforcement Learning Primitives	Periods: 9
Introduction and Basics of RL, Defining RL Framework, Probability Basics: Probability Axioms,Random Variables, Probability Mass Function, Probability Density Function, CumulativeDistribution Function and Expectation. Introduction to Agents, Intelligent Agents – ProblemSolving – Searching, Logical Agents.		CO1
UNIT-II	**Markov Decision Process and Dynamic Programming**	**Periods: 9**
Markov Property, Markov Chains, Markov Reward Process (MRP), Bellman Equations for MRP,Dynamic Programming: Polices (Evaluation, Improvement, Iteration, Valuelteration),Asynchronous Dynamic Programming, Generalized Policy Iteration, Efficiency of Dynamic Programming		CO2
UNIT-III	**Monte Carlo Methods and Temporal Difference Learning**	**Periods: 9**
Monte Carlo: Prediction, Estimation of Action Values, Control and Control without ExploringStarts, Off-Policy Control, Temporal Difference Prediction:TD(0), SARSA: On-Policy Tcontrol, Q-Learning: Off-Policy TD control, Games, Afterstates, and Other Special Cases.		CO3
UNIT-IV	**Deep Reinforcement Learning**	**Periods: 9**
Deep Q-Networks, Double Deep-Q Networks(DQN, DDQN, Dueling DQN, Prioritized Experience Replay). Policy Optimization in RL Introduction to Policy-based Methods, Vanilla Policy Gradient, REINFORCE Algorithm andStochastic Policy Search, Asynchronous Actor-Critic and Asynchronous Advantage Actor-Critic(A2C, A3C), Advanced Policy Gradient (PPO, TRPO, DDPG)		CO4
UNIT-V	**Multi Agent in RL**	**Periods: 9**
Multi-Agent Learning, Meta-learning, Partially Observable Markov Decision Process, Ethics inRL, Applying RL for Real-World Problems.		CO5

Lecture Periods: 45	Tutorial Periods: -	Practical Periods: -	Total Periods: 45

Text Books

1.Richard S. Sutton and Andrew G. Barto, "Reinforcement learning: An Introduction", Second Edition, MIT Press, 2019.
2.Russell, Stuart J., and Peter Norvig. "Artificial intelligence: a modern approach.", Pearson Education Limited, 2016.
3.Michael Wooldridge, "An Introduction to Multi Agent Systems", John Wiley, 2002.

Reference Books

1. Ian Goodfellow, YoshuaBengio, and Aaron Courville. "Deep learning." MIT press, 2017.
2. Marco Wiering, Martijn van Otterlo(Ed),"Reinforcement Learning, State-of-the-Art, Adaptation, Learning, and Optimization book series, ALO, volume 12, Springer, 2012.
3. Keng, Wah Loon, Graesser, Laura, "Foundations of Deep Reinforcement Learning: Theory and Practice in Python", Addison Wesley Data & Analytics Series, 2020.
4. Francois Chollet, "Deep Learning with Python", Manning Publications, 2018.
5. RagavVenkatesan, Baoxin Li, "Convolutional Neural Networks in Visual Computing", CRC Press, 2018

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https://www.javatpoint.com/reinforcement-learning
https://www.simplilearn.com/tutorials/machine-learning-tutorial/reinforcement-learning
https://www.learndatasci.com/tutorials/reinforcement-q-learning-scratch-python-openai-gym/
https://www.analyticsvidhya.com/blog/2017/01/introduction-to-reinforcement-learning-implementation/
https://www.tensorflow.org/agents/tutorials/0_intro_rl

* TE – Theory Exam, LE – Lab Exam

2.A.3.171

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)						Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
1	2	2	-	-	1	-	1	1	1
2	2	2	2	3	2	-	1	2	1
3	1	1	2	2	-	-	1	2	1
4	1	1	-	3	2	-	1	2	1
5	3	2	2	2	2	3	1	2	1

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	10		15	10	5	60	100

*Application Oriented /Problem solving/Design/Analytical in content beyond the syllabus to be given from Unit-5

2. A. 3. 172

Department	Computer Science and Engineering	Programme: M.Tech.						
Semester	II	Course Category : PE			*End Semester Exam Type: TE			
Course Code	P23CSE209	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	Mobile Application and Development	3	-	-	3	40	60	100

Prerequisite	No Prerequisite required	
Course Outcomes	On completion of the course, the students will be able to	BT Mapping (Highest Level)
	CO1 Identify the requirements for mobile applications development.	K2
	CO2 Illustrate the challenges in mobile application interface and development.	K3
	CO3 Extend the concept of web components to involve for mobile application development.	K4
	CO4 Make use of Android SDK and iOS SDK for platform integration.	K3
	CO5 Develop various real time mobile applications.	K4

