COURSE HAND-OUT

B.TECH. - SEMESTER VIII

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

RAJAGIRI SCHOOL OF ENGINEERING AND TECHNOLOGY (RSET)

VISION

TO EVOLVE INTO A PREMIER TECHNOLOGICAL AND RESEARCH INSTITUTION, MOULDING EMINENT PROFESSIONALS WITH CREATIVE MINDS, INNOVATIVE IDEAS AND SOUND PRACTICAL SKILL, AND TO SHAPE A FUTURE WHERE TECHNOLOGY WORKS FOR THE ENRICHMENT OF MANKIND

MISSION

TO IMPART STATE-OF-THE-ART KNOWLEDGE TO INDIVIDUALS IN VARIOUS TECHNOLOGICAL DISCIPLINES AND TO INCULCATE IN THEM A HIGH DEGREE OF SOCIAL CONSCIOUSNESS AND HUMAN VALUES, THEREBY ENABLING THEM TO FACE THE CHALLENGES OF LIFE WITH COURAGE AND CONVICTION

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (CSE), RSET

VISION

TO BECOME A CENTRE OF EXCELLENCE IN COMPUTER SCIENCE & ENGINEERING, MOULDING PROFESSIONALS CATERING TO THE RESEARCH AND PROFESSIONAL NEEDS OF NATIONAL AND INTERNATIONAL ORGANIZATIONS.

MISSION

TO INSPIRE AND NURTURE STUDENTS, WITH UP-TO-DATE KNOWLEDGE IN COMPUTER SCIENCE & ENGINEERING, ETHICS, TEAM SPIRIT, LEADERSHIP ABILITIES, INNOVATION AND CREATIVITY TO COME OUT WITH SOLUTIONS MEETING THE SOCIETAL NEEDS.

B.TECH PROGRAMME

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

1. Graduates shall have up-to-date knowledge in Computer Science & Engineering along with interdisciplinary and broad knowledge on mathematics, science, management and allied engineering to become computer professionals, scientists and researchers.

2. Graduates shall excel in analysing, designing and solving engineering problems and have life-long learning skills, to develop computer applications and systems, resulting in the betterment of the society.

3. Graduates shall nurture team spirit, ethics, social values, skills on communication and leadership, enabling them to become leaders, entrepreneurs and social reformers.

PROGRAMME OUTCOMES (POs)

Graduates will be able to achieve

a. An ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modelling and design of computer-based systems.

b. An ability to identify, analyse, formulate and solve technical problems by applying principles of computing and mathematics relevant to the problem.

c. An ability to define the computing requirements for a technical problem and to design, implement and evaluate a computer-based system, process or program to meet desired needs.

d. An ability to learn current techniques, skills and modern engineering tools necessary for computing practice.

e. An ability to carry out experiments, analyse results and to make necessary conclusions.

f. An ability to take up multidisciplinary projects and to carry out it as per industry standards.

g. An ability to take up research problems and apply computer science principles to solve them leading to publications.

h. An ability to understand and apply engineering solutions in a global and social context.

i. An ability to understand and practice professional, ethical, legal, and social responsibilities as a matured citizen.

j. An ability to communicate effectively, both written and oral, with a range of audiences.

k. An ability to engage in life-long learning and to engage in continuing professional development.

l. An ability to cultivate team spirit and to develop leadership skills thereby moulding future entrepreneurs.

INDEX

SCHEME: B.TECH. 8TH SEMESTER
(Computer Science & Engineering)

Kerala Technological University Revised Scheme for B.Tech. Syllabus Revision 2015

Course Code	Course Name	L-T-P	Credits	Exam Slot
CS402	Data Mining and Ware Housing	3-0-0	3	A
CS404	Embedded Systems	3-0-0	3	B
	Elective 4	3-0-0	3	C
	Elective 5 (Non Departmental)	3-0-0	3	D
CS492	Project	0-1-4	6	S

Total Credits = 18 Hours: 30

Cumulative Credits= 180

CS402 Data Mining and Ware Housing

COURSE INFORMATION SHEET

PROGRAMME: COMPUTER SCIENCE AND ENGINEERING	DEGREE: **BTECH (JANUARY- MAY 2019)**
COURSE: DATA MINING AND WAREHOUSING	SEMESTER: **VIII** CREDITS: **3**
COURSE CODE: **CS402** REGULATION:**2016**	COURSE TYPE:**CORE**
COURSEAREA/DOMAIN: DATA SCIENCE	CONTACT HOURS: **3 hours/week.**
CORRESPONDING LAB COURSE CODE (IF ANY):NIL	LAB COURSE NAME:NIL

