SHARDA UNIVERSITY
Beyond Boundaries

SCHOOL OF ENGINEERING AND TECHNOLOGY
Master of Technology- Computer Science and Engineering

Programme Code: SET0130
Duration- 2 Years Full Time

PROGRAM STRUCTURE
AND
CURRICULUM & SCHEME OF EXAMINATION
2020

M.Tech CSE with specialization in Software Engineering

M.Tech CSE with specialization in Data Science & Analytics

M.Tech CSE with specialization in Networking and Cyber Security

1. Standard Structure of the Program at University Level

1.1 Vision, Mission and Core Values of the University

Vision of the University

To serve the society by being a global University of higher learning in pursuit of academic excellence, innovation and nurturing entrepreneurship.

Mission of the University

1. **Transformative educational experience**
2. **Enrichment by educational initiatives that encourage global outlook**
3. **Develop research, support disruptive innovations and accelerate entrepreneurship**
4. **Seeking beyond boundaries**

Core Values

- **Integrity**
- **Leadership**
- **Diversity**
- **Community**

Note: Detailed Mission Statements of University can be used for developing Mission Statements of Schools/ Departments.

Vision of the School

To become a globally acclaimed institution of higher learning in engineering and technology promoting excellence in research, innovation and entrepreneurship

Mission of the School

1. **To impart quality education with strong industry & academic connectivity in the expanding fields of Engineering and Technology in a conductive and enriching learning environment.**
2. **To product technocrats equipped with technical & soft skills and experiential learning required to stay current with the modern tools in emerging technologies to fulfill professional responsibilities and uphold ethical values.**
3. **To inculcate a culture of interdisciplinary research, innovation and entrepreneurship to provide sustainable solutions to meet the growing challenges and societal needs.**
4. **To foster collaborative learning and to play adaptive leadership role in professional career and pursuit of higher education through effective mentoring and counseling.**

Core Values

- **Industry & Academic Connectivity**
- **Experiential learning**
- **Interdisciplinary research**
- **Global**

1.2 Vision and Mission of the Department

Vision of the Department

To be recognized as the fountainhead of excellence in technical knowledge and research in computer science and engineering to attract students and scholars across the globe

Mission of the Department

1. **To strengthen core competency of students to be successful, ethical, effective problem solver in Computer Science & Engineering through analytical learning.**
2. **To promote interdisciplinary research & innovation-based activities in emerging areas of technology globally**
3. **To facilitate and foster the industry-academia collaboration to enhance entrepreneurship skills and acquaintance with corporate culture.**
4. **To inculcate in them a higher degree of social consciousness and moral values towards solving interdisciplinary societal problems using industry-academia collaboration**

Core Values

- **Competency**
- **Global**
- **Entrepreneurship Skills**
- **Interdisciplinary research**

1.3 Programme Educational Objectives (PEO)

1.3.1 Writing Programme Educational Objectives (PEO)

Program educational objectives are broad statements that describe the career and professional accomplishments that the program is preparing graduates to achieve.

The Program Educational Objectives (PEOs) of UG Program in Computer Science & Engineering are:

PEO-1 The graduates will establish themselves as professionals by solving real-life problems using exploratory and analytical skills acquired in the field of Computer Science and Engineering.

PEO-2 The graduates will provide sustainable solutions to ever changing interdisciplinary global problems through their Research & Innovation capabilities.

PEO-3 The graduates will become employable, successful entrepreneur as an outcome of Industry-Academia collaboration.

PEO-4 The graduates will embrace professional code of ethics while providing solution to multidisciplinary social problems in industrial, entrepreneurial and research environment to demonstrate leadership qualities

Methods of Forming PEO's

STEP 1 : The needs of the Nation and society are identified through scientific publications, industry interaction and media.

STEP 2. Taking the above into consideration, the PEOs are established by the Coordination Committee of the department.

STEP 3. The PEOs are communicated to the alumni and their suggestions are obtained.

STEP 4. The PEOs are communicated to all the faculty members of the department and their feedback is obtained.

STEP 5. The PEOs are then put to the Board of Studies of the department for final approval.

[Note: Prepare a file for the same, how you arrive for PEO's]

1.3.2 Map PEOs with Mission Statements:

DEPARTMENT PEOs / DEPT OF CSE MISSION STATEMENTS	1. The graduates will establish themselves as professionals by solving real-life problems using exploratory and analytical skills acquired in the field of Computer Science and Engineering.	2. The graduates will be able to provide sustainable solutions to ever changing interdisciplinary global problems through their Research & Innovation capabilities.	3. The graduates will become employable, successful entrepreneur and innovator as an outcome of Industry-Academia collaboration.	4. The graduates will be able to embrace professional code of ethics while providing solution to multidisciplinary social problems in industrial, entrepreneurial and research environment to demonstrate leadership qualities.	
1. To strengthen core competency of students to be successful, ethical, effective problem solver in Computer Science & Engineering through analytical learning.	3	3	2	2	10/12
2. To promote interdisciplinary research & innovation based activities in emerging areas of technology globally.	2	3	2	2	9/12
3. To facilitate and foster the industry-academia collaboration to enhance entrepreneurship skills and acquaintance with corporate culture.	2	2	3	3	10/12
4: To inculcate in them a higher degree of social consciousness and moral values towards solving interdisciplinary societal problems using industry-academia collaboration	2	2	2	3	9/12
	9/12	10/12	9/12	10/12	83%

Enter correlation levels 1, 2, or 3 as defined below:

1. Slight (Low) 2. Moderate (Medium) 3. Substantial (High)

If there is no correlation, put "-"

1.3.3 Program Outcomes (PO's)

PO1:	**Advanced Technical Knowledge**	Ability to apply advanced knowledge of mathematical, scientific and computing to carry out independent research and investigate complex problems of global benchmark.
PO2:	**Research and Development**	Achieve and understand research-based solutions for problems in industry and academia using contemporary research methods.
PO3:	**Pedagogy**	Enables academic adherence by practice of method and environment for teaching which is incorporated within the curriculum enabling life-long learning and professional development through self-study, continuing education, professional and doctoral level studies.
PO4:	**Innovation and Entrepreneurial**	Inculcate innovative approaches to develop solutions towards existing real-world problem(s) to create value and wealth for the betterment of the individual and society at large.
PO5:	**Societal Values**	Inculcating the human, social and business context while knowledge discovery by providing exposure to global view and diversity in the world and will utilize their engineering skills.
PO6:	**Personal and Professional Ethics**	Recognize the need of ethical, legal and societal implications to engage in self-governing and life-long learning by making use of professional principles.
PO7:	**Communication Skills**	Ability to develop communication skills so that they are able to express ideas clearly and persuasively, in written and oral forms in a substantial technical manner.
PO8:	**Life-long learning**	Ability to engage in independent and life-long learning in the broadest context of research and technological change with the aim to educate the society and peers.
PSO1:	**Software Engineering**	To apply the software engineering principles and practices to provide high quality software solutions using state of art technologies.
PSO2:	**Data Science & Analytics**	To develop research solutions in the field of data engineering by using modern tools to provide innovative solutions for complex data science problems.
PSO3:	**Networking and Cyber Security**	To apply networking principles to understand cyber security issues and provides solutions to real world security problems.

1.3.4 Mapping of Program Outcome Vs Program Educational Objectives

Mapping	PEO1	PEO2	PEO3	PEO4
PO1:	3	3	2	1
PO2:	3	3	3	1
PO3:	2	2	3	3
PO4:	2	2	3	2
PO5:	1	2	2	3
PO6:	1	1	2	3
PO7:	1	1	3	2
PO8:	2	3	1	1
PSO1:	2	3	1	3
PSO2:	3	3	2	2
PSO3:	3	3	2	2

1. Slight (Low) ***2. Moderate (Medium)*** ***3. Substantial (High)***

1.3.5 Program Outcome Vs Courses Mapping Table[1]:

			PO1:	PO2:	PO3:	PO4:	PO5:	PO6:	PO7:	PO8:	PSO1:	PSO2:	PSO3:
Course Code	Course Name		Advanced Technical Knowledge	Research and Development	Pedagogy	Innovation and Entrepreneurial	Societal Values	Personal and Professional Ethics	Communication Skills	Life-long learning	Software Engineering	Data Science & Analytics	Networking and Cyber Security
CSE611	Analysis and Design of Algorithms	**CO1**	2	3		1				1		2	
		CO2	3	2		2				1		1	
		CO3		1								3	
		CO4		3	2	3						1	
		CO5	2	3		2						1	
		CO6		2	2					2	1	3	
CSE613	Mathematical and Statistical Techniques in Computer Science	**CO1**	3	2	1	1	-	-	-	2	-	3	1
		CO2	3	3	1	1	-	-	-	2	-	2	1
		CO3	3	3	1	2	-	-	-	2	-	3	1
		CO4	3	2	1	2	-	-	-	2	-	3	1
		CO5	3	2	1	2	-	-	-	3	-	3	1
		CO6	3	2	1	2	-	-	-	3	-	3	1
CSE604	Data Acquisition and Production	**CO1**	3	-	3	-	-	-	-	3	3	-	-
		CO2	3	1	2	-	-	2	3	3	3	-	-
		CO3	3	1	2	1	1	2	2	3	3	-	-
		CO4	3	1	2	-	1	-	3	3	3	-	-
		CO5	3	-	2	1	-	2	3	3	3	-	-
		CO6	3	2	2	2	2	2	2	3	3	-	-

[1] Cel value will contain the correlation value of respective course with PO.

0	Massive Graph Analysis	**CO1**	3	3	1	2	3	1	-	1			
		CO2	3	3	3	2	1	1	-	1			
		CO3	1	1	3	3	2	1	-	1			
		CO4	1	1	3	2	1	2	1	1			
		CO5	1	2	3	2	2	1	1	1			
		CO6	1	2	3	2	1	2	1	3			
CSE630	Advanced Computer Network	**CO1**	3	2	3	-	-	-	-	2	-	-	2
		CO2	3	2	3	-	-	-	-	2	-	-	2
		CO3	3	2	3	1	-	-	-	2	-	-	2
		CO4	3	2	3	1	2	2	-	2	-	-	2
		CO5	3	2	3	2	2	2	-	2	-	-	3
		CO6	3	2	3	2	2	2	-	2	-	-	3
CSE640NN	Object Oriented Software Engineering	**CO1**	2	-	-	-	-	2	1	2	3	-	-
		CO2	3	-	2	-	-	3	3	3	3	-	-
		CO3	3	3	2	2	-	3	2	3	3	-	-
		CO4	3	3	2	-	-	3	2	2	3	-	-
		CO5	3	-	2	-	2	3	2	3	3	-	-
		CO6	3	3	3	3	3	3	3	3	3	-	-
0	Software Architecture and Design Pattern.	**CO1**	2	1	2	-	-	-	1	1	3	-	-
		CO2	2	2	2	-	-	-	2	1	3	-	-
		CO3	2	2	2	-	-	-	2	1	3	-	-
		CO4	2	2	2	-	-	-	2	1	3	-	-
		CO5	3	3	3	-	1	1	2	1	3	-	-
		CO6	2	3	3	-	1	-	2	1	3	-	-
CSE642	Soft Computing Techniques	**CO1**	1	3	2	2	2	3	2	3	3	2	
		CO2	2	3	2	2	3	2	3	3	3	2	
		CO3	1	2	3	3	3	2	2	3	3	3	
		CO4	1	2	2	3	3	3	2	2	3	3	
		CO5	1	2	3	3	3	3	2	2	3	3	

		CO6	2	2	3	3	3	3	2	3	3	3	
CSE622	Advanced Data Mining Techniques	**CO1**	3	-	-	-	-	-	-	-	-	-	-
		CO2	3	2	-	-	-	-	-	-	-	-	-
		CO3	3	-	-	-	-	-	-	-	-	-	-
		CO4	3	2	2	-	-	-	-	2	-	3	-
		CO5	3	2	2	-	-	-	-	2	-	-	-
		CO6	3	2	3	3	2	3	3	3	-	3	-
CSE634	Advanced Mobile computing	**CO1**	3	2		3	2						
		CO2	1	1	2		1						
		CO3	2	1		2							
		CO4	2	2	3	1							
		CO5	1			2						3	
		CO6	1		2		3					3	
CSE632	Advanced Network Security	**CO1**	2			2					2		
		CO2	2	2	2	-	-	-	-	-	2		
		CO3	-	2	2	-	-	-	-	-	2		
		CO4		2		2		2			2		
		CO5	2	-	-	-	2	2	2	-	2		
		CO6	-	-	-	2	2	-	-	2	2		
CSE643	Software Requirement and Estimation	**CO1**	3	-	2	-	-	2	3	2	3	-	-
		CO2	3	2	2	2	-	2	2	2	3	-	-
		CO3	3	3	2	2	2	2	3	3	3	-	-
		CO4	3	2	2	2	-	2	3	3	3	-	-
		CO5	3	3	2	2	-	2	2	3	3	-	-
		CO6	3	3	2	-	2	2	3	3	3	-	-
0	Software Quality Metrics and Testing	**CO1**	3	-	3	-	-	-	-	3	3	-	-
		CO2	3	1	2	-	-	2	3	3	3	-	-
		CO3	3	1	2	1	1	2	2	3	3	-	-
		CO4	3	1	2	-	1	-	3	3	3	-	-

		CO5	3	-	2	1	-	2	3	3	3	-	-
		CO6	3	2	2	2	2	2	2	3	3	-	-
CSP611	Analysis and Design of Algorithms Lab	**CO1**	3	3	1	3	--	--	--	2	--	3	--
		CO2	2	3	3	2	--	--	--	2	--	2	--
		CO3	1	2	2	-	--	--	--	1	2	1	1
		CO4	2	3	3	3	--	--	--	3	--	3	--
		CO5	3	1	2	3	--	-	-	2	2	3	--
		CO6	2	3	3	1	--	-	-	1	3	2	--
0	Massive Graph Analysis Lab	**CO1**	3	3	1	2	1	1	-	1	1		
		CO2	3	3	3	2	-	1	-	1	1		
		CO3	1	1	3	3	2	1	-	1	2		
		CO4	1	1	3	2	1	2	1	1	3		
		CO5	1	2	3	2	2	1	1	1	3		
		CO6	1	2	3	2	1	2	1	3	3		
CSP630	Advanced Computer Network Lab	**CO1**	3	2	3	-	-	-	-	2	-	-	2
		CO2	3	2	3	-	-	-	-	2	-	-	2
		CO3	3	2	3	1	-	-	-	2	-	-	2
		CO4	3	2	3	1	2	2	-	2	-	-	2
		CO5	3	2	3	2	2	2	-	2	-	-	3
		CO6	3	2	3	2	2	2	-	2	-	-	3
CSP640	Object Oriented Software Engineering Lab	**CO1**	2	1	2	-	-	-	2	2	3	-	-
		CO2	2	1	2	1	-	2	3	2	3	-	-
		CO3	2	1	3	1	1	2	3	2	3	-	-
		CO4	3	1	2	1	1	3	3	2	3	-	-
		CO5	2	1	2	1	-	2	3	2	3	-	-
		CO6	3	1	3	1	1	3	3	2	3	-	-
0	Software Architecture and Design	**CO1**	3	2	2	-	-	1	3	1	3	-	-
		CO2	3	3	2	1	-	1	3	2	3	-	-
		CO3	3	3	2	1	-	1	3	2	3	-	-

	Pattern Lab	**CO4**	3	3	2	1	-	1	3	2	3	-	-
		CO5	3	3	2	1	-	1	3	2	3	-	-
		CO6	3	3	2	1	-	1	3	2	3	-	-
CSE650	Pattern Recognition	**CO1**	3	1	3	3	1	1	3	1	2	2	
		CO2	2	2	3	3	2	2	3	2	2	2	
		CO3	3	3	2	2	3	2	3	3	2	3	
		CO4	1	3	2	2	3	2	3	3	2	3	
		CO5	1	2	3	3	1	3	3	2	2	2	
		CO6											
CSE605	Machine Learning	**CO1**	3	1	1	2	3	2	3	2	1	1	
		CO2	1	3	1	2	3	1	3	3	1	2	
		CO3	1	3	3	2	1	1	2	3	1	3	
		CO4	1	3	3	2	1	1	1	3	2	3	
CSE646	Wireless Sensor Network	**CO1**	3	-	3	-	-	-	-	1	-	-	2
		CO2	3	2	3	-	-	-	-	1	-	-	2
		CO3	3	2	3	-	-	-	-	1	-	-	2
		CO4	3	2	3	-	-	-	-	1	-	-	2
		CO5	3	2	3	2	2	-	-	1	-	-	3
		CO6	3	2	3	2	2	-	-	1	-	-	3
CSE616	Intrusion Detection & Prevention	**CO1**	3	3	3	2	2	2	3	3	3		
		CO2	1	2	-	1	1	-	-	-	1		
		CO3	1	2	-	1	1	-	-	-	1		
		CO4	2	3	3	1	2	2	1	2	3		
		CO5	1	1	-	1	1	-	-	-	1		
		CO6	2	2	2	1	1	2	1	2	2		
CSE606	Cloud Services in Mobile	**CO1**	2		1	1	3						
		CO2	3		2	3	1					2	
		CO3	2	2	3		3						
		CO4	3	2		2	1				2		

		CO5	3	2	3		3						
		CO6	2		3	2	3						
0	Applications Programming	**CO1**	3	2	3	-	-	-	-	2	-	-	2
		CO2	3	2	3	-	-	-	3	2	-	-	2
		CO3	3	2	3	1	-	-	3	2	-	-	2
		CO4	3	2	3	1	2	2	2	2	-	-	2
		CO5	3	2	3	2	2	2	-	2	-	-	3
		CO6	3	2	3	2	2	2	-	2	-	-	3
CSE644	Agile Based Software Engineering	**CO1**	3	2	2	-	1	-	3	2	3	-	-
		CO2	3	3	2	-	2	-	3	3	3	-	-
		CO3	3	-	3	3	2	3	3	3	3	-	-
		CO4	2	3	2	-	-	-	3	2	3	-	-
		CO5	3	2	2	2	2	3	3	3	3	-	-
		CO6	3	3	3	2	2	3	3	3	3	-	-
CSE649	Secure Software Engineering	**CO1**	1	3	2	-	-	-	2	2	3	-	-
		CO2	3	2	2	1	1	-	3	3	3	-	-
		CO3	2	2	2	1	1	2	2	3	3	-	-
		CO4	3	3	2	1	2	2	2	2	3	-	-
		CO5	3	3	2	1	2	2	2	2	3	-	-
		CO6	3	3	2	2	3	2	2	3	3	-	-
CSE610NN	Advance Web Analytics	**CO1**	2	1	2					1		1	
		CO2	2	1	1							2	
		CO3	2	1								2	
		CO4	2									3	
		CO5	2							2		3	
		CO6	3	2	2	1				2	1	3	
CSE629	Performance Modeling of Computer	**CO1**	3	-	3	-	-	-	-	1	-	-	2
		CO2	3	2	3	-	-	-	-	1	-	-	2
		CO3	3	2	3	-	-	-	-	1	-	-	2

	Communication network	**CO4**	3	2	3	-	-	-	-	1	-	-	2
		CO5	3	2	3	2	2	-	-	1	-	-	3
		CO6	3	2	3	2	2	-	-	1	-	-	3
CSE648	Recent Advances in Software Engineering.	**CO1**	2	1	1	-	-	1	2	2	3	-	-
		CO2	3	1	1	-	-	1	-	2	3	-	-
		CO3	3	2	1	-	-	-	-	2	3	-	-
		CO4	3	2	1	-	-	1	-	2	3	-	-
		CO5	3	1	1	-	-	-	-	2	3	-	-
		CO6	3	2	1	1	-	1	3	3	3	-	-
CSE607	Grid Computing	**CO1**	3	-	3	-	-	-	-	1	-	-	2
		CO2	3	2	3	-	-	-	-	1	-	-	2
		CO3	3	2	3	-	-	-	-	1	-	-	2
		CO4	3	2	3	-	-	-	-	1	-	-	2
		CO5	3	2	3	2	2	-	-	1	-	-	3
		CO6	3	2	3	2	2	-	-	1	-	-	3
CSE628	Ad Hoc Wireless Networks	**CO1**	3	-	3	-	-	-	-	1	-	-	2
		CO2	3	2	3	-	-	-	-	1	-	-	2
		CO3	3	2	3	-	-	-	-	1	-	-	2
		CO4	3	2	3	-	-	-	-	1	-	-	2
		CO5	3	2	3	2	2	-	-	1	-	-	3
		CO6	3	2	3	2	2	-	-	1	-	-	3
CSE633	Advanced Wireless Communication	**CO1**	3	3	3	2	-	-	-	-	-	2	3
		CO2	3	3	2	3	-	-	-	-	-	2	3
		CO3	2	3	3	3	-	-	-	-	-	2	3
		CO4	3	3	3	3	-	-	-	-	-	2	3
		CO5	3	3	2	3	-	-	-	-	-	2	3
		CO6	3	2	3	3	-	-	-	-	-	2	3
CSE635	Software Reliability	**CO1**	2	1	2	-	-	1	1	1	3	-	-
		CO2	2	1	2	-	-	1	2	2	3	-	-

	Engineering	**CO3**	1	1	1	-	-	1	1	1	3	-	-
		CO4	1	1	2	-	-	1	1	-	3	-	-
		CO5	2	1	2	-	-	1	1	2	3	-	-
		CO6	3	-	-	2	2	1	2	2	3	-	-
CSE621NN	Web Engineering	**CO1**			1					2	2		
		CO2		1						2	2		
		CO3		1						2	2		
		CO4				1				2			
		CO5		1	1					2			
		CO6	1	2	1	2	1			3	1	2	
CSE608	Natural Language Computing	**CO1**	3	1	1	2	3	2	3	2	1	2	
		CO2	3	3	3	3	3	2	3	3	1	3	
		CO3	3	2	3	3	2	2	2	3	1	3	
		CO4	3	2	3	3	2	2	2	3	1	3	
		CO5	1	1	2	3	3	2	2	3	3	2	
		CO6	3	2	2	3	3	3	2	2	3	2	
CSE641	Malware Analysis, Detection & Prevention	**CO1**	-	1	1	-	-	2	2	-	1		
		CO2	2	2	2	-	2	1	-	-	2		
		CO3	2	2	2	-	2	1	-	-	2		
		CO4	-	1	1	-	1	-	1	-	1		
		CO5	2	2	2	2	2	-	-	2	2		
		CO6	3	3	3	2	-	-	3	2	3		
CSE617	Advanced Cryptography	**CO1**	-	2	1	-	-	2	2	-	2		
		CO2	2	2	2	-	2	1	-	-	2		
		CO3	2	2	2	-	2	1	-	-	2		
		CO4	-	2	1	-	-	-	1	-	1		
		CO5	-	2	2	2	2	-	-	2	2		
		CO6	2	3	3	2	-	-	3	2	3		
CSE647	Component	**CO1**	2	-	1	-	-	1	2	1	3	-	-

	Based Software Engineering	**CO2**	1	-	1	1	1	1	2	2	3	-	-
		CO3	2	1	2	1	1	2	2	2	3	-	-
		CO4	2	1	2	1	2	2	2	2	3	-	-
		CO5	3	1	2	1	-	-	2	2	3	-	-
		CO6	3	3	2	3	2	3	2	3	3	-	-
CSP646	Wireless Sensor Network Lab	**CO1**	2	2	-	-	-	-	-	2	-	-	3
		CO2	3	3	2	-	-	2	2	3	-	-	3
		CO3	2	2	2	-	-	2	2	2	-	-	3
		CO4	1	2	-	2	-	-	2	3	-	-	3
		CO5	2	2	1	-	3	-	-	2	-	-	3
		CO6	1	3	-	2	-	2	-	2	-	-	3
CSP616	Intrusion Detection & Prevention Lab	**CO1**	3	3	3	2	2	2	3	3	3		
		CO2	1	2	-	1	1	-	-	-	1		
		CO3	1	2	-	1	1	-	-	-	1		
		CO4	2	3	3	1	2	2	1	2	3		
		CO5	1	1	-	1	1	-	-	-	1		
		CO6	2	2	2	1	1	2	1	2	2		
CSP644	Agile Based Software Engineering Lab	**CO1**	2	1	2	2	-	-	3	3	3	-	-
		CO2	2	1	2	2	-	-	3	3	3	-	-
		CO3	2	1	2	2	-	-	3	3	3	-	-
		CO4	2	1	2	2	-	-	3	3	3	-	-
		CO5	2	1	2	2	-	-	3	3	3	-	-
		CO6	3	3	2	2	2	-	3	3	3	-	-
CSP649	Secure Software Engineering Lab	**CO1**	1	3	2	1	-	1	2	3	3	-	-
		CO2	1	-	2	-	-	-	-	1	3	-	-
		CO3	3	3	2	1	-	1	1	2	3	-	-
		CO4	3	-	1	2	-	2	3	2	3	-	-
		CO5	2	-	2	1	-	1	2	2	3	-	-
		CO6	1	2	2	2	-	2	2	2	3	-	-

CSE610	Advance Web Analytics Lab	**CO1**	2	1	2					1		1	
		CO2	2	1	1							2	
		CO3	2	1								2	
		CO4	2									3	
		CO5	2							2		3	
		CO6	3	2	2	1				2	1	3	
CSE629	Performance Modeling of Computer Communication network Lab	**CO1**	3	-	3	-	-	-	-	1	-	-	2
		CO2	3	2	3	-	-	-	-	1	-	-	2
		CO3	3	2	3	-	-	-	-	1	-	-	2
		CO4	3	2	3	-	-	-	-	1	-	-	2
		CO5	3	2	3	2	2	-	-	1	-	-	3
		CO6	3	2	3	2	2	-	-	1	-	-	3
CSP648	Recent Advances in Software Engineering Lab	**CO1**	2	1	1	-	-	1	2	2	3	-	-
		CO2	3	1	1	-	-	1	-	2	3	-	-
		CO3	3	2	1	-	-	-	-	2	3	-	-
		CO4	3	2	1	-	-	1	-	2	3	-	-
		CO5	3	1	1	-	-	-	-	2	3	-	-
		CO6	3	2	1	1	-	1	3	3	3	-	-
CSP681	Seminar	**CO1**	2	2	2	2	-	-	-	3	-	-	-
		CO2	1	2	2	-	-	-	-	2	3	3	3
		CO3	2	2	2	3	-	-	-	2	2	2	2
		CO4	-	-	3	-	2	3	3	1	-	-	-
		CO5	1	-	1	-	-	-	3	1	-	-	-
		CO6	1	-	1	-	-	2	3	1	-	-	-
CSP691	Dissertation 1	**CO1**	3	3	1	2	1	1	3	2	2	2	2
		CO2	3	3	1	2	1	1	3	2	2	2	2
		CO3	3	3	1	3	2	2	3	3	2	2	2
		CO4	3	3	1	3	2	2	3	3	2	2	2
		CO5	3	2	1	2	2	2	3	3	2	2	2

		CO6	1	-	3	1	1	2	3	2	-	-	-
CSP682	Project	**CO1**	3	2	2	-	-	-	-	-	2	2	2
		CO2	2	2	2	-	-	2	-	2	-	-	-
		CO3	3	2	2	-	-	2	-	2	2	2	2
		CO4	2	3	-	3	2	2	-	2	2	2	2
		CO5	-	-	-	-	-	-	3	3	-	-	-
		CO6	-	-	-	-	-	2	3	-	2	2	2

1. Slight (Low) ***2. Moderate (Medium)*** ***3. Substantial (High)***

1.3.5.2 COURSE ARTICULATION MATRIX[2]

		PO1:	PO2:	PO3:	PO4:	PO5:	PO6:	PO7:	PO8:	PSO1:	PSO2:	PSO3:
Course Code	Course Name	Advanced Technical Knowledge	Research and Development	Pedagogy	Innovation and Entrepreneurial	Societal Values	Personal and Professional Ethics	Communication Skills	Life-long learning	Software Engineering	Data Science & Analytics	Networking and Cyber Security
CSE611	Analysis and Design of Algorithms	**2.33**	**2.33**	**2.00**	**2.00**				**1.33**	**1.00**	**1.83**	
CSE613	Mathematical and Statistical Techniques in Computer Science	**3.00**	**2.33**	**1.00**	**1.67**				**2.33**		**2.83**	**1.00**
CSE604	Data Acquisition and Production	**3.00**	**1.25**	**2.17**	**1.33**	**1.33**	**2.00**	**2.60**	**3.00**	**3.00**		
0	Massive Graph Analysis	**1.67**	**2.00**	**2.67**	**2.17**	**1.67**	**1.33**	**1.00**	**1.33**			
CSE630	Advanced Computer Network	**3.00**	**2.00**	**3.00**	**1.50**	**2.00**	**2.00**		**2.00**			**2.33**
CSE640NN	Object Oriented Software Engineering	**2.83**	**3.00**	**2.20**	**2.50**	**2.50**	**2.83**	**2.17**	**2.67**	**3.00**		
0	Software Architecture and Design Pattern.	**2.17**	**2.17**	**2.33**		**1.00**	**1.00**	**1.83**	**1.00**	**3.00**		
CSE642	Soft Computing Techniques	**1.33**	**2.33**	**2.50**	**2.67**	**2.83**	**2.67**	**2.17**	**2.67**	**3.00**	**2.67**	
CSE622	Advanced Data Mining Techniques	**3.00**	**2.00**	**2.33**	**3.00**	**2.00**	**3.00**	**3.00**	**2.33**		**3.00**	
CSE634	Advanced Mobile computing	**1.67**	**1.50**	**2.33**	**2.00**	**2.00**					**3.00**	
CSE632	Advanced Network Security	**2.00**	**2.00**	**2.00**	**2.00**	**2.00**	**2.00**	**2.00**	**2.00**	**2.00**		
CSE643	Software Requirement and Estimation	**3.00**	**2.60**	**2.00**	**2.00**	**2.00**	**2.00**	**2.67**	**2.67**	**3.00**		
0	Software Quality Metrics and Testing	**3.00**	**1.25**	**2.17**	**1.33**	**1.33**	**2.00**	**2.60**	**3.00**	**3.00**		
CSP611	Analysis and Design of Algorithms Lab	**2.17**	**2.50**	**2.33**	**2.40**				**1.83**	**2.33**	**2.33**	**1.00**
0	Massive Graph Analysis Lab	**1.67**	**2.00**	**2.67**	**2.17**	**1.40**	**1.33**	**1.00**	**1.33**	**2.17**		
CSP630	Advanced Computer Network Lab	**3.00**	**2.00**	**3.00**	**1.50**	**2.00**	**2.00**		**2.00**			**2.33**

[2] Each course outcome (Based on Blooms Taxanomy-CO1, CO2, CO3, CO4, CO5, and CO6) of the course needs to map with PO. This table evolves once faculty has mapped each course outcomes of their respective course with PO's.

CSP640	Object Oriented Software Engineering Lab	**2.33**	**1.00**	**2.33**	**1.00**	**1.00**	**2.40**	**2.83**	**2.00**	**3.00**		
0	Software Architecture and Design Pattern Lab	**3.00**	**2.83**	**2.00**	**1.00**		**1.00**	**3.00**	**1.83**	**3.00**		
CSE650	Pattern Recognition	**2.00**	**2.20**	**2.60**	**2.60**	**2.00**	**2.00**	**3.00**	**2.20**	**2.00**	**2.40**	
CSE605	Machine Learning	**1.50**	**2.50**	**2.00**	**2.00**	**2.00**	**1.25**	**2.25**	**2.75**	**1.25**	**2.25**	
CSE646	Wireless Sensor Network	**3.00**	**2.00**	**3.00**	**2.00**	**2.00**			**1.00**			**2.33**
CSE616	Intrusion Detection & Prevention	**1.67**	**2.17**	**2.67**	**1.17**	**1.33**	**2.00**	**1.67**	**2.33**	**1.83**		
CSE606	Cloud Services in Mobile	**2.50**	**2.00**	**2.40**	**2.00**	**2.33**				**2.00**	**2.00**	
0	Applications Programming	**3.00**	**2.00**	**3.00**	**1.50**	**2.00**	**2.00**	**2.67**	**2.00**			**2.33**
CSE644	Agile Based Software Engineering	**2.83**	**2.60**	**2.33**	**2.33**	**1.80**	**3.00**	**3.00**	**2.67**	**3.00**		
CSE649	Secure Software Engineering	**2.50**	**2.67**	**2.00**	**1.20**	**1.80**	**2.00**	**2.17**	**2.50**	**3.00**		
CSE610NN	Advance Web Analytics	**2.17**	**1.25**	**1.67**	**1.00**				**1.67**	**1.00**	**2.33**	
CSE629	Performance Modeling of Computer Communication network	**3.00**	**2.00**	**3.00**	**2.00**	**2.00**			**1.00**			**2.33**
CSE648	Recent Advances in Software Engineering.	**2.83**	**1.50**	**1.00**	**1.00**		**1.00**	**2.50**	**2.17**	**3.00**		
CSE607	Grid Computing	**3.00**	**2.00**	**3.00**	**2.00**	**2.00**			**1.00**			**2.33**
CSE628	Ad Hoc Wireless Networks	**3.00**	**2.00**	**3.00**	**2.00**	**2.00**			**1.00**			**2.33**
CSE633	Advanced Wireless Communication	**2.83**	**2.83**	**2.67**	**2.83**						**2.00**	**3.00**
CSE635	Software Reliability Engineering	**1.83**	**1.00**	**1.80**	**2.00**	**2.00**	**1.00**	**1.33**	**1.60**	**3.00**		
CSE621NN	Web Engineering	**1.00**	**1.25**	**1.00**	**1.50**	**1.00**			**2.17**	**1.75**	**2.00**	
CSE608	Natural Language Computing	**2.67**	**1.83**	**2.33**	**2.83**	**2.67**	**2.17**	**2.33**	**2.67**	**1.67**	**2.50**	
CSE641	Malware Analysis, Detection & Prevention	**2.25**	**1.83**	**1.83**	**2.00**	**1.75**	**1.33**	**2.00**	**2.00**	**1.83**		
CSE617	Advanced Cryptography	**2.00**	**2.17**	**1.83**	**2.00**	**2.00**	**1.33**	**2.00**	**2.00**	**2.00**		
CSE647	Component Based Software Engineering	**2.17**	**1.50**	**1.67**	**1.40**	**1.50**	**1.80**	**2.00**	**2.00**	**3.00**		
CSP646	Wireless Sensor Network Lab	**1.83**	**2.33**	**1.67**	**2.00**	**3.00**	**2.00**	**2.00**	**2.33**			**3.00**
CSP616	Intrusion Detection & Prevention Lab	**1.67**	**2.17**	**2.67**	**1.17**	**1.33**	**2.00**	**1.67**	**2.33**	**1.83**		
CSP644	Agile Based Software Engineering Lab	**2.17**	**1.33**	**2.00**	**2.00**	**2.00**		**3.00**	**3.00**	**3.00**		
CSP649	Secure Software Engineering Lab	**1.83**	**2.67**	**1.83**	**1.40**		**1.40**	**2.00**	**2.00**	**3.00**		
CSE610	Advance Web Analytics Lab	**2.17**	**1.25**	**1.67**	**1.00**				**1.67**	**1.00**	**2.33**	
CSE629	Performance Modeling of Computer Communication network Lab	**3.00**	**2.00**	**3.00**	**2.00**	**2.00**			**1.00**			**2.33**

CSP648	Recent Advances in Software Engineering Lab	**2.83**	**1.50**	**1.00**	**1.00**		**1.00**	**2.50**	**2.17**	**3.00**		
CSP681	Seminar	**1.40**	**2.00**	**1.83**	**2.50**	**2.00**	**2.50**	**3.00**	**1.67**	**2.50**	**2.50**	**2.50**
CSP691	Dissertation 1	**2.67**	**2.80**	**1.33**	**2.17**	**1.50**	**1.67**	**3.00**	**2.50**	**2.00**	**2.00**	**2.00**
CSP682	Project	**2.50**	**2.25**	**2.00**	**3.00**	**2.00**	**2.00**	**3.00**	**2.25**	**2.00**	**2.00**	**2.00**

1-Slight (Low)
2-Moderate (Medium)
3-Substantial (High)

Course Outcome

- **Course Outcomes**–What is it?
  - Course outcomes (COs) are clear statements of what a student should be able to demonstrate on completion of a course.
  - COs should be assessable and measurable knowledge, skills, abilities and attitudes that student attains by the end of the course.
  - It is generally good idea to identify between 4 and 7 outcomes.
  - All courses in a particular programme shall have their own PO.
  - Each CO is mapped to relevant PO.
  - The teaching learning process and assessment process are to be designed in a way to achieve the COs.

