



Department of Computer Science and Engineering

Minutes of 7<sup>th</sup> Board of Studies Meeting (UG)

The Seventh Board of Studies meeting of Computer Science and Engineering Department was held on 7<sup>th</sup> March 2024 at 1:00 P.M. at GD Hall, Admin block, Sri Manakula Vinayagar Engineering College, with Head of the Department in the Chair through online mode.

The following members were present for the BoS meeting

Sl.No	Name of the Member with Designation and official Address	Responsibility in the BoS
1.	<b>Dr.K. Premkumar, M.E., Ph.D.,</b> Professor and Head Sri Manakula Vinayagar Engineering College Madagadipet, Puducherry hodcse@smvec.ac.in 9842127679	Chairman
2.	<b>Mr. M. Shanmugam, M.E., (Ph.D.)</b> Associate Professor, Sri Manakula Vinayagar Engineering College Madagadipet, Puducherry shanmugam.mm@smvec.ac.in 9444370963	Member Secretary
3.	<b>Dr. T. CHITHRALEKHA,</b> Professor, Department of Computer Science, School of Technology, Pondicherry University, Puducherry tchithralekha.csc@pondiuni.edu.in	Subject Expert (Pondicherry University Nominee)
4.	<b>Dr. M. Ramakrishnan,</b> Professor and Head, School of Information Technology, Department of Computer Applications, Madurai Kamaraja University, Madurai. Ph:8939432261 Mail id: ramkrishod@gmail.com	Subject Expert (Academic Council Nominee)
5.	<b>Dr. A. Kalaivani,</b> Professor, Department of Information Technology, Rajalakshmi Engineering College, Chennai. 7904977893 Mail: kalaivanianbarasan@rediffmail.com	Subject Expert (Academic Council Nominee)
6.	Aroulvel S, Technical leader, Cisco, Bangalore aroshanm@cisco.com, 9003898387	Representative from Industry

7.	Shakin Banu. H Design Engineer Specialist British Telecommunication, UK shakin2cse@gmail.com 9791854301	Postgraduate Alumnus (nominated by the Principal)
8.	<b>Dr. M. Ganesan, M.E., Ph.D.,</b> Associate Professor Sri Manakula Vinayagar Engineering College Madagadipet, Puducherry ganesan@smvec.ac.in 9486341535	Internal Member
9.	<b>Dr. R. Ramachandiran, M.Tech., Ph.D.,</b> Associate Professor Sri Manakula Vinayagar Engineering College Madagadipet, Puducherry ramachandiran@smvec.ac.in 7639031674	Internal Member
10.	<b>Dr. T. Megala, M.Tech., Ph.D.,</b> Assistant Professor Sri Manakula Vinayagar Engineering College Madagadipet, Puducherry Email :Megalag26@gmail.com 9789722271	Internal Member
11.	<b>Dr. J. Raja, M.Tech., Ph.D</b> Associate Professor, Computer Science and Engineering, Sri Manakula Vinyagar Engineering College Madagadipet, Puducherry Email id:rajacse@smvec.ac.in	Internal Member
12.	<b>Dr. N. Pazhaniraja,</b> Associate Professor, Computer Science and Engineering, Sri Manakula Vinyagar Engineering College Email:pazhaniraja.cse@smvec.ac.in	Internal Member
13.	<b>Mr. P. Karthikeyan</b> Associate Professor, Computer Science and Engineering, Sri Manakula Vinyagar Engineering College Madagadipet, Puducherry Email:karthikcse@smvec.c.in	Internal Member
14.	<b>Mr. B. Thiyagarajan</b> Assistant Professor Sri Manakula Vinayagar Engineering College Email:thiyagarajan@smvec.ac.in	Internal Member
15.	<b>Mr. S. Kumarakrishnan</b> Assistant Professor Sri Manakula Vinayagar Engineering College Madagadipet, Puducherry Email:Skumarakrishnan@smvec.ac.in	Internal Member



16.	<b>Mrs.C.Kalpana</b> Assistant Professor Sri ManakulaVinayagar Engineering College Madagadipet,Puducherry Email:ckalpana@ smvec.ac.in	Internal Member
17.	<b>Mrs.P.Bhavani</b> Assistant Professor Sri ManakulaVinayagar Engineering College Madagadipet,Puducherry Email:Bhavani@ smvec.ac.in	Internal Member
18.	<b>Mr.D.Rajesh</b> Assistant Professor Sri ManakulaVinayagar Engineering College Madagadipet,Puducherry Email:succesraju@gmail.com	Internal Member
19.	<b>Mr.Arokiaraj Christian Hubert</b> Assistant Professor Sri ManakulaVinayagar Engineering College Madagadipet,Puducherry Email:Arokiaraj@smvec.ac.in	Internal Member
20.	<b>Ms.Swathilakshmi.V</b> Assistant Professor Sri ManakulaVinayagar Engineering College Madagadipet,Puducherry Email:Swathilakshmi@gmail.com	Internal Member
21.	<b>Mrs.Gajalakshmi</b> Assistant Professor Sri ManakulaVinayagar Engineering College Madagadipet,Puducherry Email:Gajalakshmicse@smvec.ac.in	Internal Member
22.	<b>Mrs.S.Subasree</b> Assistant Professor Sri ManakulaVinayagar Engineering College Madagadipet,Puducherry Email:Subasree@smvec.ac.in	Internal Member
23.	<b>Mrs.S.Deeba</b> Assistant Professor Sri ManakulaVinayagar Engineering College Madagadipet,Puducherry Email:deebacse@smvec.ac.in	Internal Member
24.	<b>Mrs. R. Deepa</b> Assistant Professor Sri ManakulaVinayagar Engineering College Madagadipet,Puducherry Email:deepa.cse@smvec.ac.in	Internal Member
25.	<b>Mrs.C.Karthika</b> Assistant Professor Sri ManakulaVinayagar Engineering College Madagadipet,Puducherry Email:karthikacse@smvec.ac.in	Internal Member

26.	<b>Mr.K. Anbuthiruvaraman</b> Assistant Professor Sri Manakula Vinayagar Engineering College Madagadipet, Puducherry Anbuthiruvaraman.cse@smvec.ac.in	Internal Member
27.	<b>Mrs.N.Suganya</b> Assistant Professor Sri Manakula Vinayagar Engineering College Madagadipet, Puducherry Suganya.cse@smvec.ac.in	Internal Member
28.	<b>Ms.Nirmala Devi.P</b> Assistant Professor Sri Manakula Vinayagar Engineering College Madagadipet, Puducherry Nirmala.cse@smvec.ac.in	Internal Member
29.	<b>Ms.N.Pavithra</b> Assistant Professor Sri Manakula Vinayagar Engineering College Madagadipet, Puducherry Pavithra.cse@smvec.ac.in	Internal Member
30.	<b>Dr.M.A.IshrathJahan</b> Associate Professor, Department of English, SMVEC	Internal Member
31.	<b>Dr.T.Jayavarthan</b> Professor, Department of Physics, SMVEC	Internal Member
32.	<b>Dr.S.Savithiri,</b> Professor and Head, Department of Chemistry, SMVEC	Internal Member
33.	<b>Prof.K.Raja,</b> Assistant Professor, Department of Mathematics, SMVEC	Internal Member



Department of Computer Science and Engineering

Minutes of 7<sup>th</sup> Board of Studies Meeting  
(M.Tech Computer Science and Engineering)

Agenda of the Meeting

Item No. : BoS/ PG/CSE 7.1	Welcome Address and to confirm the minutes of the sixth meeting of Board of Studies held on 22.07.2023
Item No. : BoS/ PG/CSE 7.2	To discuss and approve the Curriculum for 1 to 4 semesters and syllabi of third and fourth Semesters for the M.Tech Computer Science and Engineering students admitted from the academic year 2023-24 under the Regulation R-2023.
Item No. : BoS/ PG/CSE 7.3	To apprise the End Semester Results of the students admitted in the Academic Year 2022-2023 (Ili sem) and to discuss about Extra-Curricular and Co-Curricular activities.
Item No. : BoS/ PG/CSE 7.4	To apprise about the List of Courses for Professional Electives / Ability Enhancement Courses / Mandatory Courses under R-2023 for the students admitted from the academic Year 2023-24.
Item No. : BoS/ PG/CSE 7.5	To apprise the schedule of the End Semester Examination to be conducted in the month of May/June 2024 and to discuss and recommend the panel of examiners to the Academic Council
Item No. : BoS/ PG/CSE 7.6	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/ PG/ CSE 7.1

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

Chairman, BoS, apprised the minutes of 6<sup>th</sup> BoS, its implementation and then it is confirmed with the approval in 6<sup>th</sup> BoS meeting for the incorporation of following changes

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 recommended to rename "Basic of Blockchain" unit title to "Introduction to blockchain"
3	R-23	II	Advanced Operating Systems (P23CST205)	V	Experts recommended to include Tiny OS as a topic in unit V
4	R-23	II	Smart sensing for IOT (P23CSE210)	V	Experts recommended to rename "Preparing for IOT project as "IOT Projects"

**Item No. : BoS/ PG/ CSE 7.2**

To discuss and approve the Curriculum for 1 to 4 semesters and syllabi of third and fourth Semesters for the M.Tech Computer Science and Engineering students admitted from the academic year 2023-24 under the Regulation R-2023.

The M.Tech. Degree curriculum and syllabus approval of III and IV 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	P23CSE207	Smart Sensing for IoT	-	The paper need to be removed from elective.since already the curriculum has similar paper IoT and applications

The above correction was incorporated and approved by BoS members in 7<sup>th</sup> BoS meeting, and the details are enclosed in Annexure - IV.

**Item No. : BoS/ PG/ CSE 7.3**

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

The panel discussed about Results of II and IV semester and encouraged students to participate in Extra-Curricular and Co-Curricular activities

**Item No. : BoS/ PG/ CSE 7.4**

To apprise about the List of Courses for Professional Electives / Ability Enhancement Courses / Mandatory 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 / Mandatory Courses under R-2023 for the students admitted from the academic Year 2023-24 and the same was approved by BoS members

**Item No.:BoS/PG/CSE 7.5**

To apprise the schedule of the End Semester Examination to be conducted in the month of May/June 2024 and to discuss and recommend the panel of examiners to the Academic Council



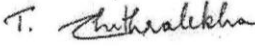


The list of question paper setters and Evaluators was presented and suggested to include government college faculties. The suggestion is incorporated and **(given in Annexure-III)**


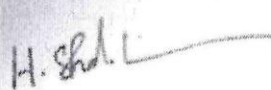



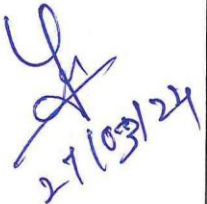


**Item No.:BoS/PG/CSE 7.6**





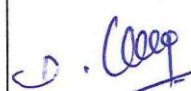



Any other item with the permission of chair





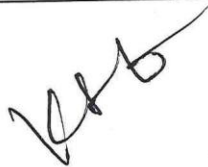


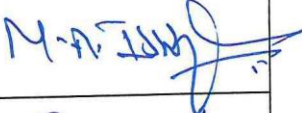
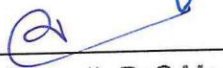
The panel discussed about bringing up new research topic in curriculum


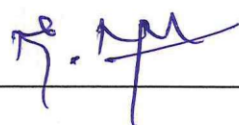


Sl.No	Name of the Member with Designation and official Address	Responsibility in the BoS	Signature
1.	<b>Dr.K. Premkumar, M.E., Ph.D.,</b> Professor and Head Sri Manakula Vinayagar Engineering College Madagadipet,Puducherry hodcse@smvec.ac.in 9842127679	Chairman	
2.	<b>Mr. M. Shanmugam, M.E.,(Ph.D.)</b> Associate Professor, Sri Manakula Vinayagar Engineering College Madagadipet,Puducherry shanmugam.mm@smvec.ac.in 9444370963	Member Secretary	
3.	<b>Dr. T. CHITHRALEKHA,</b> Professor, Department of Computer Science, School of Technology, Pondicherry University, Puducherry tchithralekha.csc@pondiuni.edu.in	Subject Expert (Pondicherry University Nominee)	
4.	<b>Dr. M. Ramakrishnan,</b> Professor and Head, School of Information Technology, Department of Computer Applications, Madurai Kamaraja University, Madurai. Ph:8939432261 Mail id: ramkrishod@gmail.com	Subject Expert (Academic Council Nominee)	
5.	<b>Dr. A. Kalaivani,</b> Professor, Department of Information Technology, Rajalakshmi Engineering College, Chennai.	Subject Expert (Academic Council Nominee)	