SYLLABUS:

MODULE	DETAILS	HOURS
I	Data Mining:- Concepts and Applications, Data Mining Stages, Data Mining Models, Data Warehousing (DWH) and On-Line Analytical Processing (OLAP), Need for Data Warehousing, Challenges, Application of Data Mining Principles, OLTP Vs DWH, Applications of DWH	6
II	Data Preprocessing: Data Preprocessing Concepts, Data Cleaning, Data integration and transformation, Data Reduction, Discretization and concept hierarchy.	6
III	Classification Models: Introduction to Classification and Prediction, Issues regarding classification and prediction, Decision Tree- ID3, C4.5, Naive Bayes Classifier.	6
IV	Rule based classification- 1R. Neural Networks-Back propagation. Support Vector Machines, Lazy Learners-K Nearest Neighbor Classifier. Accuracy and error Measures- evaluation. Prediction:-Linear Regression and Non-Linear Regression.	6
V	Association Rules Mining: Concepts, Apriori and FP-Growth Algorithm. Cluster Analysis: Introduction, Concepts, Types of data in cluster analysis, Categorization of clustering methods. Partitioning method: K-Means and K-Medoid Clustering.	8
VI	Hierarchical Clustering method: BIRCH. Density-Based Clustering –DBSCAN and OPTICS. Advanced Data Mining Techniques: Introduction, Web Mining-Web Content Mining, Web Structure Mining, Web Usage Mining. Text Mining. Graph mining:- Apriori based approach for mining frequent subgraphs. Social Network Analysis:- characteristics of social networks. Link mining:- Tasks and challenges.	7
	TOTAL HOURS	**40**

TEXT/REFERENCE BOOKS:

T/R	BOOK TITLE/AUTHORS/PUBLICATION
T	Dunham M H, "Data Mining: Introductory and Advanced Topics", Pearson Education, New

	Delhi, 2003. 2015	
T	Jaiwei Han and Micheline Kamber, "Data Mining Concepts and Techniques", Elsevier, 2006	
R	M Sudeep Elayidom, "Data Mining and Warehousing", 1st Edition, 2015, Cengage Learning India Pvt. Ltd.	
R	Mehmed Kantardzic, "Data Mining Concepts, Methods and Algorithms", John Wiley and Sons, USA, 2003.	
R	Pang-Ning Tan and Michael Steinbach, "Introduction to Data Mining", Addison Wesley, 2006	

COURSE PRE-REQUISITES:

C.CODE	COURSE NAME	DESCRIPTION	SEM
CS208	Database Management System	Basic knowledge of different types of databases	**4**

COURSE OBJECTIVES:

1	To introduce the concepts of data Mining and its applications
2	To understand investigation of data using practical data mining tool.
3	To introduce Association Rules Mining.
4	To introduce advanced Data Mining

COURSE OUTCOMES:

Sl No	DESCRIPTION	Blooms' Taxonomy Level
CS402.1	Identify the key process of Data mining and Warehousing	LEVEL 1
CS402.2	Apply appropriate techniques to convert raw data into suitable format for practical data mining tasks	LEVEL 3
CS402.3	Analyze and compare various classification algorithms and apply in appropriate domain	LEVEL 4 LEVEL 5
CS402.4	Evaluate the performance of various classification methods using performance metrics	LEVEL 5
CS402.5	Make use of the concept of association rule mining in real world scenario	LEVEL 6
CS402.6	Select appropriate clustering and algorithms for various applications	LEVEL 1

CS402.7	extend data mining methods to the new domains of data	LEVEL 6

CO-PO AND CO-PSO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CS402.1	3	2	_	_	_	_	_	_	_	_	_	_	1	_	_
CS402.2	3	2	_	_	2	_	_	_	_	_	_		_	2	_
CS402.3	_	3	2	1	_	_	_	_	_	_	_	_	_	_	1
CS402.4	_	3		2		_	_	_	_	_	_	_	_	_	3
CS402.5	1	_	2	_	2	3	_	_	_	_	_	_	_	_	3
CS402.6	1	3	_	2	_	_	3	_	_	_	_	_	_	_	3
CS402.7	_	_	3	_	_	_	_	_	_	_	_	_	_	2	3

GAPS IN THE SYLLABUS - TO MEET INDUSTRY/PROFESSION REQUIREMENTS:

SLNO	DESCRIPTION	PROPOSED ACTIONS	
1	Practical sessions on R Studio	Workshops	
2	Data Visualization	Tutorial	