Beginning words for Course Outcome:

Active verbs developed based on Bloom's Taxonomy

Knowledge	Understand	Apply	Analyze	Evaluate	Create
define	explain	solve	analyze	reframe	design
identify	describe	apply	compare	criticize	compose
describe	interpret	illustrate	classify	evaluate	create
label	paraphrase	modify	contrast	order	plan
list	summarize	use	distinguish	appraise	combine
name	classify	calculate	infer	judge	formulate
state	compare	change	separate	support	invent
match	differentiate	choose	explain	compare	hypothesize
recognize	discuss	demonstrate	select	decide	substitute
select	distinguish	discover	categorize	discriminate	write
examine	extend	experiment	connect	recommend	compile
locate	predict	relate	differentiate	summarize	construct
memorize	associate	show	discriminate	assess	develop
quote	contrast	sketch	divide	choose	generalize
recall	convert	complete	order	convince	integrate
reproduce	demonstrate	construct	point out	defend	modify
tabulate	estimate	dramatize	prioritize	estimate	organize
tell	express	interpret	subdivide	find errors	prepare
copy	Identify	Manipulate	survey	grade	produce
discover	indicate	Paint	advertise	measure	rearrange
duplicate	Infer	Prepare	appraise	predict	rewrite
enumerate	relate	produce	Break down	rank	role-play

(Reference: Retrieved from http://www.teachthought.com/learning/249-blooms-taxonomy-verbs-for-critical-thinking/)

School of Engineering and Technology							
Department Of Computer Science & Engineering							
M.Tech CSE with specialization in Software Engineering							
Batch: 2019 Onwards						TERM: I (Spring-II)	
S. No.	Course Code	Course	Teaching Load			Credits	Pre-Requisite/Co Requisite
			L	T	P		
THEORY SUBJECTS							
1	CSE611	Analysis and Design of Algorithms	3	1	0	4	
2	CSE613	Mathematical and Statistical Techniques in Computer Science	3	1	0	4	
3		Departmental Elective-1	3	0	0	3	
	CSE640	Object Oriented Software Engineering					
		Software Architecture and Design Pattern.					
4		Departmental Elective-2					
	CSE642	Soft Computing Techniques	3	0	0	3	
5		Departmental Elective-3	3	0	0	3	
	CSE643	Software Requirement and Estimation					
		Software Quality Metrics and Testing					
Practical/Viva-Voce/Jury							
1	CSP611	Analysis and Design of Algorithms Lab	0	0	2	1	
2		Departmental Elective-1	0	0	2	1	
	CSP640	Object Oriented Software Engineering Lab					
		Software Architecture and Design Pattern Lab					
TOTAL CREDITS						19	

School of Engineering and Technology							
Department Of Computer Science & Engineering							
M.Tech CSE with specialization in Data Science & Analytics							
Batch: 2019 Onwards						TERM: I (Spring-II)	
S. No.	Course Code	Course	Teaching Load			Credits	Pre-Requisite/Co Requisite
			L	T	P		
THEORY SUBJECTS							
1	CSE611	Analysis and Design of Algorithms	3	1	0	4	
2	CSE613	Mathematical and Statistical Techniques in Computer Science	3	1	0	4	Lab Based
3		Departmental Elective-1	3	0	0	3	
	CSE604	Data Acquisition and Production					
		Massive Graph Analysis					
4		Departmental Elective-2					
	CSE642	Soft Computing Techniques	3	0	0	3	
5		Departmental Elective-3	3	0	0	3	
	CSE622	Advanced Data Mining Techniques					
		Image and Video Analysis					DIP
Practical/Viva-Voce/Jury							
1	CSP611	Analysis and Design of Algorithms Lab	0	0	2	1	
2		Departmental Elective-1	0	0	2	1	
	CSP604	Data Acquisition and Production					
		Massive Graph Analysis					
TOTAL CREDITS						19	

School of Engineering and Technology							
Department Of Computer Science & Engineering							
M.Tech CSE with specialization in Networking and Cyber Security							
Batch: 2019 Onwards						TERM: I (Spring-II)	
S. No.	Course Code	Course	Teaching Load			Credits	Pre-Requisite/Co Requisite
			L	T	P		
THEORY SUBJECTS							
1	CSE611	Analysis and Design of Algorithms	3	1	0	4	
2	CSE613	Mathematical and Statistical Techniques in Computer Science	3	1	0	4	
3		Departmental Elective-1	3	0	0	3	
	CSE630	Advanced Computer Network					
		Vehicular Communication Network					
4		Departmental Elective-2					
	CSE642	Soft Computing Techniques	3	0	0	3	
5		Departmental Elective-3	3	0	0	3	
	CSE634	Advanced Mobile computing					
	CSE632	Advanced Network Security					
Practical/Viva-Voce/Jury							
1	CSP611	Analysis and Design of Algorithms Lab	0	0	2	1	
2		Departmental Elective-1	0	0	2	1	
	CSP630	Advanced Computer Network					
		Vehicular Communication Network					
TOTAL CREDITS						19	

School of Engineering and Technology							
Department Of Computer Science & Engineering							
M.Tech CSE with specialization in Software Engineering							
Batch: 2019 Onwards						TERM: II (Spring-I)	
S. No.	Course Code	Course	Teaching Load			Credits	Pre-Requisite/Co Requisite
			L	T	P		
THEORY SUBJECTS							
1	CSE650	Pattern Recognition	3	1	0	4	
2	CSE605	Machine Learning	3	0	0	3	
3		Departmental Elective-4	3	0	0	3	
	CSE644	Agile Based Software Engineering					
	CSE649	Secure Software Engineering					
4		Departmental Elective-5	2	0	0	2	
	CSE648	Recent Advances in Software Engineering.					
5		Departmental Elective-6	3	0	0	3	
	CSE635	Software Reliability Engineering					
		Web Engineering					
6		Departmental Elective-7	3	0	0	3	
	CSE647	Component Based Software Engineering					
7	MRM001	Research Methodology	2	0	0	2	
Practical/Viva-Voce/Jury							
1	CSP650	Pattern Recognition Lab	0	0	2	1	
2		Departmental Elective-4	0	0	2	1	
	CSP644	Agile Based Software Engineering Lab					
	CSP649	Secure Software Engineering Lab					
3		Departmental Elective-5	0	0	2	1	
	CSP648	Recent Advances in Software Engineering Lab					
4	CCU101	Community Connect	-	-	-	2	
TOTAL CREDITS						25	

School of Engineering and Technology							
Department Of Computer Science & Engineering							
M.Tech CSE with specialization in Data Science & Analytics							
Batch: 2019 Onwards						TERM: II (Spring-I)	
S. No.	Course Code	Course	Teaching Load			Credits	Pre-Requisite/Co Requisite
			L	T	P		
THEORY SUBJECTS							
1	CSE650	Pattern Recognition	3	1	0	4	
2	CSE605	Machine Learning	3	0	0	3	
3		Departmental Elective-4	3	0	0	3	
		Bioinformatics					
	CSE618	Big Data Analytics					
4		Departmental Elective-5	2	0	0	2	
	CSE610	Advance Web Analytics					
		Internet of Things and its applications.					
5		Departmental Elective-6	3	0	0	3	
	CSE620	Deep Learning and web					
		Health Care and Analytics					
6		Departmental Elective-7	3	0	0	3	
	CSE608	Natural Language Computing					
7	MRM001	Research Methodology	2	0	0	2	
Practical/Viva-Voce/Jury							
1	CSP601	Pattern Recognition	0	0	2	1	
2		Departmental Elective-4	0	0	2	1	
		Bioinformatics					
	CSP618	Big Data Analytics					
3		Departmental Elective-5	0	0	2	1	
	CSP610	Advance Web Analytics					
		Internet of Things and its applications.					
4	CCU101	Community Connect	-	-	-	2	
TOTAL CREDITS						25	

School of Engineering and Technology							
Department Of Computer Science & Engineering							
M.Tech CSE with specialization in Networking and Cyber Security							
Batch: 2019 Onwards						TERM: II (Spring-I)	
S. No.	Course Code	Course	Teaching Load			Credits	Pre-Requisite/Co Requisite
			L	T	P		
THEORY SUBJECTS							
1	CSE650	Pattern Recognition	3	1	0	4	
2	CSE605	Machine Learning	3	0	0	3	
3		Departmental Elective-4	3	0	0	3	
	CSE646	Wireless Sensor Network					
	CSE616	Intrusion Detection & Prevention					
	CSE606	Cloud Services in Mobile					
		Applications Programming					
4		Departmental Elective-5	2	0	2	3	
	CSE629	Performance Modeling of Computer Communication network					
	CSE607	Grid Computing	3	0	0		
5		Departmental Elective-6	3	0	0	3	
	CSE628	Ad Hoc Wireless Networks					
	CSE633	Advanced Wireless Communication					
6		Departmental Elective-7	3	0	0	3	
	CSE641	Malware Analysis, Detection & Prevention					
	CSE617	Advanced Cryptography					
7	MRM001	Research Methodology	2	0	0	2	
Practical/Viva-Voce/Jury							
1	CSP650	Pattern Recognition	0	0	2	1	
2		Departmental Elective-4	0	0	2	1	
	CSP646	Wireless Sensor Network					
	CSP616	Intrusion Detection & Prevention					

	CSP606	Cloud Services in Mobile					
		Applications Programming					
3		Departmental Elective-5	0	0	2		
	CSP629	Performance Modeling of Computer Communication network					
4	CCU101	Community Connect	-	-	-	2	
TOTAL CREDITS						25	

School of Engineering and Technology							
Department Of Computer Science & Engineering							
Master of Technology- Computer Science and Engineering							
Batch: 2019 Onwards						TERM: III	
S. No.	**Course Code**	**Course**	**Teaching Load**			**Credits**	**Pre-Requisite/Co Requisite**
			L	**T**	**P**		
Practical/Viva-Voce/Jury							
1	CSP681	Seminar	-	-	-	2	
2	CSP691	Dissertation 1	-	-	-	10	
TOTAL CREDITS						**12**	

School of Engineering and Technology							
Department Of Computer Science & Engineering							
Master of Technology- Computer Science and Engineering							
Batch: 2019 Onwards						TERM: IV	
S. No.	**Course Code**	**Course**	**Teaching Load**			**Credits**	**Pre-Requisite/Co Requisite**
			L	**T**	**P**		
Practical/Viva-Voce/Jury							
1.	CSP692	Dissertation-II	-	-	-	16	
TOTAL CREDITS						**16**	

C. Course Syllabuses

TERM-I

Analysis and Design of Algorithm

School: SET		**Batch : 2019**	
Program: M.Tech		**Current Academic Year: 2019-2021**	
Branch: Data Science		**Semester: I**	
1	Course Code	**CSE 611** Course Name: **Analysis and Design of Algorithm**	
2	Course Title	**Analysis and Design of Algorithm**	
3	Credits	5	
4	Contact Hours (L-T-P)	3-1-2	
	Course Status	PG	
5	Course Objective	The objective of the course is to teach techniques for effective problem solving in computing. The use of different paradigms of problem solving will be used to illustrate efficient ways to solve a given problem. In each case emphasis will be placed on rigorously proving correctness of the algorithm. In addition, the analysis of the algorithm will be used to show the efficiency of the algorithm over the naive techniques.	
6	Course Outcome	1. **Analyze** the performance of algorithms. 2. **Apply** the Concept of Divide and Conquer method to solve real world problems. 3. **Demonstrate** the Dynamic programming techniques. 4. **Describe** the Concept of Greedy method to solve the real world problems of backtracking 5. **Explain** the various mathematical concepts and implement the pattern matching algorithms. 6.**Propose** algorithms to real life problems	
7	Course Description		
8	Outline syllabus		CO Mapping
	Unit 1	**Introduction**	
	A	Algorithm Design Paradigms- Motivation, Concept of algorithmic efficiency, Run time analysis of algorithms, Growth of Functions, Asymptotic Notations	CO1
	B	Growth of Functions, Asymptotic Notations Time Complexity for Iterative function	CO1
	C	Time Complexity of Recursive Function: Master's Method, Iteration Method & Recursion Tree Method.	CO1
	Unit 2	**Analysis of Divide and conquer Methodology**	
	A	Structure & Analysis of divide-and-conquer algorithms: examples-Binary search	CO2
	B	Quick sort, Merge sort, Medians and Order Statistics	CO2,CO6
	C	i^{th} order statistics, Randomized Algorithms – Randomized Quick Sort	CO2,CO6
	Unit 3	**Analysis of Dynamic Programming Methodology**	
	A	Overview, Difference between dynamic	CO3,CO6

		programming and divide and conquer			
	B	Applications and analysis: Matrix Chain Multiplication, 0/1 Knapsack Problem			CO3,CO6
	C	All-pairs Shortest path in graphs, Longest Common Sub-sequence, Optimal Binary Search Tree.			CO3,CO6
	Unit 4	**Analysis of Greedy Method**			
	A	Overview of the Greedy paradigm, Fractional Knapsack problem, Minimum spanning Trees			CO4,CO6
	B	Single source shortest paths, Task Scheduling Problem, Huffman Coding Algorithm			CO4,CO6
	C	Backtracking: Concepts and N-Queens Problem, Branch and Bound: Concepts and Sum of Subsets Problem			CO4,CO6
	Unit 5	**String Matching and Approximation Algorithms**			
	A	Pattern Matching Algorithms: Rabin Karp Algorithm, Knuth Morris Pratt Algorithm, String Matching with Finite Automata			CO5,CO6
	B	Approximation Algorithms- Vertex Cover and Travelling Salesperson Problem, Turing's Halting Problem			CO5,CO6
	C	Theory of NP-Completeness: Introduction to Class-P, NP, NP- Hard & NP-Complete with examples.			CO5,CO6
	Mode of examination	Theory			
	Weightage Distribution	CA	MTE	ETE	
		30%	20%	50%	
	Text book/s*	1. Cormen et al, "Introduction of Computer Algorithm", Prentice Hall India.			
	Other References	1. Sahni et al, "Fundamentals of Computer Algorithms", Galgotia Publication. 2. Internet as a Resource for Reference.			

CO and PO Mapping

S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1	**Analyze** the performance of algorithms	PO1,PO2,PO4 ,PO8,PSO2
2	Apply the Concept of Divide and Conquer method to solve real world problems.	PO1,PO2,PO4,PO8,PSO2
3	Demonstrate the Dynamic programming techniques.	PO2 ,PSO2
4	**Describe** the Concept of Greedy method to solve the real world problems of backtracking	PO2,PO3,PO4 ,PSO2
5	Explain the various mathematical concepts and implement the pattern matching algorithms.	PO1,PO2,PO4,PSO2
6	Propose solutions to real life world problems	PO2,PO3 ,PO6,PO8,PSO1,PSO2

PO and PSO mapping with level of strength for Course Name "Analysis and Design of Algorithm" (Course Code CSE 611)

Course Code_ Course Name	COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PSO 1	PSO 2	PSO 3
CSE611_ Analysis and Design of Algorithm	CO1	2	3		1				1		2	
	CO2	3	2		2				1		1	
	CO3		1								3	
	CO4		3	2	3						1	
	CO5	2	3		2						1	
	CO6		2	2					2	1	3	

Average of non-zeros entry in following table (should be auto calculated).

Course Code	Course Name	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PSO 1	PSO 2	PSO 3
CSE611	Analysis and Design of Algorithm	2.33	2	2	1.5	1.3			1.3	1	1.7	

Strength of Correlation

1. Addressed to ***Slight (Low=1) extent*** ***2.*** Addressed to ***Moderate (Medium=2) extent***
3. Addressed to ***Substantial (High=3) extent***

School: SET		**Batch : 2019**	
Program: M.Tech		**Current Academic Year: 2019-2021**	
Branch: Data Science		**Semester: I**	
1	Course Code	**CSE613**	
2	Course Title	**Mathematical and Statistical techniques in computer science**	
3	Credits	4	
4	Contact Hours (L-T-P)	3-1-0	
	Course Status	PG	
5	Course Objective	The objective of the course is to teach students the mathematical & statistical techniques that provide sound basis for research and application development in Computer Science.	
6	Course Outcome	CO1: Identify errors from different dimensions and defining roots of equations for the use in computational problems CO2: Apply Differential and Numerical Integration for interpolation and error analysis CO3: Discover linearly independent components using eigenvectors and standard value decomposition. CO4: Formulate Exploratory data analysis using spectral methods like Fourier and wavelet analysis. CO5: Illustration of best Curve fitting for given data CO6: Apply mathematical and statistical methods in their research and application development	
7	Course Description	In this subject, the fundamental concepts and principles of Mathematical & Statistical Techniques together with the challenging issues in Computer will be introduced.	
8	Outline syllabus		CO Mapping
	Unit 1	**Introduction, Computational Errors and their Analysis**	
	A	Accuracy of numbers, Errors and a general error formula, Errors in Numerical Computations and Inverse Problems	CO1, CO6
	B	Floating Point Representations of Numbers and operations, Errors in a Series Approximation	CO1, CO6
	C	Algebraic & Transcendental Equations: Order of convergence of iterative and bisection methods, Convergence of a Sequence, Iterative methods for system of non-linear equations, Regular Falsi method	CO1, CO6
	Unit 2	**Algorithmic Optimization**	
	A	Assumptions for interpolation, errors in polynomial interpolation, finite differences, difference operators and their relationship, Newton's interpolation formula	CO2, CO6

	B	Introduction to numerical differentiation, Introduction to numerical integration, Trapezoidal and Simpson's rules,			CO2, CO6
	C	Introduction to numerical solution of ordinary differential equations, Euler's method.			CO2, CO6
	Unit 3	**Vector Calculus**			
	A	Scalar functions of several variables, Partial derivatives and differentiability, gradient vector, vector fields			CO3, CO6
	B	Linear Systems, Orthogonality, Eigenvalues & Eigenvectors: Vector spaces, Linear maps, Systems of linear equations, Orthogonality, orthogonal projections, Eigenvalues & Eigenvectors.			CO3, CO6
	C	QR & Singular value decomposition			CO3, CO6
	Unit 4	**Spectral Methods**			
	A	Time Series Analysis (Introduction to classical methods),			CO4, CO6
	B	Fourier Analysis: Introduction to Fourier and their applications in knowledge discovery & exploratory data analysis.			CO4, CO6
	C	Wavelet Analysis: wavelet transform and their applications in knowledge discovery & exploratory data analysis.			CO4, CO6
	Unit 5	**Regression analysis, Techniques for statistical quality control, Testing of hypothesis.**			
	A	Curve fitting: Principle of least squares Fitting of $y=aebx$, $y=ax^b$, $y=ab^x$.			CO5, CO6
	B	Techniques for statistical quality control,			CO5, CO6
	C	Testing of hypothesis.			CO5, CO6
	Mode of examination	Theory			
	Weightage Distribution	CA	MTE	ETE	
		30%	20%	50%	
	Text book/s*	1. MatheusGrasselli and DimitryPelinovsky, "Numerical Mathematics", Jones and Bartlet Publishers, USA. 2. M. Goyal, "Computer Based Numerical & Statistical Techniques", Infinity Science Press, LLC, MA, USA.			
	Other References	1.Lars Elden, "Mattrix Methods in Data Mining and Pattern Recognition", SIAM (Society for Industrial and Applied Mathematics), USA. 2. Internet as a resource for references			

CO and PO Mapping

S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)

1.	CO1: Identify errors from different dimensions and defining roots of equations for the use in computational problems	PO1, PO2, PO3, PO4, PO8, PSO2, PSO3
2.	CO2: Apply Differential and Numerical Integration for interpolation and error analysis	PO1, PO2, PO3, PO4, PO8, PSO2, PSO3
3.	CO3: Discover linearly independent components using eigenvectors and standard value decomposition.	PO1, PO2, PO3, PO4, PO8, PSO2, PSO3
4.	CO4: Formulate Exploratory data analysis using spectral methods like Fourier and wavelet analysis.	PO1, PO2, PO3, PO4, PO8, PSO2, PSO3
5.	CO5: Illustration of best Curve fitting for given data	PO1, PO2, PO3, PO4, PO8, PSO2, PSO3
6.	CO6: Apply mathematical and statistical methods in their research and application development	PO1, PO2, PO3, PO4, PO8, PSO2, PSO3

PO and PSO mapping with level of strength for Course Name Mathematical and Statistical techniques in Computer Science (Course Code CSE613)

Course	Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PSO 1	PSO 2	PSO 3
Mathematical and Statistical techniques (Course Code CSE613)	CO1	3	2	1	1	-	-	-	2	-	3	1
	CO2	3	3	1	1	-	-	-	2	-	2	1
	CO3	3	3	1	2	-	-	-	2	-	3	1
	CO4	3	2	1	2	-	-	-	2	-	3	1
	CO5	3	2	1	2	-	-	-	3	-	3	1
	CO6	3	2	1	2	-	-	-	3	-	3	1

Average of non-zeros entry in following table (should be auto calculated).

Course Code	**Course Name**	**PO 1**	**PO2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PSO 1**	**PSO 2**	**PSO 3**
CSE 613	**Mathematical and Statistical techniques**	**3**	**2.3**	**1**	**1.4**	**0**	**0**	**0**	**2.3**	**0**	**2.8**	**1**

Strength of Correlation

1. Addressed to ***Slight (Low=1) extent*** ***2.*** Addressed to ***Moderate (Medium=2) extent***
3. Addressed to ***Substantial (High=3) extent***

School: SET		**Batch :----**	
Program: M.Tech		**Current Academic Year:**	
Branch:CS/IT		**Semester:**	
1	Course Code	----- Course Name: **Massive Graph Analysis**	
2	Course Title	**Massive Graph Analysis**	
3	Credits	3	
4	Contact Hours (L-T-P)	3-0-0	
	Course Status		
5	Course Objective	The objective of the course is to teach students the advanced graph theory concepts and their applications in computer science.	
6	Course Outcomes	After successful completion of the course students will be able to CO1: demonstrate some of the most important notions and types of graph theory and develop their skill in solving basic applications understanding societal needs. CO2: interpret the fundamentals of graph and trees and to apply these as computer science applications and case studies. CO3: Discover the advanced applications of graph patterns, subgraph analysis. CO4: Discovering various algorithms to understand analysis and its applications in areas like coloring problem, transportation problems etc. CO5: Examine graph pattern analysis in data science and other real world applications. CO6: Relating the concepts to prepare grounds for project work and research interests.	
7	Course Description	This course is to teach students the basic graph theory concepts and their applications in computer science.	
8	Outline syllabus		CO Mapping
	Unit 1	**Introduction**	
	A	Basic terminologies and concepts of Graph Theory, Fundamental types of graphs. Properties of graphs, theorems based on different types of graph and various operations on graphs	CO1
	B	Special types of graphs (Hamiltonian, Euler), K-partite graphs, its theorems, Isomorphism and its properties, applications of isomorphism.	CO1, CO3
	C	Fundamentals of trees and their types, fundamental circuits, spanning trees, algorithms to find minimum spanning trees in a weighted graph (Kruskal& Prim).	CO2, CO6
	Unit 2	**Advanced graphs**	
	A	Fundamental circuit, Properties of circuits & cut–sets, Concept of connectivity and separability	CO3
	B	Introduction to Planar graphs, Kuratowski's non-planar graphs, Proof of Euler's formula using	CO3

		induction.	
	C	Detection of planarity, geometric duals of graph, thickness & Crossings of planar, Petersons graph, Kuratowski's graphs.	CO3, CO6
	Unit 3	**Directed graphs**	
	A	Definition, types of digraphs. Directed paths and connectedness, Walk, path, and circuit of directed graphs, Euler digraph.	CO1, CO6, CO3
	B	Connectedness and separability in digraphs. Trees with directed edges, Fundamental circuits in diagraphs	CO1, CO6, CO3
	C	Acyclic digraph and decyclization.	CO1, CO6
	Unit 4	**Coloring and covering in graphs**	
	A	Concept of proper coloring of vertices of a graph, chromatic number, Chromatic partitioning	CO4, CO6
	B	Chromatic polynomial, finding chromatic polynomial of a given graph	CO4, CO6
	C	Matching, Covering, Five color problem and its proof	CO4, CO6
	Unit 5	**Advanced graph pattern analysis**	
	A	Applications of graphs in areas of agriculture, Disease pattern analysis, defence etc., Other applications in data science.	CO5
	B	P- NP problems in graph pattern analysis.	CO5
	C	Introduction to latest tools used in graph-based pattern analysis.	CO5, CO6
	Mode of examination	Theory	
	Weightage Distribution	CA / MTE / ETE	
		30% / 20% / 50%	
	Text book/s*	Deo, N, *Graphtheory with applications to Engineering and Computer Science*, Prentice Hall India.	
	Other References	**1.** Wilson R J, *Introduction to Graph Theory*, PearsonEducation 2. Harary, F, *Graph Theory*, Narosa Bondy& Murthy, *Graph theory and application*. Addison Wesley	

CO and PO Mapping

S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	CO1: demonstrate some of the most important notions and types of graph theory and develop their skill in solving basic applications understanding societal needs.	PO1, PO2, PO4, PO5, PO8
2.	CO2: interpret the fundamentals of graphs and trees and to apply these as computer science applications and case studies.	PO1, PO2, PO3, PO4
3.	CO3: Discover the advanced applications of graph patterns, subgraph analysis.	PO3, PO4, PSO(DSA)

4.	CO4 Discovering various algorithms to understand analysis and its applications in areas like coloring problem, transportation problems etc.	PO3, PSO(DSA)
5.	CO5: Examine graph pattern analysis in data science and other real world applications.	PO2, PO3,PO8 PSO(DSA)
6	CO6: Relating the concepts to prepare grounds for project work and research interests.	PO2, PO3, PSO(DSA)

PO and PSO mapping with level of strength for Course Name: Massive Graph Analysis (-----)

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO(DSA)
CO1	3	3	1	2	3	1	-	1	1
CO2	3	3	3	2	1	1	-	1	1
CO3	1	1	3	3	2	1	-	1	2
CO4	1	1	3	2	1	2	1	1	3
CO5	1	2	3	2	2	1	1	1	3
Co6	1	2	3	2	1	2	1	3	3

Average of non-zeros entry in following table (should be auto calculated).

Course Code	**Course Name**	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PSO (DSA)**
	Massive Graph Analysis	**1.67**	**2**	**2.67**	**2.17**	**1.67**	**1.33**	**0.5**	**1.33**	**2.17**

Strength of Correlation

1. Addressed to ***Slight (Low=1) extent*** ***2.*** Addressed to ***Moderate (Medium=2) extent***
3. Addressed to ***Substantial (High=3) extent***

School: SET		**Batch : 2019 onwards**	
Program: M.Tech		**Current Academic Year: 2020-2021**	
Branch: CSE (Networking and Cyber Security)		**Semester: I**	
1	Course Code	**CSE630**	Course Name: **Advanced Computer Network**
2	Course Title	**Advanced Computer Network**	
3	Credits	3	
4	Contact Hours (L-T-P)	3-0-0	
	Course Status	PG	
5	Course Objective	Course will examine the design and implement various network protocols with the concept of layered approach of OSI and TCP/IP model.	
6	Course Outcome	CO1: Enumerate the layers of the OSI model and TCP/IP and classifying the function(s) of each layer and understanding IEEE 802.11 AND IEEE 802.3 CO2: Develop and build the skills of IP Addressing and Routing with Internet Routing Protocols and summarizing Mobility Issues. CO3: Explain the protocols of computer networks like UDP and TCP. CO4: Illustrate the issues related to the congestion control, flow control and QoS parameters. CO5: Demonstrate the traffic management and its issues. CO6:Interpreting and attributing security issues and encryption schemes.	
7	Course Description	This course is to provide students the advanced concepts of data communication and computer networks by exposing students to the concepts of Transport Layer protocol suite and network tools and programming, Traffic Management & Security measures.	
8	Outline syllabus		CO Mapping
	Unit 1	**Overview of Wired and Wireless Data Networks**	
	A	Review of Layered Network Architecture, ISO-OSI and TCP/IP Network Model Datagram Networks and Virtual Circuit Networks, Point to Point and Point to Multipoint Networks Layer 2 Switches	CO1
	B	IEEE 802.3U(Fast Ethernet) and IEEE 802.3Z(Gigabit Ethernet)Virtual LAN	CO1
	C	Wireless LAN: IEEE 802.11, Bluetooth Broadband Wireless LAN : 802.16, WIMAX	CO1
	Unit 2	**Internetworking**	
	A	Review of IP Addressing and Routing Internet Architecture :Layers 3 Switch, Edge Router and Core Router Overview of Control Plane, Data Plane ,Management	CO2

		Plane			
	B	Internet Routing Protocols**:** OSPF, BGP Broadcast and Multicast Routing**:** Flooding, Reverse Path Forwarding, Pruning, Core based trees, PIM			CO2
	C	Mobility Issues and Mobile IP			CO2
	Unit 3	**Transport Layer Protocols**			
	A	Process to Process Delivery, Review of UDP, TCP			CO3
	B	SCTP Protocol**:** Services, Features, Packet Format, Association, Error Control Wireless TCP and RTP, RTCP			CO3
	C	Real Time Application: Voice and Video over IP.			CO3
	Unit 4	**Traffic Control and Quality of Service**			
	A	Flow Control**:** Flow Model, Open Loop: Rate Control, LBAP, Closed Loop: Window scheme, TCP and SCTP Flow Control			CO4,CO5
	B	Congestion Control**:** Congestion Control in packet networks, ECN and RED Algorithm, TCP and SCTP Congestion Control			CO4,CO5
	C	Quality of Service: IP Traffic Models, Classes and Subclasses, Scheduling: GPS, WRR, DRR, WFQ, PGPS, VC.			CO4,CO5
	Unit 5	**Traffic Management & Security**			
	A	Traffic Management Framework**:** Scheduling, Renegotiation, Signaling, Admission Control, Capacity Planning			CO5
	B	Security Issues, Symmetric Encryption: DES , TripleDES ,Modes, AES			CO5, CO6
	C	Public Key Encryption: RSA , Diffie Hellman, Elliptic Curve, Hashing :MDS , SHA-1 , DSA Protocols: Kerberos,SSL/TLS, IPSec			CO5,CO6
	Mode of examination	Theory			
	Weightage Distribution	CA	MTE	ETE	
		30%	20%	50%	
	Text book/s*	1. Srinivasan Keshav" An Engineering Approach To Computer Networking ",Pearson 2. A. Tanenenbaum, " Computer Network",PHI			
	Other References	1. W. Richard Stevens "TCP/IP Illustrated "-Pearson 2. W. Stallings, " Wireless Communication and Networks" Pearson 3. Internet as source of Reference			

CO and PO Mapping

S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	CO1: Enumerate the layers of the OSI model and TCP/IP and classifying the function(s) of each layer and understanding IEEE 802.11 AND IEEE 802.3	PO1,PO2, PO3,PO8,PSO3
2.	CO2: Develop and build the skills of IP Addressing	PO1,PO2,PO3,PO8,PSO3

	and Routing with Internet Routing Protocols and summarizing Mobility Issues.	
3.	CO3: Explain the protocols of computer networks like UDP and TCP.	PO1,PO2,PO3,PO4,PO8,PSO3
4.	CO4: Illustrate the issues related to the congestion control, flow control and QoS parameters.	PO1,PO2,PO3, PO4, PO5,PO6,PO8,PSO3
5.	CO5: Demonstrate the traffic management and its issues.	PO1,PO2,PO3,PO4,PO5, PO6, PO8,PSO3
6.	CO6: Interpreting and attributing security issues and encryption schemes.	PO1,PO2,PO3,PO4,PO5, PO6, PO8, PSO3

PO and PSO mapping with level of strength for Course Name Advanced Computer Network (Course Code CSE630)

	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
	CO1	3	2	3	-	-	-	-	2	-	-	2
	CO2	3	2	3	-	-	-	-	2	-	-	2
	CO3	3	2	3	1	-	-	-	2	-	-	2
	CO4	3	2	3	1	2	2	-	2	-	-	2
	CO5	3	2	3	2	2	2	-	2	-	-	3
	CO6	3	2	3	2	2	2	-	2	-	-	3
	Avg.	3	1.6	3	1	1	1	-	2	-	-	2.3

CSE6: Object Oriented Software Engineering

School:		**School of Engineering and technology**	
Department		**Department of Computer Science and Engineering**	
Program:		**M.Tech**	
Branch:		**Software Engineering**	
1	Course Code	CSE6	
2	Course Title	Object Oriented Software Engineering	
3	Credits	3	
4	Contact Hours (L-T-P)	3-0-0	
	Course Status	Core /Elective/Open Elective	
5	Course Objective	This objective of this course is to give students an understanding of the object-oriented programming paradigm in the context of developing software that is well specified, designed and tested. Students will be exposed to a variety of notations at different stages of the development process.	
6	Course Outcomes	Students will be able to: CO1. Identify and define the principles of object oriented paradigm. CO2. Describe how to produce detailed object models and designs from system requirements CO3. Apply the system design principles for development of an object oriented software CO4. Examine the modeling techniques to model different perspectives of object-oriented software design (UML). CO5. Analyze the testing techniques using various test cases. CO6: Discuss the software development life cycle for Object-Oriented solutions for Real-World Problems	
7	Course Description	This module aims to give students an understanding of the object-oriented programming paradigm in the context of developing software that is well specified, designed and tested. Students will be exposed to a variety of notations at different stages of the development process.	
8	Outline syllabus		CO Mapping
	Unit 1	**Introduction**	
	A	Software Engineering Concepts, Software Engineering Development Activities, Software Life Cycle Models: Build and Fix, Waterfall Model, Prototyping, V-Shape Incremental Enhancement, Spiral, RAD	CO1, CO6
	B	An Overview of UML, Modeling Concepts, Basic Building Blocks of UML, View into UML, A Conceptual Model of UML, Basic Structural Modeling, UML Diagrams.	CO1, CO6
	C	Requirement Elicitation Concepts and Activities, Documenting Requirement Elicitation	CO1, CO6
	Unit 2	**Analysis**	
	A	An overview of Analysis: Analysis Model, Analysis Concepts: Analysis Object Models and Dynamic	CO2, CO6

		Models, Entity, Boundary and Control Objects, Generalization and Specialization	
	B	Analysis Activities: From Use Case to Objects: Identifying Entity Objects, Boundary Objects, Control Objects, Associations, Aggregates, Attributes	CO2, CO6
	C	Documenting Analysis: Requirements Analysis Document Template	CO2, CO6
	Unit 3	**System Design**	
	A	An overview of System Design, System Design Concepts, Architectural Styles	CO3, CO6
	B	System Design Activities: From Objects to Subsystems	CO3, CO6
	C	UML Deployment Diagrams, System Design Activities: Addressing Design Goals: Concurrency, Hardware/Software Mapping, Persistent Data Management, Global Resource Handling and Access Control, Software Control, Boundary Conditions, Documenting System Design	CO3, CO6
	Unit 4	**Object Design**	
	A	Object Design: Reuse Concepts: Application objects versus solution objects, Specification inheritance and implementation inheritance, The Liskov Substitution Principle, Delegation, Delegation and inheritance in design patterns	CO4
	B	Object Design: Interface Specification Concepts: Add visibility information, Add type signature information, Add contracts	CO4
	C	Documenting Reuse & Object Design: Structure	CO4
	Unit 5	**Testing Object Oriented Systems**	
	A	Goals of Testing, Testing Concepts: Faults, Erroneous States, and Failures, Test Cases, Test Stubs and Drivers	CO5, CO6
	B	Testing Activities: Component Inspection, Usability Testing, Unit Testing, Integration Testing, System Testing, Black-box and White-box Testing	CO5, CO6
	C	Managing Testing: Goal of test management	CO5, CO6
	Mode of examination	Theory/Jury/Practical/Viva	
	Weightage Distribution	CA / MTE / ETE	
		30% / 20% / 50%	
	Text book/s*	1. Bernd Bruegge and Allen H. Dutoit, “Object oriented Software Engineering, using UML, and Pattern Java” Pearson (2nd Edition). 2. George Wilkie, “Object oriented Software Engineering”, Addison-Wesley.	
	Other References	1. Ivar Jacobson “Object Oriented Software Engineering: A Use Case Driven Approach”, Addison-Wesley. 2. Grady Booch “Object-Oriented Analysis and Design with Applications”, Addison-Wesley Professional.	