	7904977893 Mail: kalavanianbarasan@rediffmail.com		
6.	Aroulvel S, Technical leader, Cisco,Bangalore aroshanm@cisco.com, 9003898387	Representative from Industry	
7.	Shakin Banu. H Design Engineer Specialist British Telecommunication, UK shakin2cse@gmail.com 9791854301	Postgraduate Alumnus (nominated by the Principal)	
8.	<b>Dr. M. Ganesan, M.E., Ph.D.,</b> Associate Professor Sri Manakula Vinayagar Engineering College Madagadipet, Puducherry ganesan@smvec.ac.in 9486341535	Internal Member	
9.	<b>Dr. R. Ramachandiran, M.Tech., Ph.D.,</b> Associate Professor Sri Manakula Vinayagar Engineering College Madagadipet, Puducherry ramachandiran@smvec.ac.in 7639031674	Internal Member	 27/08/2024
10.	<b>Dr. T. Megala, M.Tech., Ph.D.,</b> Assistant Professor Sri Manakula Vinayagar Engineering College Madagadipet, Puducherry Email :Megalag26@gmail.com 9789722271	Internal Member	
11.	<b>Dr. J. Raja, M.Tech., Ph.D</b> Associate Professor, Computer Science and Engineering, Sri Manakula Vinyagar Engineering College Madagadipet, Puducherry Email id:rajacse@smvec.ac.in	Internal Member	 27/08/24
12.	<b>Dr. N. Pazhaniraja,</b> Associate Professor, Computer Science and Engineering, Sri Manakula Vinyagar Engineering College Email:pazhaniraja.cse@smvec.ac.in	Internal Member	
13.	<b>Mr. P. Karthikeyan</b> Associate Professor, Computer Science and Engineering, Sri Manakula Vinyagar Engineering	Internal Member	

	College Madagadipet, Puducherry Email: karthikcse@smvec.c.in		
14.	<b>Mr.B.Thiyagarajan</b> Assistant Professor Sri Manakula Vinayagar Engineering College Email: thiyagarajan@smvec.ac.in	Internal Member	
15.	<b>Mr.S.Kumarakrishnan</b> Assistant Professor Sri Manakula Vinayagar Engineering College Madagadipet, Puducherry Email: Skumarakrishnan@smvec.ac.in	Internal Member	
16.	<b>Mrs.C.Kalpāna</b> Assistant Professor Sri Manakula Vinayagar Engineering College Madagadipet, Puducherry Email: ckalpana@ smvec.ac.in	Internal Member	
17.	<b>Mrs.P.Bhavani</b> Assistant Professor Sri Manakula Vinayagar Engineering College Madagadipet, Puducherry Email: Bhavani@ smvec.ac.in	Internal Member	
18.	<b>Mr.D.Rajesh</b> Assistant Professor Sri Manakula Vinayagar Engineering College Madagadipet, Puducherry Email: successraju@gmail.com	Internal Member	
19.	<b>Mr.Arokiaraj Christian Hubert</b> Assistant Professor Sri Manakula Vinayagar Engineering College Madagadipet, Puducherry Email: Arokiaraj@smvec.ac.in	Internal Member	
20.	<b>Ms.Swathilakshmi.V</b> Assistant Professor Sri Manakula Vinayagar Engineering College Madagadipet, Puducherry Email: Swathilakshmi@gmail.com	Internal Member	
21.	<b>Mrs.Gajalakshmi</b> Assistant Professor Sri Manakula Vinayagar Engineering College Madagadipet, Puducherry Email: Gajalakshmicse@smvec.ac.in	Internal Member	

22.	<b>Mrs.S.Subasree</b> Assistant Professor Sri Manakula Vinayagar Engineering College Madagadipet,Puducherry Email:Subasree@smvec.ac.in	Internal Member	
23.	<b>Mrs.S.Deeba</b> Assistant Professor Sri Manakula Vinayagar Engineering College Madagadipet,Puducherry Email:deebacse@smvec.ac.in	Internal Member	
24.	<b>Mrs. R. Deepa</b> Assistant Professor Sri Manakula Vinayagar Engineering College Madagadipet,Puducherry Email:deepa.cse@smvec.ac.in	Internal Member	
25.	<b>Mrs.C.Karthika</b> Assistant Professor Sri Manakula Vinayagar Engineering College Madagadipet,Puducherry Email:karthikacse@smvec.ac.in	Internal Member	
26.	<b>Mr.K. Anbuthiruvaraman</b> Assistant Professor Sri Manakula Vinayagar Engineering College Madagadipet,Puducherry Anbuthiruvaraman.cse@smvec.ac.in	Internal Member	
27.	<b>Mrs.N.Suganya</b> Assistant Professor Sri Manakula Vinayagar Engineering College Madagadipet,Puducherry Suganya.cse@smvec.ac.in	Internal Member	
28.	<b>Ms.Nirmala Devi.P</b> Assistant Professor Sri Manakula Vinayagar Engineering College Madagadipet,Puducherry Nirmala.cse@smvec.ac.in	Internal Member	- AB -
29.	<b>Ms.N.Pavithra</b> Assistant Professor Sri Manakula Vinayagar Engineering College Madagadipet,Puducherry Pavithra.cse@smvec.ac.in	Internal Member	
30.	<b>Dr.M.A.IshrathJahan</b> Associate Professor, Department of English, SMVEC	Internal Member	
31.	<b>Dr.T.Jayavarthan</b>	Internal Member	

	Professor, Department of Physics, SMVEC		
32.	<b>Dr.S.Savithiri,</b> Professor and Head, Department of Chemistry, SMVEC	Internal Member	
33.	<b>Prof.K.Raja,</b> Assistant Professor, Department of Mathematics, SMVEC	Internal Member	

d.c



**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**



*D. P. S.*  
**Dr. K. PREMANKUMAR**  
Professor & Head  
Dept. of Computer Science and Engg.  
Sri Manakula Vinayagar Engg. College  
[An Autonomous Institution]

### 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.

### 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.

**STRUCTURE FOR POST GRADUATE ENGINEERING PROGRAM**

SI.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)	-
<b>Total</b>		<b>72</b>

**SCHEME OF CREDIT DISTRIBUTION – SUMMARY**

SI.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)*	-	-	-	-	-
<b>Total</b>		<b>21</b>	<b>22</b>	<b>17</b>	<b>12</b>	<b>72</b>

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

## CURRICULUM

SEMESTER – I										
Sl. No.	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
<b>Theory</b>										
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
<b>Practical</b>										
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
<b>Ability Enhancement Course</b>										
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
<b>Theory</b>										
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
<b>Practical</b>										
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
<b>Ability Enhancement Course</b>										
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

SEMESTER – III										
Sl. No.	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
<b>Theory</b>										
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
<b>Project Work</b>										
4	P23CSW301	Project Phase - I	PA	0	0	12	6	50	50	100
5	P23CSW302	Internship	PA	0	0	0	2	100	-	100
<b>Ability Enhancement Course</b>										
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
<b>Project Work</b>										
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

## ANNEXURE- I

## PROFESSIONAL ELECTIVE COURSES

Sl. No.	Course Code	Course Title
<b>Professional Elective-I</b>		
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
<b>Professional Elective-II</b>		
1	P23CSEC01	Information Visualization
2	P23CSE206	Malware Analysis
3	P23CSEC02	Soft Computing
4	P23BDEC01	Neural Networks
5	P23CSE207	Robotic Process Automation
<b>Professional Elective-III</b>		
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
<b>Professional Elective-IV</b>		
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
<b>Professional Elective-V</b>		
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
<b>Professional Elective-VI</b>		
1	P23CSE318	Big Data Technologies
2	P23CSE319	Digital Forensics
3	P23CSE320	Knowledge Engineering and Expert Systems
4	P23BDTD01	NoSQL Databases
5	P23CSE321	Industrial IoT

## 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

Academic Curriculum and Syllabi R-2023

36	P23XXCX36	Advance Java Programming
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

Academic Curriculum and Syllabi R-2023

74	P23XXCX74	Networking
75	P23XXCX75	Python Programming
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

Academic Curriculum and Syllabi R-2023

Department	<b>Computer Science and Engineering</b>		Programme: <b>M.Tech.</b>						
Semester	<b>III</b>		Course Category : <b>PE</b>			*End Semester Exam Type: <b>TE</b>			
Course Code	<b>P23BDEC03</b>		Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CAM	ESE	TM
Course Name	<b>Analytics of Things</b>		<b>3</b>	<b>-</b>	<b>-</b>	<b>3</b>	<b>40</b>	<b>60</b>	<b>100</b>
Common to M.Tech CSE(BDA) and M.Tech CSE									
Prerequisite	Basics of IoT								
Course Outcomes	<b>On completion of the course, the students will be able to</b>							BT Mapping (Highest Level)	
	<b>CO1</b>	Understand the specific challenges in applying data analytics techniques over IoT data.						<b>K2</b>	
	<b>CO2</b>	Will know IoT network architecture and design.						<b>K2</b>	
	<b>CO3</b>	Analyze Smart objects and connecting smart objects						<b>K3</b>	
	<b>CO4</b>	Analyze various IoT networking protocols.						<b>K3</b>	
<b>CO5</b>	Apply IoT analytics for cloud and data science for IoT analytics.						<b>K4</b>		
<b>UNIT- I</b>	<b>IoT Analytics, Challenges and Network Architectures</b>					<b>Periods: 9</b>			
IoT analytics: Defining Analytics, Defining Internet of Things, The concepts of constrained - IoT challenges: the Data volume, Problem with time and space, Data quality, Analytics Challenges -Business value concerns. Drivers behind New Network Architectures, Comparing IoT Architectures, A Simplified IoT Architecture, The Core IoT Functional Stack, IoT Data Management and Compute Stack.								<b>CO1</b>	
<b>UNIT- II</b>	<b>The Things in IoT and Connecting Smart Objects</b>					<b>Periods: 9</b>			
Sensors, Actuators, and Smart Objects, Sensor Networks, Communications Criteria, Range, Frequency Bands, Power Consumption, Topology, Constrained Devices, Constrained-Node Networks, IoT Access Technologies, IEEE 802.15.4, IEEE 802.15.4g and 802.15.4e, LoRaWAN.								<b>CO2</b>	
<b>UNIT- III</b>	<b>IoT Networking Protocols</b>					<b>Periods: 9</b>			
IoT networking data messaging protocols, Message Queue Telemetry Transport (MQTT), Hyper-Text Transport Protocol (HTTP), Constrained Application Protocol (CoAP), Data Distribution Service (DDS).								<b>CO3</b>	
<b>UNIT- IV</b>	<b>Data Science for IoT Analytics</b>					<b>Periods: 9</b>			
Machine learning (ML), Feature engineering with IoT data, Validation methods, Understanding the bias– variance tradeoff, Comparing different models to find the best fit using R, Random forest models using R, Anomaly detection using R.								<b>CO4</b>	
<b>UNIT- V</b>	<b>IoT Analytics for the Cloud</b>					<b>Periods: 9</b>			
Building elastic analytics, Elastic analytics concepts, designing for scale, Cloud security and analytics, The AWS overview, Microsoft Azure overview. Contemporary Issues								<b>CO5</b>	
<b>Lecture Periods: 45</b>		<b>Tutorial Periods: -</b>		<b>Practical Periods: -</b>		<b>Total Periods: 45</b>			
<b>Text Books</b>									
1. Andrew Minter , Analytics for the Internet of things, Packt publishing 2017.									
2. David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton and Jerome Henry, IoT Fundamentals: Networking Technologies, Protocols and Use Cases for Internet of Things, Cisco Press, 2017.									
3. Adeel Javed, "Building Arduino Projects for the Internet of Things: Experiments with Real-World Applications", 1st Edition, Apress, 2016.									
<b>Reference Books</b>									
1. Pethuru Raj, Anupama C. Raman, The Internet of Things, Enabling Technologies, Platforms, and Use Cases, CRC Press, 2017.									
2. Rajkumar Buyya, Amir Vahid Dastjerdi, Internet of Things Principles and Paradigms, Morgan Kaufmann, 1st edition, 2016.									
3. Marco Schwartz, Internet of Things with Arduino Cookbook, Packt Publishing,2016.									
4. Tausifa Jan Saleem, Mohammad Ahsan Chishti, "Big Data Analytics for Internet of Things", Wiley, 2021.									
5. Data Science Salon, "IoT and Analytics Condition Based Maintenance", Data Science Salon, 2020.									
<b>Web References</b>									
1. <a href="https://dl.acm.org/doi/10.1145/3204947">https://dl.acm.org/doi/10.1145/3204947</a>									
2. <a href="https://www.researchgate.net/publication/324475172_Analytics_for_the_Internet_of_Things_A_Survey">https://www.researchgate.net/publication/324475172_Analytics_for_the_Internet_of_Things_A_Survey</a>									
3. <a href="https://link.springer.com/article/10.1007/s43926-021-00016-5">https://link.springer.com/article/10.1007/s43926-021-00016-5</a>									
4. <a href="https://www.sciencedirect.com/science/article/pii/S2666603020300294">https://www.sciencedirect.com/science/article/pii/S2666603020300294</a>									
5. <a href="https://iot-analytics.com/">https://iot-analytics.com/</a>									