UNIT-I	Application Foundation and Interfaces	Periods: 9
Introduction to mobile applications – Importance of mobile strategies – Cost of development – Mobile myths – Market and business drivers for mobile applications – Mobile web presence – Mobile applications – Benefits of a mobile app – Introduction to Interfaces – Mobile user interface design – Understanding mobile application users – Understanding mobile information design – Understanding mobile platforms – Using the tools of mobile interface design.		CO1

UNIT-II	Web Components	Periods: 9
Choosing a mobile web option – Adaptive mobile websites – Dedicated mobile websites – Mobile web apps with HTML5 – Design patterns for mobile applications – Advanced web service techniques for mobile devices.		CO2

UNIT-III	Android Software Development	Periods: 9
Android toolkit - Java for android - components of an Android Application. Eclipse Concepts and Terminology - Eclipse Views and Perspective - Eclipse and Android - Effective java for Android Building a View - Fragments and Multiplatform Support – Drawing - Handling and Persisting Data.		CO3

UNIT-IV	Platform Integration	Periods: 9
Development practices – Android fundamentals – Android SDK – Common interactions – Offline storage – iOSSDK – Debugging iOS apps – Objective - C basics – iOS features.		CO4

UNIT-V	Application Development	Periods: 9
Using google maps – GPS – Wi-Fi and WiMAX – Integration with social media applications – Foldable displays – Centralized storage – Mobile commerce.		CO5

Lecture Periods: 45	Tutorial Periods: -	Practical Periods: -	Total Periods: 45

Text Books

1. Jeff McWherter and Scott Gowell, "Professional Mobile Application Development", Wrox, 2012.
2. Charlie Collins, Michael Galpin and Matthias Kappler, "Android in Practice", Dream Tech, 2012.
3. James Dovey and Ash Furrow, "Beginning Objective C", Apress, 2012.

Reference Books

1. David Mark, Jack Nutting, Jeff LaMarche and Frederic Olsson, "Beginning iOS 6 Development: Exploring the iOS SDK", Apress, 2013.
2. Bill Phillips, Chris Stewart, Brian Hardy, and Kristin Marsicano, "Android Programming: The Big Nerd Ranch Guide", Big Nerd Ranch LLC, Third edition, 2017.
3. Reto Meier, "Professional android Development", Wiley-India Edition, 2012.
4. Lauren Darcey and Shane Conder, "Android Wireless Application Development", Pearson Education, Second edition, 2011.
5. Mark L Murphy, "Beginning Android", Wiley India Pvt Ltd, 2010.

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2. https://www.comentum.com/guide-to-web-application-development.html
3. http://developer.android.com/develop/index.html
4. https://www.stclaircollege.ca/programs/mobile-applications-development
5. https://www.fingent.com/blog/mobile-application-development-your-ultimate-guide/

* TE – Theory Exam, LE – Lab Exam

2.A.3.173

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)						Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
1	2	1	1	-	2	1	1	2	2
2	2	1	1	2	2	1	1	2	2
3	2	2	2	2	1	1	1	2	1
4	2	3	1	-	-	1	1	2	1
5	2	2	3	-	3	1	1	2	2

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	10		15	10	5	60	100

*Application Oriented /Problem solving/Design/Analytical in content beyond the syllabus to be given from Unit-5

2.A.3.174

Department	Computer Science and Engineering	Programme: M.Tech.					
Semester	II	Course Category : PE			*End Semester Exam Type: TE		
Course Code	P23CSE210	Periods / Week			Credit	Maximum Marks	
		L	T	P	C	CAM	ESE	TM
Course Name	Wireless Sensor Networks and IOT	3	-	-	3	40	60	100

Prerequisite	No Prerequisite needed	
Course Outcomes	On completion of the course, the students will be able to	BT Mapping (Highest Level)
	CO1 Understand basic sensor network concepts	K1
	CO2 Know physical layer issues, understand and analyze Medium Access Control Protocols	K2
	CO3 Comprehend network and transport layer characteristics and protocols and implement conventional protocols	K3
	CO4 Understand the network management and Middleware services	K1
	CO5 Analyze Middleware and Security issues	K3