CO and PO Mapping

S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	CO1: Identify and define the principles of object oriented paradigm.	PO1,PO6,PO7,PO8,PSO1
2.	CO2: Describe how to produce detailed object models and designs from system requirements	PO1,PO3,PO6,PO7,PO8,PSO1
3.	CO3: Apply the system design principles for development of an object oriented software	PO1,PO2,PO3,PO4,PO6,PO7,PO8,PSO1
4.	CO4: Examine the modeling techniques to model different perspectives of object-oriented software design (UML).	PO1,PO2,PO3, PO6,PO7,PO8,PSO1
5.	CO5:Analyze the testing techniques using various test cases.	PO1,PO3,PO5,PO6, PO7,PO8,PSO1
6.	CO6: Discuss the software development life cycle for Object-Oriented solutions for Real-World Problems	PO1,PO2,PO3,PO4,PO5,PO6, PO7,PO8,PSO1

PO and PSO mapping with level of strength for Course Name Object Oriented Software Engineering **(Course Code CSE6)**

Course Code_ Course Name	CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CSE6_ Object Oriented Software Engineering	CO1	2	-	-	-	-	2	1	2	3	-	-
	CO2	3	-	2	-	-	3	3	3	3	-	-
	CO3	3	3	2	2	-	3	2	3	3	-	-
	CO4	3	3	2	-	-	3	2	2	3	-	-
	CO5	3	-	2	-	2	3	2	3	3	-	-
	CO6	3	3	3	3	3	3	3	3	3	-	-

Average of non-zeros entry in following table (should be auto calculated).

Course Code	Course Name	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CSE6	Object Oriented Software Engineering	2.8	3	2.2	2.5	2.5	2.8	2.1	2.6	3	-	-

Strength of Correlation

1. Addressed to ***Slight (Low=1) extent*** ***2.*** Addressed to ***Moderate (Medium=2) extent***
3. Addressed to ***Substantial (High=3) extent***

School:		**School of Engineering and technology**	
Department		**Department of Computer Science and Engineering**	
Program:		**M.Tech**	
Branch:		**Software engineering**	
1	Course Code		
2	Course Title	Software Architecture and Design Pattern	
3	Credits	3	
4	Contact Hours (L-T-P)	3-0-0	
	Course Status	Core /Elective/Open Elective	
5	Course Objective	The main objective is to introduce the student to architecture of software and design Patterns.	
6	Course Outcomes	CO1: Summarize the architecture, creating it and moving from one to any, different structural patterns. CO2: Analyze the architecture and build the system from the components CO3: Design creational and structural patterns CO4: Analyze the behavioral patterns. CO5: Solve case study in utilizing architectural structures. CO6: Propose an architecture for given application.	
7	Course Description	This course introduces basic concepts and principles about software design and software architecture. It starts with discussion on design issues, followed by coverage on design patterns. It then gives an overview of architectural structures and styles. Practical approaches and methods for creating and analyzing software architecture are presented. The emphasis is on the interaction between quality attributes and software architecture. Students will also gain experiences with examples in design pattern application and case studies in software architecture.	
8	Outline syllabus		CO Mapping
	Unit 1	**Envisioning and creating Architecture**	
	A	The Architecture Business Cycle, What is Software Architecture, Architectural patterns	CO1
	B	reference models, reference architectures, architectural structures and views	CO1
	C	Quality Attributes, Achieving qualities, Architectural styles and patterns, designing the Architecture, Documenting software architectures, Reconstructing Software Architecture.	CO1
	Unit 2	**Analyzing Architectures**	
	A	Architecture Evaluation, Architecture design decision making, ATAM, CBAM.	CO2,CO6
	B	Moving from one system to many Software Product Lines	CO2,CO6
	C	Building systems from off the shelf components,	CO2,CO6

		Software architecture in future.			
	Unit 3	**Patterns**			
	A	Pattern Description, organizing catalogs, role in solving design problems, Selection and usage.			CO3
	B	Creational and Structural patterns Abstract factory, builder, factory method			CO3
	C	prototype, singleton, adapter, bridge, composite, façade, flyweight			CO3
	Unit 4	**Behavioral patterns**			
	A	Chain of responsibility, command, Interpreter,			CO4
	B	iterator, mediator, memento, observer			CO4
	C	state, strategy template method, visitor			CO4
	Unit 5	**Case Studies**			
	A	A-7E – A case study in utilizing architectural structures, The World Wide Web – a case study in interoperability			CO5,CO6
	B	Air Traffic Control – a case study in designing for high availability			CO5,CO6
	C	Celsius Tech – a case study in product line development			CO5,CO6
	Mode of examination	Theory/Jury/Practical/Viva			
	Weightage Distribution	CA	MTE	ETE	
		30%	20%	50%	
	Text book/s*	1. Len Bass, Paul Clements, and Rick Kazman, Software Architecture in Practice, 2nd ed, Addison-Wesley, 2003. 2. Design Patterns, Erich Gamma, Pearson Education, 1995.			
	Other References	1. Eric Braude, Software Design: From Programming to Architecture, Wiley, 2004. 2. Software architecture, David M. Dikel, David Kane and James R. Wilson, Prentice Hall PTR, 2001			

CO and PO Mapping

S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	CO1: Summarize the architecture, creating it and moving from one to any, different structural patterns.	PO1,PO2,PO3,PO7,PO8,PSO1
2.	CO2: Analyze the architecture and build the system from the components	PO1,PO2,PO3,PO7,PO8,PSO1
3.	CO3: Design creational and structural patterns	PO1,PO2,PO3,PO7,PO8,PSO1
4.	CO4: Analyze the behavioral patterns.	PO1,PO2,PO3,PO7,PO8,PSO1
5.	CO5: Solve case study in utilizing architectural structures.	PO1,PO2,PO3,PO5,PO6,PO7,PO8,PSO1
6.	CO6: Propose an architecture for given application.	PO1,PO2,PO3,PO5,PO7,PO8,PSO1

PO and PSO mapping with level of strength for Course Name Software Architecture and Design pattern and (Course Code yyyy)

Course Code_ Course Name	CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
Yyyy_software architecture and design pattern	CO1	2	1	2	-	-	-	1	1	3	-	-
	CO2	2	2	2	-	-	-	2	1	3	-	-
	CO3	2	2	2	-	-	-	2	1	3	-	-
	CO4	2	2	2	-	-	-	2	1	3	-	-
	CO5	3	3	3	-	1	1	2	1	3	-	-
	CO6	2	3	3	-	1	-	2	1	3	-	-

Average of non-zeros entry in following table (should be auto calculated).

Course Code	Course Name	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
	Software architecture and design pattern	2.1	2.1	2.3	-	1	1	1.8	1	3	-	-

Strength of Correlation

1. Addressed to ***Slight (Low=1) extent*** ***2.*** Addressed to ***Moderate (Medium=2) extent***
3. Addressed to ***Substantial (High=3) extent***

CSE642: Soft Computing Techniques

1	Course Code	**CSE642** Course Name: **Soft Computing Techniques**	
2	Course Title	**Soft Computing Techniques**	
3	Credits	3	
4	Contact Hours (L-T-P)	3-0-0	
	Course Status	PG	
5	Course Objective	**Students will try to learn:** 1. To conceptualize the working of human brain using ANN. 2. To become familiar with neural networks that can learn from available examples and generalize to form appropriate rules for inference systems. 3. To introduce the ideas of fuzzy sets, fuzzy logic and use of heuristics based on human experience. 4. To provide the mathematical background for carrying out the optimization and familiarizing genetic algorithm for seeking global optimum in self-learning situation.	
6	Course Outcome	After Successful completion of this course the student will be able to: 1. ***Identify*** basic mathematical/statistical methods used in soft computing. 2. ***Formulate*** learning techniques used in different cases. 3. ***Use*** fuzzy logic inference with emphasis on their use in the design of intelligent or humanistic systems. 4. ***Analyze*** problems involving ambiguities, uncertainties, vagueness and inexactness 5. ***Integrate*** optimization techniques in problems of Engineering and Technology using genetic algorithm. 6. ***Justify*** use of soft computing terminologies in Decision and control system.	
7	Course Description	This course introduces soft computing theories, techniques and tools. Those are frequently required for understanding and developing the exploratory data analysis techniques, and knowledge discovery and intelligent systems.	
8	Outline syllabus		CO Mapping
	Unit 1	**Neural Network**	
	A	History, overview of biological Neuro-system, Mathematical Models of Neurons, architecture, Learning rules, Training rules, Delta, Back Propagation Algorithm.	CO1
	B	Learning Paradigms-Supervised, Unsupervised and reinforcement Learning, ANN training Algorithms-perceptions	CO1, CO2
	C	Multilayer Perceptron Model, Hopfield Networks, Associative Memories, Applications of Artificial Neural Networks.	CO1, CO2

	Unit 2	**Fuzzy Logic**	
	A	Introduction to Fuzzy Logic, Classical and Fuzzy Sets: Overview of Classical Sets, Membership Function,	CO3
	B	Fuzzy rule generation, Operations on Fuzzy Sets: Compliment, Intersections, Unions,	CO1,CO3
	C	Combinations of Operations, Aggregation Operations..	CO3
	Unit 3	**Fuzzy Arithmetic**	
	A	Fuzzy Numbers, Linguistic Variables, Arithmetic Operations on Intervals & Numbers, Lattice of Fuzzy Numbers, Fuzzy Equations.	CO1, CO3
	B	Fuzzy Logic: Classical Logic, Multi-valued Logics, Fuzzy Propositions	CO1, CO3
	C	Fuzzy Qualifiers, Linguistic Hedges.	CO1, CO3
	Unit 4	**Uncertainty Based Information**	
	A	Information & Uncertainty, Non-specificity of Fuzzy & Crisp Sets,	CO3, CO4
	B	Fuzziness of Fuzzy Sets.	CO3, CO4
	C	Introduction of Neuro-Fuzzy Systems	CO3, CO4
	Unit 5	**Architecture of Neuro fuzzy Networks**	
	A	Application of Fuzzy Logic: Medicine, Economics etc.	CO3, CO6
	B	Genetic Algorithm: An Overview.	CO5, CO6
	C	GA in problem solving, Implementation of GA.	CO5, CO6
	Mode of examination	Theory	
	Weightage Distribution	CA / MTE / ETE	
		30% / 20% / 50%	
	Text book/s*	1. S.N.Sivanandam, "Principles of Soft Computing", John Wiley-India edition. 2. Timothy J. Ross, "Fuzzy Logic with Engineering Applications", PHI.	
	Other References	1. Anderson J.A., "An Introduction to Neural Networks", PHI. 2. G.J. Klir and B. Yuan "Fuzzy Sets & Fuzzy Logic", PHI. 3. Internet as a resource for references	

CO and PO Mapping

S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	***Identify*** basic mathematical/statistical methods used in soft computing.	PO1, PO6, PSO2, PSO3
2.	***Formulate*** learning techniques used in different cases.	PO2, PO5, PSO1, PSO2, PSO3
3.	***Use*** fuzzy logic inference with emphasis on their use in the design of intelligent or humanistic systems.	PO3, PO4, PO5, PSO2, PSO3, PSO4
4.	***Analyze*** problems involving ambiguities, uncertainties, vagueness and inexactness	PO4, PO5, PO6, PSO3, PSO4

5.	***Integrate*** optimization techniques in problems of Engineering and Technology using genetic algorithm.	PO3, PO4, PO5, PO6, PSO3, PSO4
6.	***Justify*** use of soft computing terminologies in Decision and control system.	PO4, PO5, PO6, PSO2, PSO3, PSO4

PO and PSO mapping with level of strength for Course Name: Soft Computing Techniques (Course Code CSE642)

Cos	**PO1:**	**PO2:**	**PO3:**	**PO4:**	**PO5:**	**PO6:**	**PO7:**	**PO8:**	**PSO1:**	**PSO2:**	**PSO3:**
CO1	1	3	2	2	2	3	2	3	3	2	
CO2	2	3	2	2	3	2	3	3	3	2	
CO3	1	2	3	3	3	2	2	3	3	3	
CO4	1	2	2	3	3	3	2	2	3	3	
CO5	1	2	3	3	3	3	2	2	3	3	
CO6	2	2	3	3	3	3	2	3	3	3	

Syllabus: CSE622 Advance Data Mining Techniques

1	Course Code	**CSE622**	**Program:M.Tech.**
2	Course Title	**Advance Data Mining Techniques**	
3	Credits	3	Contact Hours: 3hr
4	Term	XXXX	L T P : 3-0-0
5	Course Objective	Learn about the most advance data mining methods to solve real world problems.	
6	Course Outcomes (CO)	On successful completion of this module students will be able to: CO1: Understand the practical and theoretical concept of of data mining and its applications. CO2: Extend classification techniques. CO3: Illustrate the clustering Techniques & enhancement. CO4: Explain the concepts of Web and Text Mining. CO5: Make use of concept of Big Data analysis. CO6: Apply & develop Advance Data Mining concepts .	
7	Course Description	This course introduces advanced aspects of data mining, encompassing the principles, to analyze the data, identify the problems, and choose the relevant models and algorithms to apply.	
8	**Course Contents**		CO Mapping
8.01	**Unit 1**	**Data mining Overview and Advanced Pattern Mining**	
8.02	**A**	Data mining tasks – mining frequent patterns, associations and correlations, classification and regression for predictive analysis, cluster analysis , outlier analysis	CO1
8.03	**B**	Advanced pattern mining in multilevel, multidimensional space – mining multilevel associations, mining multidimensional associations	
8.04	**C**	Mining quantitative association rules, mining rare patterns and negative patterns.	
8.05	**Unit 2**	**Advance Classification**	
8.06	**A**	Classification by back propagation, support vector machines,	CO2 ,CO6
8.07	**B**	Classification using frequent patterns	
8.08	**C**	Other classification methods – genetic algorithms roughest approach, fuzzy set approach;	
8.09	**Unit 3**	**Advance Clustering**	
8.10	**A**	Density - based methods –DBSCAN, OPTICS, DENCLUE;	CO3 ,CO6
8.11	**B**	Grid-Based methods – STING, CLIQUE;Exception – maximization algorithm	
8.12	**C**	Clustering High- Dimensional Data; Clustering Graph and Network Data.	
8.13	**Unit 4**	**Web and Text Mining**	
8.14	**A**	Introduction to web mining, web content mining, web structure mining, web usage mining	CO4 ,CO6
8.15	**B**	Text mining –unstructured text, episode rule discovery	

		for texts			
8.16	**C**	Hierarchy of categories, text clustering.			
8.17	**Unit 5**	**Big Data**			
8.18	**A**	Introduction to Big Data, challenges of conventional systems, Overview of Hadoop, Hadoop Distributed File System (HDFS)			CO5,CO6
8.19	**B**	Hadoop Map reduce Framework, HBASE			
8.20	**C**	Interacting HDFS using HIVE, sample programs in HIVE-PIG			
9					
			Mid-Term Examination	End-Term Examination	
9.1	Attendance	Mandatory	Mandatory	75%	
9.2	Assignment	Yes	--	--	
9.3	Quizzes	Yes	--	--	
9.4	Projects	Yes	--	--	
9.5	Presentations	Yes	--	--	
9.6	Exam	--	Yes	Yes	
9.7	Total Marks	30	30	40	
10	**Reading Content**				
10.1	Text book*	1. Data Mining Concepts and Techniques, Jiawei Hang Micheline Kamber, Jian pei, Morgan Kaufmannn. 2. Bill Franks, "Taming the big data tidal wave: finding opportunities in huge data streams with advanced analytics", John Wiley & Sons, 2012			
10.2	other references	1. Introduction to Data Mining – Pang-Ning Tan, Vipinkumar, Michael Steinbach, Pearson. 2. Data Mining Principles & Applications – T.V Sveresh Kumar, B.Esware Reddy, Jagadish S Kalimani, Elsevier. 3. Internet as source of reference			

CO and PO Mapping:

S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	Understand the practical and theoretical concept of data mining and its applications	PO1
2.	Extend classification techniques	PO1,PO2
3.	Illustrate the clustering Techniques & enhancement.	PO1
4.	Explain the concepts of Web and Text Mining	PO1,PO2,PO3,PO8
5	Make use of concept of Big Data analysis	PO1,PO2,PO3,PO8,PSO2
6	Apply & develop Advance Data Mining concepts	PO1,PO2,PO3,PO4,PO5,PO6,PO7,PO8, PSO2

PO and PSO mapping with level of strength for Course Name :

Advance Data Mining Techniques (Course Code CSE622)

		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CSE622/ ADMT		**Advanced Technical Knowledge**	**Research and Development**	**Pedagogy**	**Innovation and Entrepreneurial**	**Societal Values**	**Personal and Professional Ethics**	**Communication Skills**	**Life-long learning**	**Software Engineering**	**Data Science & Analytics**	**Networking and Cyber Security**
	CO1	3	-	-	-	-	-	-	-	-	-	-
	CO2	3	2	-	-	-	-	-	-	-	-	-
	CO3	3	-	-	-	-	-	-	-	-	-	-
	CO4	3	2	2	-	-	-	-	2	-	3	-
	CO5	3	2	2	-	-	-	-	2	-	-	-
	CO6	3	2	3	3	2	3	3	3	-	3	-

Average of non-zeros entry in following table (should be auto calculated).

Course Code/ Name	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PSO1**	**PSO2**	**PSO 3**
CSE622/ ADMT	3	2	2.3	3	2	3	3	2.3	-	3	-

Strength of Correlation:

1. Addressed to ***Slight (Low=1) extent*** ***2.*** Addressed to ***Moderate (Medium=2) extent***

3. Addressed to ***Substantial (High=3) extent***

Department Elective 1: Advanced Mobile Computing

School: SET		**Batch : 2019**	
Program: M.Tech		**Current Academic Year: 2019-2021**	
Branch: Computer Network		**Semester: I**	
1	Course Code		Course Name**: Advanced Mobile Computing**
2	Course Title	**Advanced Mobile Computing**	
3	Credits	3	
4	Contact Hours (L-T-P)	3-0-0	
	Course Status	PG	
5	Course Objective	This course will teach the advanced concepts of mobile computing and its applications.	
6	Course Outcomes	At the end of the course, students will have achieved the following learning objectives. CO1. Define the basic concept of cellular network and introduction to mobile agents . CO2. Classify and describe the architecture of Routing and Mobile network. CO3. Describe the role of channel allocation . CO4. Categorize the concept of static and dynamic routing.. CO5. Evaluate the importance of databases in mobile computing . CO6. Elaborate the concept of wireless computing and warehousing.	
7	Course Description		
8	Outline syllabus		CO Mapping
	Unit 1	**Introduction**	
	A	Basic Concepts, Principle of Cellular Communication	CO1
	B	Overview of 1G, 2G, 2.3G, 3G and 4G, GSM and CDMA	CO1
	C	Architecture, Mobile Agent: Mobile Objects and Agents, Mobile program, Mobile Agent issues.	CO1
	Unit 2	**Routing in Base Station Subsystem**	
	A	Directory lookup, mail box, routing data to mobile, routing table update, permanent and temporary address schemes.	CO1,CO2
	B	Home domain directory, location directory, Routing: TCP/IP and other protocols, Ad-hoc networking protocols, Mobile Ipv4 and Ipv6.	CO1,CO2
	C	Mobile Internetworking Architecture, Internet Mobility issues, Route optimization, Wireless TCP, GPRS	CO1,CO2

		services, IP over CDMA.Subnet Association to Network			
	Unit 3	**Channel Allocation**			
	A	Basic Strategies, congestion control.Congestion Control Algorithms: Leaky Bucket and Token Bucket .			CO1,CO3,CO4
	B	Static Routing , Dynamic routing, Difference in static and Dynamic Routing,Routing Table configuration for Dynamic routing .			CO1,CO3,CO4
	C	Concept of Channel Borrowing.Wireless ATM: Channel borrowing.			CO1,CO3,CO4
	Unit 4	**Mobile Computing**			
	A	Database requirements, computing within a building, within a city and outside city.			CO1,CO4
	B	Mobility:Mobility Management, Configuration of wireless hardware in Mobile device.			CO1,CO4
	C	Mobile Devices: PDA, Mobile OS,Network Configuration in android and IoS.			CO1,CO4
	Unit 5	**Proxy Servers and Applications**			
	A	Wireless Internet, remote data access, Global Positioning, Document Tracing, Health Care.			CO1,CO5
	B	Warehouse, Automated Vending, Future directions in mobile networks			CO1,CO5
	C	A survey of recent work from publications including some case studies on Ad hoc networks.			CO1,CO5
	Mode of examination	Theory			
	Weightage Distribution	CA	MTE	ETE	
		30%	20%	50%	
	Text book/s*	1. Richard Wheeler, “Mobility: processes, computers and Agents”, Pearson 2. Charles Perkins, “Mobile IP: Design principle and practices”, Pearson			
	Other References	1. Stojmenovic and Cacute, “Handbook of Wireless Networks and Mobile Computing”, Wiley, 2002, ISBN 0471419028 2. Internet as a resource for references			

CO and PO Mapping

S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	Define the basic concept of cellular network and introduction to mobile agents.	PO1,PO2,PO4,PO5
2.	Classify and describe the architecture of Routing and Mobile network.	PO1,PO2,PO3,PO5

3.	Describe the role of channel allocation .	PO1,PO2,PO4,PO5
4.	Categorize the concept of static and dynamic routing.. .	PO1,PO2,PO3,PO4
5.	Evaluate the importance of databases in mobile computing .	PO1,PO2,PO4,PSO2
6.	Elaborate the concept of wireless computing and warehousing	PO1,PO3,PO5,PSO2

PO and PSO mapping with level of strength for Advanced Mobile Computing (Course Code)

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2		3	2										
CO2	1	1	2		1										
CO3	2	1		2	3										
CO4	2	2	3	1											
CO5	1	1		2										3	
CO6	1		2		3									3	

Course Code	**Course Name**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
		1.5	1.16	1.16	1.5										1	

Strength of Correlation

1. Addressed to ***Slight (Low=1) extent*** ***2.*** Addressed to ***Moderate (Medium=2) extent***
3. Addressed to ***Substantial (High=3) extent***

School:		**School of Engineering and technology**
Department		**Department of Computer Science and Engineering**
Program:		**M. Tech**
Branch:		**M. Tech. (CSE) Networking and Cyber Security**
1	Course Code	CSE632
2	Course Title	Advanced Network Security
3	Credits	3
4	Contact Hours (L-T-P)	3-0-0
	Course Status	Elective
5	Course Objective	The objective of this course is to provide an apprehension to the threats and issues of Network Security and cryptography and about key security requirements of networks, symmetric and asymmetric ciphers and application through Algorithms.
6	Course Outcomes	On successful completion of this module students will be able to: CO1: Identify the key security requirements of confidentiality, integrity, and availability, security architecture for OSI, categories of computer and network assets, fundamental security design principles, and cryptography standards CO2: Interpret knowledge of symmetric and asymmetric ciphers, classical encryption techniques, block ciphers and data encryption standard, and public key cryptography. CO3: Categorize cryptographic data integrity algorithms, cryptographic, hash function, message authentication codes, digital signatures and user authentication. CO4: Extend network access control and cloud security, transport level security, wireless network security, electronic mail security and IP security. CO5 Organize the security measures of a network in Informational resources. CO6 Evaluate the principles of Network Security in real time applications
7	Course Description	This course will provide a systematic approach of both the principles and practice of Advanced concepts in network security. It covers the basic issues to be addressed by a network security capability, and explored by providing a tutorial and survey of cryptography and network security technology.
8	Outline syllabus	CO Mapping
	Unit 1	**Basic Concept of Network Security**

	A	Network Security Model, OSI Security Architecture, Goals of network security and standards.			CO1,CO6
	B	Basic concepts of cryptography			CO1, CO2, CO4
	C	Introduction to IT-Security in Open system, threats to security, security requirements and how it works.			CO1, CO2,CO6
	Unit 2	**Network Security Threats and Issues**			
	A	Protocol Vulnerabilities: DoS and DDoS, SYN Flooding, Session Hijacking, ARP Spoofing, Attack on DNS.			CO1, CO2,CO6
	B	Wireless LAN: Frame spoofing, Violating MAC; Software Vulnerabilities: Phishing Attack, Buffer Overflow, Cross-site Scripting			CO2,CO4
	C	SQL Injection; Virus, Worm, Malware, Botnets; Eavesdropping, Password Snooping and IP Masquerade			CO2,CO4
	Unit 3	**Security at Network Level**			
	A	Authentication: password-based, certificate-based, Centralized; Kerbos, Biometrics., SSL.			CO2,CO3,CO6
	B	IP Security, IKE, Virtual Private Network.			CO1,CO2,CO6
	C	Open SSL, Wireless LAN Security: WEP, TKIP, CCMP.			CO4,CO2,CO5
	Unit 4	**Firewall Introduction to ACL**			
	A	Introduction to Firewall, Firewall Functionalities, Types of Firewalls.			CO1,CO2,CO3
	B	Packet Filtering, Reverse Proxy, Stateful Firewalls, limitation of Stateful FireWalls.			CO1,CO2,CO3,CO6
	C	Application Firewalls, Circuit Firewalls, CHECK Point, CISCO PIX, CISCO firewalls case study.			CO1,CO2,CO3
	Unit 5	**Security and Network Applications**			
	A	Electronic Payment: Payment types, SET, Chip Card Transaction.			CO2,CO3,CO4
	B	Mobile Payments; Electronic Mail Security, Web Security: SSL and TLS			CO1,CO3,CO4,CO5
	C	Web Service Security: Token Type, XML Encryption, XML Signatures, SAML; Intrusion detection and prevention systems; honey pots.			CO2,CO3,CO4,CO6
	Mode of examination	Theory			
	Weightage Distribution	CA	MTE	ETE	
		30%	20%	50%	

	Text book/s*	1. Bernard Menezes, "Network Security and Cryptography",Cengage Learning.
	Other References	1. Raymond R. Panko,"Corporate Computer and Network Security", Pearson Education. 2. Willam Stallings, "Cryptography and Network Security", Pearson Education. 3. Internet as a resource for references

CO and PO Mapping

S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	CO1: Identify the key security requirements of confidentiality, integrity, and availability, security architecture for OSI, categories of computer and network assets, fundamental security design principles, and cryptography standards	PO1,PO4 PSO
2.	CO2: Interpret knowledge of symmetric and asymmetric ciphers, classical encryption techniques, block ciphers and data encryption standard, and public key cryptography.	PO1, PO2,PO3,PSO
3.	CO3: Categorize cryptographic data integrity algorithms, cryptographic, hash function, message authentication codes, digital signatures and user authentication.	PO2, PO3,PSO
4.	CO4: Extend network access control and cloud security, transport level security, wireless network security, electronic mail security and IP security.	PO2, PO4,PO6,PSO
5.	CO5: Organize the security measures of a network in Informational resources.	PO1, PO5, PO6,PO7, PSO
6.	CO6: Evaluate the principles of Network Security in real time applications	PO4, PO5,PO8, PSO

PO and PSO mapping with level of strength for Course Name Advanced Network Security (Course Code CSE632)

Course Code_ Course Name	CO's	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO
CSE632_Advanced Network Security	CO1	2	-		2	-	-	-	-	2
	CO2	2	2	2	-	-	-	-	-	2
	CO3	-	2	2	-	-	-	-	-	2
	CO4	-	2	-	2	-	2	-	-	2
	CO5	2	-	-	-	2	2	2	-	2
	CO6	-	-	-	2	2	-	-	2	2

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Average of non-zeros entry in following table (should be auto calculated).

Course Code	Course Name	PO 1	PO2	PO 3	PO 4	PO5	PO 6	P O 7	PO8	PSO
CSE632	Advanced Network Security	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**

Strength of Correlation

1. Addressed to***Slight (Low=1) extent*** ***2.*** Addressed to***Moderate (Medium=2) extent***
3. Addressed to***Substantial (High=3) extent***

CSE643:Software requirement and Estimation

School:		**School of Engineering and technology**	
Department		**Department of Computer Science and Engineering**	
Program:		**M.Tech**	
Branch:		**Software Engineering**	
1	Course Code	CSE 643	
2	Course Title	Software requirement and Estimation	
3	Credits	3	
4	Contact Hours (L-T-P)	3-0-0	
	Course Status	Core /Elective/Open Elective	
5	Course Objective	The objective of the course is to introduce the concepts of software requirement management. This Course covers methods and methodologies for Software Size estimation, Software development efforts and schedule management etc.	
6	Course Outcomes	CO1: Explain the various software requirements and asses their nature. CO2: Apply the principles and practices of software requirement management. CO3: Examine the cost of software development by understanding various methods. CO4: Assess effort, schedule and cost estimation for software CO5: Survey tools for requirements management, software estimation Tools CO6: Discuss the formal methods and techniques for Software requirements and estimation.	
7	Course Description	The course addresses elicitation, specification, and management of software system requirements. It also discusses tools for Requirements and estimation management.	
8	Outline syllabus		CO Mapping
	Unit 1	**Software Requirement Engineering**	
	A	Software requirement, Good practices for requirements engineering and risk management.	CO1,CO6
	B	Requirement Elicitation, requirements analysis, documentation, review, elicitation techniques, analysis models	CO1,CO6
	C	Software quality attributes, setting requirement priorities, verifying requirement quality	CO1,CO6
	Unit 2	**Software Requirement management and modelling**	
	A	Requirement Management, principles and practices, Requirements attributes, change management process	CO2,CO6
	B	Requirements traceability matrix, links in requirement chain	CO2,CO6
	C	Use case modelling, analysis models, class diagrams, object analysis, problem frames	CO2,CO6
	Unit 3	**Software and size Estimation**	

	A	Components of Software Estimations, Estimation methods, Problems associated with estimation			CO3,CO6
	B	Key project factors that influence estimation. Two views of sizing, Function Point Analysis			CO3,CO6
	C	Full function point, LOC Estimation, Conversion between size measures.			CO3,CO6
	Unit 4	**Effort, Schedule and Cost Estimation**			
	A	Productivity, Estimation Factors			CO4,CO6
	B	Approaches to Effort and Schedule Estimation, COCOMO II			CO4,CO6
	C	Putnam Estimation Model, Algorithmic models, Cost Estimation.			CO4,CO6
	Unit 5	**Tools for Requirements and Estimation Management**			
	A	Benefits of using a requirements management tool.			CO5,CO6
	B	Requirements management tool, Rational Requisite pro, Caliber –RM.			CO5,CO6
	C	Desirable features in software estimation tools, IFPUG, USC's COCOMO II, SLIM (Software Life Cycle Management) Tools			CO5,CO6
	Mode of examination	Theory/Jury/Practical/Viva			
	Weightage Distribution	CA	MTE	ETE	
		30%	20%	50%	
	Text book/s*	Software Requirements and Estimation by Rajesh Naik and Swapna Kishore, Tata Mc Graw Hill			
	Other References	Software Requirements by Karl E. Weigers, Microsoft Press.			

CO and PO Mapping

S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	CO1: Explain the various software requirements and asses their nature.	PO1,PO3,PO6,PO7,PO8,PSO1
2.	CO2: Apply the principles and practices of software requirement management.	PO1,PO2,PO3,PO4,PO6,PO7,PO8,PSO1
3.	CO3: Examine the cost of software development by understanding various methods.	PO1,PO2,PO3,PO4,PO5,PO6,PO7,PO8,PSO1
4.	CO4: Assess effort, schedule and cost estimation for software	PO1,PO2,PO3,PO4,PO6,PO7,PO8,PSO1
5.	CO5: Survey tools for requirements management, software estimation	PO1, PO2, PO3, PO4, PO6,PO7,PO8,PSO1
6.	CO6: Discuss the formal methods and techniques for Software requirements and estimation.	PO1,PO2,PO3,PO5,PO6,PO7,PO8,PSO1

PO and PSO mapping with level of strength for Course Name Software requirement and Estimation **(Course Code CSE643)**

Course Code_ Course Name	CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CSE643_ Software requirement and Estimation	CO1	3	-	2	-	-	2	3	2	3	-	-
	CO2	3	2	2	2	-	2	2	2	3	-	-
	CO3	3	3	2	2	2	2	3	3	3	-	-
	CO4	3	2	2	2	-	2	3	3	3	-	-
	CO5	3	3	2	2	-	2	2	3	3	-	-
	CO6	3	3	2	-	2	2	3	3	3	-	-

Average of non-zeros entry in following table (should be auto calculated).

Course Code	Course Name	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CSE643	Software requirement and Estimation	3	2.6	2	2	2	2	2.6	2.6	3	-	-

Strength of Correlation

1. Addressed to ***Slight (Low=1) extent*** ***2.*** Addressed to ***Moderate (Medium=2) extent***
3. Addressed to ***Substantial (High=3) extent***

CSE6:Software Quality metrics and Testing

School:		**School of Engineering and technology**		
Department		**Department of Computer Science and Engineering**		
Program:		**M.Tech**		
Branch:		**Software Engineering**		
1	Course Code	CSE6		
2	Course Title	Software Quality metrics and Testing		
3	Credits	3		
4	Contact Hours (L-T-P)	3-0-0		
	Course Status	Core /Elective/Open Elective		
5	Course Objective	This course covers the important aspects of software quality. It begins with an overview of what is quality assurance, including definitions for the internal and external views of quality.		
6	Course Outcomes	Student will be able to: CO1: Define the concepts of quality and its models CO2: Summarize static analysis of code CO3: Identify and apply various software metrics, which determines the quality level of software CO4: Apply and evaluate appropriate processes and tools to troubleshoot issues related to quality assurance. CO5: Value the role of testing in quality assurance and apply several appropriate testing techniques to software development projects. CO6: Choose Software quality measurements and metrics to improve quality		
7	Course Description	This course discusses the knowledge required and techniques of professional practices in software quality processes and activities. It covers concepts of how high-quality software that can be achieved using proven techniques and established standards in software quality management. Metrics are then introduced as a mechanism for assessing the quality of software products. Lastly, the concept of software quality tools is introduced.		
8	Outline syllabus			CO Mapping
	Unit 1	**Introduction**		
	A	Popular Views. Quality: Professional Views, Software Quality, Total Quality Management, Object-Oriented Development Process		CO1,CO6
	B	The Clean room Methodology, The Defect Prevention Process, Process Maturity Framework		CO1,CO6
	C	Quality Standards, SEI Process Quality Capability Maturity Model, The SPR Assessment, Malcolm Baldrige Assessment		CO1,CO6
	Unit 2	**Fundamentals in Measurement Theory**		
	A	Definition, Operational Definition, and Measurement, Level of Measurement, Some Basic Measures		CO2,CO6
	B	Reliability and Validity, Measurement Errors, Assessing		CO2,CO6

		Reliability, Correction for Attenuation			
	C	Complexity Metrics and Models, Lines of Code, Cyclomatic Complexity, Syntactic Constructs.			CO2,CO6
	Unit 3	**Software Quality Metrics Overview**			
	A	Product Quality Metrics, Defect Density Metric, Customer Problems Metric, Customer Satisfaction Metrics			CO3,CO6
	B	In-Process Quality Metrics, Defect Density During Machine, Testing. Defect Arrival Pattern During Machine Testing, Phase-Based Defect Removal Pattern, Defect Removal Effectiveness			CO3,CO6
	C	Metrics for Software Maintenance, Fix Backlog and Backlog Management Index, Fix Response Time and Fix Responsiveness, Percent Delinquent Fixes, Fix Quality.			CO3,CO6
	Unit 4	**Applying the Basic Quality Tools in Software Development**			
	A	Ishikawa's Seven Basic Tools, Checklist, Pareto Diagram, Histogram, Run Charts, Scatter Diagram, Control Chart			CO4,CO6
	B	Cause-and-Effect Diagram, Relations Diagram, Defect Removal Effectiveness and Quality Planning			CO4,CO6
	C	Phase-Based Defect Removal Model, Cost Effectiveness of Phase Defect Removal, Defect Removal Effectiveness and Process Maturity Level			CO4,CO6
	Unit 5	**Testing**			
	A	Objectives and issues of testing, Testing activities and levels, White-Box and Black-Box Testing, Test Planning and Design			CO5,CO6
	B	Unit Testing, Data flow testing, functional testing, system testing, In-Process Metrics for Software Testing			CO5,CO6
	C	Testing Defect Arrivals Over Time, Testing Defect Backlog Over Time. In-Process Metrics and Quality Management, Case Studies.			CO5,CO6
	Mode of examination	Theory/Jury/Practical/Viva			
	Weightage Distribution	CA	MTE	ETE	
		30%	20%	50%	
	Text book/s*	1. Stephen H. Kan, “Metrics and Models in Software Quality Engineering”, Addison Wesley			
	Other References	1. SagarNaik andPiyuTripathy, “Software Testing and Quality Assurance: Theory and Practice”, Wiley. 2. Paul C. Jorgensen, “Software Testing - A Craftsman’s Approach”, CRC Press. 3. Internet as a Resource for Reference			

CO and PO Mapping

S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	CO1: Define the concepts of quality and its models	PO1,PO3,PO8,PSO1
2.	CO2: Summarize static analysis of code	PO1,PO2,PO3,PO6,PO7,PO8,PSO1
3.	CO3: Identify and apply various software metrics, which determines the quality level of software	PO1,PO2,PO3,PO4,PO5,PO6, PO7,PO8,PSO1
4.	CO4: Apply and evaluate appropriate processes and tools to troubleshoot issues related to quality assurance.	PO1,PO2,PO3,PO5, PO7,PO8,PSO1
5.	CO5: Value the role of testing in quality assurance and apply several appropriate testing techniques to software development projects.	PO1,PO3,PO4,PO6, PO7,PO8,PSO1
6.	CO6: Choose Software quality measurements and metrics to improve quality	PO1,PO2,PO3,PO4,PO5,PO6, PO7,PO8,PSO1

PO and PSO mapping with level of strength for Course Name Software quality metrics and testing (Course Code CSE604)

Course Code_ Course Name	CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CSE6_software quality metrics and testing	CO1	3	-	3	-	-	-	-	3	3	-	-
	CO2	3	1	2	-	-	2	3	3	3	-	-
	CO3	3	1	2	1	1	2	2	3	3	-	-
	CO4	3	1	2	-	1	-	3	3	3	-	-
	CO5	3	-	2	1	-	2	3	3	3	-	-
	CO6	3	2	2	2	2	2	2	3	3	-	-

Average of non-zeros entry in following table (should be auto calculated).