\* TE – Theory Exam, LE – Lab Exam

Academic Curriculum and Syllabi R-2023

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

Academic Curriculum and Syllabi R-2023

Department	<b>Computer Science and Engineering</b>		Programme: <b>M.Tech.</b>						
Semester	<b>III</b>		Course Category : <b>PE</b>			*End Semester Exam Type: <b>TE</b>			
Course Code	<b>P23CSE311</b>		Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CAM	ESE	TM
Course Name	<b>Cloud Security and Analytics</b>		<b>3</b>	<b>-</b>	<b>-</b>	<b>3</b>	<b>40</b>	<b>60</b>	<b>100</b>
Prerequisite	Basics of Cloud Computing								
Course Outcomes	<b>On completion of the course, the students will be able to</b>								BT Mapping (Highest Level)
	<b>CO1</b>	Comprehend the basics of cloud platforms and risk issues in cloud computing.							<b>K2</b>
	<b>CO2</b>	Understand cloud security architecture, challenges and requirements.							<b>K2</b>
	<b>CO3</b>	Understand the functionalities of security protocols.							<b>K2</b>
	<b>CO4</b>	Identifying best practices and strategies for a secure cloud environment.							<b>K3</b>
	<b>CO5</b>	Illustrate how to perform security analytics in cloud platform.							<b>K4</b>
<b>UNIT- I</b>	<b>Securing the cloud</b>					<b>Periods: 9</b>			
Cloud platforms and architectures Security issues from the cloud providers perspective, users perspective Understanding security and privacy - Cloud Computing risk issues. Security challenges Security requirements for the architecture - Securing private and public clouds Security patterns Cloud security architecture Infrastructure security.									<b>CO1</b>
<b>UNIT- II</b>	<b>Security Protocols and Standards</b>					<b>Periods: 9</b>			
Host security, Compromise response, Security standards Message Level Security (MLS), Transport Level Security, OAuth, OpenID, eXtensible Access Control Markup Language (XACML), and Security Assertion Markup Language (SAML).									<b>CO2</b>
<b>UNIT- III</b>	<b>Strategies and Security management in the Cloud</b>					<b>Periods: 9</b>			
Strategies and best practices Security controls: limits, best practices, monitoring Security criteria -assessing risk factors in Clouds. Security management in the cloud: SaaS, PaaS, IaaS availability management Security as a service-Trust Management for Security.									<b>CO3</b>
<b>UNIT- IV</b>	<b>Security Analytics I</b>					<b>Periods: 9</b>			
Techniques in Analytics - Challenges in Intrusion Detection System and Incident Identification DDoS attacks Analytics - Analysis of Log file - Simulation and Security Process.									<b>CO4</b>
<b>UNIT- V</b>	<b>Security Analytics II</b>					<b>Periods: 9</b>			
Access Analytics - Security Analysis with Text Mining Security Intelligence and Breaches									<b>CO5</b>
<b>Lecture Periods: 45</b>		<b>Tutorial Periods: -</b>		<b>Practical Periods: -</b>		<b>Total Periods: 45</b>			
<b>Text Books</b>									
1. Ronald L. Krutz , Russell Dean Vines, Cloud Security: A Comprehensive Guide to Secure Cloud computing, Wiley 2010									
2. Securing the Cloud: Cloud Computer Security Techniques and Tactics, by Vic (J.R) Winkler, Elsevier 2011									
3. Ben Halpert , Auditing Cloud Computing: A Security and Privacy Guide: , John Wiley Sons, 2011.									
<b>Reference Books</b>									
1. Ianlim, E.Coleen Coolidge, Paul Hourani, Securing Cloud and Mobility: A Practitioners Guide, Auerbach Publications, Feb 2013.									
2. Pethuru Raj, "Cloud Enterprise Architecture", CRC Press, 2013.									
3. Raj Kumar Buyya , James Broberg, andrzejGoscinski, Cloud Computing:!!, Wiley 2013									
4. Dave shackleford, Virtualization Security!, SYBEX a wiley Brand 2013.									
5. Mather, Kumaraswamy and Latif, Cloud Security and Privacy!, OREILLY 2011									
<b>Web References</b>									
<a href="https://aws.amazon.com/security/">https://aws.amazon.com/security/</a>									
<a href="https://jisajournal.springeropen.com/articles/10.1186/1869-0238-4-5">https://jisajournal.springeropen.com/articles/10.1186/1869-0238-4-5</a>									
<a href="https://www.mdpi.com/2673-8732/3/3/18">https://www.mdpi.com/2673-8732/3/3/18</a>									
<a href="https://cloud.google.com/learn/what-is-cloud-network-security">https://cloud.google.com/learn/what-is-cloud-network-security</a>									
<a href="https://www.sailpoint.com/identity-library/cloud-security-defined/">https://www.sailpoint.com/identity-library/cloud-security-defined/</a>									

\* 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	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

Academic Curriculum and Syllabi R-2023

Department	<b>Computer Science and Engineering</b>		Programme: <b>M.Tech.</b>						
Semester	<b>III</b>		Course Category : <b>PE</b>			*End Semester Exam Type: <b>TE</b>			
Course Code	<b>P23CSE312</b>		Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CAM	ESE	TM
Course Name	<b>Pattern Recognition</b>		<b>3</b>	<b>-</b>	<b>-</b>	<b>3</b>	<b>40</b>	<b>60</b>	<b>100</b>
Prerequisite	No pre request needed								
Course Outcomes	<b>On completion of the course, the students will be able to</b>							BT Mapping (Highest Level)	
	<b>CO1</b>	Understanding Pattern recognition						<b>K2</b>	
	<b>CO2</b>	Classification and different approaches of algorithms						<b>K3</b>	
	<b>CO3</b>	Identify different Paradigms of Pattern Recognition						<b>K3</b>	
	<b>CO4</b>	Make use of Feature Extraction						<b>K2</b>	
<b>CO5</b>	Illustrate Advances in Pattern Recognition						<b>K4</b>		
<b>UNIT- I</b>	<b>Introduction</b>					<b>Periods: 9</b>			
Introduction – Definitions, data sets for Pattern, Application Areas and Examples of pattern recognition, Design principles of pattern recognition system, Classification and clustering, supervised Learning, unsupervised learning and adaptation, Pattern recognition approaches, Decision Boundaries, Decision region , Metric spaces, distances.									<b>CO1</b>
<b>UNIT- II</b>	<b>Classification</b>					<b>Periods: 9</b>			
Classification: introduction, application of classification, types of classification, decision tree, naïve bayes, logistic regression , support vector machine, random forest, K Nearest Neighbour Classifier and variants, Efficient algorithms for nearest neighbour classification, Different Approaches to Prototype Selection, Combination of Classifiers, Training set, test set, standardization and normalization.									<b>CO2</b>
<b>UNIT- III</b>	<b>Pattern Recognition</b>					<b>Periods: 9</b>			
Different Paradigms of Pattern Recognition, Representations of Patterns and Classes, Unsupervised Learning & Clustering: Criterion functions for clustering, Clustering Techniques: Iterative square - error partitionial clustering – K means, hierarchical clustering, Cluster validation.									<b>CO3</b>
<b>UNIT- IV</b>	<b>Feature Extraction</b>					<b>Periods: 9</b>			
Introduction of feature extraction and feature selection, types of feature extraction , Problem statement and Uses, Algorithms - Branch and bound algorithm, sequential forward / backward selection algorithms, (I,r) algorithm.									<b>CO4</b>
<b>UNIT- V</b>	<b>Advances in Pattern Recognition</b>					<b>Periods: 9</b>			
Recent advances in Pattern Recognition, Structural PR, SVMs, FCM, Soft computing and Neuro-fuzzy techniques, and real-life examples, Histograms rules, Density Estimation, Nearest Neighbor Rule, Fuzzy classification.									<b>CO5</b>
<b>Lecture Periods: 45</b>		<b>Tutorial Periods: -</b>		<b>Practical Periods: -</b>		<b>Total Periods: 45</b>			
<b>Text Books</b>									
1. Richard O. Duda, Peter E. Hart and David G. Stork, "Pattern Classification", 2nd Edition, John Wiley, 2006.									
2. C. M. Bishop, "Pattern Recognition and Machine Learning", Springer, 2009.									
3. S. Theodoridis and K. Koutroumbas, "Pattern Recognition", 4th Edition, academic Press, 2009.									
<b>Reference Books</b>									
1. Robert Schalkoff, "pattern Recognition: statistical, structural and neural approaches", JohnWiley & sons , Inc, 2007.									
2. Shinghal Rajjan, "Pattern Recognition: Techniques and Applications", OUP India, 2006.									
3. Sankar K Pal, Amita Pal, "Pattern Recognition: from classical to Modern approach", World Scientific, 2001									
4. Murty M. Narasimha, "Pattern Recognition;An Algorithmic approach", Springer London Ltd, 2011									
5. Marques de Sa J.P, "Pattern Recognition: Concepts,Methods and Applications", Springer-Verlag Berlin and Heidelberg GmbH & Co. KG, 2001									
<b>Web References</b>									
1. <a href="https://www.sciencedirect.com/journal/pattern-recognition">https://www.sciencedirect.com/journal/pattern-recognition</a>									
2. <a href="https://www.cambridge.org/core/books/abs/pattern-recognition-and-neural-networks/references">https://www.cambridge.org/core/books/abs/pattern-recognition-and-neural-networks/references</a>									
3. <a href="https://www.spiceworks.com/tech/artificial-intelligence/articles/what-is-pattern-recognition/">https://www.spiceworks.com/tech/artificial-intelligence/articles/what-is-pattern-recognition/</a>									
4. <a href="https://www.geeksforgeeks.org/pattern-recognition-introduction/">https://www.geeksforgeeks.org/pattern-recognition-introduction/</a>									
5. <a href="https://viso.ai/deep-learning/pattern-recognition/">https://viso.ai/deep-learning/pattern-recognition/</a>									

\* 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	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

Academic Curriculum and Syllabi R-2023

Department	<b>Computer Science and Engineering</b>		Programme: <b>M.Tech.</b>						
Semester	<b>III</b>		Course Category : <b>PE</b>			*End Semester Exam Type: <b>TE</b>			
Course Code	<b>P23CSEC05</b>		Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CAM	ESE	TM
Course Name	<b>Game Design and Augmented Reality</b>		<b>3</b>	<b>-</b>	<b>-</b>	<b>3</b>	<b>40</b>	<b>60</b>	<b>100</b>
Common to M.Tech CSE and M.Tech CSE(BDA)									
Prerequisite	Basic knowledge about AR								
Course Outcomes	<b>On completion of the course, the students will be able to</b>							BT Mapping (Highest Level)	
	<b>CO1</b>	Learn and understand the AR world and setting up the environment.						<b>K3</b>	
	<b>CO2</b>	Understand the building of AR App						<b>K3</b>	
	<b>CO3</b>	Set up the AR Solar System and Flat Tire.						<b>K3</b>	
	<b>CO4</b>	Set up the Room Decoration with AR and AR instruction manual.						<b>K4</b>	
<b>CO5</b>	Develop the Poke the Ball Game.						<b>K5</b>		
<b>UNIT- I</b>	<b>Augment your world and setting up your system</b>					<b>Periods: 9</b>			
Augmented Reality Applications - AR Development Tools and Frameworks - User Interaction in AR - AR Content Creation and Design - Social and Ethical Implications of AR.								<b>CO1</b>	
<b>UNIT- II</b>	<b>Building our AR App and Augmented Business Cards</b>					<b>Periods: 9</b>			
Conceptualizing the AR Experience - Choosing the Right AR Development Platform - Designing AR User Interfaces - Integrating AR Features with Unity (or other AR Engines) - Testing and Iterating on Your AR App.								<b>CO2</b>	
<b>UNIT- III</b>	<b>AR Solar system and how to change a flat tire</b>					<b>Periods: 9</b>			
Solar System Exploration in AR – Educational AR Apps for Astronomy – AR Planetarium Navigation – Augmented Reality Solar System Models – Preparation and Safety Measures – Installing the Spare Tire and Finishing the Process.								<b>CO3</b>	
<b>UNIT- IV</b>	<b>Augmenting the instruction manual and room decoration with AR</b>					<b>Periods: 9</b>			
Interactive Step-by-Step Guides - Product Demos and Simulations - AR Troubleshooting and Maintenance - User Feedback and Ratings - Virtual Furniture Placement - Customizable Virtual Decor - AR Art Galleries and Displays - Seasonal and Themed Decorations.								<b>CO4</b>	
<b>UNIT- V</b>	<b>Poke the Ball Game</b>					<b>Periods: 9</b>			
Poke Game Mechanics - Scoring System - Levels and Challenges - Visual Design and Theme - Leaderboards and Social Features.								<b>CO5</b>	
<b>Lecture Periods: 45</b>		<b>Tutorial Periods: -</b>		<b>Practical Periods: -</b>		<b>Total Periods: 45</b>			
<b>Text Books</b>									
1. Micheal Lanham, "Augmented Reality for Developers: Build practical augmented reality applications with Unity, ARCore, ARKit, and Vuforia", packt Publishing, 2017.									
2. Dominic Cushnan, Sean White, "Unity AR & VR by Tutorials", Razeware LLC, 2019.									
3. Jonathan Linowes, "Title: ARCore by Example", Packt Publishing, 2018.									
<b>Reference Books</b>									
1. Raghav Sood, Mastering Unity 2D Game Development - Second Edition, Packt Publishing, 2018.									
2. Greg Kipper, Joseph Rampolla, "Augmented Reality: An Emerging Technologies Guide to AR Publication: Syngress", 2013.									
4. Daniel M. Kligler, "Beginning Windows Mixed Reality Programming: For HoloLens and Mixed Reality Headsets", Apress, 2017.									
4. Jason Odom, "Mastering Unreal Technology, Volume I: Introduction to Level Design with Unreal Engine 3", Sams Publishing, 2009.									
5. Palmer Luckey, Blake J. Harris, "The History of the Future: Oculus, Facebook, and the Revolution That Swept Virtual Reality", HarperCollins, 2019									
<b>Web References</b>									
1. <a href="https://taqtile.com/ebook-augmented-reality-training-software">https://taqtile.com/ebook-augmented-reality-training-software</a>									
2. <a href="https://docs.unity3d.com/Packages/com.unity.xr.arfoundation@5.1/manual/index.html">https://docs.unity3d.com/Packages/com.unity.xr.arfoundation@5.1/manual/index.html</a>									
3. <a href="https://docs.unity3d.com/Packages/com.unity.xr.arkit@1.0/manual/index.html">https://docs.unity3d.com/Packages/com.unity.xr.arkit@1.0/manual/index.html</a>									
4. <a href="https://github.com/google-ar/arcore-unity-sdk">https://github.com/google-ar/arcore-unity-sdk</a>									
5. <a href="https://developers.google.com/ar/develop/unity">https://developers.google.com/ar/develop/unity</a>									