UNIT-I	Fundamentals of Sensor Networks	Periods: 9	
Introduction to computer and wireless sensor networks and Overview of the syllabus- Motivation for a network of Wireless Sensor nodes- Sensing and sensors-challenges and constraints - node architecture-sensing subsystem, processor subsystem-communication interfaces- prototypes, Application of Wireless sensors- Introduction of Tiny OS Programming and TOSSIM Simulator.			CO1
UNIT-II	**Communication Characteristics And Deployment Mechanisms**	**Periods: 9**	
Wireless Transmission Technology and systems-Radio Technology Primer-Available Wireless Technologies - Hardware- Telosb, Micaz motes- Time Synchronization- Clock and the Synchronization Problem - Basics of time synchronization-Time synchronization protocols - Localization- Ranging Techniques- Range based Localization-Range Free Localization- Event driven Localization			CO2
UNIT-III	**MAC Layer**	**Periods: 9**	
Overview-Wireless Mac Protocols-Characteristics of MAC protocols in Sensor networks – Contention free MAC Protocols-characteristics- Traffic Adaptive Medium Access-Y-MAC, Low energy Adaptive Clustering - Contention based MAC Protocols-Power Aware Multi-Access with signaling, Sensor MAC-Timeout MAC-Data gathering MAC- Case study –Implementation and Analysis of MAC player protocol in TinyOS.			CO3
UNIT-IV	**Routing in Wireless Sensor Networks**	**Periods: 9**	
Design Issues in WSN routing- Data Dissemination and Gathering-Routing Challenges in WSN - Flooding-Flat Based Routing – SAR, Directed Diffusion, Hierarchical Routing- LEACH, PEGASIS - Query Based Routing- Negotiation Based Routing-Geographical Based Routing- Transport layer- Transport protocol Design issues- Performance of Transport Control Protocols.Case study- Implementation and analysis of Routing protocol or transport layer protocol in Tiny OS			CO4
UNIT-V	**Middleware and Security Issues**	**Periods: 9**	
WSN middleware principles-Middleware architecture-Existing middleware - operating systems for wireless sensor networks-performance and traffic management - Fundamentals of network security-challenges and attacks - Protocols and mechanisms for security. Case study- Handling attacks in Tiny OS			CO5
Lecture Periods: 45	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods: 45**

Text Books

1. Waltenegus Dargie, Christian Poellabauer , "Fundamentals of Wireless Sensor Networks, Theory and Practice", Wiley Series on wireless Communication and Mobile Computing, 2011
2. Kazem Sohraby, Daniel manoli , "Wireless Sensor networks- Technology, Protocols and Applications", Wiley InterScience Publications 2010.
3. Bhaskar Krishnamachari , " Networking Wireless Sensors", Cambridge University Press, 2005

Reference Books

1. C.S Raghavendra, Krishna M.Sivalingam, Taiebznati , "Wireless Sensor Networks", Springer Science 2004.
2. Jun Zheng, Abbas Jamalipour," Wireless Sensor Networks: A Networking Perspective", Wiley-IEEE Press,2009
3. Ibrahiem M. M. El Emary, S. Ramakrishnan,"Wireless Sensor Networks: From Theory to Applications", 2013
4. Robert Faludi," Building Wireless Sensor Networks", O'Reilly Media, Inc. 2010.
5. A Swami," Wireless Sensor Networks - Signal Processing and Communications Perspectives",2007.

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https://www.electronicshub.org/wireless-sensor-networks-wsn/
https://www.tutorialspoint.com/what-are-wireless-sensor-networks
https://www.save9.com/internet-and-wireless-networks/wireless-sensor-networks/
https://www.ilovephd.com/what-is-the-difference-between-wsn-and-iot/

* TE – Theory Exam, LE – Lab Exam

2.A.3.175

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)						Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3
1	2	2	-	-	1	-	1	1	1
2	2	2	2	3	2	-	1	2	1
3	1	1	2	2	-	-	1	2	1
4	1	1	-	3	2	-	1	2	1
5	3	2	2	2	2	3	1	2	1

Correlation Level: 1 - Low, 2 - Medium, 3 – High

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	CAT 1	CAT 2	Model Exam	Assignment*	Attendance		
Marks	10		15	10	5	60	100

*Application Oriented /Problem solving/Design/Analytical in content beyond the syllabus to be given from Unit-5

2. A. 3. 176

Department	Computer Science and Engineering			Programme: **M.Tech.**			
Semester				Course Category : **AC**		*End Semester Exam Type: **TE**	
Course Code	**P23ACTX01**	Periods / Week			Credit	Maximum Marks	
		L	T	P	C	CAM	ESE	TM
Course Name	**English for Research Paper Writing**	**2**	**-**	**-**	**-**	**100**	**-**	**100**

(Common to all M.Tech Programme)