Course Code	Course Name	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CSE 6	Software quality metrics and testing	3	1.25	2.1	1.3	1.3	2	2.6	3	3	-	-

Strength of Correlation

1. Addressed to ***Slight (Low=1) extent*** ***2.*** Addressed to ***Moderate (Medium=2) extent***
3. Addressed to ***Substantial (High=3) extent***

School:		**Batch:**
Program:		**Current Academic Year:**
Branch:		**Semester:**
1	Course Code	CSP611
2	Course Title	Analysis and design of algorithms lab
3	Credits	1
4	Contact Hours (L-T-P)	0-0-2
	Course Status	CompulsoryPG
5	Course Objective	The objective of the course is to teach techniques for effective problem solving in computing. The use of different paradigms of problem solving will be used to illustrate clever and efficient ways to solve a given problem. In each case emphasis will be placed on rigorously proving correctness of the algorithm.
6	Course Outcomes (same as theory course)	Students will be able to: **CO1: calculate** time complexity of searching algorithm **CO2**: **Write** program based on dynamic programming. **CO3: apply** greedy algorithm to any problem **CO4: develop** program based on advanced data structure CO5: **design** a program based on different string matching algorithm CO6**: implement** real world problem based on greedy and dynamic algorithm
7	Course Description	Algorithms are the soul of computing. ... This course introduces basic methods for the design and analysis of efficient algorithms emphasizing methods useful in practice. Different algorithms for a given computational task are presented and their relative merits evaluated based on performance measures.
8	Outline syllabus	CO Mapping
	Unit 1	**Program Based on Divide & Conquer**

		1. Write a program to search an element in the array using Binary search determine the time required to search the element. 2.Write a program to sort given set of numbers in ascending/descending order using Quick Sort and determine the time required to sort the elements 3.Write a program to sort given set of numbers in ascending/descending order using Merge Sort and determine the time required to sort the elements.	CO1
	Unit 2	**Practical based on Dynamic Programming**	
		1. Write a program to implement Longest Common Subsequence's (LCS). 2. Write a program to implement Matrix chain multiplication. 3. WAP to demonstrate concept of 0 – 1 Knapsack Problem	CO2, CO6
	Unit 3	**Practical based on Greedy Programming**	
		1. Write a program to implement fractional Knapsack problem.	CO3, CO6
		2. Write a program to implement Task Scheduling problem.	
		3. Find Minimum Cost Spanning Tree of a given undirected graph using Prim's algorithm.	
		4. Find Minimum Cost Spanning Tree of a given undirected graph using Kruskal's algorithm.	
	Unit 4	**Practical based on Advance concepts**	
		Find a subset of a given set S = {s1,s2,.....,sn} of n positive integers whose sum is equal to a given positive integer d. For example, if S= {1, 2, 5, 6, 8} and d = 9 there are two solutions {1,2,6} and {1,8}.A suitable message is to be displayed if the given problem instance doesn't have a solution.	CO4
		Implement All-Pairs Shortest Paths Problem using Floyd's algorithm.	CO4
		From a given vertex in a weighted connected graph, find shortest paths to other vertices using Dijkstra's algorithm.	CO4
	Unit 5	**Practical based on Pattern Matching**	
		1.Write a program to implement Rabin Karp Algorithm problem.	CO5,CO6
		2. Write a program to implement Knuth Morris Pratt Algorithm problem.	

	Mode of examination	Jury/Practical/Viva			
	Weightage Distribution	CA	MTE	ETE	
		60%	0%	40%	
	Text book/s*	-			
	Other References				

COPO Mapping

S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1	**CO1: Analyze** the asymptotic performance of algorithms	PO1, PO2, PO3, PO4, PO5,PO8, PSO2
2	**CO2**: **Describe** the dynamic-programming and Greedy paradigm and explain when an algorithmic design situation calls for it.	PO1, PO2, PO3, PO4, PO5,PO8, PSO2
3	**CO3:** Demonstrate the Dynamic programming techniques.	PO1, PO2,PO3, PO5, PO8, PSO1, PSO2,PSO3
4	**CO4: Apply** important algorithmic design paradigms and methods of analysis	PO1, PO2, PO3, PO4, PO5,PO8, PSO2
5	**CO5: Discuss** NP-complete problems and develop algorithms to solve the problems.	PO1, PO2, PO3, PO4, PO5,PO8, PSO1, PSO2
6	**CO6: Choose** appropriate algorithm design techniques for solving problems.	PO1, PO2, PO3, PO4, PO5,PO8, PSO1, PSO2

PO and PSO mapping with level of strength for Course Name Analysis and Design of Algorithm Lab(Course Code CSP 611)

Course Code_ Course Name	COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PSO 1	PSO 2	PSO 3
CSP611 _ Analysis and Design of Algorithm Lab	CO1	3	3	1	3	--	--	--	2	--	3	--
	CO2	2	3	3	2	--	--	--	2	--	2	--
	CO3	1	2	2	-	--	--	--	1	2	1	1
	CO4	2	3	3	3	--	--	--	3	--	3	--
	CO5	3	1	2	3	--	-	-	2	2	3	--
	CO6	2	3	3	1	--	-	-	1	3	2	--

Average of non-zeros entry in following table (should be auto calculated).

Course Code	Course Name	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CSP611	Analysis & Design of Algorithm lab	2.16	2.5	2.3	2.4	-	-	-	1.83	2.3	2.3	1

Strength of Correlation

1. Addressed to ***Slight (Low=1) extent*** ***2.*** Addressed to ***Moderate (Medium=2) extent***
3. Addressed to ***Substantial (High=3) extent***

School:		**School of Engineering and technology**	
Department		**Department of Computer Science and Engineering**	
Program:		**M.Tech.**	
Branch:		**DSA**	
1	Course Code		
2	Course Title	**Massive Graph Analysis Lab**	
3	Credits		
4	Contact Hours (L-T-P)	0-0-2	
	Course Status	Compulsory/Elective	
5	Course Objective	The objective of the course is to teach students the advanced graph theory concepts and their applications in computer science.	
6	Course Outcomes (must be 6 COs, following verbs given in Bloom's Taxonomy)	After successful completion of the course students will be able to CO1: demonstrate graph theory concepts via basic processing programs . CO2: Apply the fundamentals of graph and trees and to apply these as computer science applications. CO3: Demonstrate the advanced applications of graph analysis. CO4: Apply various algorithms to understand analysis and its applications in areas like coloring problem, transportation problems etc. CO5: Examine a graph using matrices to cater their application in real world. CO6: Relating the concepts to prepare grounds for project work and research interests.	
7	Course Description	Numerical Analysis gives understanding of transcendental equation, solving linear equation, interpolation, differential equation.	
8	Outline syllabus		CO Mapping
	Unit 1	**Practical related to Basics of algorithms**	
	A	To create and display a graph.	CO1,CO6
	B	To display connectedness and components and calculate rank and nullity.	CO1,CO6
	C	To find minimum spanning trees.	CO2,CO6
	Unit 2	**Practical related to advanced graphs**	
	A	To find set of fundamental circuits.	CO3,CO6
	B	To find cut-vertices.	CO3,CO6
	C	To demonstrate separability.	CO3,CO6
	Unit 3	**Practical related to directed graphs**	
	A	To create and display a directed graph.	CO1,CO6
	B	To display directed circuits.	CO2,CO6
	C	To demonstrate planarity of graph.	CO2,CO6
	Unit 4	**Practical related to Application of graphs**	
	A	To implement Shortest path between every pair of vertices.	CO4,CO6
	B	To find shortest path between pair of vertices.	CO4,CO6
	C	To implement DFS, BFS	CO4,CO6
	Unit 5	**Practical related to Matrix Representation of**	

		Graphs			
	A	To implement graph operations using matrices.			CO5,CO6
	B	To demonstrate use of incidence matrix or cut-set matrix or circuit matrix and its application.			CO5,CO6
	C	To demonstrate use of adjacency matrix and its application.			CO5,CO6
	Mode of examination	Jury/Practical/Viva			
	Weightage Distribution	CA	MTE	ETE	
		60%	0%	40%	
	Text book/s*	**1.** Deo, N, *Graphtheory with applications to Engineering and Computer Science*, Prentice Hall India.			
	Other References	**3.** Wilson R J, *Introduction to Graph Theory*, PearsonEducation **4.** Harary, F, *Graph Theory*, Narosa Bondy& Murthy, *Graph theory and application*. Addison Wesley			

S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	CO1: demonstrate some of the most important notions and types of graph theory and develop their skill in solving basic exercises.	PO1, PO2, PO4
2.	CO2: Apply the fundamentals of graph and trees and to apply these as computer science applications.	PO1, PO2, PO3, PO4
3.	CO3: Demonstrate the advanced applications of graph analysis.	PO3, PO4, PSO(DSA)
4.	CO4: Apply various algorithms to understand analysis and its applications in areas like coloring problem, transportation problems etc.	PO3, PSO(DSA)
5.	CO5: Examine a graph using matrices to cater their application in real world	PO2, PO3, PSO(DSA)
6	CO6: Relating the concepts to prepare grounds for project work and research interests.	PO2, PO3, PSO(DSA)

PO and PSO mapping with level of strength for Course Name: Massive Graph Analysis Lab (-----)

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO(DSA)
CO1	3	3	1	2	1	1	-	1	1
CO2	3	3	3	2	-	1	-	1	1
CO3	1	1	3	3	2	1	-	1	2
CO4	1	1	3	2	1	2	1	1	3
CO5	1	2	3	2	2	1	1	1	3
Co6	1	2	3	2	1	2	1	3	3

Average of non-zeros entry in following table (should be auto calculated).

Course Code	Course Name	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PSO (DSA)
	Massive Graph Analysis Lab	**1.67**	**2**	**2.67**	**2.17**	**1.17**	**1.33**	**0.5**	**1.33**	**2.17**

Strength of Correlation

1. Addressed to ***Slight (Low=1) extent*** ***2.*** Addressed to ***Moderate (Medium=2) extent***
3. Addressed to ***Substantial (High=3) extent***

School: SET		**Batch: 2019 onwards**	
Program: M.Tech			
Branch:CSE (Networks and Cyber Security)		**Semester: IV**	
1	Course Code	CSP 630	
2	Course Title	Advanced Computer Network Lab	
3	Credits	1	
4	Contact Hours (L-T-P)	0-0-2	
	Course Status	Compulsory	
5	Course Objective	Course will examine the design and implement various network protocols with the concept of layered approach of OSI and TCP/IP model.	
6	Course Outcomes	CO1: Examine the various difference and challenges in wired and wireless Data networks CO2: Define various routing protocols and mobile IP. CO3: Examine the behaviour of various Transport Layer Protocols. CO4: Illustrate various Flow Control, Congestion Control and QoS Protocols. CO5: Outline several Traffic scheduling algorithms CO6: Identify various Encryption Techniques	
7	Course Description	This course is to provide students the advanced concepts of data communication and computer networks by exposing students to the concepts of Transport Layer protocol suite and network tools and programming, Traffic Management & Security measures.	
8	Outline syllabus		CO Mapping
	Unit 1	**Overview of Wired and Wireless Data Networks**	
	A	Configuration and logging to a CISCO Router and introduction to the basic user Interfaces. Introduction to the basic router configuration and basic commands.	CO1
	B	Configuration of IP addressing for a given scenario for a given set of topologies.	CO1
	C	Configure a DHCP Server to serve contiguous IP addresses to a pool of four IP devices with a default gateway and a default DNS address. Integrate the DHCP server with a BOOTP demon to automatically serve Windows and Linux OS Binaries based on client MAC address	CO1
	Unit 2	**Internetworking**	
	A	Configure, implement and debugBGP routing	CO2
	B	Configure, implement and debugOSPF routing protocols	CO2
	C	Configure, implement and debugStatic routes (check	CO2

		using netstat)			
	Unit 3	**Transport Layer Protocols**			
	A	Simulation of TCP variants for wireless communication			CO3
	B	Simulation of TCP, UDP and SCTP with constant traffic for VOIP services			CO3
	C	Simulation of TCP, UDP and SCTP with constant traffic for Video Over IP services			CO3
	Unit 4	**Traffic Control and Quality of Service**			
	A	Simulation of TCP and SCTP Flow control			CO4
	B	Simulation of TCP and SCTPcongestion control			CO4
	C	Implementing and comparing WRR, DRR, WFQ, PGPS, VC.			CO4
	Unit 5	**Traffic Management & Security**			
	A	Implementing Admission Control protocols			CO5
	B	Implement AES and DES and compare			CO6
	C	Implement RSA			CO6
	Mode of examination	Jury/Practical/Viva			
	Weightage Distribution	CA	MTE	ETE	
		60%	0%	40%	
	Text book/s*	1.			
	Other References	1.			

S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	Examine the various difference and challenges in wired and wireless Data networks	PO1,PO2, PO3,PO8,PSO3
2.	Define various routing protocols and mobile IP.	PO1,PO2,PO3,PO8,PSO3
3.	Examine the behaviour of various Transport Layer Protocols.	PO1,PO2,PO3,PO4,PO8,PSO3
4.	Illustrate various Flow Control, Congestion Control and QoS Protocols.	PO1,PO2,PO3, PO4, PO5,PO6,PO8,PSO3
5.	Outline several Traffic scheduling algorithms	PO1,PO2,PO3,PO4,PO5, PO6,PO8,PSO3
6.	Identify various Encryption Techniques	PO1,PO2,PO3,PO4,PO5, PO6,PO8, PSO3

PO and PSO mapping with level of strength for Course Name Advanced Computer Network Lab (Course Code CSP630)

	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
	CO1	3	2	3	-	-	-	-	2	-	-	2
	CO2	3	2	3	-	-	-	-	2	-	-	2
	CO3	3	2	3	1	-	-	-	2	-	-	2
	CO4	3	2	3	1	2	2	-	2	-	-	2
	CO5	3	2	3	2	2	2	-	2	-	-	3
	CO6	3	2	3	2	2	2	-	2	-	-	3
	Avg.	3	1.6	3	1	1	1	-	2	-	-	2.3

CSP640:Object Oriented Software Engineering Lab

School:		**School of Engineering and technology**	
Department		**Department of Computer Science and Engineering**	
Program:		**M.Tech**	
Branch:		**Software Engineering**	
1	Course Code	CSP640	
2	Course Title	Object Oriented Software Engineering Lab	
3	Credits	1	
4	Contact Hours (L-T-P)	0-0-2	
	Course Status	Compulsory/Elective	
5	Course Objective	The objective of this lab is to provide students with a ready-to-use, expressive visual modeling language so they can develop and exchange meaningful models.	
6	Course Outcomes	Students will be able to: CO1: Summarize problem statement to develop SRS for object oriented system. CO2: Explain the facets of the Unified Process approach to designing and building a software system. CO3: Create use case and class diagrams that capture requirements for a software system. CO4: Construct various Behavioral UML diagrams CO5: Demonstrate component and deployment diagram CO6: Construct design solutions by using Functional, structural and behavioural patterns	
7	Course Description	This lab deals with the analysis and design of a software problem using UML. It is used for an object oriented design of a problem. The course describes the step by step object oriented methodology of software development from problem statement through analysis, system design, and class design.	
8	Outline syllabus		CO Mapping
	Unit 1	**Problem Statement & SRS**	
		Write down the problem statement for solving system modeling and design problems.	CO1
		Develop Software Requirement Specification (SRS) for suggested object-oriented system.	CO1
	Unit 2	**Function Oriented Design**	
		To perform the function oriented diagram: Data Flow Diagram (DFD).	CO2,CO6
		To study various UML diagrams.	CO2,CO6
	Unit 3	**Use Case & Structural View**	
		To perform the user's view analysis for the suggested system: Use case diagram.	CO3,CO6
		To draw the structural view diagram for the system: Class diagram, object diagram.	CO3,CO6
	Unit 4	**Behavioral View**	
		To draw the behavioral view diagram : State-chart diagram, Activity diagram	CO4,CO6

		To perform the behavioral view diagram for the suggested system : Sequence diagram, Collaboration diagram			CO4,CO6
	Unit 5	**Implementation & Environment View**			
		To perform the implementation view diagram: Component diagram for the system.			CO5,CO6
		To perform the environmental view diagram: Deployment diagram for the system.			CO5,CO6
	Mode of examination	Jury/Practical/Viva			
	Weightage Distribution	CA	MTE	ETE	
		60%	0%	40%	
	Text book/s*	1. Bernd Bruegge and Allen H. Dutoit, "Object oriented Software Engineering, using UML, and Pattern Java" Pearson (2nd Edition). 2. George Wilkie, "Object oriented Software Engineering", Addison-Wesley.			
	Other References	1. Ivar Jacobson "Object Oriented Software Engineering: A Use Case Driven Approach", Addison-Wesley. 2. Grady Booch "Object-Oriented Analysis and Design with Applications", Addison-Wesley Professional.			

PO and PSO mapping with level of strength for Course Name Object oriented software engineering Lab (Course Code CSP640)

Course Code_ Course Name	CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CSP640_Object oriented software Engineering lab	CO1	2	1	2	-	-	-	2	2	3	-	-
	CO2	2	1	2	1	-	2	3	2	3	-	-
	CO3	2	1	3	1	1	2	3	2	3	-	-
	CO4	3	1	2	1	1	3	3	2	3	-	-
	CO5	2	1	2	1	-	2	3	2	3	-	-
	CO6	3	1	3	1	1	3	3	2	3	-	-

Average of non-zeros entry in following table (should be auto calculated).

Course Code	Course Name	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CSP 640	Object oriented software Engineering lab	2.3	1	2.3	1	1	2.4	2.8	2	3	-	-

Strength of Correlation

1. Addressed to ***Slight (Low=1) extent*** ***2.*** Addressed to ***Moderate (Medium=2) extent***
3. Addressed to ***Substantial (High=3) extent***

School:		**School of Engineering and technology**	
Department		**Department of Computer Science and Engineering**	
Program:		**M.Tech**	
Branch:		**Software Engineering**	
1	Course Code		
2	Course Title	Software Architecture and Design Pattern Lab	
3	Credits	1	
4	Contact Hours (L-T-P)	0-0-1	
	Course Status	Compulsory/Elective	
5	Course Objective	Software Architecture and Design teaches the principles and concepts involved in the analysis and design of large software systems. It also teaches UML and Analysis of system, Software Architecture and software design for the system.	
6	Course Outcomes	CO1:Demonstrate necessity of use case and Abstract factory design CO2: Construct Adapter class and object pattern CO3: Compare builder and bridge design patterns CO4: Examine behavioral patterns CO5: Design proxy and visitor patterns CO6: Select proper architecture and patterns to improve quality of software	
7	Course Description	This course introduces to the concepts, principles and standards underlying modern software architecting. Notions and practice of some of the most popular notations, techniques and tools involved in the different steps of software architecting are given. More specifically UML for the requirement specification phase.	
8	Outline syllabus		CO Mapping
	Unit 1	**Use case and abstract factory**	
		Use case diagram for Library management system	CO1
		Using UML design abstract factory design pattern	CO1,CO6
	Unit 2	**Adapter class and object pattern**	
		Using UML design Adapter-class design pattern	CO1,CO6
		Using UML design adapter object design pattern	CO1,CO6
	Unit 3	**Builder & Bridge pattern**	
		Using UML design builder design pattern	CO3
		Using UML design bridge design pattern	CO3
	Unit 4	**Chain of responsibility and flyweight design pattern**	
		User gives a print command from a word document. Design to represent this chain of responsibility design pattern.	CO4,CO6
		Design a flyweight design pattern	CO4,CO6
	Unit 5	**Proxy and visitor pattern**	
		Using UML design proxy design pattern	CO5,CO6
		Using UML design visitor design pattern	CO5,CO6
	Mode of	Jury/Practical/Viva	

	examination				
	Weightage Distribution	CA	MTE	ETE	
		60%	0%	40%	
	Text book/s*	1. The Unified Modeling Language User Guide, Grady Booch, James Rumbaugh, Ivar Jacobson, Addison-Wesley 1999, ISBN: 0-201-57168-4 2. Internet as a resource			
	Other References	https://drive.google.com/file/d/1PerTeiRAwoqJ66SD5pLThVqYr9b3MeQ8/preview			

PO and PSO mapping with level of strength for Course Name xxxx (Course Code yyyy)

Course Code_ Course Name	CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
Yyyy_Software Architecture and design pattern Lab	CO1	3	2	2	-	-	1	3	1	3	-	-
	CO2	3	3	2	1	-	1	3	2	3	-	-
	CO3	3	3	2	1	-	1	3	2	3	-	-
	CO4	3	3	2	1	-	1	3	2	3	-	-
	CO5	3	3	2	1	-	1	3	2	3	-	-
	CO6	3	3	2	1	-	1	3	2	3	-	-

Average of non-zeros entry in following table (should be auto calculated).

Course Code	Course Name	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
	Software architecture and design pattern Lab	3	2.8	2	1	-	1	3	1.8	3	-	-

Strength of Correlation

1. Addressed to ***Slight (Low=1) extent*** ***2.*** Addressed to ***Moderate (Medium=2) extent***
3. Addressed to ***Substantial (High=3) extent***

TERM-II

Program: M.Tech		Current Academic Year: 2019-2021	
Branch: Cyber Security & Networking		Semester: II	
1	Course Code	**CSE650**	Course Name: Pattern Recognition
2	Course Title	Pattern Recognition	
3	Credits	5	
4	Contact Hours (L-T-P)	3-1-2	
	Course Status	PG	
5	Course Objective	The objectives of this course to teach the students various feature extraction techniques and classifiers, so that, they can implement these concepts in real life projects like information retrieval, data mining, document image analysis and recognition, computational linguistics, forensics, biometrics and bioinformatics.	
6	Course Outcomes	After the completion of this course, students will be able to: CO1: To Identify/introduce the ideas of existing patterns CO2: To implement existing patterns ideas based on data analysis. CO3:To conceptualize the working of patterns explorations using computational algorithms CO4: To apply performance evaluation methods for pattern recognition CO5: To become familiar with feature knowledge that can be extracted from available examples and generalize to form appropriate feature models.	
8	Outline syllabus		CO Mapping
	Unit 1	**Introduction**	
	A	Introduction to pattern recognition systems and their design cycle, learning and adaptation.	CO1,CO2
	B	Data sets for pattern recognition, Pre Processing of Input data set, Output analysis	CO1,CO2
	C	Application areas of pattern recognition with case studies in Medical, Defense and Optical Document Recognition	CO1,CO2
	Unit 2	**Mathematical Background**	
	A	Bayes Rule, Expectation, Correlation, Covariance.	CO3, CO4
	B	Review of Linear Algebra, Linear Transformations	CO3,CO4
	C	Decision Theory, ROC Curves, Likelihood Ratio Test, Linear Discriminants, FMI.	CO3,CO4
	Unit 3	**Feature Extraction**	
	A	Introduction, Shape representation Techniques – One dimensional function, polygonal approximation, spatial interrelation.	CO5
	B	Moments, Scale shape methods, Shape transform domains	CO5
	C	Chi-square statistic, Singular value decomposition, Feature Selection for Time Series Data	CO5
	Unit 4	**Classification**	
	A	Applications of Classification techniques, Classification with and without learning.	CO1,CO2,CO3,CO4,CO5

	B	Support Vector Machine, k-Nearest Neighbour Classifier			CO1,CO2,CO3,CO4,CO5
	C	Decision tree, Artificial Neural Network Classifiers-Multilayer Perceptron, Backpropagation algorithms.			CO1,CO2,CO3,CO4,CO5
	Unit 5	**Clustering**			
	A	Clustering Large Datasets, Applications of Clustering, Clustering techniques – K Means			CO1,CO2,CO , CO4,CO5
	B	Sequential Algorithms, Agglomerative hierarchical clustering,			CO1,CO2,CO3, CO4,CO5
	C	Functional Optimization-Based Clustering, Graph Clustering			CO1,CO2,CO3,CO4,CO5
	Mode of examination	Theory			
	Weightage Distribution	CA	MTE	ETE	
		30%	20%	50%	
	Text book/s*	1. Duda and Hart P.E, "Pattern classification and scene analysis", John Wiley and sons, NY. 2. Fu K.S., Eaglewood cliffs, "Syntactic Pattern recognition and applications", Prentice Hall, N.J.			
	Other References	1. Earl Gose, Richard Johnsonbaugh, and Steve Jost, "Pattern Recognition and Image Analysis", PHI Pvt. Ltd., NewDelhi. 2. Rochard O. Duda , Hart P.E, and David G Stork, "Pattern classification" , John Wiley & Sons Inc. 3. Internet as source of Reference.			

CO and PO Mapping

S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	CO1: To Identify/introduce the ideas of existing patterns	PO1, PO3, PO4,PO5, PSO1
2.	CO2: To implement existing patterns ideas based on data analysis.	PO1, PO3, PO4, PO5, PSO1
3.	CO3:To conceptualize the working of patterns explorations using computational algorithms	PO1, PO5, PSO1, PSO2, PSO4
4.	CO4: To apply performance evaluation methods for pattern recognition	PO1, PO5, PSO1, PSO2, PSO4
5.	CO5: To become familiar with feature knowledge that can be extracted from available examples and generalize to form appropriate feature models.	PO1, PO3, PO4, PO5, PSO1

PO and PSO mapping with level of strength (3 being the highest) for Pattern Recognition (CSE650)

CO	PO1:	PO2:	PO3:	PO4:	PO5:	PO6:	PO7:	PO8:	PSO1:	PSO2:	PSO3:
CO1	3	1	3	3	1	1	3	1	2	2	
CO2	2	2	3	3	2	2	3	2	2	2	
CO3	3	3	2	2	3	2	3	3	2	3	
CO4	1	3	2	2	3	2	3	3	2	3	
CO5	1	2	3	3	1	3	3	2	2	2	

Machine Learning

School: SET		**Batch : 2019**	
Program: M.Tech		**Current Academic Year: 2019-2021**	
Branch: Data Science		**Semester: II**	
1	Course Code	CSE605 | Course Name- Machine Learning	
2	Course Title	Machine Learning	
3	Credits	3	
4	Contact Hours (L-T-P)	3-0-0	
	Course Status	PG	
5	Course Objective	This course provides an introduction to machine learning and statistical pattern recognition in a way to solve the problem in real-time	
6	Course Outcomes	After completion of this course, student will be able to:- 1. Understand learning problems and Identify fundamental problems in machine learning. 2. Conceptualize various algorithms for machine learning. 3. Select and Apply appropriate tools for developing solutions for real world problems using machine learning algorithms. 4. Create and Evaluate hypothesis for problems and to implement solutions for them.	
7	Course Description	Introduction and concept of learning task, Decision Tree and Artificial Neural Networks, Evaluating hypothesis and Bayesian learning, Computational Learning Theory and Instance Based Learning , Genetic Algorithms and Reinforcement Learning	
8	Outline syllabus		CO Mapping
	Unit 1	**Introduction**	
	A	Well defined learning problems, Designing a Learning System, Issues in Machine Learning	CO1
	B	The Concept Learning Task - General-to-specific ordering of hypotheses, Find-S, List then eliminate algorithms, Candidate elimination algorithm, Inductive bias	CO1
	C	Decision Tree Learning - Decision tree learning algorithm, Issues in Decision tree learning	CO1
	Unit 2	**Artificial Neural Networks**	
	A	Perceptrons, Gradient descent and the Delta rule	CO2, CO3
	B	Adaline, Multilayer networks	CO2, CO3
	C	Derivation of backpropagation rule Backpropagation Algorithm Convergence	CO2, CO3
	Unit 3	**Hypotheses**	
	A	Evaluating Hypotheses – Estimating Hypotheses Accuracy, Basics of sampling Theory	CO3, CO4
	B	Comparing Learning Algorithms	CO3, CO4
	C	Bayesian Learning – Bayes theorem, Naïve Bayes classifier, Bayesian belief networks	CO3, CO4
	Unit 4	**Computational Learning Theory**	

	A	Sample Complexity for Finite Hypothesis spaces			CO2, CO3, CO4
	B	Sample Complexity for Infinite Hypothesis space Instance-Based Learning			CO2, CO3, CO4
	C	k-Nearest Neighbor Learning, Locally Weighted Regression, Radial basis function networks			CO2, CO3
	Unit 5	**Genetic Algorithms**			
	A	An illustrative example, Hypothesis space search, Genetic Programming			CO2, CO3, CO4
	B	Models of Evolution and Learning Learning first order rules-sequential covering algorithms-General to specific beam search-FOIL			CO2, CO3
	C	Reinforcement Learning - The Learning Task, Q Learning			CO2, CO3
	Mode of examination	Theory			
	Weightage Distribution	CA	MTE	ETE	
		30%	20%	50%	
	Text book/s*	1. Tom. M. Mitchell, Machine Learning, McGraw Hill International Edition			
	Other References	1. Ethern Alpaydin, Introduction to Machine Learning. Eastern Economy Edition, Prentice Hall of India 2.Bishop, C., Pattern Recognition and Machine Learning. Berlin: Springer-Verlag.			

CO and PO Mapping

S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	CO1	PO1, PO5, PSO1
2.	CO2	PO2, PO5, PSO1, PSO2
3.	CO3	PO2, PO3, PSO2, PSO4
4.	CO4	PO2, PO3, PSO2, PSO4, PSO3

PO and PSO mapping with level of strength for Machine LearningCSE605)

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

School:		**School of Engineering and Technology**	
Program:		**M.Tech.**	
Branch:		**M.Tech Data Science DE-6**	
1	Course Code	CSE618	
2	Course Title	Big Data Analytics	
3	Credits	3	
4	Contact Hours (L-T-P)	3-0-0	
	Course Status	Departmental Elective DE-6	
5	Course Objective	The objective of this course is to bring together several key big data technologies used for storage, analysis and manipulation of data.	
6	Course Outcomes (5-6)	CO1: To bring together several key big data technologies used for storage, analysis and manipulation of data. CO2: Identify and mitigate the challenges in Big data. CO3: To recognize the key concepts of Hadoop framework, MapReduce, Pig, Hive, and No-SQL. CO4: To prepare a sample project in Hadoop API.	
7	Course Description	This course is to bring together several key big data technologies used for storage, analysis and manipulation of data.	
8	Outline syllabus		CO Mapping
	Unit 1		
	A	Big Data and its Importance, Four V's of Big Data, Drivers for Big Data ,	CO1, CO2
	B	Introduction to Big Data Analytics, Big Data Analytics applications.	CO2
	C	Algorithms using map reduce, Matrix-Vector Multiplication by Map Reduce.	CO1, CO3
	Unit 2		
	A	Introduction HADOOP: Apache Hadoop	CO1, CO3
	B	Hadoop EcoSystem ,Moving Data in and out of Hadoop,	CO2, CO3
	C	Understanding inputs and outputs of MapReduce, Data Serialization.	CO2, CO3
	Unit 3		
	A	Hadoop Architecture, Hadoop Storage: HDFS,	CO2, CO3
	B	Common Hadoop Shell commands , Anatomy of File Write and Read., NameNode, Secondary NameNode, and DataNode,	CO1, CO2, CO3
	C	Hadoop MapReduce paradigm, Map and Reduce tasks, Job, Task trackers - Cluster Setup – SSH & Hadoop Configuration – HDFS Administering –Monitoring & Maintenance.	CO1, CO2, CO3
	Unit 4		
	A	HADOOP ECOSYSTEM AND YARN: Hadoop ecosystem components - Schedulers - Fair and Capacity,	CO1, CO2, CO3
	B	Hadoop 2.0 New Features- NameNode High Availability, HDFS Federation,	CO1, CO2, CO3

	C	MRv2, YARN, Running MRv1 in YARN.			CO1, CO2, CO3
	Unit 5				
	A	HIVE AND HIVEQL, HBAS: Hive Architecture and Installation, Comparison with Traditional Database,			CO2, CO3
	B	HiveQL - Querying Data - Sorting And Aggregating, Map Reduce Scripts, Joins & Sub-queries,			CO1, CO2, CO3
	C	HBase concepts- Advanced Usage, Schema Design, Advance Indexing - PIG, Zookeeper - how it helps in monitoring a cluster, HBase uses Zookeeper and how to Build Applications with Zookeeper.			CO1, CO2, CO3
	Mode of examination	Theory/Jury/Practical/Viva			
	Weightage Distribution	CA	MTE	ETE	
		30%	20%	50%	
	Text book/s*	1. Boris lublinsky, Kevin t. Smith, Alexey Yakubovich, "Professional Hadoop Solutions", Wiley, ISBN: 9788126551071, 2015. 2.			
	Other References	2. Chris Eaton, Dirk deroos et al. , "Understanding Big data ", McGraw Hill, 2012. 3. Tom White, "HADOOP: The definitive Guide" , O Reilly 2012. 3. Arvind Sathi, "Big Data Analytics: Disruptive Technologies for Changing the Game", 1st Edition, IBM Corporation, 2012. 4. Bill Franks, "Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics", 1st Edition, Wiley and SAS Business Series, 2012. 5. Tom White, "Hadoop: The Definitive Guide", 3rd Edition, O'reilly, 2012.			

CO and PO Mapping

S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	CO1: To bring together several key big data technologies used for storage, analysis and manipulation of data.	PO1,PO5,PSO1
2.	CO2: Identify and mitigate the challenges in Big data.	PO1, PO2, PO3, PO4, PO5, PSO1, PSO2, PSO4
3.	CO3: To recognize the key concepts of Hadoop framework, MapReduce, Pig, Hive, and No-SQL.	PO1, PO3, PO4, PSO2, PSO4
4.	CO4: To prepare a sample project in Hadoop API.	PO1, PO3, PO4, PSO2, PSO4

PO and PSO mapping with level of strength for Course Name Big Data Analytics (Course Code CSE618)

Average of non-zeros entry in following table (should be auto calculated).