\* 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	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	10	15	10	5	60	100

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

Academic Curriculum and Syllabi R-2023

Department	<b>Computer Science and Engineering</b>		Programme: <b>M.Tech.</b>							
Semester	<b>III</b>		Course Category : <b>PE</b>			*End Semester Exam Type: <b>TE</b>				
Course Code	<b>P23CSE313</b>		Periods / Week			Credit	Maximum Marks			
			L	T	P	C	CAM	ESE	TM	
Course Name	<b>IoT Security and Trust</b>		<b>3</b>	<b>-</b>	<b>-</b>	<b>3</b>	<b>40</b>	<b>60</b>	<b>100</b>	
Prerequisite	Wireless Sensor Networks and IoT									
Course Outcomes	<b>On completion of the course, the students will be able to</b>							BT Mapping (Highest Level)		
	<b>CO1</b>	Understanding encryption for cyber security							<b>K2</b>	
	<b>CO2</b>	Identify IoT security framework							<b>K3</b>	
	<b>CO3</b>	Illustrate Elementary blocks of IoT Security & Models for Identity Management							<b>K4</b>	
	<b>CO4</b>	Identity Management and Trust Establishment							<b>K3</b>	
<b>CO5</b>	Analyze Security, Digital Identity in Cloud Computing and Cyber Crimes							<b>K3</b>		
<b>UNIT- I</b>	<b>Fundamentals of encryption for cyber security.</b>					<b>Periods: 9</b>				
Cryptography – Need and the Mathematical basics- History of cryptography, symmetric ciphers, block ciphers, DES – AES. Public-key cryptography: RSA, Diffie-Hellman Algorithm, Elliptic Curve Cryptosystems, Algebraic structure, Triple Data Encryption Algorithm (TDEA) Block cipher									<b>CO1</b>	
<b>UNIT- II</b>	<b>IoT security framework</b>					<b>Periods: 9</b>				
IIOT security frame work, Security in hardware, Bootprocess, OS & Kernel, application, run time environment and containers. Need and methods of Edge Security, Network Security: Internet, Intranet, LAN, Wireless Networks, Wireless cellular networks, Cellular Networks and VOIP.									<b>CO2</b>	
<b>UNIT- III</b>	<b>Elementary blocks of IoT Security &amp; Models for Identity Management</b>					<b>Periods: 9</b>				
Vulnerability of IoT and elementary blocks of IoT Security, Threat modeling – Key elements. Identity management Models and Identity management in IoT, Approaches using User-centric, Device-centric and Hybrid.									<b>CO3</b>	
<b>UNIT- IV</b>	<b>Identity Management and Trust Establishment</b>					<b>Periods: 9</b>				
Trust management lifecycle, Identity and Trust, Web of trust models. Establishment: Cryptosystems – Mutual establishment phases – Comparison on security analysis. Identity management framework. Capability-based access control schemes, Concepts, identity-based and identity-driven, Light weight cryptography, need and methods.									<b>CO4</b>	
<b>UNIT- V</b>	<b>Security, Digital Identity in Cloud Computing and Cyber Crimes</b>					<b>Periods: 9</b>				
Cloud security, Digital identity management in cloud, Classical solutions, alternative solutions, Management of privacy and personal data in Cloud. Cyber Crimes and Laws – Hackers – Dealing with the rise tide of Cyber Crimes – Cyber Forensics and incident Response – Network Forensics.									<b>CO5</b>	
<b>Lecture Periods: 45</b>			<b>Tutorial Periods: -</b>			<b>Practical Periods: -</b>		<b>Total Periods: 45</b>		
<b>Text Books</b>										
1. John R. Vacca, "Computer and Information Security Handbook", Elsevier, 2013.										
2. Parikshit Narendra Mahalle, Poonam N. Railkar, "Identity Management for Internet of Things", River Publishers, 2015.										
3. William Stallings, "Cryptography and Network security: Principles and Practice", 5th Edition, Pearson Education, India. 2014.										
<b>Reference Books</b>										
1. Maryline Laurent, Samia Bouzefrane, "Digital Identity Management", Elsevier, 2015.										
2. Christof Paar and Jan Pelzl, "Understanding Cryptography – A Textbook for Students and Practitioners", Springer, 2014.										
3 Behrouz A. Forouzan : Cryptography & Network Security – The McGraw Hill Company, 2007.										
4. Charlie Kaufman, Radia Perlman, Mike Speciner, Network Security: "Private Communication in a public World", PTR Prentice Hall, Second Edition, 2002.										
5. Alasdair Gilchrist, "IoT security Issues", O'Reilly publications, 2017										
<b>Web References</b>										
1. <a href="https://www.sciencedirect.com/science/article/abs/pii/S2542660522001214">https://www.sciencedirect.com/science/article/abs/pii/S2542660522001214</a>										
2. <a href="https://dl.acm.org/doi/10.1145/3325112.3325234">https://dl.acm.org/doi/10.1145/3325112.3325234</a>										
3. <a href="https://www.internet-society.org/wp-content/uploads/2018/05/iot_trust_framework2.5a_EN.pdf">https://www.internet-society.org/wp-content/uploads/2018/05/iot_trust_framework2.5a_EN.pdf</a>										
4. <a href="https://ieeexplore.ieee.org/document/9187908">https://ieeexplore.ieee.org/document/9187908</a>										
5. <a href="https://link.springer.com/article/10.1007/s42452-021-04156-9">https://link.springer.com/article/10.1007/s42452-021-04156-9</a>										

\* TE – Theory Exam, LE – Lab Exam

Academic Curriculum and Syllabi R-2023

**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

Department	<b>Computer Science and Engineering</b>		Programme: <b>M.Tech.</b>						
Semester	<b>III</b>		Course Category : <b>PE</b>		*End Semester Exam Type: <b>TE</b>				
Course Code	<b>P23CSEC06</b>		Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CAM	ESE	TM
Course Name	<b>Image and Video Analytics</b>		<b>3</b>	<b>-</b>	<b>-</b>	<b>3</b>	<b>40</b>	<b>60</b>	<b>100</b>
Common to M.Tech CSE and M.Tech CSE(BDA)									
Prerequisite	No Prerequisite								
Course Outcomes	<b>On completion of the course, the students will be able to</b>							BT Mapping (Highest Level)	
	<b>CO1</b>	Understand the requirements of image processing						<b>K2</b>	
	<b>CO2</b>	Illustrate the principles and techniques of digital image in applications related to digital imaging system						<b>K4</b>	
	<b>CO3</b>	Demonstrate the image recognition and motion recognition						<b>K3</b>	
	<b>CO4</b>	Understand the fundamentals of digital video processing						<b>K2</b>	
<b>CO5</b>	Design and Analysis of video processing in application						<b>K4</b>		
<b>UNIT- I</b>	<b>Image Segmentation, Compression and Colour Image Processing</b>					<b>Periods: 9</b>			
Basic steps of Image processing system – Pixel relationship- Image Transforms-. Image Enhancement- Histogram Processing, Spatial filtering, Frequency Domain filtering - Image Segmentation –Detection of Discontinuities. - Edge Linking and Boundary Detection. - Thresholding. -Region-Based Segmentation. Image Compression – Encoder-Decoder model, Lossy and Lossless compression, Huffman Coding, Arithmetic Coding, JPEG, JPEG 2000. Colour Image Processing – Colour Models, Color Transformations Color Image Smoothing and Sharpening, Color Noise Reduction, Color-Based Image Segmentation								<b>CO1</b>	
<b>UNIT- II</b>	<b>Feature extraction and Texture Analysis</b>					<b>Periods: 9</b>			
Feature Extraction - Binary object feature, Histogram-based (Statistical) Features, Intensity features, Shape feature extraction, PCA - SIFT – SURF. Texture Analysis - Concepts and classification, statistical, structural and spectral analysis.								<b>CO2</b>	
<b>UNIT- III</b>	<b>Object recognition and Image Retrieval</b>					<b>Periods: 9</b>			
Object Recognition -Patterns and pattern class, Bayes' Parametric classification, Feature Selection and Boosting, Template-Matching. Content Based Image Retrieval - Feature based image retrieval, Object Based Retrieval								<b>CO3</b>	
<b>UNIT- IV</b>	<b>Digital video processing, Segmentation and Tracking</b>					<b>Periods: 9</b>			
Digital Video, Sampling of video signal, Video Enhancement and Noise Reduction- Rate control and buffering, MPEG, H.264, Inter frame Filtering Techniques, Fundamentals of Motion Estimation and Motion Compensation - Change Detection, Background modelling, Motion Segmentation, Simultaneous Motion Estimation and Segmentation, Motion Tracking, Multi-target/Multi-camera tracking								<b>CO4</b>	
<b>UNIT- V</b>	<b>Video Analysis Action Recognition</b>					<b>Periods: 9</b>			
Video Analysis Action Recognition, Video based rendering, Context and scene understanding. Case Study: Surveillance - Advanced Driver Assistance System								<b>CO5</b>	
<b>Lecture Periods: 45</b>		<b>Tutorial Periods: -</b>		<b>Practical Periods: -</b>		<b>Total Periods: 45</b>			
<b>Text Books</b>									
1. Rafael C. Gonzalez and Richard E. Woods, "Digital Image Processing", Third Ed., Prentice-Hall, 2008									
2. Murat Tekalp, "Digital Video Processing", Second Edition, Prentice Hall, 2015.									
3. Milan Sonka, Vaclav Hlavac, Roger Boyle, Image Processing, Analysis, and Machine Vision, 4nd edition, Thomson Learning, 2013									
<b>Reference Books</b>									
1. Oge Marques, "Practical Image and Video Processing Using MATLAB", Wiley-IEEE Press,2011									
2. Yu Jin Zhang, "Image Engineering: Processing, Analysis and Understanding", Tsinghua University Press, 2009.									
3. Mark Nixon and Alberto S. Aquado, "Feature Extraction & Image Processing for Computer Vision", Third Edition, Academic Press, 2012									
4. Richard Szeliski, "Computer Vision: Algorithms and Applications", Springer, 2010									
5. Boguslaw Cyganek, "Object Detection and Recognition in Digital Images: Theory and Practice", Wiley 2013									
<b>Web References</b>									
<a href="https://www.sciencedirect.com/topics/computer-science/video-analytics">https://www.sciencedirect.com/topics/computer-science/video-analytics</a>									
<a href="https://dl.acm.org/doi/10.1145/3576935">https://dl.acm.org/doi/10.1145/3576935</a>									
<a href="https://cloudinary.com/documentation/video_analytics">https://cloudinary.com/documentation/video_analytics</a>									
<a href="https://www.happiestminds.com/services/image-processing-text-audio-video-analytics/">https://www.happiestminds.com/services/image-processing-text-audio-video-analytics/</a>									
<a href="https://ieeexplore.ieee.org/document/9362900">https://ieeexplore.ieee.org/document/9362900</a>									