Prerequisite	No Prerequisite	
Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Understand that how to improve your writing skills and level of readability.	**K2**
	CO2 Learn about what to write in each section.	**K1**
	CO3 Understand the skills needed when writing a Title.	**K2**
	CO4 Understand the skills needed when writing the Conclusion.	**K2**
	CO5 Ensure the good quality of paper at very first-time submission.	**K3**

UNIT-I	**Introduction to Research Paper Writing**	**Periods: 6**	
Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness.			**CO1**
UNIT-II	**Presentation Skills**	**Periods: 6**	
Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticizing, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts, Introduction.			**CO2**
UNIT-III	**Title Writing Skills**	**Periods: 6**	
Key skills are needed when writing a Title, key skills are needed when writing an Abstract, key skills are needed when writing an Introduction, skills needed when writing a Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check.			**CO3**
UNIT-IV	**Result Writing Skills**	**Periods: 6**	
Skills are needed when writing the Methods, skills needed when writing the Results, skills are needed when writing the Discussion, skills are needed when writing the Conclusions.			**CO4**
UNIT-V	**Verification Skills**	**Periods: 6**	
Useful phrases, checking Plagiarism, how to ensure paper is as good as it could possibly be the first- time submission.			**CO5**

Lecture Periods: 30	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods: 30**

Reference Books

1. Adrian Wallwork, "English for Writing Research Papers", Springer, New York, Dordrecht Heidelberg London, 2011.
2. Day R, "How to Write and Publish a Scientific Paper", Cambridge University Press, 2006.
3. Goldbort R, "Writing for Science", Yale University Press (Available on Google Books), 2006.
4. Highman N, "Handbook of Writing for the Mathematical Sciences", SIAM. Highman's book, 1998.

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	Assignment 1	**Assignment 2**	**Test 1**	**Test 2**	**Attendance**		
Marks	20	20	25	25	10	-	100

2. A. 3. 128

Department	Computer Science and Engineering			Programme: **M.Tech.**			
Semester				Course Category : **AC**		*End Semester Exam Type: **TE**	
Course Code	**P23ACTX02**	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Disaster Management**	**2**	**-**	**-**	**-**	**100**	**-**	**100**

(Common to all M.Tech Programme)

Prerequisite		
Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Ability to summarize basics of disaster.	**K1**
	CO2 Ability to explain a critical understanding of key concepts in disaster risk reduction and humanitarian response.	**K2**
	CO3 Ability to illustrate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.	**K3**
	CO4 Ability to describe an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.	**K3**
	CO5 Ability to develop the strengths and weaknesses of disaster management approaches.	**K3**

UNIT-I	**Introduction**	**Periods: 6**	
Disaster: Definition, Factors and Significance; Difference between Hazard And Disaster; Natural and Manmade Disasters: Difference, Nature, Types and Magnitude.			**CO1**
UNIT-II	**Repercussions of Disasters and Hazards**	**Periods: 6**	
Economic Damage, Loss of Human and Animal Life, Destruction of Ecosystem. Natural Disasters: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts and Famines, Landslides and Avalanches, Man-made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks and Spills, Outbreaks Of Disease And Epidemics, War And Conflicts.			**CO2**
UNIT-III	**Disaster Prone Areas in India**	**Periods: 6**	
Study of Seismic Zones; Areas Prone To Floods and Droughts, Landslides And Avalanches; Areas Prone To Cyclonic and Coastal Hazards with Special Reference To Tsunami; Post-Disaster Diseases and Epidemics.			**CO3**
UNIT-IV	**Disaster Preparedness and Management**	**Periods: 6**	
Preparedness: Monitoring Of Phenomena Triggering a Disaster or Hazard; Evaluation of Risk: Application of Remote Sensing, Data from Meteorological And Other Agencies, Media Reports: Governmental and Community Preparedness.			**CO4**
UNIT-V	**Risk Assessment**	**Periods: 6**	
Disaster Risk: Concept and Elements, Disaster Risk Reduction, Global and National Disaster Risk Situation. Techniques of Risk Assessment, Global Co-Operation in Risk Assessment and Warning, People's Participation in Risk Assessment. Strategies for Survival			**CO5**

Lecture Periods: 30	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods: 30**

Reference Books

1. Goel S. L., "Disaster Administration And Management Text And Case Studies", Deep & Deep Publication Pvt. Ltd., New Delhi, 2009.
2. NishithaRai, Singh A.K, "Disaster Management in India: Perspectives, issues and strategies", New Royal book Company, 2007.
3. Sahni, Pardeep Et.Al. , "Disaster Mitigation Experiences And Reflections", Prentice Hall Of India, New Delhi, 2001.