Strength of Correlation

1. Addressed to ***Slight (Low=1) extent*** ***2.*** Addressed to ***Moderate (Medium=2) extent***
3. Addressed to ***Substantial (High=3) extent***

School: SET		**Batch : 2019 onwards**	
Program: M.Tech.		**Current Academic Year: 2020-2021**	
Branch: CSE (Networking & Cyber Security)		**Semester: II**	
1	Course Code	**CSE646** Course Name: **Wireless Sensor Network**	
2	Course Title	**Wireless Sensor Network**	
3	Credits	3	
4	Contact Hours (L-T-P)	3-0-0	
	Course Status	PG	
5	Course Objective	This course provides a broad coverage of challenges and recent research results related to the design and management of wireless sensor networks	
6	Course Outcomes	CO1: Architect sensor networks for various application setups CO2: Access Energy consumption of sensor nodes CO3: Devise appropriate data dissemination protocols and model links cost CO4: Assess Topology control CO5: Assess localization services and task control CO6: Develop knowledge to implement in allied applications	
7	Course Description	The course covers concepts of wireless sensor networks, architecture and protocols with energy management issues:	
8	Outline syllabus		CO Mapping
	Unit 1	**Introduction: Hardware, Architecture & Application**	
	A	Introduction: Ad Hoc Wireless Networks, Issues in Ad-Hoc Wireless Networks, Sensor networks as ad hoc networks, Comparison with Ad Hoc Wireless Networks	CO1
	B	Issues and challenges in Designing a Sensor Network, Applications of Sensor Networks	CO1
	C	Sensor Network Architecture-Layered Architecture, Clustered Architecture, Network architecture – Sensor network scenarios – types of sources and sinks – single hop Vs multi hop-multiple sources and sinks – mobility	CO1
	Unit 2	**Hardware & Software components**	
	A	Hardware components – sensor node overview – controller- memory -communication device - sensors and actuators – power supply of sensor nodes	CO1, CO2
	B	Energy consumption of sensor nodes, operation states with different power consumption , microcontroller energy consumption memory, Radio transceivers computation and communication power consumption.	CO2
	C	OS, Embedded OS, programming paradigms	CO2, CO6

		,protocol stack ,energy and power management, TinyOS and nesC, Gateway ,Need ,WSN to internet ,Internet to WSN ,WSN tunneling			
	Unit 3	**Communication protocols**			
	A	Physical layer and transceiver design in WSN energy usage profile –choice of modulation scheme, dynamic modulation scaling – antenna.			CO3
	B	MAC protocols - Low duty cycle protocols and wake up concepts : S-MAC, Mediation device protocol, Wakeup radio concepts			CO3
	C	Naming and addressing – Address and name management in WSN, Assignment of MAC addresses – distributed assignment of network wide addresses			CO3, CO6
	Unit 4	**Topology & Routing**			
	A	Routing protocols – Energy efficient – overview – unicast protocols, multipath unicast routing, Geographic routing – position based routing – geocasting			CO4
	B	Topology control –controlling topology in flat networks –power control, Clustering – hierarchical networks by clustering – clusters - connecting clusters – rotating cluster heads, Multihop clusters – multilayer of clustering – passive clustering			CO4
	C	Time synchronization: need – properties – protocol – LTS – TPSN – RBS – HRTS, clocks and communication delays – interval methods – reference broadcasts			CO4, CO6
	Unit 5	**Localization – services & task control**			
	A	Localization and positioning – properties – approaches – alteration problem – Single Hop localization, positioning in multihop environment			CO5
	B	Localization services – Ranging techniques – range based localization algorithms – location services			CO5
	C	Sensor tasking and control – Task driven sensing – roles of sensor nodes and utilities – information based sensor tasking, Sensor tasking and control – joint routing and information aggregation			CO5, CO6
	Mode of examination	Theory			
	Weightage Distribution	CA	MTE	ETE	
		30%	20%	50%	
	Text book/s*	1- “Protocols and Architectures for Wireless Sensor Networks”, Holger Karl, Andreas Willig, *Wiley, ISBN:* 0-470-09510-5			

	Other References	1. “Wireless Sensor Networks”, Cauligi S. Raghavendra, Krishna Sivalingam, Taieb M. Znati, *Springer, ISBN:* 1-4020-7883-8 2. Internet as a resource for references

CO and PO Mapping

S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	CO1: Architect sensor networks for various application setups	PO1, PO3,PO8,PSO3
2.	CO2: Access Energy consumption of sensor nodes	PO1,PO2,PO3,PO8, PSO3
3.	CO3: Devise appropriate data dissemination protocols and model links cost	PO1,PO2,PO3,PO8,PSO3
4.	CO4: Assess Topology control	PO1,PO2,PO3, PO8,PSO3
5.	CO5: Assess localization services and task control	PO1, PO2,PO3,PO4,PO5,PO8,PSO3
6.	CO6: Develop knowledge to implement in allied applications	PO1,PO2,PO3, PO4, PO5,PO8,PSO3

PO and PSO mapping with level of strength for Course Name Wireless Sensor Network (Course CodeCSE646)

	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
	CO1	3	-	3	-	-	-	-	1	-	-	2
	CO2	3	2	3	-	-	-	-	1	-	-	2
	CO3	3	2	3	-	-	-	-	1	-	-	2
	CO4	3	2	3	-	-	-	-	1	-	-	2
	CO5	3	2	3	2	2	-	-	1	-	-	3
	CO6	3	2	3	2	2	-	-	1	-	-	3
	Avg.	3	1.6	3	0.6	0.6	-	-	1	-	-	2.3

School:		**School of Engineering and technology**	
Department		**Department of Computer Science and Engineering**	
Program:		**M. Tech**	
Branch:		M. Tech. (CSE) Networking and Cyber Security	
1	Course Code	CSE616	
2	Course Title	**Intrusion detection and prevention**	
3	Credits	3	
4	Contact Hours (L-T-P)	3-0-0	
	Course Status	Core /Elective/Open Elective	
5	Course Objective	The objective of this course is to provide an in depth introduction to intrusion detection and prevention. The course covers methodologies, techniques, and tools for monitoring events in computer system or network, with the objective of preventing and detecting unwanted process activity and recovering from malicious behavior.	
6	Course Outcomes	On successful completion of this module students will be able to: CO1: illustrate in-depth introduction to the Science and Art of Intrusion Detection and Prevention CO2: demonstrate the skill to capture and analyze network packets CO3: analyze packet and detection methods CO4: analyze and apply Snort rules, outputs, and plug-ins to detect unauthorized activity CO5: apply different protocol analyzers tools CO6: apply different tools related to traffic monitoring, snort, toolkits	
7	Course Description	This course introduces intrusion detection and prevention, which is one of the most essential concepts in looking at how threats and attacks are detected and mitigated.	
8	Outline syllabus		CO Mapping
	Unit 1	**Introduction**	
	A	Intrusion Detection, basics of Intrusion detection and prevention, Intrusion Detection system and its types, Intrusion Prevention System, History, IDS and IPS analysis schemes, Attacks	CO1
	B	Detection approaches: Misuse detection, anomaly detection, specification-based detection, hybrid detection; Tiered Architecture of Intrusion Detection system and Intrusion Prevention System	CO1

	C	DDos attacks, TCP reset attack, malformed DNS attack	CO1
	Unit 2	**Traffic monitoring**	
	A	tcpdump , binary packet capture, formats of tcpdump filters, bit masking	CO2, CO6
	B	packet capturing using wireshark, wireshark display filters	CO2, CO6
	C	Live network packet capturing, protocol analysis	CO2, CO6
	Unit 3	**Packets Analysis**	
	A	Examination of fields in TCPchecksums, normal and abnormal tcp stimulus and response	CO3
	B	Detection methods for application protocols, pattern matching, protocol decode and anomaly detection	CO3
	C	Sample attacks http, malformed dns , DDos, tcp reset attacks	CO3
	Unit 4	**Open source IDS: Snort**	
	A	Function of IDS, configuration of snort	CO4, CO6
	B	flow process of snort, Model of operation sniffer, logger, NIDS	CO4, CO6
	C	Writing snort rules, writing a rule for vulnerability	CO4, CO6
	Unit 5	**Analyst toolkit**	
	A	ngrep, tcpflow, netcat	CO5, CO6
	B	using jpcap to create , read/write, alter and send packets	CO5, CO6
	C	launch arp poisining, dns poisioning attacks using jpcap	CO5, CO6
	Mode of examination	Theory/Jury/Practical/Viva	
	Weightage Distribution	CA / MTE / ETE	
		30% / 20% / 50%	
	Text book/s*	1. Intrusion Detection & Prevention , Carl F. Endorf, Eugene Schultz and Jim Mellander, McGraw Hill Professional, 2004	
	Other References	1. Metasploit: The Penetration Tester's Guide by David Kennedy, Jim O'Gorman, Devon Kearns, Mati Aharoni 2. Internet as a Resource for Reference.	

CO and PO Mapping

S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	CO1: illustrate in-depth introduction to the Science and Art of Intrusion Detection and Prevention	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PSO

2.	CO2: demonstrate the skill to capture and analyze network packets	PO1, PO2, PO4, PO5, PSO
3.	CO3: analyze packet and detection methods	PO1, PO2, PO4, PO5, PSO
4.	CO4: analyze and apply Snort rules, outputs, and plug-ins to detect unauthorized activity	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PSO
5.	CO5: apply different protocol analyzers tools	PO1, PO2, PO4, PO5, PSO
6.	CO6: apply different tools related to traffic monitoring, snort, toolkits	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PSO

PO and PSO mapping with level of strength for Course Name Intrusion detection and prevention (Course Code CSE616**)**

Course Code_ Course Name	**CO's**	**PO 1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PSO**
CSE616_Intrusion detection and prevention	**CO1**	3	3	3	2	2	2	3	3	3
	CO2	1	2	-	1	1	-	-	-	1
	CO3	1	2	-	1	1	-	-	-	1
	CO4	2	3	3	1	2	2	1	2	3
	CO5	1	1	-	1	1	-	-	-	1
	CO6	2	2	2	1	1	2	1	2	2

Average of non-zeros entry in following table (should be auto calculated).

Course Code	**Course Name**	**PO1**	**PO2**	**PO 3**	**PO 4**	**PO5**	**PO6**	**PO7**	**PO8**	**PSO**
CSE616	Intrusion detection and prevention	1.5	2.16	2.66	2	1.16	2	1.66	2.33	1.833

Strength of Correlation

1. Addressed to ***Slight (Low=1) extent*** ***2.*** Addressed to ***Moderate (Medium=2) extent***

3. Addressed to ***Substantial (High=3) extent***

1	Course Code	CSE 606	
2	Course Title	**Cloud Services in Mobile**	
3	Credits	3	
4	Contact Hours	(3-0-0)	
5	Course Objective	• To understand the need of Cloud services in mobile App	
6	Course Outcomes (CO)	• CO1: To understand basics and underlying concepts of cloud computing • CO2: Apply different cloud programs, platforms, tools, and storage systems • CO3: To understand basics of mobile app development in cloud • CO4: Build and define phases of mobile application development • CO5:Analyse testing and development of mobile app on the cloud. • CO6 : Understand the concept of mobile design .	
7	**Prerequisite**		CO Mapping
8	**Course Contents**		
8.01	Unit A	**Introduction to cloud services**	
8.02	Unit A Topic 1	Introduction to Distributed systems, Distributed computing	CO1
8.03	Unit A Topic 2	Introduction to Cluster Computing,Introduction to Grid Computing,,Benefits of different computing environments.	CO1
8.04	Unit A Topic 3	Virtualization, Introduction to Cloud Computing, Basic Paradigms, Models, Data Centers	CO1
8.05	Unit B	**File and storage services in cloud**	
8.06	Unit B Topic 1	Distributed file systems, Google file system, Google Big Table	CO1,CO 2
8.07	Unit B Topic 2	Programming frameworks, Mapreduce, Hadoop	CO1,CO 2
8.08	Unit B Topic 3	Cloud Storage Service providers :AWS and Google, Effective utilization of Cloud Storage	CO1,CO 2
8.09	Unit C	**Mobile Application development Framework**	
8.10	Unit C Topic 1	Mobile Clients, Developing mobile applications	CO1,CO 3
8.11	Unit C Topic 2	Integrating networking, the OS and hardware into mobile-applications	CO1,CO 3
8.12	Unit C Topic	Overview of the Android framework, Application models	CO1,CO

	3	of mobile application frameworks	3
8.13	Unit D	**Feature and application of Mobile Application**	
8.14	Unit D Topic 1	Integrating with cloud services, Mobile app development phases	CO1,CO 4
8.15	Unit D Topic 2	Features of mobile apps on cloud: performance, scalability, modifiability, availability and security etc.	CO1,,C O4
8.16	Unit D Topic 3	User-interface design for mobile applications, Design principles of user interface	CO1,CO 4
8.17	Unit E	**Testing in Mobile Application**	
8.18	Unit E Topic 1	Testing methodologies for mobile applications : Native ,Hybrid and Mobile Web	CO1,CO 5,CO6
8.19	Unit E Topic 2	Application Testing ,Platform Testing ,UI Testing	CO1,CO 5,CO6
8.20	Unit E Topic 3	Management frameworks :RobotiumSelendroid ,Appium ,Zucchini	CO1,CO 5,CO6
9			

		Continuous Assessment	Mid-Term Examination	End-Term Examination	
9.11	Attendance	Mandatory	Mandatory	75%	
9.12	Assignment	10 Assignments(no weight)	--	--	
9.13	Quizzes	7Best quizzes(out of 10 assignments),30 marks	--	--	

9.14	Projects		--	--	
9.15	Presentations	--	--		
9.16	Exam	--	Yes	Yes	
9.17	Total Marks	30	30	40	
10	**Reading Content**				
9.1	Text book*	1. Distributed and Cloud Computing, 1st edition, Morgan Kaufmann, 2011.			
9.2	other references	1. Dominic Duggan, Enterprise Software Architecture and Design, Willy Publication, 2013. 2. Internet as a resource for references			

CO and PO Mapping

S. No.	Course Outcome (CO)	Program Outcomes (PO)
1.	CO1: To understand basics and underlying concepts of cloud computing	PO1, PO3, PO4, PO5
2.	CO2: To understand different cloud programs, platforms, tools, and storage systems	PO1, PO3, PO4, PO5,PSO2
3.	CO3: To understand basics of mobile app development in cloud	PO1, PO2, PO4, PO5
4.	CO4: To understand phases of mobile application development	PO1, PO2, PO4, PO5,PSO1
5.	CO5: To understand testing and development of mobile apps on the cloud.	PO1, PO2, PO3, PO5
6	CO6:Understand the concept of mobile design	PO1, PO3, PO4, PO5

PO and PSO mapping with level of strength for Course Name: Cloud Services in Mobile Applications (cse-606)

1-Slight (Low) 2-Moderate (Medium) 3-Substantial (High)

Strength of Correlation

1. Addressed to ***Slight (Low=1) extent*** ***2.*** Addressed to ***Moderate (Medium=2) extent***
3. Addressed to ***Substantial (High=3) extent***

School:		School of Engineering and technology	
Department		Department of Computer Science and Engineering	
Program:		M. Tech	
Branch:		M. Tech. (CSE) Networking and Cyber Security	
1	Course Code		
2	Course Title	Applications Programming	
3	Credits	3	
4	Contact Hours (L-T-P)	3-0-0	
	Course Status	Core	
5	Course Objective	Emphasis is placed on procedural programming, algorithm design, and language constructs common to most high level languages and Email handling through Python Programming.	
6	Course Outcomes	Upon successful completion of this course, the student will be able to: CO1: apply the concept of decision, repetition structures and various data types. CO2: formulate methods and functions to improve readability of programs. CO3: develop a module for Email processing using SMTP. CO4:construct a logical solution by using object-oriented programming methodology CO5: build application based python program to interact with database. CO6: design logical solution to solve real life problems using Python concept.	
7	Course Description	Python is a language with a simple syntax, and a powerful set of libraries. It is widely used in many scientific areas for data exploration. This course is an introduction to the Python programming language for students without prior programming experience. We cover data types, control flow, object-oriented programming and Email handling	
8	Outline syllabus		CO Mapping
	Unit 1	**Introduction**	
	A	Introduction: History, Python architecture, Variables, Data Types, Operators.Conditional Statements: If, If-else, Nested if-else. Looping: For,While, Nested loops Control Statements: Break, Continue, Pass	CO1,CO6
	B	Lists:Introduction, Accessing list, Operations, Working with lists, Functionand Methods with Lists	CO1,CO6
	C	Tuple:Introduction, Accessing tuples, Operations, Working, Functions and Methods with Tuples	CO1,CO6

	Unit 2	**Dictionary, Functions and Exceptions**	
	A	Dictionaries :Introduction, Accessing values in dictionaries, Working with dictionaries,Functions	CO2,CO6
	B	Functions:Defining a function, Calling a function, Types of functions, Function Arguments, Anonymous functions, Global and local variables	CO2,CO6
	C	Exception Handling: Definition Exception, Exceptionhandling, Except clause, Try ? finally clause, User Defined Exceptions	CO2,CO6
	Unit 3	**Modules, Email Processing**	
	A	Modules: Importing module, Math module, Random module, Matplotlib, Packages	CO3, CO6
	B	Contacting User Through Emails Using Python: Installing SMTP python module, Sending email.	CO3, CO6
	C	Reading from file and sending emails to all users addressing them directly for marketing	CO3, CO6
	Unit 4	**Object oriented programming**	
	A	OOPs concept : Class and object, Attributes, Inheritance	C04, CO6
	B	Overloading, Overriding, Data hiding	C04, CO6
	C	Python File Operation: Opening, Closing, Reading, Writing operation into files. Manipulating File Pointer	C04, CO6
	Unit 5	**Database Handling**	
	A	Python Database Interaction: SQL Database connection using python, Creating and searching tables	CO5,CO6
	B	Reading and storing config information on database	CO5,CO6
	C	Programming using database connections	CO5,CO6
	Mode of examination	Theory	
	Weightage Distribution	CA / MTE / ETE 30% / 20% / 50%	
	Text book/s*	1. The Complete Reference Python, Martin C. Brown, McGrwHill	
	Other References	1. Introduction to computing in problem solving using Python, E Balahurusamy, McGrwHill 2. Introduction to programming using Python, Y. Daniel Liang, Pearson 3. Mastering Python, Rick Van Hatten, Packet Publishing House 4. Starting out with Python, Tony Gaddis, Pearson	

CO and PO Mapping

S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	CO1: Apply the concept of decision, repetition structures and various data types.	PO1, PO2, PO8,PSO3
2.	CO2: Formulate methods and functions to improve readability of programs.	PO1, PO2,PO3, PO6, PO7, PO8, PSO3
3.	CO3: Develop a module for Email processing using SMTP.	PO1, PO2, PO3, PO6, PO7, PO8, PSO3
4.	CO4: Construct a logical solution by using object-oriented programming	PO1, PO2, PO4, PO7,PO8,PSO3
5.	CO5: Build application based python program to interact with data base.	PO1, PO2, PO3, PO5, PO8, PSO3
6.	CO6: Design logical solution to solve real life problems using Python concept.	PO1, PO2, PO4, PO6,PO8,PSO3

PO and PSO mapping with level of strength for Course Name Applications Programming (Course Code)

Applications Programming	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO3
	CO1	3	2	3	-	-	-	-	2	2
	CO2	3	2	3	-	-	-	3	2	2
	CO3	3	2	3	1	-	-	3	2	2
	CO4	3	2	3	1	2	2	2	2	2
	CO5	3	2	3	2	2	2	-	2	3
	CO6	3	2	3	2	2	2	-	2	3

Course Code	Course Name	PO 1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PSO
	Applications Programming	3	2	3	1.5	2	2	2.6	2	2.3

Average of non-zeros entry in following table (should be auto calculated)

School:		**School of Engineering and technology**	
Department		**Department of Computer Science and Engineering**	
Program:		**M.Tech**	
Branch:		**Software Engineering**	
1	Course Code	CSE644	
2	Course Title	Agile Based Software Engineering	
3	Credits	3	
4	Contact Hours (L-T-P)	3-0-0	
	Course Status	Core /Elective/Open Elective	
5	Course Objective	This course will provide the understanding of what Agility means, when and why to employ Agile development, the pitfalls, issues and common mistakes to watch out for, and will cover key methodologies including Scrum and XP.	
6	Course Outcomes	Students will be able to CO1: Demonstrate the ability to participate effectively in agile practices/process for software development. CO2:Analyze best and effective Agile Development model required for Software Project Development. CO3: Apply Scrum &XP practices to projects CO4: Compare agile software development to traditional software development models. CO5: Test application for feature testing, integration testing, TDD and BDD testing methods CO6: Choose each of the major agile development methods underscoring their strengths and weaknesses	
7	Course Description	This course will address what agile methods are and how they are implemented. A variety of agile methods will be described, but the focus will be on Scrum and Extreme Programming. The course will conclude with a discussion of some of the issues facing organizations adopting agile methods.	
8	Outline syllabus		CO Mapping
	Unit 1	**Agile Fundamentals**	
	A	Overview of traditional software life cycle models. Problems with the waterfall. Rapid software development. Introduction to Agile. History of Agile: More or less a process?	CO1
	B	Necessity & requirement of Agility in software development. Agile Manifesto & Principles. Benefits, characteristics and Challenges of Agile methodology.	CO1
	C	Suitability of Agile Methods: When to Use Agile and When NOT to? Agile misconceptions, Agile hype, Applications of Agile Software development. Agile Lifecycle. Concept of Agile Alliance.	CO1

	Unit 2	**Agile development**			
	A	Iterative development Process, Risk-Driven and Client-Driven iterative planning, Time boxed iterative development. Incremental development,			CO2,CO4, CO6
	B	Software prototyping: Process, benefits, throw-away prototypes. Conflicting objectives of Incremental development and throw-away prototypes.			CO2,CO4, CO6
	C	Evolutionary and adaptive development. Classification of different Agile Methods.			CO2,CO4, CO6
	Unit 3	**Scrum**			
	A	SCRUM Roots, Philosophy behind Scrum, Scrum overview, Key Features, Scrum Values, Scrum Lifecycle, Scrum Events-Sprint,			CO3,CO6
	B	Sprint Planning, Daily Scrum, Sprint Review, Sprint Retrospective, Scrum Meetings, Strengths and Weaknesses, Characteristics, Pros and cons, Tools and Techniques			CO3,CO6
	C	Scrum artifacts, Scrum practices, Work products, Roles, Responsibilities, Common mistakes and misunderstandings, Adoption strategies.			CO3,CO6
	Unit 4	**XP(Extreme Programming)**			
	A	Method overview , Core values of XP, XP practices, XP Lifecycle, XP and agile principles, Work products			CO3
	B	Roles and Responsilities, Strengths and Weaknesses, Characteristics, Pros and cons, Tools and Techniques			CO3
	C	Common mistakes and misunderstandings, Adoption strategies, Scrum vs. XP, Testing in XP, Pair Programming.			CO3,CO6
	Unit 5	**Agile testing**			
	A	Concept of agile testing, Roles and activities on an Agile Team, Traditional vs. Agile testing, Concept of Whole-Team Approach			CO5
	B	Role of Tester in Agile Team, Ten Principles for Agile testers, Six concrete practices for testing on agile teams. Organizational and cultural challenges affect tester's role on agile team			CO5
	C	Agile testing methods-TDD, ATDD, BDD, Exploratory. Agile Testing Lifecycle, Test Plan for Agile. Agile testing Quadrants.			CO5,CO6
	Mode of examination	Theory/Jury/Practical/Viva			
	Weightage Distribution	CA	MTE	ETE	
		30%	20%	50%	
	Text book/s*	1. Agile Testing: A Practical Guide for Testers and Agile Teams 2. Agile and Iterative Development: A Manager's Guide By Craig Larman			
	Other References	1. Succeeding with Agile: Software Development Using Scrum 2. Agile Software Engineering By Orit Hazzan, Yael Dubinsky. 3. Internet resources			

CO and PO Mapping

S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	CO1: Demonstrate the ability to participate effectively in agile practices/process for software development.	PO1,PO2,PO3,PO5,PO7,PO8,PSO1
2.	CO2:Analyze best and effective Agile Development model required for Software Project Development.	PO1,PO2,PO3,PO5,PO7,PO8,PSO1
3.	CO3: Apply Scrum &XP practices to projects	PO1,PO3,PO4,PO5,PO6,PO7,PO8,PSO1
4.	CO4: Compare agile software development to traditional software development models.	PO1,PO2,PO3,PO7,PO8,PSO1
5.	CO5: Test application for feature testing, integration testing, TDD and BDD testing methods	PO1,PO2,PO3,PO4,PO5,PO6,PO7,PO8,PSO1
6.	CO6: Choose each of the major agile development methods underscoring their strengths and weaknesses	PO1,PO2,PO3,PO4,PO5,PO6,PO7,PO8,PSO1

PO and PSO mapping with level of strength for Course Name Agile based software Engineering(Course Code CSE644)

Course Code_ Course Name	CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CSE644_ Agile based software engineering	CO1	3	2	2	-	1	-	3	2	3	-	-
	CO2	3	3	2	-	2	-	3	3	3	-	-
	CO3	3	-	3	3	2	3	3	3	3	-	-
	CO4	2	3	2	-	-	-	3	2	3	-	-
	CO5	3	2	2	2	2	3	3	3	3	-	-
	CO6	3	3	3	2	2	3	3	3	3	-	-

Average of non-zeros entry in following table (should be auto calculated).

Course Code	Course Name	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CSE644	Agile based software engineering	2.8	2.6	2.3	2.3	1.8	3	3	2.6	3	-	-

Strength of Correlation

1. Addressed to ***Slight (Low=1) extent*** ***2.*** Addressed to ***Moderate (Medium=2) extent***
3. Addressed to ***Substantial (High=3) extent***

CSE649: Secure Software Engineering

School:		**School of Engineering and technology**	
Department		**Department of Computer Science and Engineering**	
Program:		**M.Tech**	
Branch:		**Software Engineering**	
1	Course Code	CSE649	
2	Course Title	Secure software Engineering	
3	Credits	3	
4	Contact Hours (L-T-P)	3-0-0	
	Course Status	Core /Elective/Open Elective	
5	Course Objective	The objective is to demonstrate an understanding for secure software engineering and a formal specification for secure software systems.	
6	Course Outcomes	Students will be able to: CO1: Outline issues related secure software development methodologies CO2: Select the most appropriate requirement engineering approach to secure software development CO3: Identify the implications and impact of secure architecture design CO4: Analyze challenges of security protocols, functional and attacker perspectives CO5: Assess adaptations to the development process to make sure a secure deployment CO6: Adapt approaches and tools that support the security concerns in the whole systems development lifecycle resulting in software that is secure by default.	
7	Course Description	The course describes the security aspects of software development that are embedded into the system to be developed. It includes secure architecture design, secure coding, secure deployment and secure software development methodologies	
8	Outline syllabus		CO Mapping
	Unit 1	**Security a software Issue**	
	A	Introduction, the problem, Software Assurance and Software Security	CO1
	B	Threats to software security, Sources of software insecurity, Benefits of Detecting Software Security	CO1
	C	What Makes Software Secure: Properties of Secure Software, Influencing the security properties of software	CO1
	Unit 2	**Requirements Engineering for secure software**	
	A	Introduction, Misuse and Abuse Cases	CO2
	B	The SQUARE process Model	CO2,CO6
	C	Requirements elicitation and prioritization	CO2,CO6
	Unit 3	**Secure Software Architecture and Design**	
	A	Introduction, Software security practices for architecture and design: Architectural risk analysis.	CO3,CO6
	B	Software security knowledge for architecture and	CO3,CO6

		design: Security principles			
	C	Security guidelines, and Attack patterns			CO3,CO6
	Unit 4	**Security and Complexity**			
	A	System Assembly Challenges: introduction, security failures			CO4
	B	Functional and attacker perspectives for security analysis			CO4,CO6
	C	System complexity drivers and security			CO4,CO6
	Unit 5	**Governance and Managing for More Secure Software**			
	A	Governance and security			CO5,CO6
	B	Adopting an enterprise software security framework, How much security is enough?			CO5,CO6
	C	Security and project management, Maturity of Practice			CO5,CO6
	Mode of examination	Theory/Jury/Practical/Viva			
	Weightage Distribution	CA	MTE	ETE	
		30%	20%	50%	
	Text book/s*	1. Software Security Engineering: A Guide for Project Managers, by Julia H. Allen, Sean Barnum, Robert J. Ellison, Gary McGraw, Nancy R. Mead, Addison-Wesley , 1st edition, 2008. 2. Security Metrics: Replacing Fear, Uncertainty, and Doubt , by Andrew Jaquith, AddisonWesley , 1st edition , 2007			
	Other References	1. Developing Secure Software: Jason Grembi, Cengage Learning 2. Software Security : Richard Sinn, Cengage Learning			

CO and PO Mapping

S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	CO1: Outline issues related secure software development methodologies	PO1,PO2,PO3,PO7,PO8, PSO1
2.	CO2: Select the most appropriate requirement engineering approach to secure software development	PO1,PO2,PO3,PO4,PO5, PO7,PO8,PSO1
3.	CO3: Identify the implications and impact of secure architecture design	PO1,PO2,PO3,PO4,PO5, PO6,PO7,PO8,PSO1
4.	CO4: Analyze challenges of security protocols, functional and attacker perspectives	PO1,PO2,PO3,PO4,PO5, PO6,PO7,PO8,PSO1
5.	CO5: Assess adaptations to the development process to make sure a secure deployment	PO1,PO2,PO3,PO4,PO5, PO6,PO7,PO8,PSO1
6.	CO6: Adapt approaches and tools that support the security concerns in the whole systems development lifecycle resulting in software that is secure by default.	PO1,PO2,PO3,PO4,PO5, PO6,PO7,PO8,PSO1

PO and PSO mapping with level of strength for Course Name Secure software engineering (Course Code CSE649)

Course Code_ Course Name	CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CSE649_ secure software engineering	CO1	1	3	2	-	-	-	2	2	3	-	-
	CO2	3	2	2	1	1	-	3	3	3	-	-
	CO3	2	2	2	1	1	2	2	3	3	-	-
	CO4	3	3	2	1	2	2	2	2	3	-	-
	CO5	3	3	2	1	2	2	2	2	3	-	-
	CO6	3	3	2	2	3	2	2	3	3	-	-

Average of non-zeros entry in following table (should be auto calculated).

Course Code	Course Name	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO 1	PSO 2	PSO 3
CSE649	secure software engineering	2.5	2.6	2	1.2	1.8	2	2.1	2.5	3	-	-

Strength of Correlation

1. Addressed to ***Slight (Low=1) extent*** ***2.*** Addressed to ***Moderate (Medium=2) extent***
3. Addressed to ***Substantial (High=3) extent***

2.1 Template A1: Syllabus for Theory Courses (SAMPLE)

School:		**School of Engineering and technology**	
Department		**Department of Computer Science and Engineering**	
Program:		**MTECH**	
Branch:			
1	Course Code	CSE 6	
2	Course Title	Advance Web Analytics	
3	Credits	2	
4	Contact Hours (L-T-P)	2-0-0	
	Course Status	Core /Elective/Open Elective	
5	Course Objective	An introductory study of Web analytics on how organizations may use to analyze and measure website traffic which helps in enhancing their business presence.	
6	Course Outcomes	CO1: Define importance of Web Analytics and Qualitative analysis. CO2:Illustrate data collection options available for strong analytics with pros and cons of each methodology CO3:Identify effective Web analytics strategies and implementation CO4:Examine Key tools and diagnostics associated with Web analytics CO5: Determine basic navigation of Google Analytics Interface. CO6:Elaborate how web analytic is used as a tool for e-Commerce, business research, and market research	
7	Course Description	This course is an overview of the modern Web Analytical tool used for the Web. The motivation behind this course is to give students the basic understanding of how things work in the Web world from the analytical point of view as well as to give the essential outline of the different open source technologies with use cases.	
8	Outline syllabus		CO Mapping
	Unit 1	**Introduction**	
	A	History, current landscape and challenges, The ROI of Web Analytics , Importance of Web Analytics	CO1
	B	Data Collection - Importance and Options , Clickstream Data, Outcomes Data, Research Data, Competitive Data	CO2
	C	Overview of Qualitative Analysis –Heuristic evaluation,Components of Successful Web Analytics Strategy	CO1
	Unit 2	**Web Analytic Fundamentals – Core Analytic Concepts**	
	A	Introduction to XML technologies, Web Analytics Process: Key Performance Indicators (KPI),Data Capturing	CO3
	B	Key features and capabilities of Google analytics, Website content quality and navigation report, discoverability	CO3

	C	Selecting and Comparing Date Ranges, Scheduled Export of Data , Cross-Segmentation	CO3
	Unit 3	**Web Data Analysis – Search Analytics**	
	A	Performing Internal Site Search Analytics , Beginning Search Engine Optimization, Measuring SEO Efforts, Analyzing Pay per Click Effectiveness .	CO3
	B	How Google analytic works, Audience Analysis, Acquisition Analysis, Behavior Analysis, Conversion Analysis	CO4
	C	Introduction of Web analytics tools(OPTIMIZELY, ,KISSMETRICS, CRAZY EGG, KEY METRICS)	CO4
	Unit 4	**Measuring Email and multi-channel marketing**	
	A	Email marketing-advance tracking, measure website effectiveness,	CO4
	B	Leveraging benchmarks and goals for driving actions, dashboards and create effective programs,	CO4
	C	Competitive intelligence Analytics, Competitive Traffic Reports, Search Engine Reports	CO4
	Unit 5	**Implementation of Google Analytics**	
	A	Create Google Analytics Account, Tagging and collection of data	CO5
	B	Setting Up Client Accounts, Seven Steps to Creating a Data-Driven Decision-Making Culture	CO5,CO6
	C	E-Commerce Tracking ,Online Campaign Tracking, Event Tracking	CO5,CO6
	Mode of examination	Theory/Jury/Practical/Viva	
	Weightage Distribution	CA / MTE / ETE	
		30% / 20% / 50%	
	Text book/s*	Web Analytics : an hour a day, Avinash Kaushik, John Wiley & Sons.	
	Other References	Web Analytics 2.0 : The art of online accountability and science of customer centricity (Google ebook), Avinash Kaushik, John wiley & sons.	

CO and PO Mapping

S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	CO1: Define importance of Web Analytics and Qualitative analysis.	PO1,PO2,PO3,PO8,PSO2
2.	CO2:Illustrate data collection options available for strong analytics with pros and cons of each methodology	PO1,PO2,PO3,PSO2
3.	CO3:Identify effective Web analytics strategies and implementation	PO1,PO2,PSO2
4.	CO4:Examine Key tools and diagnostics	PO1,PSO2

	associated with Web analytics	
5.	CO5:Determine basic navigation of Google Analytics Interface.	PO1,PO8,PSO2
6.	CO6:Elaborate how web analytic is used as a tool for e-Commerce, business research, and market research	PO1,PO2,PO3,PO4,PO8,PSO1,PSO2

PO and PSO mapping with level of strength for Course Name Advance Web Analytics **(Course Code CSE 6)**

Course Code_ Course Name	CO's	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PSO 1	PSO 2	PSO 3
Cse6_ Advance Web Analytics	CO1	2	1	2					1		1	
	CO2	2	1	1							2	
	CO3	2	1								2	
	CO4	2									3	
	CO5	2							2		3	
	CO6	3	2	2	1				2	1	3	

Average of non-zeros entry in following table (should be auto calculated).