\* TE – Theory Exam, LE – Lab Exam

Academic Curriculum and Syllabi R-2023

**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	10	15	10	5	60	100

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

Academic Curriculum and Syllabi R-2023

Department	<b>Computer Science and Engineering</b>		Programme: <b>M.Tech.</b>						
Semester	<b>III</b>		Course Category : <b>PE</b>			*End Semester Exam Type: <b>TE</b>			
Course Code	<b>P23CSE314</b>		Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CAM	ESE	TM
Course Name	<b>Web Application Security</b>		<b>3</b>	<b>-</b>	<b>-</b>	<b>3</b>	<b>40</b>	<b>60</b>	<b>100</b>
Prerequisite	Basics of Web application								
Course Outcomes	<b>On completion of the course, the students will be able to</b>							BT Mapping (Highest Level)	
	<b>CO1</b>	Identify the vulnerabilities in the web applications.						<b>K2</b>	
	<b>CO2</b>	Identify the various types of threats and mitigation measures of web applications.						<b>K2</b>	
	<b>CO3</b>	Apply the security principles in developing a reliable web application.						<b>K4</b>	
	<b>CO4</b>	Use industry standard tools for web application security.						<b>K2</b>	
<b>CO5</b>	Apply penetration testing to improve the security of web applications.						<b>K4</b>		
<b>UNIT- I</b>	<b>Overview of Web Applications</b>					<b>Periods: 9</b>			
Introduction history of web applications interface ad structure benefits and drawbacks of web applications Web application Vs Cloud application. Web Application Security Fundamentals ,Security Fundamentals: Input Validation - Attack Surface Reduction Rules of Thumb- Classifying and Prioritizing Threads- Browser Security Principles -Origin Policy - Exceptions to the Same-Origin Policy - Cross-Site Scripting and Cross-Site Request Forgery - Reflected XSS - HTML Injection								<b>CO1</b>	
<b>UNIT- II</b>	<b>Web Application Vulnerabilities</b>					<b>Periods: 9</b>			
Web Application Vulnerabilities -Understanding vulnerabilities in traditional client server application and web applications, client state manipulation, cookie based attacks, SQL injection, cross domain attack (XSS/XSRF/XSSI) http header injection. SSL vulnerabilities and testing - Proper encryption use in web application- Session vulnerabilities and testing - Cross-site request forgery								<b>CO2</b>	
<b>UNIT- III</b>	<b>Web Application Mitigations</b>					<b>Periods: 9</b>			
Web Application Mitigations -Http request , http response, rendering and events , html image tags, image tag security, issue, java script on error , Java script timing , port scanning , remote scripting , running remote code, frame and iframe , browser sandbox, policy goals, same origin policy, library import, domain relaxation								<b>CO3</b>	
<b>UNIT- IV</b>	<b>Secure website design</b>					<b>Periods: 9</b>			
Secure website design : Architecture and Design Issues for Web Applications, Deployment Considerations Input Validation, Authentication, Authorization, Configuration Management ,Sensitive Data, Session Management, Cryptography, Parameter Manipulation, Exception Management, Auditing and Logging, Design Guidelines, Forms and validity, Technical implementation								<b>CO4</b>	
<b>UNIT- V</b>	<b>Web Application Security</b>					<b>Periods: 9</b>			
Cutting Edge Web Application Security -Clickjacking - DNS rebinding - Flash security - Java applet security - Single-sign-on solution and security -IPv6 impact on web security								<b>CO5</b>	
<b>Lecture Periods: 45</b>		<b>Tutorial Periods: -</b>		<b>Practical Periods: -</b>		<b>Total Periods: 45</b>			
<b>Text Books</b>									
1. Sullivan, Bryan, and Vincent Liu. Web Application Security, A Beginner's Guide. McGraw Hill Professional, 2011.									
2. Stuttard, Dafydd, and Marcus Pinto. The Web Application Hacker's Handbook: Finding and Exploiting Security Flaws. John Wiley Sons, 2011									
3. Cross M, "Developer'S Guide To Web Application Security", Elsevier, 2007.									
<b>Reference Books</b>									
1. Carlos serao, "Web Application Security", Springer-Verlag Berlin and Heidelberg GmbH & Co. KG, 2009.									
2. Andrew Hoffman, "Web Application Security: Exploitation and Countermeasures for Modern Web Applications", O'Reilly, 2020									
3. Dafydd Stuttard and Marcus Pinto, "The Web Application Hacker's Handbook: Finding and Exploiting Security Flaws", Wiley, 2011									
4. Malcolm McDonald "Grokking Web Application Security", MEAP,2024									
5. Dr Sunny Wear, "Burp Suite Cookbook - Second Edition: Web application security made easy with Burp Suite", Packt Publishing, 2023									
<b>Web References</b>									
<a href="https://www.imperva.com/learn/application-security/web-application-security/">https://www.imperva.com/learn/application-security/web-application-security/</a>									
<a href="https://www.cuit.columbia.edu/sites/default/files/content/Web%20Application%20Security%20Standards%20and%20Practices.pdf">https://www.cuit.columbia.edu/sites/default/files/content/Web%20Application%20Security%20Standards%20and%20Practices.pdf</a>									
<a href="https://www.w3.org/2019/03/webappsec-2019-charter.html">https://www.w3.org/2019/03/webappsec-2019-charter.html</a>									
<a href="https://ieeexplore.ieee.org/document/8342469/">https://ieeexplore.ieee.org/document/8342469/</a>									
<a href="https://owasp.org/www-project-top-ten/">https://owasp.org/www-project-top-ten/</a>									

\* 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	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

Academic Curriculum and Syllabi R-2023

Department	<b>Computer Science and Engineering</b>		Programme: <b>M.Tech.</b>						
Semester	<b>III</b>		Course Category : <b>PE</b>			*End Semester Exam Type: <b>TE</b>			
Course Code	<b>P23CSE315</b>		Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CAM	ESE	TM
Course Name	<b>Cognitive Science</b>		<b>3</b>	<b>-</b>	<b>-</b>	<b>3</b>	<b>40</b>	<b>60</b>	<b>100</b>
Prerequisite	No pre request needed								
Course Outcomes	<b>On completion of the course, the students will be able to</b>							BT Mapping (Highest Level)	
	<b>CO1</b>	Understand basics of Cognitive Computing						<b>K2</b>	
	<b>CO2</b>	Plan and use the primary tools associated with cognitive computing						<b>K2</b>	
	<b>CO3</b>	Plan and execute a project that leverages Cognitive Computing						<b>K2</b>	
	<b>CO4</b>	Make use of Learning models of Cognition						<b>K3</b>	
<b>CO5</b>	Analyze Case Studies of Cognition						<b>K3</b>		
<b>UNIT- I</b>	<b>Introduction</b>					<b>Periods: 9</b>			
Cognitive science and cognitive Computing with AI, Cognitive Computing - Cognitive Psychology - The Architecture of the Mind - The Nature of Cognitive Psychology – Cognitive architecture – Cognitive processes – The Cognitive Modeling Paradigms - Declarative / Logic based Computational cognitive modeling –connectionist models – Bayesian models. Introduction to Knowledge-Based AI – Human Cognition on AI – Cognitive Architectures								<b>CO1</b>	
<b>UNIT- II</b>	<b>Cognitive Computing with Inference and Decision Support Systems</b>					<b>Periods: 9</b>			
Intelligent Decision making, Fuzzy Cognitive Maps, Learning algorithms: Non linear Hebbian Learning – Data driven NHL - Hybrid learning, Fuzzy Grey cognitive maps, Dynamic Random fuzzy cognitive Maps.								<b>CO2</b>	
<b>UNIT- III</b>	<b>Cognitive Computing with Machine Learning</b>					<b>Periods: 9</b>			
Machine learning Techniques for cognitive decision making – Hypothesis Generation and Scoring - Natural Language Processing - Representing Knowledge - Taxonomies and Ontologies - Deep Learning.								<b>CO3</b>	
<b>UNIT- IV</b>	<b>Learning models of Cognition</b>					<b>Periods: 9</b>			
Learning as Conditional Inference – Learning with a Language of Thought – Hierarchical Models-Learning (Deep) Continuous Functions – Mixture Models.								<b>CO4</b>	
<b>UNIT- V</b>	<b>Case Studies</b>					<b>Periods: 9</b>			
Cognitive Systems in health care – Cognitive Assistant for visually impaired – AI for cancer detection, Predictive Analytics - Text Analytics - Image Analytics -Speech Analytics – IBM Watson								<b>CO5</b>	
<b>Lecture Periods: 45</b>		<b>Tutorial Periods: -</b>		<b>Practical Periods: -</b>		<b>Total Periods: 45</b>			
<b>Text Books</b>									
1 Hurwitz, Kaufman, and Bowles, "Cognitive Computing and Big Data Analytics",Wiley, Indianapolis, IN, 2005..									
2 Masood, Adnan, Hashmi, Adnan,"Cognitive Computing Recipes-Artificial Intelligence Solutions Using Microsoft Cognitive Services and TensorFlow", 2015									
3.Vijay V Raghavan,Venkat N.Gudivada, VenuGovindaraju, C.R. Rao, "Cognitive Computing: Theory and Applications: (Handbook of Statistics 35)", Elsevier publications, 2016.									
<b>Reference Books</b>									
1.Judith Hurwitz, Marcia Kaufman, Adrian Bowles, Cognitive Computing and Big Data Analytics, Wiley Publications, 2015									
2.Robert A. Wilson, Frank C. Keil, "The MIT Encyclopedia of the Cognitive Sciences",The MIT Press, 1999									
3 Peter Fingar, Cognitive Computing: A Brief Guide for Game Changers, PHI Publication, 2015									
4 Gerardus Blokdyk ,Cognitive Computing Complete Self-Assessment Guide, 2018									
5 Rob High, Tanmay Bakshi, Cognitive Computing with IBM Watson: Build smart applications using Artificial Intelligence as a service, IBM Book Series.									
<b>Web References</b>									
1. <a href="https://hcil.umd.edu/tutorial-cognitive-science-in-hcil/">https://hcil.umd.edu/tutorial-cognitive-science-in-hcil/</a>									
2. <a href="https://groups.inf.ed.ac.uk/teaching/cogsci/course/tutorials">https://groups.inf.ed.ac.uk/teaching/cogsci/course/tutorials</a>									
3. <a href="http://www.digimat.in/nptel/courses/video/109104123/L01.html">http://www.digimat.in/nptel/courses/video/109104123/L01.html</a>									
4. <a href="https://www.youtube.com/watch?v=LTThJMTew8">https://www.youtube.com/watch?v=LTThJMTew8</a>									
5. <a href="https://emeritus.org/blog/healthcare-cognitive-science/">https://emeritus.org/blog/healthcare-cognitive-science/</a>									

\* 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	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	10	15	10	5	60	100

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

Academic Curriculum and Syllabi R-2023

Department	<b>Computer Science and Engineering</b>		Programme: <b>M.Tech.</b>						
Semester	<b>III</b>		Course Category : <b>PE</b>			*End Semester Exam Type: <b>TE</b>			
Course Code	<b>P23CSE316</b>		Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CAM	ESE	TM
Course Name	<b>Cloud Application Development and Management</b>		<b>3</b>	<b>-</b>	<b>-</b>	<b>3</b>	<b>40</b>	<b>60</b>	<b>100</b>
Prerequisite	Basics about Cloud								
Course Outcomes	<b>On completion of the course, the students will be able to</b>							BT Mapping (Highest Level)	
	<b>CO1</b>	Demonstrate the ability to access the various cloud platforms used						<b>K2</b>	
	<b>CO2</b>	Describe the standardization process of cloud platform and various API's						<b>K2</b>	
	<b>CO3</b>	Describe the methods for managing the data in cloud and demonstrate the concepts of automation, provisioning using puppet tool.						<b>K2</b>	
	<b>CO4</b>	Develop Applications in the cloud platform						<b>K4</b>	
	<b>CO5</b>	Analyze and use of an appropriate framework and APIs for the task						<b>K3</b>	
<b>UNIT- I</b>	<b>Introduction</b>					<b>Periods: 9</b>			
Basic concepts and techniques-Business case for implementing cloud application, Requirements collection for cloud application development, Cloud service models and deployment models, Open challenges in Cloud Computing: Cloud inter-operability and standards, scalability and fault tolerance, security, trust and privacy.								<b>CO1</b>	
<b>UNIT- II</b>	<b>Application Development Framework</b>					<b>Periods: 9</b>			
Application development framework-Accessing the clouds: Web application vs Cloud Application, Frameworks: Model View Controller (MVC), Struts, Spring. Cloud platforms in Industry – Google AppEngine, Microsoft Azure, Openshift, CloudFoundry								<b>CO2</b>	
<b>UNIT- III</b>	<b>Cloud Service Delivery Environment and API</b>					<b>Periods: 9</b>			
Cloud service delivery environment and API Storing objects in the Cloud, Session management, Working with third party APIs: Overview of interconnectivity in Cloud ecosystems. Facebook API, Twitter API, Google API								<b>CO3</b>	
<b>UNIT- IV</b>	<b>Architecting for the Cloud</b>					<b>Periods: 9</b>			
Architecting for the Cloud : Best practices-Best practices in architecture cloud applications in AWS cloud, Amazon Simple Queue Service (SQS), RabbitMQ- Cloud applications Amazon Simple Notification Service (Amazon SNS), multi-player online game hosting on cloud resources, Building content delivery-networks using clouds								<b>CO4</b>	
<b>UNIT- V</b>	<b>Managing the data in Cloud</b>					<b>Periods: 9</b>			
Managing the data in cloud-Securing data in the cloud, ACL, OAuth, OpenID, XACML, securing-data for transport in the cloud, scalability of applications and cloud services. Automation and provisioning tool-Puppet and Chef – steps for automation: Introduction, files and packages, services and subscriptions, exec and notify, facts, conditional statements and logging.								<b>CO5</b>	
<b>Lecture Periods: 45</b>		<b>Tutorial Periods: -</b>		<b>Practical Periods: -</b>		<b>Total Periods: 45</b>			
<b>Text Books</b>									
1. Rajkumar Buyya, James Broberg, Andrzej Goscinski, "Cloud Computing: Principles and Paradigms", Wiley, 2013									
2. David E.Y.Sarna, "Implementing and Developing Cloud Computing Applications", Auerbach Publications,2010									
3. John Biggs, Vicente García, Jose Salanova, "Building Intelligent Cloud Applications: Develop Scalable Models Using Serverless Architectures with Azure", O'Reilly, 2019.									
<b>Reference Books</b>									
1. Rajkumar buyya, Christian vecchiola, S Thamarai Selvi , "Mastering cloud computing", Tata McGraw Hill Education Private Limited, 2013 .									
2. Anthony T .Velte, Toby J. Velte, Robert Elsenpeter, "Cloud Computing a Practical Approach", Tata McGraw-HILL, 2010 Edition.									
3. Barrie sosinsky, "Cloud computing bible, Wiley publishing									
4. James Loope, "Managing Infrastructure with puppet", O'REILLY , June 2011									
5. Michael Miller, "Cloud Computing: Web Based Applications That Change The Way You Work And Collaborate Online", Pearson, 2008.									
<b>Web References</b>									
<a href="https://cloud.google.com/appengine/docs">https://cloud.google.com/appengine/docs</a>									
<a href="https://www.chef.io/solutions/cloud-management/">https://www.chef.io/solutions/cloud-management/</a>									
<a href="https://aws.amazon.com/documentation">https://aws.amazon.com/documentation</a>									
<a href="https://learn.rumie.org/jR/bytes/learn-the-basics-of-cloud-computing">https://learn.rumie.org/jR/bytes/learn-the-basics-of-cloud-computing</a>									
<a href="https://www.reply.com/alpha-reply/en/content/cloud-computing-in-web-app-development-what-are-you-waiting-for">https://www.reply.com/alpha-reply/en/content/cloud-computing-in-web-app-development-what-are-you-waiting-for</a>									