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	Assignment 1	Assignment 2	Test 1	Test 2	Attendance		
Marks	20	20	25	25	10	-	100

2.A.3.179

2. A. 3. 180

Department	Computer Science and Engineering	Programme: **M.Tech.**						
Semester		Course Category : **AC**			*End Semester Exam Type: **TE**			
Course Code	P23ACTX03	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Sanskrit for Tecnical Knowledge**	**2**	**-**	**-**	**-**	**100**	**-**	**100**
(Common to all M.Tech Programme)								
Prerequisite								

Course Outcomes	On completion of the course, the students will be able to	BT Mapping (Highest Level)
	CO1 Understanding basic Sanskrit language.	**K2**
	CO2 Write sentences	**K2**
	CO3 Know the order and roots of Sanskrit.	**K3**
	CO4 Know about technical information about Sanskrit literature	**K3**
	CO5 Understand the technical concepts of Engineering.	**K2**

UNIT-I	**Alphabets**	**Periods: 6**
Alphabets in Sanskrit.		**CO1**
UNIT-II	**Tenses and Sentences**	**Periods: 6**
Past/Present/Future Tense - Simple Sentences.		**CO2**
UNIT-III	**Order and Roots**	**Periods: 6**
Order - Introduction of roots of Engineering-Electrical, Mechanical, Architecture, Mathematics.		**CO3**
UNIT-IV	**Sanskrit Literature**	**Periods: 6**
Technical information about Sanskrit Literature.		**CO4**
UNIT-V	**Technical Concepts of Engineering**	**Periods: 6**
Technical concepts		**CO5**

Lecture Periods: 30	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods: 30**

Reference Books

1. Dr. Vishwas, "Abhyaspustakam", Samskrita-Bharti Publication, New Delhi.
2. Prathama Deeksha, Vempati Kutumbshastri, Rashtriya Sanskrit Sansthanam, "Teach Yourself Sanskrit", New Delhi Publication.
3. Suresh Soni, "India's Glorious Scientific Tradition", Ocean books (P) Ltd., New Delhi, 2017

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	Assignment 1	Assignment 2	Test 1	Test 2	Attendance		
Marks	20	20	25	25	10	-	100

2. A. 3. 181

Department	Computer Science and Engineering			Programme: **M.Tech.**			
Semester				Course Category : **AC**		*End Semester Exam Type: **TE**	
Course Code	**P23ACTX04**	Periods / Week			Credit	Maximum Marks	
		L	T	P	C	CAM	ESE	TM
Course Name	**Value Education**	**2**	**-**	**-**	**-**	**100**	**-**	**100**
(Common to all M.Tech Programme)								
Prerequisite								

Course Outcomes	On completion of the course, the students will be able to	BT Mapping (Highest Level)
	CO1 Knowledge of self-development.	**K2**
	CO2 Learn the importance of Human values.	**K1**
	CO3 Developing the overall personality.	**K3**
	CO4 Developing Character and Competence	**K3**

UNIT-I	**Values and Self Development**	**Periods: 6**	
Values and self-development–Social values and individual attitudes. Work ethics, Indian vision of humanism. Moral and non-moral valuation. Standards and principles. Value judgments of Women. All religions and same message. Mind your Mind, Self-control. Honesty, Studying effectively.			**CO1**
UNIT-II	**Cultivation of Values**	**Periods: 6**	
Importance of cultivation of values. Sense of duty. Devotion, Self-reliance. Confidence, Concentration. Truthfulness, Cleanliness. Honesty, Humanity. Power of faith, National Unity. Patriotism. Love for nature, Discipline			CO2
UNIT-III	**Personality Development**	**Periods: 6**	
Personality and Behavior Development-Soul and Scientific attitude. Positive Thinking. Integrity and discipline. Punctuality, Love and Kindness. Avoid fault Thinking. Free from anger, Dignity of labour. Universal brother hood and religious tolerance. True friendship. Happiness Vs suffering, love for truth. Aware of self-destructive habits. Association and Cooperation. Doing best for saving nature.			**CO3**
UNIT-IV	**Character Development**	**Periods: 6**	
Character and Competence–Holy books vs Blind faith. Self-management and Good health. Science of reincarnation. Equality, Nonviolence, Humility, Role.			**CO4**

Lecture Periods: 30	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods: 30**

Reference Books

1. Chakroborty, S.K. "Values and Ethics for organizations Theory and practice", Oxford University Press, New Delhi.

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	Assignment 1	Assignment 2	Test 1	Test 2	Attendance		
Marks	20	20	25	25	10	-	100