Course Code	Course Name	PO 1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PSO 1	PSO 2	PSO 3

Strength of Correlation

1. Addressed to ***Slight (Low=1) extent*** ***2.*** Addressed to ***Moderate (Medium=2) extent***
3. Addressed to ***Substantial (High=3) extent***

School: SET		**Batch : 2019 onwards**	
Program: M.Tech		**Current Academic Year: 2020-2021**	
Branch: CSE (Networking & Cyber Security)		**Semester: II**	
1	Course Code	**CSE-629**	Course Name: **Performance Modeling of Computer Communication Network**
2	Course Title	**Performance Modeling of Computer Communication Network**	
3	Credits	2	
4	Contact Hours (L-T-P)	2-0-0	
	Course Status	PG	
5	Course Objective	The course applies the concepts of available modeling techniques, including mathematical and simulation methods.	
6	Course Outcomes	CO1. Identify the role of probabilistic, poisson process and markov chain in evaluating network performance CO2.Classify the various performance models CO3.Explain the working of queueing theory CO4.Illustrate the working of petri nets CO5.Analyze various performance models CO6. Apply the simulation based on perti nets Model	
7	Course Description	This course examine the methods and concepts of communication network modeling using simulation methods.	
8	Outline syllabus		CO Mapping
	Unit 1	**Introduction to probability theory**	
	A	sample points, events probability, random variable	CO1
	B	Expectation and other moments, stochastic process	CO1
	C	exponential distribution and poisson process, markov chains	CO1
	Unit 2	**Performance Modelling**	
	A	system, model and modelling, classification of models	CO1, CO2
	B	performance models, simulation models	CO1, CO2
	C	Analytical models	CO1, CO2
	Unit 3	**Single server queueing model**	
	A	M|M|1 Queueing models	CO3
	B	M|G|1-FCFS Queuing Models, G|M|1-FCFS and G|G|1-FCFS Queueing Models	CO3
	C	PH|PH|1 Queueing Models, Polling Models	CO3
	Unit 4	**Queueing Network Model**	
	A	Open Queuing Networks, Closed Queueing Networks	CO3, CO4

	B	BCMP Queueing Networks			CO3, CO4
	C	Hierarchical Queueing Networks			CO3, CO4
	Unit 5	**Stochastic Petri Models**			
	A	Stochastic Petri Nets, Numerical Solution of Markov Chains			CO5, CO6
	B	Stochastic Petri Net application, infinite-state SPN			CO5, CO6
	C	Simulation methodology and statistics			CO5, CO6
	Mode of examination	Theory			
	Weightage Distribution	CA	MTE	ETE	
		30%	20%	50%	
	Text book/s*	1.Performance of Computer Communication Systems: A Model-Based Approach, Boudewijn R. Haverkort, 1998 John Wiley & Sons, Ltd			
	Other References	1. Performance Models and Risk Management in Communications Systems Gülpınar, Nalân, Harrison, Peter G., Rustem, Berc (Eds. 2. Performance Modelling of Communication Networks and Computer Architectures : Peter G. Harrison , Naresh M. Patel 3. Internet as source of reference			

CO and PO Mapping

S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	CO1. Identify the role of probabilistic, poisson process and markov chain in evaluating network performance	PO1,PO3,PO8 PSO3
2.	CO2.Classify the various performance models	PO1,PO2,PO3,PO8 PSO3
3.	CO3.Explain the working of queueing theory	PO1,PO2,PO3,PO8 PSO3
4.	CO4.Illustrate the working of petri nets	PO1,PO2,PO3,PO8 PSO3
5	CO5.Analyze various performance models	PO1,PO2,PO3,PO4,PO5,PO8 PSO3
6.	CO6. Apply the simulation based on perti nets Model	PO1,PO2,PO3,PO4,PO5,PO8 PSO3

PO and PSO mapping with level of strength for Course Name Performance Modeling of Computer Communication Network (Course Code CSE629)

	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
	CO1	3	-	3	-	-	-	-	1	-	-	2
	CO2	3	2	3	-	-	-	-	1	-	-	2
	CO3	3	2	3	-	-	-	-	1	-	-	2
	CO4	3	2	3	-	-	-	-	1	-	-	2
	CO5	3	2	3	2	2	-	-	1	-	-	3
	CO6	3	2	3	2	2	-	-	1	-	-	3
	Avg.	3	1.6	3	0.6	0.6	-	-	1	-	-	2.3

CSP648:Recent Advances in Software Engineering Lab

School:		**School of Engineering and technology**			
Department		**Department of Computer Science and Engineering**			
Program:		**M.Tech**			
Branch:		**Software Engineering**			
1	Course Code	CSP648			
2	Course Title	Recent Advances in Software Engineering Lab			
3	Credits	3			
4	Contact Hours (L-T-P)	3-0-0			
	Course Status	Compulsory/Elective			
5	Course Objective	To Create a requirements model using UML class notations To prepare the backlog and plan the sprint effectively using JIRA To use MS Project and do project planning			
6	Course Outcomes	CO1: Illustrate the fundamental principles through advanced concepts of analysis and design using UML CO2: Explain the features of JIRA CO3: Construct the project reports using JIRA CO4: Plan project activities using MS Project CO5: Assess and fixing project conflicts. CO6: Design project using recent tools of software engineering			
7	Course Description	This course introduces UML Designs-activity, sequence, deployment and component diagram. This course enables students to explore JIRA, MS Project.			
8	Outline syllabus				CO Mapping
	Unit 1	**Software Design using UML**			
		Design Activity and sequence diagram			CO1
		Design Deployment and Component Diagram			CO1
	Unit 2	**Introduction to Jira**			
		Explore Jira software			CO2,CO6
		Create a project			CO2,CO6
	Unit 3	**Report generation using Jira**			
		Create a backlog and Create a sprint			CO3,CO6
		Track the progress of the task and Generation of report			CO3,CO6
	Unit 4	**Project planning in MS Project**			
		Getting Started with MS Project			CO4,CO6
		To create a project plan and add tasks with date			CO4,CO6
	Unit 5	**Task scheduling in MS Project**			
		Create Gantt chart, Network Diagram and Assign the resource to the task			CO5,CO6
		Document the resource and track the completion of the work.			CO5,CO6
	Mode of examination	Jury/Practical/Viva			
	Weightage Distribution	CA	MTE	ETE	
		60%	0%	40%	
	Text book/s*	-			

	Other References	Internet as a resource	

PO and PSO mapping with level of strength for Course Name Recent advances in Software Engineering Lab (Course Code CSP648)

Course Code_ Course Name	CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CSP648_Recent advances in software Engineering	CO1	1	1	1	-	-	1	3	2	3	-	-
	CO2	3	3	1	-	-	1	3	2	3	-	-
	CO3	3	3	1	-	-	1	3	3	3	-	-
	CO4	3	3	1	-	-	1	3	3	3	-	-
	CO5	3	3	2	-	-	1	3	3	3	-	-
	CO6	3	3	2	2	-	2	3	3	3	-	-

Average of non-zeros entry in following table (should be auto calculated).

Course Code	Course Name	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CSP648	Recent advances in software Engineering	2.6	2.6	1.3	2	-	1.16	3	2.6	3	-	-

Strength of Correlation

1. Addressed to ***Slight (Low=1) extent*** ***2.*** Addressed to ***Moderate (Medium=2) extent***
3. Addressed to ***Substantial (High=3) extent***

School: SET		**Batch : 2019 onwards**	
Program: M.Tech.		**Current Academic Year: 2020-21**	
Branch: CSE (Networking and Cyber Security)		**Semester: II**	
1	Course Code	**CSE607** Course Name: **Grid Computing**	
2	Course Title	**Grid Computing**	
3	Credits	3	
4	Contact Hours (L-T-P)	3-0-0	
	Course Status	PG	
5	Course Objective	The student should be enable to gain knowledge on the concept of virtualization and security issues in the grid and the cloud environment.	
6	Course Outcomes	CO1: Explain Grid computing infrastructure and architecture CO2: Experiment with Grid Computing protocols and models CO3: Demonstrate Grid scheduling and monitoring framework CO4: Apply the concept of Hadoop and other grid middleware CO5: Identify security issues in grid computing CO6: Compare the cloud environments.	
7	Course Description	This course is intended to computational grids and the various type of cloud environments. basic services.	
8	Outline syllabus		CO Mapping
	Unit 1	**Introduction**	
	A	Evolution of Distributed computing, Scalable computing over the Internet, Technologies for network based systems, clusters of cooperative computers	CO1
	B	Grid computing Infrastructures, cloud computing, service oriented architecture	CO1
	C	Introduction to Grid Architecture and standards, Elements of Grid, Overview of Grid Architecture	CO1
	Unit 2	**Grid Computing protocols and models**	
	A	High Performance computing – cluster Computing, Peer-to-peer Computing, Internet Computing, Grid Computing	CO2
	B	Grid Computing Models, Grid protocols	CO2
	C	Types of Grids: Desktop Grids, Cluster Grids , HPC Grids, Data Grids	CO2
	Unit 3	**Grid Monitoring Architecture and scheduling**	
	A	Grid Monitoring Architecture (GMA) - An Overview of Grid Monitoring Systems	CO3
	B	Grid Scheduling and Resource Management, Scheduling Paradigms, Working principles of Grid Scheduling with QoS	CO3
	C	QoS based resource provisioning and scheduling in grids	CO3

	Unit 4	**Middleware**			
	A	Introduction to Hadoop Framework, Design of Hadoop file system, HDFS concepts			CO4
	B	Introduction to Open Grid Services Architecture (OGSA), Motivation, Functionality Requirements			CO4
	C	Practical & Detailed view of OGSA/OGSI, Data intensive grid service models, OGSA services.			CO4
	Unit 5	**Security**			
	A	Trust models for Grid security environment, Authentication and Authorization methods, Grid security infrastructure			CO5
	B	Security issues in grid computing			CO5
	C	IAM practices in the cloud, SaaS, PaaS, IaaS availability in the cloud, Key privacy issues in the cloud			CO6
	Mode of examination	Theory			
	Weightage Distribution	CA	MTE	ETE	
		30%	20%	50%	
	Text book/s*	1. Kai Hwang, Geoffery C. Fox and Jack J. Dongarra, "Distributed and Cloud Computing: Clusters, Grids, Clouds and the Future of Internet", First Edition, Morgan Kaufman Publisher, an Imprint of Elsevier, 2012. 2. Maozhen Li, Mark Baker, The Grid Core Technologies, John Wiley & Sons ,2005.			
	Other References	1. Jason Venner, "Pro Hadoop- Build Scalable, Distributed Applications in the Cloud", A Press, 2009 2. Tom White, "Hadoop The Definitive Guide", First Edition. O"Reilly, 2009. 3. Bart Jacob (Editor), "Introduction to Grid Computing", IBM Red Books, Vervante, 2005			

CO and PO Mapping

S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	CO1: Explain Grid computing infrastructure and architecture	PO1, PO3, PO8,PSO3
2.	CO2: Experiment with Grid Computing protocols and models	PO1,PO2,PO3, PO8, PSO3
3.	CO3: Demonstrate Grid scheduling and monitoring framework	PO1,PO2,PO3, PO8, PSO3
4.	CO4: Apply the concept of Hadoop and other grid middleware	PO1,PO2,PO3, PO8, PSO3
5.	CO5: Identify security issues in grid computing	PO1,PO2,PO3,PO4,PO5, PO8,PSO3
6	CO6: Compare the cloud environments.	PO1,PO2,PO3,PO4,PO5, PO8,PSO3

PO and PSO mapping with level of strength for Course Name Grid Computing (CSE607)

	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
	CO1	3	-	3	-	-	-	-	1	-	-	2
	CO2	3	2	3	-	-	-	-	1	-	-	2
	CO3	3	2	3	-	-	-	-	1	-	-	2
	CO4	3	2	3	-	-	-	-	1	-	-	2
	CO5	3	2	3	2	2	-	-	1	-	-	3
	CO6	3	2	3	2	2	-	-	1	-	-	3
	Avg.	3	1.6	3	0.6	0.6	-	-	1	-	-	2.3

School: SET		**Batch : 2019 onwards**	
Program: M.Tech.		**Current Academic Year: 2020-2021**	
Branch: CSE (Networking & Cyber Security)		**Semester: II**	
1	Course Code	**CSE628**	Course Name: **Ad Hoc Wireless Networks**
2	Course Title	**Ad Hoc Wireless Networks**	
3	Credits	3	
4	Contact Hours (L-T-P)	3-0-0	
	Course Status	PG	
5	Course Objective	This course will enable students to 1. Understand the fundamental principles of Ad-hoc Networks and protocols. 2. Study the current and emerging trends in Ad-hoc Wireless Networks. 3. Analyze energy management in ad-hoc wireless networks 4. Interpret the different types of MAC protocols.	
6	Course Outcomes	CO1: Evaluate and analyze the issues in ad-hoc networks, energy consumption and management CO2: Explain the challenges in designing MAC, routing and transport protocols for wireless ad-hoc networks. CO3: Examine the issues in designing protocols and Classifications of Routing Protocols CO4: Illustrate TCP issues in ad-hoc networks. CO5: Discuss the architecture and protocols of wireless sensor networks. CO6: Contrast the issues in Ad-hoc and wireless sensor networks.	
7	Course Description	The course examines wireless, ad hoc and sensor networks for various aspects of routing , mobility, QoS and Energy efficiency.	
8	Outline syllabus		CO Mapping
	Unit 1	**Introduction**	
	A	Cellular and Ad-hoc Wireless Networks, Applications of Ad-hoc Wireless Networks	CO1
	B	Issues in Ad-Hoc Wireless Networks-Medium Access scheme, security	CO1
	C	Energy Management, Deployment considerations	CO1
	Unit 2	**MAC Protocols**	
	A	Introduction to Mac, Issues in Designing a MAC Protocol for Ad-HOC Wireless Networks	CO2
	B	Classifications of MAC protocols-Contention based protocols, Contention based protocols with reservation mechanisms, Contention based MAC protocols with scheduling Mechanisms	CO2
	C	Other MAC protocols- Multi Channel MAC protocol, Power Control MAC protocol for Ad- Hoc Networks	CO2

	Unit 3	**Routing Protocol**			
	A	Issues in Designing a Routing Protocol for Ad- Hoc Wireless Networks-Mobility, Hidden and Exposed terminal Problems, Characteristics of an Ideal Routing Protocol for Ad Hoc Wireless Networks			CO1,CO3
	B	Classifications of Routing Protocols-Based on Routing Information, Routing Topology, Utilization of Specific resources, Hierarchical Routing Protocol, Power aware Routing Protocol			CO1,CO3
	C	Multicast Routing-Introduction, Issues in Multicast Routing Protocols, classification: Tree Based Multicast Routing protocol, Mesh Based Multicast Routing protocol			CO1, CO3
	Unit 4	**Ad Hoc Transport Layer Protocols**			
	A	Ad hoc transport layer Issues, Design Goals and Classification of Transport layer Protocol			CO4
	B	TCP over Ad-hoc Wireless Networks-Feedback Based TCP,TCP with Explicit Link Failure Notification			CO4
	C	TCP-BuS, Ad-hoc TCP and Split TCP.			CO4
	Unit 5	**Wireless sensor networks**			
	A	Introduction to wireless sensor networks , Applications of Sensor Networks, Comparison with Ad-hoc Wireless Networks ,			CO5, CO6
	B	Issues and challenges in Designing a Sensor Network, Sensor Network Architecture			CO2,CO5,CO6
	C	Comparison of MAC in ad-hoc and WSN, Energy management in WSN .			CO1,CO5,CO6
	Mode of examination	Theory			
	Weightage Distribution	CA	MTE	ETE	
		30%	20%	50%	
	Text book/s*	1. C.Siva Ram Murthy and B.Smanoj, " Ad Hoc Wireless Networks – Architectures and Protocols", Pearson Education			
	Other References	1. Feng Zhao and Leonidas Guibas, "Wireless Sensor Networks", Morgan Kaufman Publishers 2. C.K.Toh, "Ad Hoc Mobile Wireless Networks", Pearson Education 3. Thomas Krag and Sebastin Buettrich, "Wireless Mesh Networking", O'Reilly 4. Internet as Source of Reference			

CO and PO Mapping

S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	CO1: Evaluate and analyze the issues in ad-hoc networks, energy consumption and management.	PO1,PO3,PO8, PSO3
2.	CO2: Explain the challenges in designing MAC, routing and transport protocols for wireless ad-hoc networks	PO1, PO2,PO3,PO8, PSO3
3.	CO3: Examine the issues in designing protocols and Classifications of Routing Protocols	PO1, PO2,PO3,PO8, PSO3
4.	CO4: Illustrate TCP issues in ad-hoc networks.	PO1, PO2,PO3,PO8, PSO3
5.	CO5: Discuss the architecture and protocols of wireless sensor networks.	PO1, PO2,PO3,PO4,PO8, PSO3
6.	CO6: Contrast the issues in Ad-hoc and wireless sensor networks.	PO1, PO2,PO3,PO4,PO8, PSO3

PO and PSO mapping with level of strength for Course Name Ad Hoc Wireless Networks (Course Code CSE628)

	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
	CO1	3	-	3	-	-	-	-	1	-	-	2
	CO2	3	2	3	-	-	-	-	1	-	-	2
	CO3	3	2	3	-	-	-	-	1	-	-	2
	CO4	3	2	3	-	-	-	-	1	-	-	2
	CO5	3	2	3	2	2	-	-	1	-	-	3
	CO6	3	2	3	2	2	-	-	1	-	-	3
	Avg.	3	1.6	3	0.6	0.6	-	-	1	-	-	2.3

School:		**School of Engineering and Technology**		
Department		**Department of Computer Science and Engineering**		
Program:		**M.TECH -CSE**		
Branch:		**Networking & Cyber Security**		
1	Course Code	CSE633		
2	Course Title	**Advanced Wireless Communication**		
3	Credits	3		
4	Contact Hours (L-T-P)	3	0	0
	Course Status	Core /Elective/Open Elective		
5	Course Objective	To provide students the recent developments in wireless communications area. At the end of this course, students will get a flavor of new and future wireless communications technologies, the ideas, main concepts, and simple theories behind these technologies, as well as application of these technologies to the future wireless services.		
6	Course Outcomes	CO1: Model the wireless channel to estimate the path loss and study of capacity of wireless channels CO2: Illustrate multipath channel models CO3: Evaluate the performance of digital modulation techniques over wireless channels CO4: Define the possible techniques to improve the performance of wireless systems CO5: Identify the advantages of multicarrier modulation and study of receiver & Transmitter diversity CO6: Categorize different types of wireless equalizers		
7	Course Description	This course illustrates path loss, multipath channel models, and modulation techniques for wireless communication.		
8	Outline syllabus			CO Mapping
	Unit 1	**WIRELESS CHANNELS**		
	A	Radio wave propagation, Physical modeling for wireless channels, Path loss and Shadowing		CO1
	B	time and frequency coherence, Statistical multipath channel models		CO1,CO2
	C	narrowband fading models, wideband fading models, Space-time channel models		CO1,CO2
	Unit 2	**CAPACITY OF WIRELESS CHANNELS**		
	A	AWGN channel capacity, capacity of flat fading channels		CO1
	B	channel distribution Information known at transmitter or receiver and both capacity comparisons		CO1,CO2
	C	Capacity of frequency selective fading channels-time invariant- time variant.		CO1,CO2
	Unit 3	**PERFORMANCE OF DIGITAL MODULATION OVER WIRELESS CHANNELS**		
	A	SNR and bit/symbol energy, error probability for		CO3,CO4,CO5

		BPSK, QPSK, MPSK, MPAM, MQAM ,	
	B	Index Modulation over fading channels. Error probability for FSK and CPFSK	CO3,CO4,CO5
	C	error probability approximation for coherent modulations and differential modulation	CO3,CO4,CO5
	Unit 4	**DIVERSITY**	
	A	Receiver diversity: selection combining (SC), threshold combining, maximal ratio combining (MRC), equal gain combining (EGC)	CO5
	B	Transmitter diversity: channel known at the transmitter, channel unknown at the transmitter, Alamouti scheme, moment generating functions(MGF) in diversity analysis	CO5
	C	Diversity analysis for non-coherent and differentially coherent modulation.	CO5
	Unit 5	**EQUALIZATION**	
	A	equalizer noise enhancement, equalizer types	CO6
	B	zero forcing equalizer, MMSE equalizer, maximum likelihood sequence estimation	CO6
	C	decision feedback equalization, adaptive equalizers	CO6
	Mode of examination	Theory/Jury/Practical/Viva	
	Weightage Distribution	CA: 30% / MTE: 20% / ETE: 50%	
	Text book/s*	1]. Andrea goldsmith, `Wireless Communication`, South Asia Edition 2015, Cambridge University Press [2].Theodore S. Rappaport, 'Wireless Communications Principles and Practice," Third Edition, Pearson Education. (Indian Edition is available).	
	Other References	[1]David Tse, Pramod Viswanath, "Fundamentals of Wireless Communication", Cambridge University Press [2]. Todd K Moon, Wynn C. Stirling" Mathematical Methods and Algorithms for Signal Processing, Prentice Hall	

CO and PO Mapping

S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	Model the wireless channel to estimate the path loss and study of capacity of wireless channels	PO1,PO2,PO3,PO4,PSO2,PSO3
2.	Illustrate multipath channel models	PO1,PO2,PO3,PO4,PSO2,PSO3
3.	Evaluate the performance of digital modulation techniques over wireless channels	PO1,PO2,PO3,PO4,PSO2,PSO3
4.	Define the possible techniques to improve the performance of wireless systems	PO1,PO2,PO3,PO4,PSO2,PSO3

5.	Identify the advantages of multicarrier modulation and study of receiver & Transmitter diversity	PO1,PO2,PO3,PO4,PSO2,PSO3
6.	Categorize different types of wireless equalizers	PO1,PO2,PO3,PO4,PSO2,PSO3

PO and PSO mapping with level of strength for Course Name Advanced Wireless Communication (Course Code CSE633)

Course Code_ Course Name	CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO1	PSO2	PSO3
CSE633_Advanced Wireless communication	CO1	3	3	3	2	-	-	-	-	-	2	3
	CO2	3	3	2	3	-	-	-	-	-	2	3
	CO3	2	3	3	3	-	-	-	-	-	2	3
	CO4	3	3	3	3	-	-	-	-	-	2	3
	CO5	3	3	2	3	-	-	-	-	-	2	3
	CO6	3	2	3	3	-	-	-	-	-	2	3

Average of non-zeros entry in following table (should be auto calculated).

Course Code	Course Name	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CSE633	Advanced Wireless communication	2.8	2.8	2.6	2.8	-	-	-	-	-	2	3

Strength of Correlation

1. Addressed to ***Slight (Low=1) extent*** ***2.*** Addressed to ***Moderate (Medium=2) extent***
3. Addressed to ***Substantial (High=3) extent***

School:		**School of Engineering and technology**	
Department		**Department of Computer Science and Engineering**	
Program:		**M.Tech**	
Branch:		**Software Engineering**	
1	Course Code	CSE635	
2	Course Title	Software Reliability Engineering	
3	Credits	3-0-0	
4	Contact Hours (L-T-P)	3-0-0	
	Course Status	Core /Elective/Open Elective	
5	Course Objective	To learn about the engineering techniques for developing and maintaining reliable software systems. This Course measures the reliability of software systems.	
6	Course Outcomes	Students will be able to: CO1: Explain the fundamental concepts of Software Reliability CO2: Apply fault handling and failure intensity in software systems. CO3: Analyze reliability models for software systems. CO4: Distinguish static and dynamic program complexity CO5: Elaborate Software reliability Estimation CO6: Develop reliable software systems	
7	Course Description	This course is a step by step introduction of software reliability engineering and software reliability process. The course includes introduction to the software reliability process, defining necessary reliability, developing operational profiles, preparing and executing test.	
8	Outline syllabus		CO Mapping
	Unit 1	**Introduction and Operational Profile**	
	A	The Need for Reliable Software, Software Reliability Engineering Concepts, Basic definitions, Software practitioners biggest problem	CO1
	B	software reliability engineering approach, software reliability engineering process, defining the product, Reliability concepts, software reliability and hardware reliability	CO1
	C	developing operational profiles, applying operational profiles, learning operations and run concepts.	CO1
	Unit 2	**Software Reliability Concepts**	
	A	Defining failure for the product, common measure for all associated systems, setting system failure intensity objectives	CO2
	B	determining develop software failure intensity objectives, software reliability strategies, failures, faults and errors, availability	CO2

	C	system and component reliabilities and failure intensities, predicting basic failure intensity	CO2
	Unit 3	**Software Reliability Modeling Survey**	
	A	Introduction, Historical Perspective and Implementation, Exponential Failure Time Class of Models, Weibull and Gamma Failure Time Class of Models	CO3,CO6
	B	Infinite Failure Category Models, Bayesian Models, Model Relationship	CO3,CO6
	C	Software Reliability Prediction in Early Phases of the Life Cycle, software reliability growth modeling	CO3,CO6
	Unit 4	**Software Metrics for Reliability Assessment**	
	A	Introduction, Static Program Complexity, Dynamic Program Complexity	CO4,CO6
	B	Software Complexity and Software Quality	CO4,CO6
	C	Software Reliability Modeling	CO4,CO6
	Unit 5	**Software Testing and Reliability**	
	A	Introduction, Overview of Software Testing, Operational profiles	CO5
	B	Time/Structure Based Software Reliability Estimation, Benefits and approaches of SRE, SRE during requirements phase	CO5,CO6
	C	SRE during implementation phase, SRE during Maintenance phase	CO5,CO6
	Mode of examination	Theory/Jury/Practical/Viva	
	Weightage Distribution	CA / MTE / ETE	
		30% / 20% / 50%	
	Text book/s*	1. Handbook of Software Reliability Engineering Edited by Michael R. Lyu, published by IEEE Computer Society Press and McGraw-Hill Book Company. 2. Software Reliability Engineering, John D. Musa, second edition Tata McGraw-Hill.	
	Other References	1. Practical Reliability Engineering, Patric D. T. O connor 4th Edition, John Wesley & Sons, 2003. 2. Fault tolerance principles and Practice, Anderson and PA Lee, PHI, 1981. 3. Fault tolerant computing-Theory and Techniques, Pradhan D K (Ed.): Vol 1 and Vol 2, Prentice hall, 1986. 4. Reliability Engineering ,E. Balagurusamy, Tata McGrawHill, 1994.	

CO and PO Mapping

S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	CO1: Explain the fundamental concepts of Software Reliability	PO1,PO2,PO3,PO6,PO7,PO8,PSO1
2.	CO2: Apply fault handling and failure intensity in software systems.	PO1,PO2,PO3,PO6,PO7,PO8,PSO1

3.	CO3: Analyze reliability models for software systems.	PO1,PO2,PO3,PO6,PO7,PO8,PSO1
4.	CO4: Distinguish static and dynamic program complexity	PO1,PO2,PO3,PO6,PO7,PO8,PSO1
5.	CO5: Elaborate Software reliability Estimation	PO1,PO2,PO3,PO6,PO7,PO8,PSO1
6.	CO6: Develop reliable software systems	PO1,PO4,PO5,PO6,PO7,PO8,PSO1

PO and PSO mapping with level of strength for Course Name Software Reliability Engineering (Course Code CSE635)

Course Code_ Course Name	CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CSE635_ Software reliabilty Engineering	CO1	2	1	2	-	-	1	1	1	3	-	-
	CO2	2	1	2	-	-	1	2	2	3	-	-
	CO3	1	1	1	-	-	1	1	1	3	-	-
	CO4	1	1	2	-	-	1	1	-	3	-	-
	CO5	2	1	2	-	-	1	1	2	3	-	-
	CO6	3	-	-	2	2	1	2	2	3	-	-

Average of non-zeros entry in following table (should be auto calculated).

Course Code	Course Name	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO 1	PSO 2	PSO 3
CSE635	Software reliabilty Engineering	1.8	1	1.8	2	2	1	1.3	1.6	3	-	-

Strength of Correlation

1. Addressed to ***Slight (Low=1) extent*** ***2.*** Addressed to ***Moderate (Medium=2) extent***
3. Addressed to ***Substantial (High=3) extent***

2.1 Template A1: Syllabus for Theory Courses

School:		**School of Engineering and technology**		
Department		**Department of Computer Science and Engineering**		
Program:				
Branch:				
1	Course Code	**CSE6**		
2	Course Title	Web Engineering		
3	Credits	3		
4	Contact Hours (L-T-P)	3-0-0		
	Course Status	Core /Elective/Open Elective		
5	Course Objective	This course aims to introduce the methods and techniques used in Web-based system development.		
6	Course Outcomes	CO1: Define basic concepts of Web Engineering CO2: Contrast developments in web application architecture with more traditional tiered approaches. CO3: Identify the web engineering methodologies for Web application development CO4:Analyze and transform data using XML and its related technologies CO5:Select the appropriate framework components in creation of webservice solution CO6. Develop effective approaches to solve a real life challenges.		
7	Course Description	Students will be familiar with web application development software tools and environments currently available on the market. Students will learn the concepts, principles and methods of web engineering.		
8	Outline syllabus			CO Mapping
	Unit 1	**Introduction**		
	A	Introduction to Web Engineering: Need of Web Engineering, Web Applications and their Categorization, Characteristics of Web Applications,		CO1
	B	Software Engineering v/s Web Engineering, Difference between a web application and a software, Evolutionary web development process		CO1, CO2
	C	HTTP, SMTP, POP3, MIME, IMAP,Domain Name Server		CO1
	Unit 2	HTML,CSS & Javascript		
	A	HTML basic tags, various links implementation, image, table formatting, Lists, form design.		CO3
	B	Cascading style sheet, inline styles, embedded style, linking external style sheets		CO3
	C	JavaScripts: Introduction to scripting, user input/output, memory concepts, arithmetic, decision making, control statement, functions, event handling in javascript.		CO3
	Unit 3	XML & Document Object Model		

	A	XML, syntax, well form XML document, DTD, schema			CO4
	B	Introduction, modelling a document, DOM nodes and trees, Traversing and modifying a DOM tree			CO4
	C	DOM collections, Dynamic styles, summary of DOM objects and Collections			CO4
	Unit 4	Web Services			
	A	Introduction to Web Services, UDDI, SOAP, WSDL,			CO5
	B	Roles in a Web Services Architecture, Operations in a Web Service Architecture, Artifacts of a Web Service, Web Services Development Lifecycle			CO5
	C	Ajax–Improving web page performance using Ajax, Programming in Ajax.			CO5
	Unit 5	WEB APPLICATION ARCHITECTURES			
	A	Introduction- Components of a Generic Web Application Architecture, Layered Architectures, Data-aspect Architectures,			CO5,CO6
	B	Database-centric Architectures Architectures for Multimedia Data, MVC			CO5,CO6
	C	Web Services Stack, XML Messaging to Web Services			CO5,CO6
	Mode of examination	Theory			
	Weightage Distribution	CA	MTE	ETE	
		30%	20%	50%	
	Text book/s*	1.Roger Pressman, “Web Engineering: A Practitioner's Approach”, McGraw-Hill Higher Education 2. Deitel and Deitel, Internet and World Wide Web: How to Program, 4th edition, Prentice Hall, 2009			
	Other References	1.Web Services Conceptual Architecture (WSCA 1.0) https://www.csd.uoc.gr/~hy565/docs/pdfs/papers/wsca.pdf 2.Internet as source of Reference.			

CO and PO Mapping

S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	CO1: Define basic concepts of Web Engineering	PO3,PO8,PSO1
2.	CO2: Contrast developments in web application architecture with more traditional tiered approaches.	PO2,PO8,PSO1
3.	CO3: Identify the web engineering methodologies for Web application development	PO2,PO8,PSO1
4.	CO4:Analyze and transform data using XML and its related technologies	PO4,PO8
5.	CO5:Select the appropriate framework components in creation of webservice solution	PO2,PO3,PO8
6.	CO6. Develop effective approaches to solve a real life challenges.	PO1,PO2,PO3,PO4,PO5,PO8,PSO1,PSO2

PO and PSO mapping with level of strength for Course Name Web Engineering **(Course Code cse6)**

Course Code_ Course Name	CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CSE6_ Web Engineering	CO1			1					2	2		
	CO2		1						2	2		
	CO3		1						2	2		
	CO4				1				2			
	CO5		1	1					2			
	CO6	1	2	1	2	1			3	1	2	

Average of non-zeros entry in following table (should be auto calculated).

Course Code	Course Name	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CSE6	Web Engineering	1	1.3	1	1.5	1	0	0	2.2	1.75	2	0	1	1.3	1	1.5

Strength of Correlation

1. Addressed to ***Slight (Low=1) extent*** ***2.*** Addressed to ***Moderate (Medium=2) extent***
3. Addressed to ***Substantial (High=3) extent***

CSE608: Natural Language Computing

1	Course Code	**CSE608** Course Name: **Natural Language Computing**	
2	Course Title	**Natural Language Computing**	
3	Credits	3	
4	Contact Hours (L-T-P)	3-0-0	
	Course Status	PG	
5	Course Objective	This course presents an introduction to natural language computing in applications such as information retrieval and extraction, intelligent web searching, speech recognition, and machine translation. These applications will involve various statistical and machine learning techniques.	
6	Course Outcome	After the completion of this course, students will be able to: CO-1. ***Identify*** Linguistic phenomena and an ability to model them with formal grammars**.** CO-2. ***Illustrate*** proper experimental methodology for training and evaluating empirical NLP systems. CO-3. ***Use*** probabilities, construct statistical models over strings and trees, and estimate parameters using supervised and unsupervised training methods. CO-4. ***Compare*** algorithmic description of the main language levels: morphology, syntax, semantics, and pragmatics. CO-5. ***Integrate*** knowledge representation, inference, and relations to the artificial intelligence. CO-6. ***Support*** Machine Translation techniques in intelligent systems.	
7	Course Description	This course introduces natural language computing theories, techniques and tools. Those are frequently required for understanding and developing the exploratory data analysis techniques, and knowledge discovery and intelligent systems.	
8	Outline syllabus		CO Mapping
	Unit 1	Introduction	
	A	Definition, History, Applications, Goals.	CO1
	B	Regular expressions and Automata,	CO1, CO2
	C	Morphology and Finite State Transducers.	CO1, CO2
	Unit 2	N-grams:	
	A	Introduction, Simple (Unsmoothed) N-Grams,	CO2
	B	Smoothing: Add-one smoothing, Witten-Bell Discounting,	CO2,CO3
	C	Good-Turing Discounting, Back off, Deleted Interpolation. Entropy	CO2, CO3
	Unit 3	HMM	
	A	Overview	CO3
	B	Viterbi Algorithm	CO3, CO4
	C	Syntax: Word Classes and Part-of Speech Tagging, Context Free Grammars for English,	CO3, CO4

		Parsing with Context-Free Grammars.		
	Unit 4	Classification		
	A	Word Sense Disambiguation: Selection Restriction Based Disambiguation,		CO3, CO4
	B	Robust WSD: Machine Learning, Supervised Learning Approaches,		CO4, CO5
	C	Bootstrapping Approaches, Unsupervised Methods, Dictionary Based Approaches.		CO4, CO5
	Unit 5	Machine Translation:		
	A	Introduction, Language Similarities and Differences,		CO5, CO6
	B	Approaches, in machine translation system design.		CO5, CO6
	C	Steps involved in machine translation system design.		CO5, CO6
	Mode of examination	Theory		
	Weightage Distribution	CA	MTE	ETE
		30%	20%	50%
	Text book/s*	1) Jurafsky, D. & J. Martin, "Speech and Language Processing: An Introduction to Natural Language Processing Computational Linguistics, and Speech Recognition" Prentice Hall. 2) Grosz, B.J., Sparck Jones, K. & Webber, B.L. (eds) "Readings in natural language processing", Los Altos, CA. Morgan Kaufmann.		
	Other References	3) Allen, J., "Natural Language Understanding", Redwood City, Benjamin/Cummings. 4) Bharti, Akshar, Chaitanya Vineet, Sangal Rajeev, "Natural Language Processing", Prentice Hall. 5) Internet as source of Reference.		