\* 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	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

Academic Curriculum and Syllabi R-2023

Department	<b>Computer Science and Engineering</b>		Programme: <b>M.Tech.</b>						
Semester	<b>III</b>		Course Category : <b>PE</b>			*End Semester Exam Type: <b>TE</b>			
Course Code	<b>P23CSE317</b>		Periods / Week			Credit	Maximum Marks		
Course Name	<b>Intelligent Internet of Things</b>		L	T	P	C	CAM	ESE	TM
			<b>3</b>	<b>-</b>	<b>-</b>	<b>3</b>	<b>40</b>	<b>60</b>	<b>100</b>
Prerequisite	Basics of IoT								
Course Outcomes	<b>On completion of the course, the students will be able to</b>								BT Mapping (Highest Level)
	<b>CO1</b>	Understanding IoT and Intelligent Systems							<b>K2</b>
	<b>CO2</b>	Make use of IoT Sensors and Actuators							<b>K2</b>
	<b>CO3</b>	Illustrate Data Processing and analytics in IoT							<b>K3</b>
	<b>CO4</b>	Apply Artificial Intelligence in IoT							<b>K4</b>
	Illustrate IoT applications and Future Trends							<b>K3</b>	
<b>UNIT- I</b>	<b>Introduction to IoT and Intelligent Systems</b>					<b>Periods: 9</b>			
Overview of IoT-Definition, evolution, and key concepts-IoT architecture and components-Intelligent Systems-Introduction to AI in IoT-Machine learning and IoT applications-Interconnectivity and Communication Protocols-IoT communication protocols-Edge computing in IoT									<b>CO1</b>
<b>UNIT- II</b>	<b>IoT Sensors and Actuators</b>					<b>Periods: 9</b>			
Sensor Technologies-Types of sensors used in IoT-Sensor data acquisition and processing-Actuators in IoT-Overview and applications-Controlling devices in IoT systems-Data Fusion and Sensor Networks-Sensor data fusion techniques-Wireless sensor networks									<b>CO2</b>
<b>UNIT- III</b>	<b>Data Processing and Analytics in IoT</b>					<b>Periods: 9</b>			
Data Storage and Management-IoT data storage solutions-Big Data and IoT-Data Analytics in IoT-Descriptive, predictive, and prescriptive analytics-Real-time analytics in IoT- Security and Privacy in IoT - Threats and challenges-Security measures in IoT systems									<b>CO3</b>
<b>UNIT- IV</b>	<b>Artificial Intelligence in IoT</b>					<b>Periods: 9</b>			
Introduction to AI-Basics of artificial intelligence-Machine learning algorithms-AI Applications in IoT Predictive maintenance-Anomaly detection-Smart cities and homes-Edge Computing and AI Deploying AI models at the edge-Edge intelligence in IoT systems									<b>CO4</b>
<b>UNIT- V</b>	<b>IoT Applications and Future Trends</b>					<b>Periods: 9</b>			
Industry-specific IoT Applications-Healthcare, agriculture, manufacturing-Case studies and real-world examples-Ethical considerations in IoT-Social impact and responsibility-Future Trends in IoT									<b>CO5</b>
<b>Lecture Periods: 45</b>			<b>Tutorial Periods: -</b>			<b>Practical Periods: -</b>		<b>Total Periods: 45</b>	
<b>Text Books</b>									
Maciej Kranz, "Building the Internet of Things", Wiley, 2016									
Rajkumar Buyya et al., "Internet of Things: Principles and Paradigms", Morgan Kaufmann Publishers In, 2016.									
Claire Rowland and Elizabeth Goodman, "Designing Connected Products", O'Reilly Media, 2015.									
<b>Reference Books</b>									
Stuart Russell and Peter Norvig, "Artificial Intelligence: A Modern Approach", Pearson, 2010.									
Bruce Sinclair, "IoT Inc: How Your Company Can Use the Internet of Things to Win in the Outcome Economy", McGraw Hill, 2017.									
Perry Lea, "IoT and Edge Computing for Architects", Packt Publishing Limited, 2020.									
Aurélien Géron, "Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow", Shroff/O'Reilly, 2022.									
Data Science Salon, "IoT and Analytics Condition Based Maintenance", Data Science Salon, 2020.									
<b>Web References</b>									
1. <a href="https://dl.acm.org/doi/10.1145/3204947">https://dl.acm.org/doi/10.1145/3204947</a>									
2. <a href="https://www.researchgate.net/publication/324475172_Analytics_for_the_Internet_of_Things_A_Survey">https://www.researchgate.net/publication/324475172_Analytics_for_the_Internet_of_Things_A_Survey</a>									
3. <a href="https://link.springer.com/article/10.1007/s43926-021-00016-5">https://link.springer.com/article/10.1007/s43926-021-00016-5</a>									
4. <a href="https://www.sciencedirect.com/science/article/pii/S2666603020300294">https://www.sciencedirect.com/science/article/pii/S2666603020300294</a>									
5. <a href="https://iot-analytics.com/">https://iot-analytics.com/</a>									

\* 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	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*		
Marks	10	10	15	10	5	60

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

Academic Curriculum and Syllabi R-2023

Department	<b>Computer Science and Engineering</b>		Programme: <b>M.Tech.</b>						
Semester	<b>III</b>		Course Category : <b>PE</b>			*End Semester Exam Type: <b>TE</b>			
Course Code	<b>P23CSE318</b>		Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CAM	ESE	TM
Course Name	<b>Big Data Technologies</b>		<b>3</b>	<b>-</b>	<b>-</b>	<b>3</b>	<b>40</b>	<b>60</b>	<b>100</b>
Prerequisite	Basics of Big Data								
Course Outcomes	<b>On completion of the course, the students will be able to</b>							BT Mapping (Highest Level)	
	<b>CO1</b>	Illustrate the usage of data on different Big data ecosystems.						<b>K4</b>	
	<b>CO2</b>	Demonstrate the Pig architecture and evaluation of pig scripts.						<b>K3</b>	
	<b>CO3</b>	Describe the Hive architecture and execute SQL queries on sample data sets.						<b>K3</b>	
	<b>CO4</b>	Understand the concepts of indexing and use these concepts in solr search engine.						<b>K2</b>	
	<b>CO5</b>	Implement and evaluate the data manipulation procedures using pig, hive, sqoop and solr.						<b>K3</b>	
<b>UNIT- I</b>	<b>Introduction</b>					<b>Periods: 9</b>			
Big data- Concepts, Needs and Challenges of big data. Types and source of big data. Components of Hadoop Eco System- Data Access and storage, Data Intelligence, Data Integration, Data Serialization, Monitoring, Indexing.								<b>CO1</b>	
<b>UNIT- II</b>	<b>Apache Pig</b>					<b>Periods: 9</b>			
Apache Pig -Introduction, Parallel processing using Pig, Pig Architecture, Grunt, Pig Data Model-scalar and complex types. Pig Latin- Input and output, Relational operators, User defined functions. Working with scripts - Apache Hive Fundamentals - Introduction-Hive modules, Data types and file formats, Hive QL-Data Definition and Data Manipulation.								<b>CO2</b>	
<b>UNIT- III</b>	<b>Apache Hive Advanced Concepts</b>					<b>Periods: 9</b>			
Apache Hive Advanced Concepts -Hive QL queries, Hive QL views- reduce query complexity. Hive scripts. Hive QL Indexes- create, show, drop. Aggregate functions. Bucketing vs Partitioning.								<b>CO3</b>	
<b>UNIT- IV</b>	<b>Importing and Handling Relational Data in Hadoop</b>					<b>Periods: 9</b>			
Importing and Handling Relational Data in Hadoop using Sqoop-Relational database management in Hadoop: Bi directional data transfer between Hadoop and external database. Import data- Transfer an entire table, import subset data, use different file format. Incremental import import new data, incrementally import data, preserving the value								<b>CO4</b>	
<b>UNIT- V</b>	<b>Export transfer data from Hadoop</b>					<b>Periods: 9</b>			
Export transfer data from Hadoop, update the data, update at the same time, export subset of columns. Hadoop ecosystem integration- import data to hive, using partitioned hive tables, replace special delimiters. - Introduction. Information retrieval search engine, categories of data, inverted index. Design- field attributes and types. Indexing- indexing tool. Indexing operations using csv documents. Searching data- parameters, default query- Recent Trends in Big data								<b>CO5</b>	
<b>Lecture Periods: 45</b>		<b>Tutorial Periods: -</b>		<b>Practical Periods: -</b>		<b>Total Periods: 45</b>			
<b>Text Books</b>									
1.AlanGates,"Programming Pig Data flow Scripting with Hadoop",O'ReillyMedia,Inc,2011.									
2.Jason Rutherglen, Dean Wampler, Edward Caprialo, "Programming Hive", O'ReillyMedia Inc, 2012									
3.KathleenTing,JarekJarcec Cecho, "Apache Sqoop Cook book",O'ReillyMediaInc,2013.									
<b>Reference Books</b>									
1.Dikshant Shahi, "Apache Solr: A Practical approach to enterprise search", Apress, 2015.									
2.Chuck Lam, "Hadoop in Action", Manning Publications,2010.									
3.Andrea Gazzarini, "Apache Solr Essentials", PACKT Publications, 2015									
4. Viktor Mayer-Schonberger, Kenneth Cukier, "Big Data: A Revolution That Will Transform How We Live, Work, and Think", Houghton Mifflin Harcourt, 2013									
5. Bernard Marr, "Big Data in Practice", wiley,2016.									
<b>Web References</b>									
<a href="https://link.springer.com/chapter/10.1007/978-3-030-68176-0_6">https://link.springer.com/chapter/10.1007/978-3-030-68176-0_6</a>									
<a href="https://link.springer.com/referencework/10.1007/978-3-319-63962-8">https://link.springer.com/referencework/10.1007/978-3-319-63962-8</a>									
<a href="https://www.interviewbit.com/blog/big-data-technologies/">https://www.interviewbit.com/blog/big-data-technologies/</a>									
<a href="https://www.mdpi.com/2227-7390/11/1/96">https://www.mdpi.com/2227-7390/11/1/96</a>									
<a href="https://www.sciencedirect.com/science/article/pii/S1319157817300034">https://www.sciencedirect.com/science/article/pii/S1319157817300034</a>									

\* 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	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	10	15	10	5	60	100