2. A. 3. 183

Department	Computer Science and Engineering			Programme: **M.Tech.**			
Semester				Course Category : **AC**		*End Semester Exam Type: **TE**	
Course Code	P23ACTX05	Periods / Week			Credit	Maximum Marks	
		L	T	P	C	CAM	ESE	TM
Course Name	**Constitution of India**	**2**	**-**	**-**		**100**	**-**	**100**

(Common to all M.Tech Programme)

Prerequisite		
Course Outcomes	**On completion of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.	**K3**
	CO2 Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.	**K3**
	CO3 Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections.	**K3**
	CO4 Discuss the passage of the Hindu Code Bill of 1956.	**K3**
	CO5 Discuss the administration and Election commission	**K3**

UNIT-I	**History of Making of The Indian Constitution**	**Periods: 6**	
History, Drafting Committee, (Composition & Working).			**CO1**
UNIT-II	**Philosophy of The Indian Constitution**	**Periods: 6**	
Preamble, Salient Features.			**CO2**
UNIT-III	**Contours of Constitutional Rights and Duties**	**Periods: 6**	
Fundamental Rights, Right to Equality, Right to Freedom, Right against Exploitation, Right to Freedom of Religion, Cultural and Educational Rights, Right to Constitutional Remedies, Directive Principles of State Policy, Fundamental Duties.			**CO3**
UNIT-IV	**Organs of Governance**	**Periods: 6**	
Parliament, Composition, Qualifications and Disqualifications, Powers and Functions, Executive, President, Governor, Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualifications, Powers and Functions.			**CO4**
UNIT-V	**Local Administration and Election Commission**	**Periods: 6**	
District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO, Municipal Corporation. Pachayati raj: Introduction, PRI: Zila Pachayat. Elected officials and their roles, CEO Zila Pachayat: Position and role. Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy. Election Commission: Role and Functioning. Chief Election Commissioner and Election Commissioners - Institute and Bodies for the welfare of SC/ST/OBC and women.			**CO5**

Lecture Periods: 30	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods: 30**

Reference Books

1. "The Constitution of India, 1950(Bare Act), Government Publication.
2. Dr.S.N.Busi, Dr.B. R.Ambedkar framing of Indian Constitution, 1 st Edition, 2015.
3. M.P. Jain, Indian Constitution Law, 7th Edition, Lexis Nexis, 2014.
4. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.
5. Suresh Soni, "India's Glorious Scientific Tradition" Ocean books (P) Ltd., New Delhi, 2017.

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	Assignment 1	Assignment 2	Test 1	Test 2	Attendance		
Marks	20	20	25	25	10	-	100

2.A.3.185

Department	Computer Science and Engineering			Programme: **M.Tech.**			
Semester				Course Category : **AC**		*End Semester Exam Type: **TE**	
Course Code	**P23ACTX06**	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	**Pedagogy Studies**	**2**	**-**	**-**		**100**	**-**	**100**
(Common to all M.Tech Programme)								
Prerequisite								

Course Outcomes	On completion of the course, the students will be able to	BT Mapping (Highest Level)
	CO1 What pedagogical practices are being used by teachers informal and informal classrooms in developing countries?	**K2**
	CO2 What is the evidence on the effectiveness of these pedagogical practices, in what conditions, and with what population of learners?	**K2**
	CO3 How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy?	**K2**
	CO4 Illustrate Professional development	**K3**
	CO5 Identify Research gaps and Future Directions	**K3**

UNIT-I	**Introduction and Methodology**	**Periods: 6**	
Aims and rationale, Policy background, Conceptual framework and terminology - Theories of learning, Curriculum, Teacher education - Conceptual framework, Research questions – Overview of methodology and Searching.			CO1
UNIT-II	**Thematic Overview**	**Periods: 6**	
Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries - Curriculum, Teacher education.			**CO2**
UNIT-III	**Evidence on The Effectiveness of Pedagogical Practices**	**Periods: 6**	
Methodology for the in depth stage: quality assessment of included studies - How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy? - Theory of change - Strength and nature of the body of evidence for effective pedagogical practices - Pedagogic theory and pedagogical approaches - Teachers' attitudes and beliefs and Pedagogic strategies			**CO3**
UNIT-IV	**Professional Development**	**Periods: 6**	
Professional development: alignment with classroom practices and follows up support – Peer support - Support from the head teacher and the community - Curriculum and assessment - Barriers to learning: limited resources and large class sizes			**CO4**
UNIT-V	**Research Gaps and Future Directions**	**Periods: 6**	
Research design – Contexts – Pedagogy - Teacher education - Curriculum and assessment - Dissemination and research impact.			**CO5**

Lecture Periods: 30	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods: 30**