CO and PO Mapping

S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	***Identify*** Linguistic phenomena and an ability to model them with formal grammars**.**	PO1,PO5,PSO1
2.	***Illustrate*** proper experimental methodology for training and evaluating empirical NLP systems.	PO1, PO2, PO3, PO4, PO5, PSO1, PSO2, PSO4
3.	***Use*** probabilities, construct statistical models over strings and trees, and estimate parameters using supervised and unsupervised training methods.	PO1, PO3, PO4, PSO2, PSO4
4.	***Compare*** algorithmic description of the main language levels: morphology, syntax, semantics, and pragmatics.	PO1, PO3, PO4, PSO2, PSO4
5.	***Integrate*** knowledge representation, inference, and relations to the artificial intelligence.	PO4, PO5, PSO2, PSO3
6.	***Support*** Machine Translation techniques in intelligent systems.	PO1, PO4, PO5, PO6, PSO3

PO and PSO mapping with level of strength for Course Name: Natural Language Computing (Course Code CSE608)

Cos	**PO1:**	**PO2:**	**PO3:**	**PO4:**	**PO5:**	**PO6:**	**PO7:**	**PO8:**	**PSO1:**	**PSO2:**	**PSO3:**
CO1	3	1	1	2	3	2	3	2	1	2	
CO2	3	3	3	3	3	2	3	3	1	3	
CO3	3	2	3	3	2	2	2	3	1	3	
CO4	3	2	3	3	2	2	2	3	1	3	
CO5	1	1	2	3	3	2	2	3	3	2	
CO6	3	2	2	3	3	3	2	2	3	2	

Strength of Correlation

1. Addressed to ***Slight (Low=1) extent*** ***2.*** Addressed to ***Moderate (Medium=2) extent***
3. Addressed to ***Substantial (High=3) extent***

School:		**School of Engineering and technology**	
Department		**Department of Computer Science and Engineering**	
Program:		**M. Tech**	
Branch:		**M. Tech. (CSE) Networking and Cyber Security**	
1	Course Code	CSE641	
2	Course Title	Malware Analysis, Detection & Prevention	
3	Credits	3	
4	Contact Hours (L-T-P)	3-0-0	
	Course Status	Elective	
5	Course Objective	The objective of this course is to provide an insight to fundamentals of malware analysis, detection and prevention such as different types of malware, static and dynamic analysis, functionality and detection technique of malware.	
6	Course Outcomes	On successful completion of this module students will be able to: CO1: illustrate the nature of malware, its capabilities, types and its analysis CO2: apply the tools and methodologies used to perform static analysis. CO3: apply the tools and methodologies used to perform dynamic analysis. CO4: explain executable formats, Windows internals and API, and analysis techniques. CO5: utilize the techniques of signature-based and non-signature based of malware detection. CO6: identify and apply the techniques for real world problems in the domain	
7	Course Description	This course is to provide students with an overview of the concepts and fundamentals of malware, static analysis, dynamic analysis, malware functionality, Covert malware launching, malware detection techniques and Case Studies.	
8	Outline syllabus		CO Mapping
	Unit 1	**Introduction**	
	A	Introduction to malware, OS security concepts, malware threats, evolution of malware.	CO1
	B	Malware types, viruses, worms, rootkits, Trojans, bots, spyware, adware, logic bombs,	CO1
	C	Malware analysis, static malware analysis, dynamic malware analysis.	CO1
	Unit 2	**Static Analysis**	
	A	Antivirus Scanning: A Useful First Step, Hashing: A	CO2

		Fingerprint for Malware, Finding Strings, Packed and Obfuscated Malware, Portable Executable File Format, Linked Libraries and Functions			
	B	Static Analysis in Practice, PotentialKeylogger.exe: An Unpacked Executable, PackedProgram.exe: A Dead End, The PE File Headers and Sections			CO2, CO6
	C	Malware analysis in virtual machines : The Structure of a Virtual Machine, Creating Your Malware Analysis Machine, Configuring VMware, Using Your Malware Analysis Machine			CO2, CO6
	Unit 3	**Dynamic Analysis**			
	A	Sandboxes: The Quick-and-Dirty Approach, Using a Malware Sandbox, Sandbox Drawbacks, Running Malware, Monitoring with Process Monitor, The Procmon Display, Filtering in Procmon			CO3
	B	Viewing Processes with Process Explorer: The Process Explorer Display, Using the Verify Option, Comparing Strings, Using Dependency Walker, Analyzing Malicious Documents. Comparing Registry Snapshots with Regshot, Faking a Network : Using ApateDNS, Monitoring with Netcat			CO3, CO6
	C	Packet Sniffing with Wireshark, Using INetSim, Basic Dynamic Tools in Practice			CO3, CO6
	Unit 4	**Malware Functionality**			
	A	Downloaders and Launchers, Backdoors, Credential Stealers			CO4
	B	Persistence Mechanisms, Privilege Escalation, Covering Its Tracks—User-Mode Rootkits			CO4
	C	Covert malware launching- Launchers, Process Injection, Process Replacement, Hook Injection, Detours, APC injection			CO4
	Unit 5	**Malware Detection Techniques**			
	A	Signature-based techniques: malware signatures, packed malware signature, metamorphic and polymorphic malware signature			CO5
	B	Non-signature based techniques: similarity-based techniques, machine-learning methods, invariant inferences			CO5
	C	Case Studies – Plankton, DroidKungFu, AnserverBot, Smartphone (Apps) Security			CO6
	Mode of examination	Theory/Jury/Practical/Viva			
	Weightage	CA	MTE	ETE	

	Distribution	30%	20%	50%	
	Text book/s*	1. Michael Sikorski and Andrew Honig, "Practical Malware Analysis : The Hands-On Guide to Dissecting Malicious Software", No Starch Press,2012.			
	Other References	1. Jamie Butler and Greg Hoglund, "Rootkits: Subverting the Windows Kernel", Addison-Wesley, 2005. 2. Dang, Gazet, Bachaalany, "Practical Reverse Engineering", Wiley, 2014. 3. Reverend Bill Blunden, "The Rootkit Arsenal: Escape and Evasion in the Dark Corners of the System" Second Edition, Jones & Bartlett, 2012. 4. Monnappa K A, "Learning Malware Analysis: Explore the concepts, tools, and techniques to analyze and investigate Windows malware"			

CO and PO Mapping

S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	CO1: illustrate the nature of malware, its capabilities, types and its analysis	PO2, PO3. PO6, PO7, PSO
2.	CO2: apply the tools and methodologies used to perform static analysis.	PO1, PO2, PO3, PO5, PO6, PSO
3.	CO3: apply the tools and methodologies used to perform dynamic analysis.	PO1, PO2, PO3, PO5, PO6, PSO
4.	CO4: explain executable formats, Windows internals and API, and detection and prevention techniques	PO2, PO3, PO5, PO7, PSO
5.	CO5: utilize the techniques of signature-based and non-signature based of malware detection.	PO1, PO2, PO3, PO4, PO5, PO8, PSO
6.	CO6: identify and apply the techniques for real world problems in the domain	PO1, PO2, PO3, PO4, PO7, PO8, PSO

PO and PSO mapping with level of strength for Course Name Malware Analysis, Detection & Prevention **(Course Code** CSE641**)**

Course Code_ Course Name	CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO
CSE641_Malware Analysis, Detection & Prevention	**CO1**	-	1	1	-	-	2	2	-	1
	CO2	2	2	2	-	2	1	-	-	2
	CO3	2	2	2	-	2	1	-	-	2
	CO4	-	1	1	-	1	-	1	-	1
	CO5	2	2	2	2	2	-	-	2	2
	CO6	3	3	3	2	-	-	3	2	3

Average of non-zeros entry in following table (should be auto calculated).

Course Code	Course Name	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO
CSE641	Malware Analysis, Detection & Prevention	**2.25**	**1.83**	**1.83**	**2**	**1.75**	**1.33**	**2**	**2**	**1.83**

Strength of Correlation

1. Addressed to ***Slight (Low=1) extent*** ***2.*** Addressed to ***Moderate (Medium=2) extent***
3. Addressed to ***Substantial (High=3) extent***

School:		**School of Engineering and technology**	
Department		**Department of Computer Science and Engineering**	
Program:		**M. Tech**	
Branch:		**M. Tech. (CSE) Networking and Cyber Security**	
1	Course Code	**CSE617**	
2	Course Title	**Advanced Cryptography**	
3	Credits	3	
4	Contact Hours (L-T-P)	3-0-0	
	Course Status	Elective	
5	Course Objective	The main objective of the course is to Introduce to students Advance theories, techniques of Cryptography. Applications that are frequently required for understanding and transmission of data across networks.	
6	Course Outcomes	On successful completion of this module students will be able to: CO1: Evaluate different cryptographic protocols CO2: Apply advanced cryptographic Protocols with mathematical analysis. CO3: Identify the security services in different real life scenarios. CO4: Demonstrate vulnerabilities, mechanisms to identify vulnerabilities/threats/attacks. CO5: Compare various advanced cryptographic protocolsused for Network Security. CO6: Compare various Advanced algorithm of cryptography used for Information Security.	
7	Course Description	This course will provide a survey of both the principles and practice of advanced cryptography. It covers the cryptographic technique to be addressed by a mathematical solutions on network security capability, and explored by providing a solution of Hash Function and Digital Signaturenetwork security technology.	
8	Outline syllabus		CO Mapping
	Unit 1	**Basic Concept of Network Security**	
		Cryptographic Protocols	CO1
	A	Review of modern cryptographic techniques.	CO1
	B	Authentication, digital signatures, Key exchange, Time stamping services, Undeniable digital Signatures, Proxy signatures, Group signatures, Fail stop digital signatures.	CO1,CO2
	C	Zero knowledge Proofs, Zero Knowledge proofs of identity, Blind signatures, Identity based public key cryptography.	
	Unit 2	**Cryptographic Techniques**	CO2
	A	Mathematics behind cryptographic key,	CO2, CO6

		symmetric key length and public key length, Birthday attack, key management.			
	B	Block Cipher Techniques - Lucifer, Madryga, New DES, FEAL-4, REDOC			CO2, CO6
	C	IDEA, MMB, CAST, BLOWFISH, CRAB, RC5.			
	Unit 3	**Hash Functions**			CO3
	A	One way hash functions - MD2, MD4, MD-5.			CO3,CO4
	B	SHA, RIPMED, HAVAL.			CO3, CO6
	C	Key Exchange Algorithms - Station to Station, Shamir's Algorithm, COMSET.			
	Unit 4	**Digital Signatures**			CO4
	A	DSA, DSA variants, Ghost signature algorithms, Discrete Logarithmic Signature Schemes.			CO4,CO5
	B	Ong-Schnorr-Shamir Signature Scheme, Electronic Signatures in Global and National Commerce Act.			CO4
	C	Identification schemes - Feige–Fiat–Shamir identification scheme, The Guillou-Quisquater protocol, Schnorr signature.			
	Unit 5	**Real Life Problems**			CO5
	A	IBM secret key exchange protocol, Kerberos			CO5
	B	PGP, Smart cards, PKCS			CO6
	C	Message security protocol, Privacy Enhanced mail, SESAME			
	Weightage Distribution	CA	MTE	ETE	
		30%	20%	50%	
	Text book/s*	1. Steven Galbraith, "Public Key Cryptography",Cengage Learning.			
	Other References	1. Raymond R. Panko,"Corporate Computer and Network Security", Pearson Education. 2. Willam Stallings, "Cryptography and Network Security", Pearson Education. 3. Internet as a resource for references			

CO and PO Mapping

CO and PO Mapping

S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	CO1:Evaluate different cryptographic protocols	PO2, PO3. PO6, PO7, PSO

2.	CO2: Apply advanced cryptographic Protocols with mathematical analysis.	PO1, PO2, PO3, PO5, PO6, PSO
3.	CO3: Identify the security services in different real life scenarios.	PO1, PO2, PO3, PO5, PO6, PSO
4.	CO4: Demonstrate vulnerabilities, mechanisms to identify vulnerabilities/threats/attacks.	PO2, PO3, PO7, PSO
5.	CO5: Compare various advanced cryptographic protocolsused for Network Security.	PO2, PO3, PO4, PO5, PO8, PSO
6.	CO6: Compare various Advanced algorithm of cryptography used for Information Security.	PO1, PO2, PO3, PO4, PO7, PO8, PSO

PO and PSO mapping with level of strength for Course Name Advanced Cryptography **(CSE617)**

Course Code_ Course Name	CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO
Advanced Cryptography	CO1	-	2	1	-	-	2	2	-	2
	CO2	2	2	2	-	2	1	-	-	2
	CO3	2	2	2	-	2	1	-	-	2
	CO4	-	2	1	-	-	-	1	-	1
	CO5	-	2	2	2	2	-	-	2	2
	CO6	2	3	3	2	-	-	3	2	3

Average of non-zeros entry in following table (should be auto calculated).

Course Code	Course Name	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO
CSE617	Advanced Cryptography	2	2.16	1.83	2	2	1.33	2	2	2

Strength of Correlation

1. Addressed to***Slight (Low=1) extent*** ***2.*** Addressed to***Moderate (Medium=2) extent***

3. Addressed to***Substantial (High=3) extent***

CSE647: Component Based Software Engineering

School:		**School of Engineering and technology**	
Department		**Department of Computer Science and Engineering**	
Program:		**M.Tech**	
Branch:		**Computer Science and Engineering**	
1	Course Code	CSE 647	
2	Course Title	Component Based Software Engineering	
3	Credits	3	
4	Contact Hours (L-T-P)	3-0-0	
	Course Status	Core /Elective/Open Elective	
5	Course Objective	Component-based software engineering, as an emerging development paradigm, targets very similar goals by focusing on the assembly of software systems from components and emphasizing software reuse. This course Describe technical platforms conditions for and challenges with the development of larger component-based software systems.	
6	Course Outcomes	Students will be able to: CO1: Define component based software development, models and approaches CO2: Demonstrate the principles and role of teams in building component based software development. CO3: Identify the processes involved in Design of Software Component Infrastructures and study existing models CO4: Demonstrate the learnt principles in effective reuse and maintenance of software CO5: Survey technologies that support implementation of component based software development CO6: Design and maintain software using technologies and standard for component based software	
7	Course Description	The course provides knowledge on the essentials of component-based software engineering main characteristics of components and component models. This course creates awareness on software development processes for component-based systems and also to understand relations between software architecture and component models.	
8	Outline syllabus		CO Mapping
	Unit 1	**Introduction**	
	A	Introduction to Component Based Development: Definition of a Software Component and its elements	CO1
	B	The Component Industry Metaphor	CO1
	C	Component Models and Component Services	CO1
	Unit 2	**Software Engineering Practices**	
	A	Practices of Software Engineering	CO2
	B	Roles for Component-Based Development	CO2
	C	From Subroutines to Subsystems: Component-Based Software Development	CO2

	Unit 3	**Design of Software Component**			
	A	Software Components and the UML, Component Infrastructures : Placing Software Components in Context			CO3,CO6
	B	Business Components, Components and Connectors, An Open Process for Component-Based Development			CO3,CO6
	C	Software Architecture, Software Architecture Design Principles			CO3,CO6
	Unit 4	**Management of CBD**			
	A	Measurement and Metrics for Software Components			CO4,CO6
	B	The Practical Reuse of Software components, Selecting the Right COTS Software			CO4,CO6
	C	The Evolution, Maintenance and Management of Component-Based Systems			CO4,CO6
	Unit 5	**Component Technologies**			
	A	Overview of the CORBA Component Model			CO5,CO6
	B	Enterprise JavaBeans Component Model			CO5,CO6
	C	Software Agents as Next Generation Software Components			CO5,CO6
	Mode of examination	Theory/Jury/Practical/Viva			
	Weightage Distribution	CA	MTE	ETE	
		30%	20%	50%	
	Text book/s*	1. Component - Based Software Engineering, G.T. Heineman and W.T. Councill, Addison- Wesley, Pearson Education			
	Other References	1. Component Software, C.Szyperski, D.Gruntz and S.Murer, Pearson Education. 2. Software Engineering, Roger S. Pressman, 6thedition, Tata McGraw-Hill. 3. Software Engineering, Ian Sommerville, seventh edition, Pearson education, 2004. 4. Software Engineering Principles and Practice, Hans Van Vliet, 3rd edition, Wiley India.			

CO and PO Mapping

S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	CO1: Define component based software development, models and approaches	PO1,PO3,PO6,PO7,PO8 ,PSO1
2.	CO2: Demonstrate the principles and role of teams in building component based software development.	PO1,PO3,PO4,PO5,PO6 ,PO7,PO8,PSO1
3.	CO3: Identify the processes involved in Design of Software Component Infrastructures and study existing models	PO1,PO2,PO3,PO4,PO5 ,PO6,PO7,PO8,PSO1
4.	CO4: Demonstrate the learnt principles in effective reuse and maintenance of software	PO1,PO2,PO3,PO4,PO5 ,PO6,PO7,PO8,PSO1

5.	CO5: Survey technologies that support implementation of component based software development	PO1,PO2,PO3,PO4,PO7 PO8,PSO1
6.	CO6: Design and maintain software using technologies and standard for component based software	PO1,PO2,PO3,PO4,PO5 ,PO6,PO7,PO8,PSO1

PO and PSO mapping with level of strength for Course Name Component Based Software Engineering **(Course Code CSE647)**

Course Code_ Course Name	CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CSE647_ Component Based Software Engineering	CO1	2	-	1	-	-	1	2	1	3	-	-
	CO2	1	-	1	1	1	1	2	2	3	-	-
	CO3	2	1	2	1	1	2	2	2	3	-	-
	CO4	2	1	2	1	2	2	2	2	3	-	-
	CO5	3	1	2	1	-	-	2	2	3	-	-
	CO6	3	3	2	3	2	3	2	3	3	-	-

Average of non-zeros entry in following table (should be auto calculated).

Course Code	Course Name	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CSE 647	Compo ent Based Software Engineering	2.1	1.5	1.6	1.4	1.5	1.8	2	2	3	-	-

Strength of Correlation

1. Addressed to ***Slight (Low=1) extent*** ***2.*** Addressed to ***Moderate (Medium=2) extent***
3. Addressed to ***Substantial (High=3) extent***

School: SET		Batch : 2019 onwards	
Program: M.Tech		Current Academic Year: 2020-2021	
Branch: CSE		Semester: II	
1	Course Code	CSP646	Course Name: Wireless Sensor Network lab
2	Course Title	Wireless Sensor Network Lab	
3	Credits	1	
4	Contact Hours (L-T-P)	0-0-2	
	Course Status	PG	
5	Course Objective	This course provides a broad coverage of challenges and latest research results related to the design and management of wireless sensor networks	
6	Course Outcomes	• CO1: Explain the basic concepts of wireless sensor networks, sensing, computing and communication tasks • CO2: Describe and explain radio standards and communication protocols adopted in wireless sensor networks • CO3: Describe and explain the hardware, software and communication for wireless sensor network nodes • CO4 Explain the architectures, features, and performance for wireless sensor network systems and platforms • CO5: Describe and analyse the specific requirements of applications in wireless sensor networks for energy efficiency, computing, storage and transmission • CO6:Evaluate the significance of scientific studies in wireless sensor networks	
7	Course Description	The course covers concepts in sensor networks, its energy issues and challenges.	
8	Outline syllabus		CO Mapping
	Unit 1	Introduction: Hardware, Architecture & Application	
	A	Understand IP forwarding within a LAN and across a router	CO1
	B	Study the working of spanning tree algorithm by varying the priorityamong the switches.	CO1
	C	Understand the working of “Connection Establishment” in TCP usingNetSim.	CO1
	Unit 2	Hardware & Software components	
	A	Study the throughputs of Slow start + Congestion avoidance (OldTahoe) and Fast Retransmit (Tahoe) Congestion Control Algorithms.	CO2
	B	Study how the Data Rate of a Wireless LAN (IEEE 802.11b) networkvaries as the distance between the Access Point and the wireless nodes isvaried	CO2
	C	Study the working and routing table formation of Interior routingprotocols, i.e. Routing Information Protocol (RIP) and Open Shortest	CO2

		PathFirst (OSPF)	
	Unit 3	Communication protocols	
	A	Plot the characteristic curve throughput versus offered traffic for a Slotted ALOHA system	CO3
	B	Understand the impact of bit error rate on packet error and investigate the impact of error of a simple hub based CSMA / CD network	CO3
	C	To determine the optimum persistence of a p-persistent CSMA / CD network for a heavily loaded bus capacity.	CO3
	Unit 4	Topology & Routing	
	A	Analyze the performance of a MANET, (running CSMA/CA (802.11b) in MAC) with increasing node density	CO4
	B	Analyze the performance of a MANET, (running CSMA/CA (802.11b) inMAC) with increasing node mobility	CO4
	C	Study the working of BGP and formation of BGP Routing table	CO4
	Unit 5	Localization – services& task control	
	A	Analyze the scenario shown, where Node 1 transmits data to Node 2,with no path loss and obtain the theoretical throughput based on IEEE802.15.4 standard. Compare this with the simulation result.	CO5
	B	To analyze how the operational behavior of Incumbent (Primary User)affects the throughput of the CR CPE (Secondary User)	CO5, CO6
	C	Introduction and working of internet of things (IoT).	CO5, CO6
	Mode of examination	Jury/Practical/Viva	
	Weightage Distribution	CA / MTE / ETE	
		60% / 0% / 40%	
	Text book/s*	"Protocols and Architectures for Wireless Sensor Networks", Holger Karl, Andreas Willig, *Wiley, ISBN:* 0-470-09510-5	
	Other References	"Wireless Sensor Networks", Cauligi S. Raghavendra, Krishna Sivalingam, Taieb M. Znati, *Springer*	

CO and PO Mapping

S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	CO1: Explain the basic concepts of wireless sensor networks, sensing, computing and communication tasks	PO1, PO2, PO8,PSO3

2.	CO2: Describe and explain radio standards and communication protocols adopted in wireless sensor networks	PO1, PO2,PO3, PO6, PO7, PO8, PSO3
3.	CO3: Describe and explain the hardware, software and communication for wireless sensor network nodes	PO1, PO2, PO3, PO6, PO7, PO8, PSO3
4.	CO4 Explain the architectures, features, and performance for wireless sensor network systems and platforms	PO1, PO2, PO4, PO7,PO8,PSO3
5.	CO5: Describe and analyse the specific requirements of applications in wireless sensor networks for energy efficiency, computing, storage and transmission	PO1, PO2, PO3, PO5, PO8, PSO3
6.	CO6:Evaluate the significance of scientific studies in wireless sensor networks	PO1, PO2, PO4, PO6,PO8,PSO3

PO and PSO mapping with level of strength for Course Name Wireless Sensor Network (Course Code CSP646)

	COs	PO1	PO2	PO3	PO4	PO5	PO6	PS7	PO8	PSO1	PSO2	PSO3
	CO1	2	2	-	-	-	-	-	2	-	-	3
	CO2	3	3	2	-	-	2	2	3	-	-	3
	CO3	2	2	2	-	-	2	2	2	-	-	3
	CO4	1	2	-	2	-	-	2	3	-	-	3
	CO5	2	2	1	-	3	-	-	2	-	-	3
	CO6	1	3	-	2	-	2	-	2	-	-	3
	Average	1.83	2.33	0.83	0.67	0.5	1	1	2.5	-	-	3

School:		**School of Engineering and technology**	
Department		**Department of Computer Science and Engineering**	
Program:		**M. Tech**	
Branch:		**M. Tech. (CSE) Networking and Cyber Security**	
1	Course Code	CSP616	
2	Course Title	**Intrusion detection and prevention Lab**	
3	Credits	1	
4	Contact Hours (L-T-P)	0-0-2	
	Course Status	Core /Elective/Open Elective	
5	Course Objective	The objective of this course is to provide an in depth introduction to intrusion detection and prevention. The course covers methodologies, techniques, and tools for monitoring events in computer system or network, with the objective of preventing and detecting unwanted process activity and recovering from malicious behavior.	
6	Course Outcomes	On successful completion of this module students will be able to: CO1: illustrate and able to perform scanning using nmap. CO2: demonstrate the skill to capture and analyze network packets CO3: analyze packet and detection methods CO4: analyze and apply Snort rules, outputs, and plug-ins to detect unauthorized activity CO5: apply different protocol analyzers tools CO6: apply different tools related to traffic monitoring, snort, toolkits	
7	Course Description	This course introduces intrusion detection and prevention, which is one of the most essential concepts in looking at how threats and attacks are detected and mitigated.	
8	Outline syllabus		CO Mapping
	Unit 1	**nmap**	
	A	Performa an experiment to demonstrate 1. Download and install nmap. 2. Use nmap with different options to scan open ports. 3. Perform OS fingerprinting, ping scan, tcp port scan, udp port scan, etc. using nmap	CO1
	B		CO1
	C		CO1
	Unit 2	**Traffic monitoring**	

		1. Performa an experiment to demonstrate how to perform binary packet capture, formats of tcpdump filters, bit masking using tcpdump 2. Performa an experiment to demonstrate how to sniff for router traffic by using the tool wireshark - Download and install wireshark network analyzer. - Capturing live network data - Open, save and merge Capture Files - Working with captured packets	CO2, CO6
	Unit 3	**Packets Analysis**	
		Performa an experiment to demonstrate 1. Examination of fields in TCPchecksums, normal and abnormal tcp stimulus and response 2. Detection methods for application protocols, pattern matching, protocol decode and anomaly detection 3. Sample attacks http, malformed dns , DDos, tcp reset attacks	CO3
	Unit 4	**Open source IDS: Snort**	
		Performa an experiment to demonstrate 1. Installing Snort into the Operating System. 2. Configuring and Starting the Snort IDS. 3. Defines Snort rules to detect the intrusions. 4. Write and Add Snort Rule 5. Triggering an Alert for the New Rule	CO4, CO6
	Unit 5	**Analyst toolkit**	
		Performa an experiment to demonstrate 1. TCP/ UDP connectivity using ngrep, tcpflow, netcat. 2. Create , read/write, alter and send packets using jpcap 3. launch arp poisining, dns poisioning attacks using jpcap	CO5, CO6
	Mode of examination	Theory/Jury/Practical/Viva	
	Weightage Distribution	CA: 30% / MTE: 20% / ETE: 50%	
	Text book/s*	1.Intrusion Detection & Prevention , Carl F. Endorf, Eugene Schultz and Jim Mellander, McGraw Hill Professional, 2004	
	Other References	1. Metasploit: The Penetration Tester's Guide by David Kennedy, Jim O'Gorman, Devon Kearns, Mati Aharoni 2. Internet as a Resource for Reference.	

CO and PO Mapping

S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	CO1: illustrate and able to perform scanning using nmap.	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PSO
2.	CO2: demonstrate the skill to capture and analyze network packets	PO1, PO2, PO4, PO5, PSO
3.	CO3: analyze packet and detection methods	PO1, PO2, PO4, PO5, PSO
4.	CO4: analyze and apply Snort rules, outputs, and plug-ins to detect unauthorized activity	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PSO
5.	CO5: apply different protocol analyzers tools	PO1, PO2, PO4, PO5, PSO
6.	CO6: apply different tools related to traffic monitoring, snort, toolkits	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PSO

PO and PSO mapping with level of strength for Course Name Intrusion detection and prevention (Course Code)

Course Code_ Course Name	**CO's**	**PO 1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PSO**
CSP616_Intrusion detection and prevention	**CO1**	3	3	3	2	2	2	3	3	3
	CO2	1	2	-	1	1	-	-	-	1
	CO3	1	2	-	1	1	-	-	-	1
	CO4	2	3	3	1	2	2	1	2	3
	CO5	1	1	-	1	1	-	-	-	1
	CO6	2	2	2	1	1	2	1	2	2

Average of non-zeros entry in following table (should be auto calculated).

Course Code	**Course Name**	**PO1**	**PO2**	**PO 3**	**PO 4**	**PO5**	**PO6**	**PO7**	**PO8**	**PSO**
	Intrusion detection and prevention	1.5	2.16	2.66	2	1.16	2	1.66	2.33	1.833

Strength of Correlation

1. Addressed to ***Slight (Low=1) extent*** ***2.*** Addressed to ***Moderate (Medium=2) extent***

3. Addressed to ***Substantial (High=3) extent***

School: SET		**Batch:**			
Program: BTECH		**Current Academic Year:**			
Branch:CSE		**Semester:**			
1	Course Code	CSP 606			
2	Course Title	Cloud Services in Mobile Applications Lab			
3	Credits	1			
4	Contact Hours (L-T-P)	0-0-2			
	Course Status	Compulsory/Elective			
5	Course Objective	The objective is to understand the need of Cloud services in mobile App			
6	Course Outcomes	CO1: Able to design basic concepts of cloud computing CO2: Setting up different tool of cloud in mobile CO3: Build application in android . CO4 Testing and development of mobile app.			
7	Outline syllabus				CO Mapping
	Unit 1	**Introduction to cloud services**			
		1. Create an account on any online android emulator (e.g. AWS,GenyMotion) 2. Configure a basic android emulator .			CO1
	Unit 2	**File and storage services in cloud**			
		3. Write a program to create a small android application with some internal storage(Use Dynamo DB for Storage). 4. Create a list maker app in AWS.			CO1,CO2
	Unit 3	**Mobile Application development Framework**			
		5. Handle a complete CRUD operation in Android. 6. Setup facebook sign-in in AWS.			CO3
	Unit 4	**Application of Mobile Application**			
		7. Setup Google sign in on AWS. 8. Create a project on AWS mobile hub.			CO2,CO4,CO5
	Unit 5	**Testing in Mobile Application**			
		9. Test and compile a calculator application on Android Studio . 10. Test and compile a calculator application on cloud .			CO2,CO4,CO5
	Tool Use	Android Studio / AWS Cloud			
	Mode of examination	Jury/Practical/Viva			
	Weighta	CA	MTE	ETE	

	ge Distribution	60%	0%	40%	
	Text book/s*	-			
	Other References				

PO and PSO mapping with level of strength for Course Name Cloud Services in Mobile Applications Lab (Course Code CSP 606)

School:		**School of Engineering and technology**	
Department		**Department of Computer Science and Engineering**	
Program:		**M.Tech**	
Branch:		**Software Engineering**	
1	Course Code	CSP644	
2	Course Title	Agile Based Software Engineering Lab	
3	Credits	2	
4	Contact Hours (L-T-P)	0-0-2	
	Course Status	Compulsory/Elective	
5	Course Objective	This course provides an overview of ClickUp a project management tool that is used to assist organizations in streamlining a hierarchical structure, promoting compartmentalization between clients or departments.	
6	Course Outcomes	Students will be able to: CO1: Define the process management activities. CO2: Outline the task management activities CO3: Choose the different time management events CO4: Analyze the integration of software with other applications. CO5: Assess team collaboration and device agnostic CO6: Build tasks, documents, chats, goals, timelines and reminders for daily operations of project management.	
7	Course Description	With agile methodologies, client portals, Gantt charts, milestone tracking, resource management and collaboration tools, ClickUp can help to improve the automation and collaboration for every type of team.	
8	Outline syllabus		CO Mapping
	Unit 1	**Process management**	
		Streamlines and automates the steps required to ensure custom statuses are completed.	**CO1,CO6**
		Streamlines and automates the steps required to ensure recurring checklists and status templates are completed.	CO1,CO6
	Unit 2	**Task management**	
		Filter and search tasks and sort all important details	**CO2,CO6**
		Create sidebars and use the drag-and-drop option	CO2,CO6
	Unit 3	**Time management**	
		To schedule time, manage workforce capacity and organize important events.	**CO3,CO6**
		Implement two-way calendar sync and Gantt charts	CO3,CO6
	Unit 4	**Integrations**	
		To integrate other applications within the system	**CO4,CO6**
		Provide connectivity among popular productivity tools such as API, GitLab, Slack, Harvest and more.	CO4,CO6
	Unit 5	**Team collaboration & Device agnostic**	
		To embed links and set permissions to increase productivity and teamwork between the workforces.	**CO5,CO6**

		To download and integrate the software solution on all platforms and to use the application with other mobile or desktop services like Amazon Alexa, Google Assistant, Chrome and Image Markup.			CO5,CO6
	Mode of examination	Jury/Practical/Viva			
	Weightage Distribution	CA	MTE	ETE	
		60%	0%	40%	
	Text book/s*	Internet as resource			
	Other References	NIL			

PO and PSO mapping with level of strength for Course Name Agile based software engineering Lab (Course Code CSP644)

Course Code_ Course Name	CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CSP644_ Agile based software engineering lab	CO1	2	1	2	2	-	-	3	3	3	-	-
	CO2	2	1	2	2	-	-	3	3	3	-	-
	CO3	2	1	2	2	-	-	3	3	3	-	-
	CO4	2	1	2	2	-	-	3	3	3	-	-
	CO5	2	1	2	2	-	-	3	3	3	-	-
	CO6	3	3	2	2	2	-	3	3	3	-	-

Average of non-zeros entry in following table (should be auto calculated).

Course Code	Course Name	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CSP644	Agile based software engineering lab	2.1	1.3	2	2	2	-	3	3	3	-	-

Strength of Correlation

1. Addressed to ***Slight (Low=1) extent*** ***2.*** Addressed to ***Moderate (Medium=2) extent***
3. Addressed to ***Substantial (High=3) extent***

School:		**School of Engineering and technology**	
Department		**Department of Computer Science and Engineering**	
Program:		**M.Tech**	
Branch:		**Software Engineering**	
1	Course Code	CSP 649	
2	Course Title	Secure Software Engineering Lab	
3	Credits	1	
4	Contact Hours (L-T-P)	0-0-2	
	Course Status	Compulsory/Elective	
5	Course Objective	Course objective it to integrate secure software development and patterns into software engineering.	
6	Course Outcomes	CO1: Demonstrate various aspects and principles of software security CO2: Illustrate Configuring server securely CO3: Inspect, identify and apply security mechanisms CO4: Test for software security using test cases and prioritizing the test cases CO5: Explain security issues and secure software CO6: Discuss and compare software engineering practices and standards related to software security	
7	Course Description	This course will introduce the practical approaches and tools that support the security concerns in the whole systems development lifecycle resulting in software that is secure by default.	
8	Outline syllabus		CO Mapping
	Unit 1	**Apache Tomcat server**	
		Study of secure software engineering in research and find topic related to it for review.	CO1,CO6
		To Install Apache Tomcat Server in Windows.	CO1,CO2
	Unit 2	**Configuring Apache Tomcat server**	
		To Configure Apache Tomcat Server in Windows.	CO2
		To startup, access and shutdown Apache Tomcat Server in Windows.	CO2
	Unit 3	**Development of web app**	
		Develop and Deploy a Web App.	CO3
		Configuring Tomcat To Use SSL.	CO2
		Perform static analysis (Memory leaks, Access violations,Arithmetic errors, array and string overruns etc) of code using open source tool	CO1,CO3
	Unit 4	**Secure software designing**	
		Requirement: Develop a user login password page for web-site in which password should be strong and consists of combination of letter, number, special character and capital letter. It should consist of at least 8 characters.	CO4,CO5,CO6
	Unit 5	**Secure software testing**	
		Perform requirement-based testing.	CO4,CO5,CO6
		Test login-password page using test cases	CO4,CO5,CO6

		Analyze the security issue considered while design, implementation and testing phases of the requirement.			CO3,CO5,CO6
	Mode of examination	Jury/Practical/Viva			
	Weightage Distribution	CA	MTE	ETE	
		60%	0%	40%	
	Text book/s*	-			
	Other References				

PO and PSO mapping with level of strength for Course Name Secure Software Engineering Lab (Course Code CSP649)

Course Code_ Course Name	CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CSP649_Secure software Engineering lab	CO1	1	3	2	1	-	1	2	3	3	-	-
	CO2	1	-	2	-	-	-	-	1	3	-	-
	CO3	3	3	2	1	-	1	1	2	3	-	-
	CO4	3	-	1	2	-	2	3	2	3	-	-
	CO5	2	-	2	1	-	1	2	2	3	-	-
	CO6	1	2	2	2	-	2	2	2	3	-	-

Average of non-zeros entry in following table (should be auto calculated).