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

Academic Curriculum and Syllabi R-2023

Department	<b>Computer Science and Engineering</b>		Programme: <b>M.Tech.</b>						
Semester	<b>III</b>		Course Category : <b>PE</b>			*End Semester Exam Type: <b>TE</b>			
Course Code	<b>P23CSE319</b>		Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CAM	ESE	TM
Course Name	<b>Digital Forensics</b>		<b>3</b>	<b>-</b>	<b>-</b>	<b>3</b>	<b>40</b>	<b>60</b>	<b>100</b>
Prerequisite	Basics about Forensics								
Course Outcomes	<b>On completion of the course, the students will be able to</b>							BT Mapping (Highest Level)	
	<b>CO1</b>	Understanding Digital forensics						<b>K2</b>	
	<b>CO2</b>	Make use of Windows Systems and artifacts						<b>K3</b>	
	<b>CO3</b>	Make use of Linux Systems and artifacts						<b>K3</b>	
	<b>CO4</b>	Illustrate current computer forensics tools						<b>K4</b>	
	<b>CO5</b>						Analyze Identification of data	<b>K3</b>	
<b>UNIT- I</b>	<b>Digital forensic</b>					<b>Periods: 9</b>			
Computer forensics and investigations as a profession, understanding computer forensics, computer forensics versus other related disciplines, History of computer Forensics, understanding case laws, developing computer forensics resources, preparing for computer investigations, understanding law enforcement agency investigations, Following the legal process, understanding corporate investigations, establishing company policies, Displaying warning Banners.								<b>CO1</b>	
<b>UNIT- II</b>	<b>Windows Systems and artifacts</b>					<b>Periods: 9</b>			
Windows Systems and Artifacts: Introduction, Windows File Systems, File Allocation Table, New Technology File System, File System Summary, Registry, Event Logs, Prefetch Files, Shortcut Files, Windows Executable.								<b>CO2</b>	
<b>UNIT- III</b>	<b>Linux Systems and artifacts</b>					<b>Periods: 9</b>			
Linux Systems and Artifacts: Introduction, Linux File Systems, File System Layer, File Name Layer , Metadata Layer, Data Unit Layer, Journal Tools, Deleted Data, Linux Logical Volume Manager, Linux Boot Process and Services, System V , BSD, Linux System Organization and Artifacts, Partitioning, File system Hierarchy, Ownership and Permissions, File Attributes, Hidden Files, User Accounts , Home Directories, Shell History GNOME Windows Manager Artifacts, Logs, User Activity Logs, Syslog, Command Line Log Processing, Scheduling Tasks								<b>CO3</b>	
<b>UNIT- IV</b>	<b>Current Computer Forensics Tools</b>					<b>Periods: 9</b>			
Evaluating Computer Forensics Tool Needs, Types of Computer Forensics Tools, Tasks Performed by Computer Forensics Tools, Tool Comparisons, Other Considerations for Tools, Computer Forensics Software Tools, Command-Line Forensics Tools, UNIX/Linux Forensics Tools, Other GUI Forensics Tools, Computer Forensics Hardware Tools, Forensic Workstations, Using a Write-Blocker.								<b>CO4</b>	
<b>UNIT- V</b>	<b>Identification of data</b>					<b>Periods: 9</b>			
Identification of Data: Timekeeping, Forensic Identification and Analysis of Technical Surveillance Devices, Reconstructing Past Events: How to Become a Digital Detective, Useable File Formats, Unusable File Formats, Converting Files, Investigating Network Intrusions and Cyber Crime, Network Forensics and Investigating logs, Investigating network Traffic, Investigating Web attacks , Router Forensics. Cyber forensics tools and case studies.								<b>CO5</b>	
<b>Lecture Periods: 45</b>		<b>Tutorial Periods: -</b>		<b>Practical Periods: -</b>		<b>Total Periods: 45</b>			
<b>Text Books</b>									
1. Cory Altheide, Harlan Carvey, Digital Forensics with Open Source Tools, Syngress imprint of Elsevier.									
2. Bill Nelson, Amelia Phillips, Christopher Steuart, "Guide to Computer Forensics and Investigations", Fourth Edition, Course Technology.									
3. Angus M.Marshall, "Digital forensics: Digital evidence in criminal investigation", John Wiley and Sons, 2008									
<b>Reference Books</b>									
1. Greg Gogolin, "Digital Forensics Explained", Taylor & Francis Ltd, 2021									
2. Nilakshi Jain, Dhananjay R. Kalbande, "Digital Forensic: The Fascinating World of Digital Evidences", Wiley, 2016									
3. Kavrestad J, "Fundamentals of Digital Forensics", Springer, 2018									
4. Bhardwaj, K Kaushik, "Practical Digital Forensics", BPB, 2023									
5. Lin X, "Introductory Computer Forensics A Hands On Practical Approach", Springer, 2018									
<b>Web References</b>									
<a href="https://www.forensicsciencesimplified.org/digital/resources.html">https://www.forensicsciencesimplified.org/digital/resources.html</a>									
<a href="https://www.bluevoyant.com/knowledge-center/understanding-digital-forensics-process-techniques-and-tools">https://www.bluevoyant.com/knowledge-center/understanding-digital-forensics-process-techniques-and-tools</a>									
<a href="https://www.sciencedirect.com/topics/computer-science/digital-forensic-tool">https://www.sciencedirect.com/topics/computer-science/digital-forensic-tool</a>									
<a href="https://www.techtarget.com/searchsecurity/definition/computer-forensics">https://www.techtarget.com/searchsecurity/definition/computer-forensics</a>									
<a href="https://onlinecourses.nptel.ac.in/noc23_cs127/preview">https://onlinecourses.nptel.ac.in/noc23_cs127/preview</a>									

\* 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	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	10	15	10	5	60	100

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

Academic Curriculum and Syllabi R-2023

Department	<b>Computer Science and Engineering</b>		Programme: <b>M.Tech.</b>							
Semester	<b>III</b>		Course Category : <b>PE</b>			*End Semester Exam Type: <b>TE</b>				
Course Code	<b>P23CSE320</b>		Periods / Week			Credit	Maximum Marks			
			L	T	P	C	CAM	ESE	TM	
Course Name	<b>Knowledge Engineering and Expert Systems</b>		<b>3</b>	<b>-</b>	<b>-</b>	<b>3</b>	<b>40</b>	<b>60</b>	<b>100</b>	
Prerequisite	No Pre request needed									
Course Outcomes	<b>On completion of the course, the students will be able to</b>							BT Mapping (Highest Level)		
	<b>CO1</b>	Develop production systems, description logic-based systems and Bayesian networks							<b>K3</b>	
	<b>CO2</b>	Use logic in knowledge representation, reasoning and planning							<b>K2</b>	
	<b>CO3</b>	Design knowledge representation models for expert systems							<b>K4</b>	
	<b>CO4</b>	Design knowledgebase for expert systems							<b>K4</b>	
	<b>CO5</b>	Analyzing Expert System							<b>K3</b>	
<b>UNIT- I</b>	<b>Basics of Knowledge Processes</b>					<b>Periods: 9</b>				
Introduction to Knowledge – Knowledge units, facts, concepts, relations, Types of Knowledge – Tacit, Explicit, Implicit, Hybrid, Knowledge Processes – acquisition, representation, reasoning, storing, sharing, reuse. Knowledge Cycle – Acquire, Represent, Store, Share, Hybridization									<b>CO1</b>	
<b>UNIT- II</b>	<b>Knowledge Acquisition and Expression</b>					<b>Periods: 9</b>				
Knowledge sources– structured, semi-structured, unstructured. Introduction to knowledge representation and reasoning, role of logic, the language of First orders logic, forward chaining & backward chaining approaches and Expressing Knowledge.									<b>CO2</b>	
<b>UNIT- III</b>	<b>Knowledge Representation</b>					<b>Periods: 9</b>				
The propositional case, handling variables and quantifiers, dealing with computational intractability. Clauses, Concepts, Relations, Knowledge Units, Representation.									<b>CO3</b>	
<b>UNIT- IV</b>	<b>Procedural Control of Reasoning and Rules</b>					<b>Periods: 9</b>				
Horn Clauses, SLD resolution, Computing SLD derivations. Facts and rules, Rule formation and search strategy, algorithm design, specifying goal order, committing to proof methods, controlling backtracking, negation as failure, Dynamic databases									<b>CO4</b>	
<b>UNIT- V</b>	<b>Expert System</b>					<b>Periods: 9</b>				
Production systems, working memory, production rules, conflict resolution, making production systems more efficient. Objects and frames, a basic frame formalism, Probability Theory, the subjective Bayesian method, the certainty factor model, Dempster-Shafer Theory, Network Models									<b>CO5</b>	
<b>Lecture Periods: 45</b>		<b>Tutorial Periods: -</b>		<b>Practical Periods: -</b>		<b>Total Periods: 45</b>				
<b>Text Books</b>										
1. Simon Kendal, Malcolm Creen, "An Introduction to Knowledge Engineering", Springer, 2007										
2. Rafael Valencia-Garcia, Giner Alor-Hernández, Current Trends on Knowledge-Based Systems, Springer International Publishing AG, 2018										
3. Grega Jakus, Veljko Milutinovic, Sanida Omerovic, Saso Tomazic, "Concepts, Ontologies and Knowledge Representation", Springer, 2013										
<b>Reference Books</b>										
1. Ronald J. Brachman and Hector J. Levesque, "Knowledge representation and reasoning", 2 <sup>nd</sup> edition, Elsevier publications, 2004										
2. Ela Kumar, "Knowledge Engineering", Dreamtech Press, 2019.										
3. Donald A. Waterman, "A Guide To Expert Systems", Pearson, 1986										
4. P. Megaladevi, "Knowledge engineering for industrial expert systems", De Gruyter 2022.										
5. Spyros Tzafestas "Expert Systems in Engineering Applications", Springer Verlag, 1993.										
<b>Web References</b>										
<a href="https://nptel.ac.in/courses/106106140">https://nptel.ac.in/courses/106106140</a>										
<a href="https://dl.acm.org/journal/esjoke">https://dl.acm.org/journal/esjoke</a>										
<a href="https://link.springer.com/chapter/10.1007/978-1-4471-0631-9_1">https://link.springer.com/chapter/10.1007/978-1-4471-0631-9_1</a>										
<a href="https://www.sciencedirect.com/science/article/abs/pii/S000510989190009Q">https://www.sciencedirect.com/science/article/abs/pii/S000510989190009Q</a>										
<a href="https://ieeexplore.ieee.org/document/4307009">https://ieeexplore.ieee.org/document/4307009</a>										

\* 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	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

Academic Curriculum and Syllabi R-2023

Department	<b>Computer Science and Engineering</b>		Programme: <b>M.Tech.</b>						
Semester	<b>III</b>		Course Category : <b>PE</b>			*End Semester Exam Type: <b>TE</b>			
Course Code	<b>P23BDTD01</b>		Periods / Week			Credit	Maximum Marks		
			L	T	P	C	CAM	ESE	TM
Course Name	<b>No SQL Databases</b>		<b>3</b>	<b>-</b>	<b>-</b>	<b>3</b>	<b>40</b>	<b>60</b>	<b>100</b>
Common to M.Tech CSE(BDA) and M.Tech CSE									
Prerequisite	Basics of SQL and Databases								
Course Outcomes	<b>On completion of the course, the students will be able to</b>								BT Mapping (Highest Level)
	<b>CO1</b>	Illustrate the detailed architecture, Database properties and storage requirements.							<b>K2</b>
	<b>CO2</b>	Differentiate and identify right database models for real time applications.							<b>K3</b>
	<b>CO3</b>	Outline Key value architecture, characteristics, and Design Schema and implement CRUD operations, distributed data operations.							<b>K2</b>
	<b>CO4</b>	Compare data ware housing schemas and implement various column store internals.							<b>K3</b>
<b>CO5</b>	Choose and implement advanced columnar data model functions for the realtime Applications.							<b>K4</b>	
<b>UNIT- I</b>	<b>Introduction to NoSQL</b>					<b>Periods: 9</b>			
Data base revolutions: First generation, second generation, third generation, Managing Transactions and Data Integrity, ACID and BASE for reliable database transactions, speeding Performance by strategic use of RAM, SSD, and disk, achieving horizontal scalability with Data base sharing, Brewers CAP theorem.									<b>CO1</b>
<b>UNIT- II</b>	<b>NoSQL Data Architecture Patterns</b>					<b>Periods: 9</b>			
NoSQL Data model: Aggregate Models- Document Data Model- Key-Value Data Model Columnar Data Model, Graph Based Data Model Graph Data Model, NoSQL system ways to handle big data problems, Moving Queries to data, not data to the query, hash rings to distribute the data on clusters, replication to scale reads, Database distributed queries to Data nodes.									<b>CO2</b>
<b>UNIT- III</b>	<b>Key Value Data Stores and Document Oriented Database</b>					<b>Periods: 9</b>			
Essential features of key value Databases, Properties of keys, Characteristics of Values, Key-Value Database Data Modeling Terms, Key-Value Database. Document, Collection, Naming, CRUD operation, querying, indexing, Replication, Sharing.									<b>CO3</b>
<b>UNIT- IV</b>	<b>Columnar Data Model – I and II</b>					<b>Periods: 9</b>			
Data warehousing schemas: Comparison of columnar and row-oriented storage, Column-store Architectures: C-Store and Vector-Wise, Column-store internals and, Inserts/updates/deletes. Advanced techniques: Vectorized Processing Compression, Write penalty, Operating Directly on Compressed Data Late Materialization Joins , Group-by, Aggregation and Arithmetic Operations.									<b>CO4</b>
<b>UNIT- V</b>	<b>Data Modeling with Graph</b>					<b>Periods: 9</b>			
Comparison of Relational and Graph Modeling, Property Graph Model Graph Analytics: Link analysis algorithm- Web as a graph, Page Rank- Markov chain, page rank computation, Topic specific page rank (Page Ranking Computation techniques: iterative processing, Random walk distribution Querying Graphs: Introduction to Cypher, case study: Building a Graph Database Application- community detection									<b>CO5</b>
<b>Lecture Periods: 45</b>			<b>Tutorial Periods: -</b>			<b>Practical Periods: -</b>		<b>Total Periods: 45</b>	
<b>Text Books</b>									
<ol style="list-style-type: none"> <li>1. Dan Sullivan Sullivan, "NoSQL for Mere Mortals", Addison-Wesley, 2015.</li> <li>2. Christopher D.manning, Prabhakar Raghavan, Hinrich Schutze, "An introduction to Information Retrieval", Cambridge University Press,2008.</li> <li>3. Daniel Abadi, Peter Boncz and Stavros Harizopoulos, "The Design and Implementation of Modern Column-Oriented Database Systems", Now Publishers,2013.</li> </ol>									
<b>Reference Books</b>									
<ol style="list-style-type: none"> <li>1. Elmasri and Navathe , "Fundamentals of Database Systems", Pearson Education 2013.</li> <li>2. Sadalage P &amp; Fowler, "NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence", Wiley Publications,1st Edition, 2019.</li> <li>3. Perkins, Eric Redmond, Jim Wilson, Seven Databases in Seven Weeks: A Guide to Modern Databases and the NoSQL Movement, 2nd Edition, Pragmatic Bookshelf, 2018.</li> <li>4. Andreas Meier, Michael Kaufmann, "SQL &amp; Nosql Databases",Repro Books, 2019</li> <li>5. Guy Harrison, "Next Generation Database: NoSQL and big data", Apress, 2015.</li> </ol>									
<b>Web References</b>									
<ol style="list-style-type: none"> <li>1. <a href="https://www.coursera.org/lecture/nosql-databases/introduction-to-nosql-VdRNp">https://www.coursera.org/lecture/nosql-databases/introduction-to-nosql-VdRNp</a></li> <li>2. <a href="https://www.geeksforgeeks.org/introduction-to-nosql/">https://www.geeksforgeeks.org/introduction-to-nosql/</a></li> <li>3. <a href="https://www.javatpoint.com/nosql-databa">https://www.javatpoint.com/nosql-databa</a></li> <li>4. <a href="https://intellipaat.com/nosql-cassandra-hbase-training/">https://intellipaat.com/nosql-cassandra-hbase-training/</a></li> <li>5. <a href="https://www.udemy.com/nosql/online-cours">https://www.udemy.com/nosql/online-cours</a></li> </ol>									