Reference Books

1. Ackers J, Hardman,F, "Classroom interaction in Kenyan primary schools, Compare", 31(2): 245- 261, 2001.
2. Agrawal M, "Curricular reform in schools: The importance of evaluation, Journal of Curriculum Studies", 36(3):361-379, 2004.
3. Akyeampong K, "Teacher training in Ghana-does it count? Multi-site teacher education research project (MUSTER) country report", London, DFID, 2003.
4. Akyeampong K, Lussier K, Pryor J, Westbrook J, "Improving teaching and learning of basic maths and reading in Africa: Does teacher preparation count?", International Journal Educational Development, 33(3): 272–282, 2013.
5. Alexander RJ, "Culture and pedagogy: International comparisons in primary education", Oxford and Boston: Blackwell, 2001.
6. Chavan M, "Read India: Amass scale, rapid, 'learning to read' campaign", 2003.
7. www.pratham.org/images/resource%20working%20paper%202.pdf.

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	Assignment 1	Assignment 2	Test 1	Test 2	Attendance		
Marks	20	20	25	25	10	-	100

2. A. 3. 187

Department	Computer Science and Engineering	Programme: **M.Tech.**						
Semester		Course Category : **AC**			*End Semester Exam Type: **TE**			
Course Code	P23ACTX07	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	Stress Management by Yoga	**2**	**-**	**-**		**100**	**-**	**100**
(Common to all M.Tech Programme)								
Prerequisite								

Course Outcomes	On completion of the course, the students will be able to	BT Mapping (Highest Level)
	CO1 Develop healthy mind in a healthy body thus improving social health also	**K2**
	CO2 Improve efficiency.	**K2**
	CO3 Understand Asan and Pranayam	**K2**
	CO4 Apply Asanas	**K4**
	CO5 Apply Pranayam	**K4**

UNIT-I	Introduction	**Periods: 6**	
Definitions of Eight parts of yoga. (Ashtanga).			**CO1**
UNIT-II	**Do`s and Don't's in Life**	**Periods: 6**	
Yam and Niyam - Do`s and Don't's in life - i) Ahinsa, satya, astheya, bramhacharya and aparigraha, ii) Ahinsa, satya, astheya, bramhacharya and aparigraha.			**CO2**
UNIT-III	**Asan and Pranayam**	**Periods: 6**	
Asan and Pranayam - Various yoga poses and their benefits for mind & body - Regularization of breathing techniques and its effects-Types of pranayam.			**CO3**
UNIT-IV	**Asan Practices**	**Periods: 6**	
Practice on Various yoga poses			**CO4**
UNIT-V	**Pranayam Practices**	**Periods: 6**	
Practice on various pranayam			**CO5**

Lecture Periods: 30	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods: 30**

Reference Books

1. Janardan Swami Yoga bhyasi Mandal, "Yogic Asanas for Group Tarining-Part-I", Nagpur.
2. Swami Vivekananda, "Rajayoga or conquering the Internal Nature", Advaita Ashrama Publication Department, Kolkata

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	Assignment 1	Assignment 2	Test 1	Test 2	Attendance		
Marks	20	20	25	25	10	-	100

2.A.3.189

2. A. 3. 1870

Department	Computer Science and Engineering				Programme: **M.Tech.**			
Semester					Course Category : **AC**		*End Semester Exam Type: **TE**	
Course Code	P23ACTX08				Periods / Week		Credit	Maximum Marks
		L	T	P	C	CAM	ESE	TM
Course Name	Personality **Development through Life Enlightenment Skills**	**2**	**-**	**-**		**100**	**-**	**100**
(Common to all M.Tech Programme)								
Prerequisite								
Course Outcomes	On completion **of the course, the students will be able to**							BT Mapping (Highest Level)
	CO1 Study of Shrimad-Bhagwad-Geeta will help the student in developing his personality and achieve the highest goal in life.							**K3**
	CO2 The person who has studied Geeta will lead the nation and mankind to peace and prosperity.							**K1**
	CO3 Study of Neet is hatakam will help in developing versatile personality of students.							**K3**
UNIT-I						**Periods: 6**		
Neetisatakam-holistic development of personality - Verses- 19,20,21,22 (wisdom) - Verses- 29,31,32 (pride & heroism) – Verses- 26,28,63,65 (virtue) - Verses- 52,53,59 (dont's) - Verses- 71,73,75,78 (do's) 4-Verses 18, 38,39 Chapter18 – Verses37,38,63.								**CO1**
UNIT-II						**Periods: 12**		
Approach to day to day work and duties - Shrimad Bhagwad Geeta: Chapter 2-Verses 41, 47,48 - Chapter 3- Verses 13, 21, 27, 35 Chapter 6-Verses 5,13,17,23, 35 - Chapter 18-Verses 45, 46, 48.model – shrimad bhagwad geeta - Chapter2- Verses 17, Chapter 3-Verses 36,37,42 – Chapter.								**CO2**
UNIT-III						**Periods: 12**		
Statements of basic knowledge – Shrimad Bhagwad Geeta: Chapter2-Verses 56, 62, 68 Chapter12 -Verses 13, 14, 15, 16,17, 18 - Personality of role.								**CO3**
Lecture Periods: 30	**Tutorial Periods: -**				**Practical Periods: -**		**Total Periods: 30**	
Reference Books								
1. Gopinath, Rashtriya Sanskrit Sansthanam P, "Bhartrihari's Three Satakam, Niti-sringar- vairagya", New Delhi,2010. 2. Swami Swarupananda, Srimad Bhagavad Gita, Advaita Ashram, Publication Department, Kolkata, 2016								