Course Code	Course Name	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO 1	PSO 2	PSO 3
CSP649	Secure software Engineering lab	1.8	2.6	1.8	1.4	-	1.4	2	2	3	-	-

Strength of Correlation

1. Addressed to ***Slight (Low=1) extent*** ***2.*** Addressed to ***Moderate (Medium=2) extent***
3. Addressed to ***Substantial (High=3) extent***

School: SET		**Batch:**			
Program: BTECH		**Current Academic Year:**			
Branch:CSE		**Semester:**			
1	Course Code	CSP 610			
2	Course Title	Advance Web Analytics Lab			
3	Credits	1			
4	Contact Hours (L-T-P)	0-0-2			
	Course Status				
5	Course Objective	An introductory study of Web analytics on how organizations may use to analyze and measure website traffic which helps in enhancing their business presence.			
6	Course Outcomes	CO1: Define the concept of data collection and Qualitative analysis. CO2:Demonstrate the mechanism of Web analytic processes and XML technologies. CO3:Identify effective Web analytics strategies and implementation CO4:Analyze qualitative and quantitative data from your website using web analytic tool. CO5: Determine basic navigation of Google Analytics Interface. CO6:Elaborate how web analytic is used as a tool for e-Commerce, business research, and market research			
7	Course Description	This course is an overview of the modern Web Analytical tool used for the Web. The motivation behind this course is to give students the basic understanding of how things work in the Web world from the analytical point of view as well as to give the essential outline of the different open source technologies with use cases.			
8					CO Mapping
	Unit 1	**Introduction**			
		Program related to Qualitative Analysis			CO1
	Unit 2	**Web Analytic Fundamentals – Core Analytic Concepts**			
		Program related to XML technologies ,web analytics processes			CO2
	Unit 3	**Web Data Analysis – Search Analytics**			
		Program related to search analytics and web analytics tools			CO3
	Unit 4	**Measuring Email and multi-channel marketing**			
		Program related to Email and competitive intelligence analytics			CO5
	Unit 5	**Implementation of Google Analytics**			
		Program related to Google analytics.			CO5,CO6
	Mode of examination	Theory/Jury/Practical/Viva			
	Weightage Distribution	CA	MTE	ETE	
		30%	20%	50%	
	Text book/s*	Web Analytics : an hour a day, Avinash Kaushik, John Wiley & Sons.			

	Other References	Web Analytics 2.0 : The art of online accountability and science of customer centricity (Google ebook), Avinash Kaushik, John wiley & sons.

CO and PO Mapping

S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	CO1: Define the concept of data collection and Qualitative analysis.	PO1,PO2,PO3,PO8,PSO2
2.	CO2:Demonstrate the mechanism of Web analytic processes and XML technologies.	PO1,PO2,PO3,PSO2
3.	CO3:Identify effective Web analytics strategies and implementation	PO1,PO2,PSO2
4.	CO4:Analyze qualitative and quantitative data from your website using web analytic tool.	PO1,PSO2
5.	CO5: Determine basic navigation of Google Analytics Interface.	PO1,PO8,PSO2
6.	CO6:Elaborate how web analytic is used as a tool for e-Commerce, business research, and market research	PO1,PO2,PO3,PO4,PO8,PSO1,PSO2

PO and PSO mapping with level of strength for Course Name Advance Web Analytics **lab(Course Code CSP 610)**

Course Code_ Course Name	CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CSP610_ Advance Web Analytics lab	CO1	2	1	2	1				1		1	
	CO2	2		1							2	
	CO3	2	1								2	
	CO4	2	1	1	1				1		3	
	CO5	2							2		3	
	CO6	3	2	2	1				2	1	3	

Average of non-zeros entry in following table (should be auto calculated).

Course Code	Course Name	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO 1	PSO 2	PSO 3
CSp610	Advance web anaytics	2.2	1.3	1.5	1	0	0	0	1.5	1	2.3	0

Strength of Correlation

1. Addressed to ***Slight (Low=1) extent*** ***2.*** Addressed to ***Moderate (Medium=2) extent***
3. Addressed to ***Substantial (High=3) extent***

List of Experiments

- Write a PHP program to print a message.
- Write a PHP program to find a square of a number.
- Write a PHP program to swap two numbers without using 3rd variable.
- Write a PHP program to find the area of rectangle, square, circle using predefined value.
- Write a PHP program to find factorial of a number
- Write a PHP program to print Fibonacci series upto 17.
- Write a PHP program to implement calculator.
- Write a PHP program to find the smallest number from an array.
- Write a PHP program to arrange the numbers in ascending order.
- Write a PHP program to make a login form and check the input using another PHP page.
- Write a PHP program to find the sum of all elements in a multidimensional array using for loop.
- Write a PHP program to validate a form input.
- Write a PHP program of file handling (reading a file line by line until end of file
- Write a PHP program for uploading a file in PHP.
- Write a program to read input data, from table and display all these information in tabular form on output screen.

School: SET		**Batch: 2019-2023**	
Program: M.Tech			
Branch:CSE (Networks and Cyber Security)		**Semester:II**	
1	Course Code	CSP 629	
2	Course Title	Performance Modeling of Computer Communication network Lab	
3	Credits	1	
4	Contact Hours (L-T-P)	0-0-2	
	Course Status	Compulsory	
5	Course Objective	To strengthen students in primal principles, performance measure of different protocols for a Computer Networks and analysis of Computer Network protocols.	
6	Course Outcomes	CO1: Describe and compare the basic technologies used in computer network systems CO2: Evaluate performance of different protocols CO3: Analyze the protocols used in computer networks CO4: Compare of different protocol as a stochastic process CO5: Illustrate the use of simulation tools CO6: Utilize the performance modeling principles in real life applications of networks.	
7	Course Description	This course provides an introduction to the techniques and tools needed to construct and analyse performance models of computer systems and communication networks. Such skills are indispensable for research-related careers.	
8	Outline syllabus		CO Mapping
	Unit 1	**Introduction to probability theory**	
	A	Implement Bayes Theorem in Python	CO1
	B	Implement Poisson distribution in Python	CO1
	C	Implement Markov chain rule in Python	CO1
	Unit 2	**Performance Modelling**	
	A	Measure the performance of the computer network while it is handling real traffic.	CO2, CO6
	B	evaluate the impact of different versions of a network component, strategy or algorithm on network performance.	CO2, CO6
	C	to control, minimize and/or understand physical phenomenon or other interference sources that can produce discrepancies and variability in the measurement results	CO2, CO6
	Unit 3	**Single server queueing model**	
	A	Implement M/M/1**queueing model**	CO3,CO5
	B	Implement M/G/1**queueing model**	CO3,CO5
	C	Implement G/G/1 **queueing model**	CO3,CO5
	Unit 4	**Queueing Network Model**	

	A	Implement M/M/n **queueing model**			CO3,CO5
	B	Implement BCMP networks using python			CO3,CO5
	C	Study the working of Hierarchical queuing models			CO3,CO4
	Unit 5	**Stochastic Petri Models**			
	A	Modelling and Evaluation of Stochastic Petri Nets With Time NET			CO4,CO5
	B	Study the working of infinite-state SPN			CO4,CO6
	Mode of examination	Jury/Practical/Viva			
	Weightage Distribution	CA	MTE	ETE	
		60%	0%	40%	
	Text book/s*	2.			
	Other References	2.			

S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	CO1: Describe and compare the basic technologies used in computer network systems	PO1, PO2, PO8,PSO3
2.	CO2: Evaluate performance of different protocols	PO1, PO2,PO3, PO6, PO7, PO8, PSO3
3.	CO3: Analyze the protocols used in computer networks	PO1, PO2, PO3, PO6, PO7, PO8, PSO3
4.	CO4: Compare of different protocol as a stochastic process	PO1, PO2, PO4, PO7,PO8,PSO3
5.	CO5: Illustrate the use of simulation tools	PO1, PO2, PO3, PO5, PO8, PSO3
6.	CO6: Utilize the performance modeling principles in real life applications of networks.	PO1, PO2, PO4, PO6,PO8,PSO3

PO and PSO mapping with level of strength for Course Name Performance Modeling of Computer Communication network Lab (Course Code CSP 629)

	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
	CO1	3	2	3	-	-	-	-	2	-	-	2
	CO2	3	2	3	-	-	-	-	2	-	-	2
	CO3	3	2	3	1	-	-	-	2	-	-	2
	CO4	3	2	3	1	2	2	-	2	-	-	2
	CO5	3	2	3	2	2	2	-	2	-	-	3
	CO6	3	2	3	2	2	2	-	2	-	-	3
	Avg.											

School:		**School of Engineering and technology**			
Department		**Department of Computer Science and Engineering**			
Program:		**M.Tech**			
Branch:		**Software Engineering**			
1	Course Code	CSP648			
2	Course Title	Recent Advances in Software Engineering Lab			
3	Credits	3			
4	Contact Hours (L-T-P)	3-0-0			
	Course Status	Compulsory/Elective			
5	Course Objective	To Create a requirements model using UML class notations To prepare the backlog and plan the sprint effectively using JIRA To use MS Project and do project planning			
6	Course Outcomes	CO1: Illustrate the fundamental principles through advanced concepts of analysis and design using UML CO2: Explain the features of JIRA CO3: Construct the project reports using JIRA CO4: Plan project activities using MS Project CO5: Assess and fixing project conflicts. CO6: Design project using recent tools of software engineering			
7	Course Description	This course introduces UML Designs-activity, sequence, deployment and component diagram. This course enables students to explore JIRA, MS Project.			
8	Outline syllabus				CO Mapping
	Unit 1	**Software Design using UML**			
		Design Activity and sequence diagram			CO1
		Design Deployment and Component Diagram			CO1
	Unit 2	**Introduction to Jira**			
		Explore Jira software			CO2,CO6
		Create a project			CO2,CO6
	Unit 3	**Report generation using Jira**			
		Create a backlog and Create a sprint			CO3,CO6
		Track the progress of the task and Generation of report			CO3,CO6
	Unit 4	**Project planning in MS Project**			
		Getting Started with MS Project			CO4,CO6
		To create a project plan and add tasks with date			CO4,CO6
	Unit 5	**Task scheduling in MS Project**			
		Create Gantt chart, Network Diagram and Assign the resource to the task			CO5,CO6
		Document the resource and track the completion of the work.			CO5,CO6
	Mode of examination	Jury/Practical/Viva			
	Weightage Distribution	CA	MTE	ETE	
		60%	0%	40%	
	Text book/s*	-			

	Other References	Internet as a resource	

PO and PSO mapping with level of strength for Course Name Recent advances in Software Engineering Lab (Course Code CSP648)

Course Code_ Course Name	CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CSP648_Recent advances in software Engineering	CO1	1	1	1	-	-	1	3	2	3	-	-
	CO2	3	3	1	-	-	1	3	2	3	-	-
	CO3	3	3	1	-	-	1	3	3	3	-	-
	CO4	3	3	1	-	-	1	3	3	3	-	-
	CO5	3	3	2	-	-	1	3	3	3	-	-
	CO6	3	3	2	2	-	2	3	3	3	-	-

Average of non-zeros entry in following table (should be auto calculated).

Course Code	Course Name	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CSP648	Recent advances in software Engineering	2.6	2.6	1.3	2	-	1.16	3	2.6	3	-	-

Strength of Correlation

1. Addressed to ***Slight (Low=1) extent*** ***2.*** Addressed to ***Moderate (Medium=2) extent***
3. Addressed to ***Substantial (High=3) extent***

School: SET		**Batch : 2019-21**			
Program: MTech		**Current Academic Year: 2019-20**			
Branch: NA		**Semester: IIIrd**			
1	**Course Code**	CSP681			
2	**Course Title**	**SEMINAR**			
3	**Credits**	**2**			
4	**Contact Hours (L-T-P)**				
	Course Status	**PG**			
5	Course Objective	The students will be identifying relevant information, defining and explaining topic chosen for seminar. Students will apply theories, methods and knowledge bases from multiple fields to a single question or problem.			
6	Course Outcomes	Students will be able : CO1: Develop the ability for independent learning and acquiring knowledge. CO2: Identify and discuss domain specific problems. CO3: Choose a multidisciplinary strategy to address real-world issues. CO4: Apply principles of ethics and respect while interaction with others. CO5: Demonstrate the ability to participate effectively in discussions. CO6: Improve oral and written communication skills.			
7	Course Description	This is a 2-credit course aimed at teaching 2nd year Mtech students to make research presentations. Each student has to choose a paper / topic related to Computer Science and Engineering. It need not be related to the Mtech project. A detailed literature review of a specific research problem. This can include: background related to the problem, categorization of approaches, specific approaches, etc.			
8	Outline syllabus				
	Each student has to choose a paper / topic related to Computer Science and Engineering. It need not be related to the Mtech project. A detailed literature review of a specific research problem. This can include: background related to the problem, categorization of approaches, specific approaches, etc. One selected journal/TOP-tier conference paper published by others. A research problem with well-identified solution and partial results, based on your own work. Guidelines/Suggestions on how to prepare a good talk will be made by Mtech coordinator.			
	Weightage Distribution	CA	MTE	ETE	
		30%	20%	50%	

CO and PO Mapping

S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	CO1: Develop the ability for independent learning and acquiring knowledge.	PO1,PO2,PO3,PO4,PO8
2.	CO2: Identify and discuss domain specific problems.	PO1,PO2,PO3,PO8,PSO1,PSO2,PSO3
3.	CO3: Choose a multidisciplinary strategy to address real-world issues.	PO1,PO2,PO3,PO4,,PO8,PSO1,PSO2,PSO3
4.	CO4: Apply principles of ethics and respect while interaction with others.	PO3,PO5,PO6,PO7,PO8
5	CO5: Demonstrate the ability to participate effectively in discussions.	PO1,PO3,PO4,PO7,PO8
6	CO6: Improve oral and written communication skills.	PO1,PO3,PO4,PO6,PO7,PO8

CO/PO-PSO Mapping

(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Low

Course Objectives	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	2	2	2	2	-	-	-	3	-	-	-
CO2	1	2	2	-	-	-	-	2	3	3	3
CO3	2	2	2	3	-	-	-	2	2	2	2
CO4	-	-	3	-	2	3	3	1	-	-	-
CO5	1	-	1	-	-	-	3	1	-	-	-
CO6	1	-	1	-	-	2	3	1	-	-	-
Average PO attained	1.4	2	1.84	2.5	2	2.5	3	1.67	2.5	2.5	2.5

School: SET		**Batch :**
Program:MTech		**Current Academic Year:**
Branch:		**Semester:**
1	Course Code	**CSP682**
2	Course Title	**PROJECT**
3	Credits	4
4	Contact Hours (L-T-P)	
	Course Status	PG
5	Course Objective	In this course, students will use the wide range of knowledge and skills that they have gathered over the course of their post graduate program. This course presents the opportunity to build upon a core of learning, gained in the earlier years, and to broaden the scope of that knowledge.
6	Course Outcomes	Students will be able to: CO1: Demonstrate a sound technical knowledge of selected project topic. CO2: Plan problem identification, formulation and solution strategies. CO3: Design engineering solutions to complex problems utilizing a systematic approach. CO4: Develop solutions of real world engineering problems. CO5: Utilize technology tools for communication, collaboration, information management, and decision support. CO6: Communicate project work effectively with research community at large in written and oral forms, mandatorily a research paper.
7	Course Description	Students are required to take complete ownership of their project and this necessitates a considerable shift in attitude as the project demands that, beyond the exercise of knowledge and skills, they must be self-regulating and self-directed in their time management.

Outline syllabus

Project being the student's important activity at the institution, it fulfills a purpose of synthesis of all the knowledge they have acquired throughout the different years. In addition, this knowledge must be used in a particular way, in order to solve a specific problem, which lets student demonstrate their aptitude by applying this knowledge.

This project also helps the student to analyze and determine the current requirements of the society, to understand the whole project development process. Makes student follow strict schedules, learn efficient time management & make changes as per the constrained requirements. It also helps student to improve communication skills. All these factors affect the overall development of student for his/her future profession.

CO and PO Mapping

S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	CO1: Demonstrate a sound technical knowledge of selected project topic.	PO1,PO2,PO3,PSO1,PSO2,PSO3
2.	CO2: Plan problem identification, formulation and solution strategies.	PO1,PO2,PO3,PO6,PO8
3.	CO3: Design engineering solutions to complex problems utilizing a systematic approach.	PO1,PO2,PO3,PO6,PO8,PSO1,PSO2,PSO3
4.	CO4: Develop solutions of real world engineering problems.	PO1,PO2,PO4,PO5,PO6,PO8,PSO1,PSO2,PSO3
5	CO5: Utilize technology tools for communication, collaboration, information management, and decision support.	PO6,PO7,PSO1,PSO2,PSO3
6	CO6: Communicate project work effectively with research community at large in written and oral forms, mandatorily a research paper.	PO7,PO8

CO/PO Mapping

(1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Low

Course Objectives	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	2	2	-	-	-	-	-	2	2	2
CO2	2	2	2	-	-	2	-	2	-	-	-
CO3	3	2	2	-	-	2	-	2	2	2	2
CO4	2	3	-	3	2	2	-	2	2	2	2
CO5	-	-	-	-	-	-	3	3	-	-	-
CO6	-	-	-	-	-	2	3	-	2	2	2
Avg PO attained	2.5	2.25	2	3	2	2	3	2.25	2	2	2

School: SET		**Batch : 2019-2021**			
Program: MTech		**Current Academic Year: 19-20**			
Branch: NA		**Semester: IIIrd**			
1	**Course Code**	CSP691			
2	**Course Title**	**DISSERTATION-I**			
3	**Credits**	**10**			
4	**Contact Hours (L-T-P)**				
	Course Status				
5	Course Objective	The main objective of this course is to provide exposure to design a research investigation that incorporates appropriate theoretical approaches, conceptual models, and a review of the existing literature.			
6	Course Outcomes	Students will be able to: CO1: Identify, summarize and evaluate relevant literature. CO2: Analyze and interpret suitable data to enable the research question to be answered. CO3: Formulate research questions and hypotheses, and operationalize them. CO4: Propose the solution to the real world problem which shall benefit the community. CO5: Use modern tools, computer programs and simulators to evaluate the proposed solution and result. CO6: Develop an ability to effectively communicate (oral and written) knowledge in a scientific manner.			
7	Course Description	The dissertation presents a major piece of guided independent research on a topic agreed between the student and their supervisor. It typically involves a literature review and an appropriate form of critical analysis of sources of primary and /or secondary data; it may involve field and/or laboratory work. The dissertation must show evidence of wide reading and understanding of critical analysis and/or appropriate use of advanced research techniques.			
	Weightage Distribution	CA	MTE	ETE	

CO and PO Mapping

S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	CO1: Identify, summarize and evaluate relevant literature.	PO1,PO2,PO3,PO4,PO5,PO6,PO7,PO8,PSO1,PSO2,PSO3
2.	CO2: Analyze and interpret suitable data to enable the research question to be answered.	PO1,PO2,PO3,PO4,PO5,PO6,PO7,PO8,PSO1,PSO2,PSO3
3.	CO3: Formulate research questions and hypotheses, and operationalize them.	PO1,PO2,PO3,PO4,PO5,PO6,PO7,PO8,PSO1,PSO2,PSO3
4.	CO4: Propose the solution to the real world problem which shall benefit the community.	PO1,PO2,PO3,PO4,PO5,PO6,PO7,PO8,PSO1,PSO2,PSO3
5	CO5: Use modern tools, computer programs and simulators to evaluate the proposed solution and result.	PO1,PO2,PO3,PO4,PO5,PO6,PO7,PO8,PSO1,PSO2,PSO3
6	CO6: Develop an ability to effectively communicate (oral and written) knowledge in a scientific manner.	PO1,PO3,PO4,PO5,PO6,PO7,PO8

PO and PSO mapping with level of strength

Course Objectives	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	3	1	2	1	1	3	2	2	2	2
CO2	3	3	1	2	1	1	3	2	2	2	2
CO3	3	3	1	3	2	2	3	3	2	2	2
CO4	3	3	1	3	2	2	3	3	2	2	2
CO5	3	2	1	2	2	2	3	3	2	2	2
CO6	1	-	3	1	1	2	3	2	-	-	-
Average PO attainted	2.7	2.8	1.3	2.1	1.5	1.67	3	2.5	2	2	2

School: SET		**Batch : 2019**	
Program: M.Tech		**Current Academic Year: 2019-2021**	
Branch: Data Science		**Semester: II**	
1	Course Code		Course Name- **Bioinformatics**
2	Course Title	**Bioinformatics**	
3	Credits	3	
4	Contact Hours (L-T-P)	3-0-0	
	Course Status	PG	
5	Course Objective		
7	Course Description		
8	Outline syllabus		CO Mapping
	Unit 1	**Fundamental of Bioinformatics**	
	A	Introduction to Bioinformatics: philosophical, directional and application oriented background of Bioinformatics.	
	B	Basic Biology: Prokaryotes and Eukaryotes, Yeast and People, Evolutionary time and relatedness.	
	C	Living parts: Tissues, cells, compartments and organelles, Central dogma of molecular biology, Concept of DNA, RNA, Protein and metabolic pathway.	
	Unit 2	**Biological databanks**	
	A	NCBI data model, GenBank sequence database.	
	B	Structural database, biodiversity information, virology information database, Chemoinformatics databases.	
	C	Protein databases-PIR, SWISSPROT, TrEMBL, Prosite, PRINTS.	
	Unit 3	**Sequence Analysis**	
	A	Methods of sequence alignment. Pair wise alignment- Global, local, dot plot and its applications.	
	B	Words method of alignment- FASTA and its variations, BLAST- Filtered and gapped BLAST, PSIBLAST.	
	C	Multiple sequence alignment- methods and Tools for MSA, Application of multiple alignments, Viewing and editing of MSA	
	Unit 4	**Molecular phylogeny**	
	A	Concepts of trees- Distance matrix methods.	
	B	Character based methods. maximum Parsimony, maximum likelihood methods	
	C	Solving UPGMA, NJ and small parsimony problems	

	Unit 5	**Applications**			
	A	Application of graph theory in Biology: Biochemical Pathway			
	B	Protein-protein interaction network, Regulatory network and their analysis.			
	C	Bioinformatics in pharmaceutical industry: informatics & drug- discovery			
	Mode of examination	Theory			
	Weightage Distribution	CA	MTE	ETE	
		30%	20%	50%	
	Text book/s*	1. Attwood T K, D J Parry-Smith, "Introduction to Bioinformatics", Pearson Education, 2005. 2. David W Mount, "Bioinformatics: Sequence and genome analysis", Cold spring harbor laboratory press, 2nd edition, 2004. 3. Des Higgins and Willie Taylor, "Bioinformatics Sequence, Structures and Databanks", Oxford University Press, USA, 2000.			
	Other References	1. Arun Jagota, "Data Analysis and Classification for Bioinformatics", Pine Press, 2001. 2. David Edwards, Jason Eric Stajich, David Hansen, "Bioinformatics: Tools and Applications", Springer, 2009. 3. Internet as a Resource for Reference			

CO and PO Mapping

S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.		
2.		
3.		
4.		

PO and PSO mapping with level of strength for Course Name Computer Hardware and Trouble shooting (Course Code BCO105)

CSE	Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	PSO5
	CO 1																	
	CO																	

	2																	
	CO 3																	
	CO 4																	

School: SET		**Batch : 2019**	
Program: M.Tech		**Current Academic Year: 2019-2021**	
Branch: Software Engineering		**Semester: II**	
1	Course Code		Course Name**: Internet of Things**
2	Course Title	**Internet of Things**	
3	Credits	3	
4	Contact Hours (L-T-P)	3-0-0	
	Course Status	PG	
5	Course Objective	To look top-down as well as bottom-up, in providing a comprehensive understanding of IoT.	
6	Course Outcomes	On successful completion of this module students will be able to: 1. analyze types of technologies that are available and in use today and can be utilized to implement IoT solutions 2. apply these technologies to tackle business scenarios	
7	Course Description		
8	Outline syllabus		CO Mapping
	Unit 1	**Introduction**	
	A	Motivation & Need of IoT, Overview & Introduction	
	B	IoT Communication Protocols	
	C		
	Unit 2	**Internet of Things (IoT) and Web of Things (WoT)**	
	A	IoC to IoT	
	B	IoT to WoT	
	C	Internet & Web Layering	
	Unit 3	**Business Aspects of the IoT**	
	A	Business cases & Concepts	
	B	Business Issues & Models	
	C	Persuasive Technologies & Behavioural change	
	Unit 4	**Modeling**	
	A	Representational State Transfer (REST)	
	B	Activity Streams	
	C	Making Things Smart: Getting things onto the Internet	
	Unit 5	**Applicative Dimension**	
	A	Big Data & Semantic Technologies	
	B	Implications of Society	

	C	IoT in the Wild			
	Mode of examination	Theory			
	Weightage Distribution	CA	MTE	ETE	
		30%	20%	50%	
	Text book/s*	1.http://dret.net/lectures/iot-spring15/			
	Other References	1. http://www.iot-lab.ch/wp-content/uploads/2014/09/EN_Bosch-Lab-White-Paper-GM-im-IOT-1_1.pdf 2.http://www.ischool.berkeley.edu/newsandevents/events/20140226yingding 3. Internet as a Resource for Reference			

CO and PO Mapping

S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.		
2.		
3.		
4.		
5.		
6.		

PO and PSO mapping with level of strength for Course Name (Course Code)

	Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	PSO5
	CO 1																	
	CO 2																	
	CO 3																	
	CO 4																	
	CO 5																	
	CO 6																	

School: SET		**Batch : 2019**	
Program: M.Tech		**Current Academic Year: 2019-2021**	
Branch: Computer Network		**Semester: I**	
1	Course Code	**CSE 632** Course Name: **Vehicular Communication**	
2	Course Title	**Vehicular Communication**	
3	Credits	3	
4	Contact Hours (L-T-P)	3-0-0	
	Course Status	PG	
5	Course Objective		
6	Course Outcomes		
7	Course Description		
8	Outline syllabus		CO Mapping
	Unit 1	**Introduction to Vehicular Ad Hoc Networks (VANETs)**	
	A	Traffic Monitoring, Causes of congestion, Traffic Monitoring Data, Common Applications of Traffic Data	
	B	Commonly used sensor technology, Detection methods, Vehicular Applications	
	C	Safety related vehicular applications, use of Infrastructure in VANETs.	
	Unit 2	**Models for Traffic flow and Vehicle Motion**	
	A	Models for Longitudinal Vehicle Movement, Lane changes situations	
	B	Simulating Vehicle-toVehicle	
	C	Infrastructure-to-Vehicle Communication.	
	Unit 3	**Networking Issues**	
	A	Routing in MANET, Applicability of MANET.	
	B	Routing to Vehicular Environment	
	C	Routing protocols for VANET	
	Unit 4	**Delay-Tolerant Networks in VANETs**	
	A	Deterministic/Stochastic Delay-Tolerant Routing	
	B	Vehicle Traffic Model, Vehicle-Roadside Data Access	

	C	Data Dissemination in VANETs .			
	Unit 5	**Localization in Vehicular Ad-Hoc Networks**			
	A	Localization-Aware VANET applications, Localization Techniques for VANETs			
	B	Data Fusion in VANET Localization Systems			
	C	Vehicular Network Simulators.			
	Mode of examination	Theory			
	Weightage Distribution	CA	MTE	ETE	
		30%	20%	50%	
	Text book/s*	1. Stephan Olariu, Michele C. Weigle, "Vehicular Networks from Theory to Practice", CRC Press. 2. Hassnaa Moustafa and Yan Zhang, "Vehicular Networks: Techniques, Standards and Applications," Auerbach Publications, 2009			
	Other References	1. C. Siva Ram Murthy and B.S. Manoj, "Ad Hoc Wireless Networks: Architectures and Protocols," Prentice Hall, 2004. 2. Internet as a resource for references			

School: SET		**Batch : 2019**	
Program: M.Tech		**Current Academic Year: 2019-2021**	
Branch: Data Science		**Semester: I**	
1	Course Code		Course Name: Data Acquisition and Production
2	Course Title	Data Acquisition and Production	
3	Credits	4	
4	Contact Hours (L-T-P)	3-0-2	
	Course Status	PG	
5	Course Objective	1. To explore the fundamental concept of data processing, extraction, cleaning, annotation, integration 2. To understand various information visualization techniques. 3. To understand data productization techniques	
6	Course Description	Major topics covered in this subjects are data acquisition process, managing data, Graphical representation of data, Data Aggregation, Group Operations ,Timeseries , Visualization of data, Data Productization IoT, and Virtualization on Embedded Boards IoT.	
8	Outline syllabus		CO Mapping
	Unit 1	**Introduction**	
	A	Introduction to Data Warehouse- OLTP and OLAP concepts- Introduction to Data Mining- Data Objects and Attribute Types- Basic Statistical Descriptions of Data Exploratory	
	B	Data analysis- Measuring Data Similarity and Dissimilarity- Graphical representation of data. Introduction to Data Acquisition – Applications –Process- Data Extraction-	
	C	Data Cleaning and Annotation- Data Integration –Data Reduction, Data Transformation, Data Discretization and Concept Hierarchy Generation	
	Unit 2	**Data Aggregation**	
	A	Group Operations ,Time series , Group By Mechanics – Data Aggregation – Group wise Operations and Transformations	
	B	Pivot Tables and Cross Tabulations – Date and Time Date Type tools	
	C	Time Series Basics – Data Ranges, Frequencies and Shifting.	
	Unit 3	**Visualization**	
	A	Terminology- Basic Charts and Plots- Multivariate Data Visualization- Data Visualization Techniques– Pixel-Oriented	

		Visualization Techniques-			
	B	Geometric Projection Visualization Techniques- Icon-Based Visualization Techniques- Hierarchical Visualization Techniques- Visualizing Complex Data and Relations- Data Visualization Tools			
	C	Rank Analysis Tools- Trend Analysis Tools Multivariate Analysis Tools- Distribution Analysis Tools- Correlation Analysis Tools Geographical Analysis Tools.			
	Unit 4	**Data Productization**			
	A	IoT Overview- IoT Design methodology- Semantic Web Infrastructure Intelligence Applications			
	B	Programming Framework for IoT- Distributed Data Analysis for IoT			
	C	Security and Privacy in IoT- Applied IoT- Cloud Based Smart Facilities Management			
	Unit 5	**Embedded Boards**			
	A	Virtualization on Embedded Boards IoT- Stream Processing in IoT			
	B	Internet of Vehicles and Applications			
	C	Case study on Data Acquisition using Dashboards, Android and iOSapps			
	Mode of examinatio n	Theory			
	Weightage Distribution	CA	MTE	ETE	
		30%	20%	50%	
	Text book/s*	Han, Jiawei, Jian Pei, and Micheline Kamber, “Data mining: concepts and techniques”,3rd Edition,Elsevier,2011.			
	Other References	1. Margaret H. Dunham, "Data Mining: Introductory and Advanced Topics", Pearson Education,2012. 2. Arshdeep Bahga, Vijay Madisetti, “Internet of Things - A hands-on approach”, UniversitiesPress,2015. 3. Manoel Carlos Ramon, “Intel Galileo and Intel Galileo Gen 2: API Features and ArduinoProjectsforLinuxProgrammers”,Apress,2014. 4. KarlPover,“LearningQlikviewDataVisualization”,Packt, 2013. 5. Rajkumar Buyya, Amir Vahid Dastjerdi, “Internet of Things: Principles and Paradigms”,Elsevier,2016.			

CO and PO Mapping

S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.		
2.		
3.		
4.		
5.		

PO and PSO mapping with level of strength for Course Name (Course Code)

	Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	PSO5
	CO 1																	
	CO 2																	
	CO 3																	
	CO 4																	
	CO 5																	

COURSE : DEEP LEARNING AND WEB

1	**Department/Centre proposing the course**	Computer Science & Engineering
2	**Course Title** (<45 characters)	Deep Learning
3	**L-T-P Structure**	3-0-0
4	**Credit**	3
5	**Course number**	
6	**Status (UG/PG)** (Category for program)	PG

7	**Pre-requisites** (course no./title)	**Knowldege of Neural Network, MATLAB, PYTHON**

8	**Status vis-à-vis other courses**(givecourse number/title)	
8.1	Overlap with any UG/PG course of the Dept./Centre	
8.2	Overlap with any UG/PG course of other Dept./Centre	
8.3	Supercedes any existing course	

9	**Not allowed for** (indicate program names)	

10	**Frequency of offering** **a) Every semester, b) first semester, c) second semester , d) Either Semester**	

11	**Faculty who will teach the course**	
12	**Will the course require any visiting faculty?**	

13	**Course objective** (about 50 words) : To acquire knowledge on the basics of Deep learning neural network. To implement neural network using computational tools for variety of problems. To know the importance of the qualitative data, get insights and techniques. To know the principles, tools and methods of web intelligence. To apply analytics for business situation.

14	**Course contents**(about 150 words) (include laboratory/design activities) : In this course student will learn different algorithm for simulating deep learning algorithm. Define train and use a deep Neural Network for solving real world problems that require artificial intelligence based solutions. In this course student will also learn the concepts and techniques related to web analytics. Exploration of various parameter used for web analytics and their impact. Can use various tools and techniques for web analytics.

15. Lecture Outline (with topics and number of lectures)

Module No.	Topic	No of hours
1	Basics of Deep leaning- Deep learning architectures: Convolutional Neural Networks : Neurons in Human Vision-The Shortcomings of Feature Selection-Vanilla Deep Neural Networks Don't Scale-Filters and Feature Maps-Full Description of the Convolutional Layer-Max Pooling-Full Architectural Description of Convolution Networks-Closing the Loop on MNIST with Convolutional Networks-Image Preprocessing Pipelines Enable More Robust Models-Accelerating Training with Batch Normalization-Building a Convolutional Network for CIFAR-10-Visualizing Learning in Convolutional Networks.	**7**
2	Memory Augmented Neural Networks : Neural Turing Machines-Attention-Based Memory Access-NTM Memory Addressing Mechanisms-Differentiable Neural Computers-Interference-Free Writing in DNCs-DNC Memory Reuse-Temporal Linking of DNC. Reinforcement Learning: Deep Reinforcement Learning Masters Atari GamesWhat Is Reinforcement Learning?-Markov Decision Processes (MDP)-Explore Versus Exploit-Policy versus Value Learning-Pole-Cart with Policy Gradients-Q-Learning and DeepQ-Networks	**7**
3	Web Analytics – Basics – Traditional Ways – Expectations – Data Collection – Clickstream Data – Weblogs – Beacons – JavaScript Tags – Packet Sniffing – Outcomesdata–Competitivedata–SearchEngineData. Qualitative Analysis – Customer Centricity – Site Visits – Surveys – Questionnaires – Website Surveys – Post visits – Creating and Running- Benefits of surveys – Critical componentsofsuccessfulstrategy.	**7**
4	Web Analytic concepts – URLS – Cookies – Time on site – Page views – Understand standard reports – Website content quality – Navigation reports (top pages, top destinations, site overlay). – Search Analytics – Internal search, SEO and PPC – Measuring Email and Multichannel Marketing - Competitive intelligence and Web 2.0 Analytics–Segmentation–Connectablereports.	**7**

5	Qualitative Analysis – Customer Centricity – Site Visits – Surveys – Questionnaires – Website Surveys – Post visits – Creating and Running- Benefits of surveys – Critical componentsofsuccessfulstrategy. Web Analytic concepts – URLS – Cookies – Time on site – Page views – Understand standard reports – Website content quality – Navigation reports (top pages, top destinations, site overlay). – Search Analytics – Internal search, SEO and PPC. Google Analytics: Analytics - Cookies - Accounts vs Property - Tracking Code Tracking Unique Visitors - Demographics - Page Views & Bounce Rate Acquisitions CustomReporting.	
COURSE TOTAL (14 TIMES 'L')		

16. Brief description of tutorial activities

17. Brief description of laboratory activities

Module No.	Topic	No of hours
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
COURSE TOTAL (14 TIMES 'P')		

18. Suggested texts and reference materials

(STYLE:Author name and initials, Title, Edition, Publisher, Year

1. Phil Kim, "MATLAB Deep Learning: With Machine Learning, Neural Networks and Artificial Intelligence", First Edition , Apress, 2017.
2. Nikhil Buduma, Nicholas Locascio, "Fundamentals of Deep Learning: Designing Next-GenerationMachineIntelligenceAlgorithms",O'ReillyMedia,2017.
3. Avinash Kaushik, "Web Analytics 2.0: The Art of Online Accountability and ScienceOfCustomerCentricity",1stedition,Sybex,2009.
4. Michael Beasley, "Practical Web Analytics for User Experience: How Analytics canhelpyouUnderstandyourUsers",MorganKaufmann,2013.

5. Bing Liu, “Web Data Mining: Exploring Hyperlinks, Content, and Usage Data”, 2nd Edition,Springer,2011.
6. JustinCutroni,“GoogleAnalytics”,O’Reilly,2010. 6. Eric Fettman, Shiraz Asif, Feras Alhlou , “Google Analytics Breakthrough”, John Wiley&sons,2016.

19. Recourses required for the course (Itemized & students accessrequirements, if any)

19.1		
19.2		
19.3		
19.4		
19.5		
19.6		
19.7		

20. Design content of the course (Percent of students time with examples, if any)

20.1		
20.2		
20.3		
20.4		
20.5		