\* 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	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

Academic Curriculum and Syllabi R-2023

Department	<b>Computer Science and Engineering</b>		Programme: <b>M.Tech.</b>						
Semester	<b>III</b>		Course Category : <b>PE</b>			*End Semester Exam Type: <b>TE</b>			
Course Code	<b>P23CSE321</b>		Periods / Week			Credit	Maximum Marks		
Course Name	<b>Industrial IoT</b>		L	T	P	C	CAM	ESE	TM
			<b>3</b>	<b>-</b>	<b>-</b>	<b>3</b>	<b>40</b>	<b>60</b>	<b>100</b>
Prerequisite	Basics of IoT								
Course Outcomes	<b>On completion of the course, the students will be able to</b>								BT Mapping (Highest Level)
	<b>CO1</b>	Knowledge of theory and practice related to Industrial IoT Systems							<b>K2</b>
	<b>CO2</b>	Ability to identify, formulate and solve engineering problems by using Industrial IoT							<b>K2</b>
	<b>CO3</b>	Ability to implement real field problem by gained knowledge of Industrial applications with IoT capability							<b>K3</b>
	<b>CO4</b>	Analyze Visualization and Data Types							<b>K3</b>
	<b>CO5</b>	Illustrate Applications of IIOT							<b>K4</b>
<b>UNIT- I</b>	<b>Introduction to Industrial IoT (IIoT) Systems</b>					<b>Periods: 9</b>			
The Various Industrial Revolutions, Role of Internet of Things (IoT) & Industrial Internet of Things (IIoT) in Industry, Industry 4.0 revolutions, difference between IoT and IIoT, Architecture of IIoT, IIoT node, Challenges of IIoT									<b>CO1</b>
<b>UNIT- II</b>	<b>IIoT Components</b>					<b>Periods: 9</b>			
Fundamentals of Control System, introductions, components, closed loop & open loop system. Introduction to Sensors - Description - Working principle- Types of sensors, working principle of basic Sensors -Ultrasonic Sensor, IR sensor, MQ2, Temperature and Humidity Sensors (DHT-11), Digital switch, Electro Mechanical switches.									<b>CO2</b>
<b>UNIT- III</b>	<b>Communication Technologies</b>					<b>Periods: 9</b>			
Communication Protocols: IEEE 802.15.4, ZigBee, Z Wave, Bluetooth, BLE, NFC, RFID Industry standards communication technology (LoRAWAN, OPC UA, MQTT), connecting into existing Modbus and Profibus technology, wireless network communication									<b>CO3</b>
<b>UNIT- IV</b>	<b>Visualization and Data Types</b>					<b>Periods: 9</b>			
Front-end EDGE devices, Enterprise data for IIoT, Emerging descriptive data standards for IIoT, Cloud data base, Cloud computing, Fog or Edge computing. Connecting an Arduino/Raspberry pi to the Web: Introduction, setting up the Arduino/Raspberry pi development environment, Options for Internet connectivity with Arduino, Configuring your Arduino/Raspberry pi board for the IoT.									<b>CO4</b>
<b>UNIT- V</b>	<b>Applications of IIOT</b>					<b>Periods: 9</b>			
Applications: Health monitoring, IoT smart city, Smart irrigation, Robot surveillance									<b>CO5</b>
<b>Lecture Periods: 45</b>			<b>Tutorial Periods: -</b>			<b>Practical Periods: -</b>		<b>Total Periods: 45</b>	
<b>Text Books</b>									
1. Alasdair Gilchrist, "Industry 4.0: The Industrial Internet of Things", Apress, 2016									
2. Bartodziej, Christoph Jan Springer, "The Concept Industry 4.0 An Empirical Analysis of Technologies and Applications in Production Logistics", Economic science. 2017.									
3. Mahmood, Zaigham (Ed.), "The Internet of Things in the Industrial Sector", Springer, 2019									
<b>Reference Books</b>									
1. Ismail Butun, "Industrial IoT Challenges, Design Principles, Applications, and Security", Springer, 2020.									
2. Sabina Jeschke, Christian Brecher, Houbing Song, Danda B. Rawat "Industrial Internet of Things: Cyber manufacturing System", Springer,									
3. Rajkamal, "Embedded System: Architecture, Programming and Design", TMH3. 2017									
4. Dr. OvidiuVermesan, Dr. Peter Friess, "Internet of Things: Converging Technologies for Smart Environments and Integrated Ecosystems", River Publishers,2013.									
<b>Web References</b>									
<a href="https://onlinecourses.nptel.ac.in/noc20_cs69/preview">https://onlinecourses.nptel.ac.in/noc20_cs69/preview</a>									
<a href="https://aws.amazon.com/iot/solutions/industrial-iiot/">https://aws.amazon.com/iot/solutions/industrial-iiot/</a>									
<a href="https://www.i-scoop.eu/internet-of-things-iiot/industrial-internet-things-iiot-saving-costs-innovation/">https://www.i-scoop.eu/internet-of-things-iiot/industrial-internet-things-iiot-saving-costs-innovation/</a>									
<a href="https://www.geeksforgeeks.org/benefits-of-internet-of-things-iiot-in-manufacturing-industry/">https://www.geeksforgeeks.org/benefits-of-internet-of-things-iiot-in-manufacturing-industry/</a>									
<a href="https://www.techtarget.com/iiotagenda/definition/Industrial-Internet-of-Things-IIoT">https://www.techtarget.com/iiotagenda/definition/Industrial-Internet-of-Things-IIoT</a>									

\* TE – Theory Exam, LE – Lab Exam

Academic Curriculum and Syllabi R-2023

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

Academic Curriculum and Syllabi R-2023

Department	<b>Computer Science and Engineering</b>	Programme: <b>M.Tech.</b>						
Semester	<b>III</b>	Course Category : <b>PA</b>			*End Semester Exam Type: <b>LE</b>			
Course Code	<b>P23CSW301</b>	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	<b>Project Phase - I</b>	-	-	<b>12</b>	<b>6</b>	<b>50</b>	<b>50</b>	<b>100</b>

**Aim & Objective:**

The project work aims to develop the work practice and to apply theoretical and practical tools/techniques for solving real life problems related to industry and current research. The objective of the project work is to improve the professional competency and research attitude by touching the areas which are not covered in theory or laboratory classes.

- The project work shall be a design project/experimental project and/or computer simulation project on any of the topic in manufacturing engineering or related field.
- The project work shall be allotted individually on different topics.
- The students shall be encouraged to do their project work in the parent institute itself. In exceptional cases the students shall be permitted to undertake continue their project outside the parent institute with appropriate permission from Head of the institution through the Project Coordinator.
- Department shall constitute an Evaluation Committee to review the project work.
- The Evaluation committee shall consist of at least three faculty members namely internal guide, project coordinator and another expert in the specified area of the project.

The student is required to undertake the project phase I during the third semester and the same shall be continued in the 4 th semester (Phase II). Phase I consist of preliminary thesis work, three reviews of the work and the submission of preliminary report. First review shall highlight the topic, objectives and origin of problem, second review shall highlight, Literature survey, methodology and expected results. Third review shall evaluate the progress of the work, preliminary report and scope of the work which shall be completed in the 4 th semester. Also the evaluation of project phase - I shall be done externally.

Academic Curriculum and Syllabi R-2023

Department	<b>Computer Science and Engineering</b>	Programme: <b>M.Tech.</b>						
Semester	<b>III</b>	Course Category : <b>PA</b>				*End Semester Exam Type: -		
Course Code	<b>P23CSW302</b>	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	<b>Internship</b>	-	-	-	<b>2</b>	<b>100</b>	-	<b>100</b>

Students should undergo training or internship during summer / winter vacation at Industry/ Research organization / University (after due approval from the Programme Academic Coordinator and Department Consultative Committee (DCC). In such cases, the internship/training should be undergone continuously (without break) in one organization. Normally no extension of time is allowed. However, DCC may provide relaxation based on the exceptional case. The students are allowed to undergo three to four weeks internship in established industry / Esteemed institution during vacation period. The student should give presentation and submit report to DCC. The Internship is assessed internally for 100 marks.

Academic Curriculum and Syllabi R-2023

Department	<b>Computer Science and Engineering</b>	Programme: <b>M.Tech.</b>						
Semester	<b>III</b>	Course Category : <b>AEC</b>				*End Semester Exam Type: -		
Course Code	<b>P23CSC301</b>	Periods / Week			Credit	Maximum Marks		
Course Name	<b>NPTEL/SWAYAM/MOOC</b>	L	T	P	C	CAM	ESE	TM
		-	-	-	-	<b>100</b>	-	<b>100</b>
<p>Student should register online courses like MOOC / SWAYAM / NPTEL etc. approved by the Department committee comprising of HoD, Programme Academic Coordinator and Subject Experts. Students have to complete relevant online courses successfully. The list of online courses is to be approved by Academic Council on the recommendation of HoD at the beginning of the semester if necessary, subject to ratification in the next Academic council meeting. The Committee will monitor the progress of the student and recommend the grade (100% Continuous Assessment pattern) based on the marks secured in online examinations. The marks attained for this course is not considered for CGPA calculation.</p>								

Academic Curriculum and Syllabi R-2023

Department	<b>Computer Science and Engineering</b>	Programme: <b>M.Tech.</b>						
Semester	<b>IV</b>	Course Category : <b>PA</b>			*End Semester Exam Type: <b>LE</b>			
Course Code	<b>P23CSW403</b>	Periods / Week			Credit	Maximum Marks		
		L	T	P	C	CAM	ESE	TM
Course Name	<b>Project Phase - II</b>	-	-	<b>24</b>	<b>12</b>	<b>50</b>	<b>50</b>	<b>100</b>

**Aim & Objective:**

The project work aims to develop the work practice and to apply theoretical and practical tools/techniques for solving real life problems related to industry and current research. The objective of the project work is to improve the professional competency and research attitude by touching the areas which are not covered in theory or laboratory classes.

- The project work shall be a design project/experimental project and/or computer simulation project on any of the topic in manufacturing engineering or related field.
- The project work shall be allotted individually on different topics.
- The students shall be encouraged to do their project work in the parent institute itself. In exceptional cases the students shall be permitted to undertake continue their project outside the parent institute with appropriate permission from Head of the institution through the Project Coordinator.
- Department shall constitute an Evaluation Committee to review the project work.
- The Evaluation committee shall consist of at least three faculty members namely internal guide, project coordinator and another expert in the specified area of the project.

Project phase II is a continuation of project phase I which started in the third semester. There shall be three reviews in the fourth semester, first in the beginning of the semester, second in the middle of the semester and the Third at the end of the semester. First review is to evaluate the progress of the work and planned activity; second review shall be presentation and discussion. Third review shall be a presubmission presentation before the evaluation committee to assess the quality and quantity of the work done. This would be a pre qualifying exercise for the students for getting approval for the submission of the thesis. At least one technical paper shall be prepared for possible publication in journals or conferences. The technical paper shall be submitted along with the thesis. The final evaluation of the project shall be done externally.

# ANNEXURE V

2. A. 3. 158