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	Assignment 1	Assignment 2	Test 1	Test 2	Attendance		
Marks	20	20	25	25	10	-	100

2. A. 3. 191

Department	Computer Science and Engineering			Programme: **M.Tech.**			
Semester				Course Category : **AC**		*End Semester Exam Type: **TE**	
Course Code	P23ACTX09	Periods / Week			Credit	Maximum Marks	
		L	T	P	C	CAM	ESE	TM
Course Name	Unnat Bharath **Abhiyan**	**2**	**-**	**-**		**100**	**-**	**100**
(Common to all M.Tech Programme)								
Prerequisite								

Course Outcomes	On completion **of the course, the students will be able to**	BT Mapping (Highest Level)
	CO1 Gain an understanding of rural life, culture and social realities	**K3**
	CO2 Develop a sense of empathy and bonds of mutuality with local community	**K1**
	CO3 Appreciate significant contributions of local communities to Indian society and economy	**K3**
	CO4 Learn to value the local knowledge and wisdom of the community	**K3**
	CO5 Identify opportunities for contributing to community's socio-economic improvements.	**K3**

UNIT-I	Appreciation **of Rural Society**	**Periods: 6**	
Rural life style, rural society, caste and gender relations, rural values with respect to community, nature and resources, elaboration of "soul of India lies in villages' (Gandhi), rural infrastructure.			**CO1**
UNIT-II	Understanding **Rural Economy and Livelihood**	**Periods: 6**	
Agriculture, farming, landownership, water management, animal husbandry, non-farm livelihoods and artisans, rural entrepreneurs, rural markets.			**CO2**
UNIT-III	RURAL INSTITUTIONS	**Periods: 6**	
Traditional rural organizations, Self-help Groups, Panchayati raj institutions (Gram Sabha, Gram Panchayat, Standing Committees), local civil society, local administration.			**CO3**
UNIT-IV	RURAL DEVELOPMENT **PROGRAMMES**	**Periods: 6**	
History of rural development in India, current national programmes: Sarva Shiksha Abhiyan, Beti Bachao, Beti Padhao, Ayushman Bharat, Swatchh Bharat, PM Awaas Yojana, Skill India, Gram Panchayat Decentralized Planning, NRLM, MNREGA, etc.			**CO4**
UNIT-V	FIELD BASED **PRACTICAL ACTIVITIES**	**Periods: 6**	
Visit MGNREGS project sites. Swachh Bharat project sites, Conduct Mission Antyodaya surveys, Interactive community exercise with local leaders, Panchayat functionaries, Visit Rural Schools / mid-day meal centres, study Academic and infrastructural resources and gaps, Participate in Gram Sabha meetings, Visit local Anganwadi Centre, Conduct soil health test, drinking water analysis.			**CO5**
Lecture Periods: 30	**Tutorial Periods: -**	**Practical Periods: -**	**Total Periods: 30**

Reference Books

1. Singh, Katar, "Rural Development : Principles, Policies and Management", Sage Publications, New Delhi, 2015.
2. A Hand book on Village Panchayat Administration, Rajiv Gandhi Chair for Panchayati Raj Studies, 2002.
3. United Nations, "Sustainable Development Goals", 2015.
4. M.P.Boraian, "Best Practices in Rural Development", Shanlax Publishers, 2016

Evaluation Method

Assessment	Continuous Assessment Marks (CAM)					End Semester Examination (ESE) Marks	Total Marks
	Assignment 1	Assignment 2	Test 1	Test 2	Attendance		
Marks	20	20	25	25	10	-	100

2. A. 3. 193

2. A. 3. 194.