PROPOSED ACTIONS: TOPICS BEYOND SYLLABUS/ASSIGNMENT/NPTEL ETC

JUSTIFICATIONS FOR CO-PO MAPPING

MAPPING	LOW/MEDIUM/HIGH	JUSTIFICATION
CS402.1 PO1	H	The students will be able to gain a thorough understanding of the concepts of Data mining and warehousing
CS402.1 PO2	M	The students will get an insight into concepts of Data mining and warehousing and they would be able to apply these practices in data science projects.
CS402.1 PSO1	L	With the knowledge of Data mining and warehousing, the students will be able to identify, analyze and design solutions for complex engineering problems in multidisciplinary areas by understanding the core principles and concepts of OOP.
CS402.2 PO1	H	Applying appropriate techniques for data coversion, will enable the students to gain a thorough understanding of the concepts of Data mining and warehousing
CS402.2 PO2	M	The students will get an insight into various data conversion techniques and they would be able to apply these practices in real data science problems while applying appropriate techniques for data coversion,
CS402.2 PO5	M	Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the

			limitations.
CS402.2 PSO2	M		The ability to acquire programming efficiency by designing algorithms and applying standard practices in software project development to deliver quality software products meeting the demands of the industry, practicing the various data conversion techniques.
CS402.3 PO2	H		Analyzing and comparing various classification algorithms and applying in appropriate domain will make students to Identify, formulate, review research literature, and analyze complex engineering problems.
CS402.3 PO3	M		Designing solutions for complex engineering problems and design system components or processes that meet the specified needs will be done while applying various classification algorithms in appropriate domain.
CS402.3 PO4	L		Students use research-based knowledge including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions by comparing various classification algorithms and applying in appropriate domain.
CS402.3 PSO3	L		The students will be able to develop ability to apply the fundamentals of computer science in competitive research, by comparing various classification algorithms and applying them in appropriate domain.
CS402.4 PO2	H		Evaluation of various classification algorithms will make students to Identify, formulate, review research literature, and analyze complex engineering problems.
CS402.4 PO4	M		Students use research-based knowledge including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions by evaluating various classification algorithms.
CS402.4 PSO3	H		Efficient evaluation of classification methods, will enable the students to apply the fundamentals of computer science in competitive research and to develop an efficient data product or service.
CS402.5 PO1	L		Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems like association rule mining in real world scenario.
CS402.5 PO3	M		The students will be able to identify, analyze and design solutions for complex engineering problems in multidisciplinary areas by implementing association rule mining in real world scenario.
CS402.5 PO5	M		Students will create, select, and apply appropriate techniques, resources, and modern engineering and IT tools to implement association rule mining in real world scenario.
CS402.5 PO6	H		Application of Association rule mining in real world scenario, will enable the students to perform reasoning informed by the contextual knowledge.

Department of CSE, RSET

CS402.5 PSO3	H	Application of Association rule mining in real world scenario methods, will enable the students to apply the fundamentals of computer science in competitive research and to develop an efficient data product or service.
CS402.6 PO1	L	Apply the knowledge of mathematics, science, engineering fundamentals, to select the various clustering algorithms for various applications.
CS402.6 PO2	H	Selection of various clustering algorithms will make students to Identify, formulate, review research literature, and analyze complex engineering problems.
CS402.6 PO4	M	Students use research-based knowledge including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions by selecting appropriate clustering algorithms for various applications.
CS402.6 PO7	H	Selection of appropriate clustering algorithms for various applications will lead the student to understand the impact of the professional engineering solutions in societal and environmental contexts.
CS402.5 PSO3	H	Selection of appropriate clustering algorithms for various applications, will enable the students to apply the fundamentals of computer science in competitive research and to develop an efficient data product or service.
CS402.7 PO3	H	The students will be able to identify, analyze and design solutions for complex engineering problems in multidisciplinary areas by extending data mining methods to new domains of data..
CS402.7 PSO2	M	Extension of data mining methods to new domains of data will make students to Identify, formulate, review research literature, and analyze complex engineering problems.
CS402.7 PSO3	H	Extension of data mining methods to new domains of data, will enable the students to apply the fundamentals of computer science in competitive research and to develop an efficient data product or service.

TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN:

SLNO	DESCRIPTION	PROPOSED ACTIONS	PO Mapping
1	Mining tools like weka	Tutorial	PO5
2	Mining tools in Mathlab	Tutorial	PO5
3	Open source Mining tools	Assignment	PO5

WEB SOURCE REFERENCES:

1	http://en.wikipedia.org/wiki/Weka_%28machine_learning%29

2	http://www.siliconafrica.com/the-best-data-minning-tools-you-can-use-for-free-in-your-company/
3	www.weka.net.nz
4	https://www.coursera.org/learn/datasciencemathskills
5	https://onlinecourses.nptel.ac.in/noc18_cs14

DELIVERY/INSTRUCTIONAL METHODOLOGIES:

☑CHALK & TALK	☑ STUD. ASSIGNMENT	☑ WEB RESOURCES	☑ LCD/SMART BOARDS
☑ STUD. SEMINARS	☑ ADD-ON COURSES		

ASSESSMENT METHODOLOGIES-DIRECT

☑ ASSIGNMENTS	☑ STUD. SEMINARS	☑ TESTS/MODEL EXAMS	☑ UNIV. EXAMINATION
☐ STUD. LAB PRACTICES	☐ STUD. VIVA	☑ MINI/MAJOR PROJECTS	☐ CERTIFICATIONS
☐ ADD-ON COURSES	☐ OTHERS		

ASSESSMENT METHODOLOGIES-INDIRECT

☑ ASSESSMENT OF COURSE OUTCOMES (BY FEEDBACK, ONCE)	☑ STUDENT FEEDBACK ON FACULTY (TWICE)
☑ ASSESSMENT OF MINI/MAJOR PROJECTS BY EXT. EXPERTS	☐ OTHERS

Prepared by   **Approved by**
Ms. Anjusree V.K/ Ms.Sreedevi T R/Mr.Ajith S   **Dr. Sminu Izudheen**
(Faculty)   **(HOD)**

CS404 Embedded Systems

COURSE INFORMATION SHEET

PROGRAMME: **COMPUTER SCIENCE AND ENGINEERING**	DEGREE: BTECH
COURSE: **EMBEDDED SYSTEMS**	SEMESTER: VIII CREDITS: 3
COURSE CODE: **CS404** REGULATION: 2016	COURSE TYPE: **CORE**
COURSE AREA/DOMAIN: System Design	CONTACT HOURS: **4 hours/Week.**
CORRESPONDING LAB COURSE CODE (IF ANY): N.A	LAB COURSE NAME: N.A

SYLLABUS:

UNIT	DETAILS	HOURS
I	Fundamentals of Embedded Systems- complex systems and microprocessors- Embedded system design process .Specifications- architecture design of embedded system design of hardware and software components- structural and behavioural description	6
II	Hardware Software Co-Design and Program Modelling −Fundamental Issues, Computational Models- Data Flow Graph, Control Data Flow Graph, State Machine,. Sequential Model, Concurrent Model, Object oriented model, UML	9
III	Design and Development of Embedded Product − Firmware Design and Development − Design Approaches, Firmware Development Languages.	6
IV	Integration and Testing of Embedded Hardware and Firmware- Integration of Hardware and Firmware. Embedded System Development Environment − IDEs, Cross Compilers, Disassemblers, Decompilers, Simulators, Emulators and Debuggers.	6
V	RTOS based Design − Basic operating system services. Interrupt handling in RTOS environment. Design Principles. Task scheduling models. How to Choose an RTOS. Case Study − MicroC/OS-II.	9
VI	Networks − Distributed Embedded Architectures, Networks for embedded systems, Network based design, Internet enabled systems. Embedded Product Development Life Cycle − Description − Objectives -Phases − Approaches1. Recent Trends in Embedded Computing.	6
	TOTAL HOURS	42

TEXT/REFERENCE BOOKS:

T/R	BOOK TITLE/AUTHORS/PUBLICATION
R	J Staunstrup and Wayne Wolf, Hardware / Software Co-Design: Principles and Practice, Prentice Hall.
R	Jean J. Labrose, Micro C/OS II: The Real Time Kernel, 2e, CRC Press, 2002.
R	Raj Kamal, Embedded Systems: Architecture, Programming and Design, Third

R	Edition, McGraw Hill Education (India), 2014.
R	Shibu K.V., Introduction to Embedded Systems, McGraw Hill Education (India), 2009.
R	Steave Heath, Embedded System Design, Second Edition, Elsevier. Wayne Wolf , Computers as Components-Principles of Embedded Computer System Design, Morgan Kaufmann publishers, Third edition, 2012.

COURSE PRE-REQUISITES:

C.CODE	COURSE NAME	DESCRIPTION	SEM
	NIL		

COURSE OBJECTIVES:

1	To introduce the technologies behind embedded computing systems.
2	To introduce and discuss various software components involved in embedded system design and development.
3.	To expose students to the recent trends in embedded system design.

COURSE OUTCOMES:

Students will be able to

CS404.1	demonstrate the role of individual components involved in a typical embedded system. (LEVEL 3)
CS404.2	analyze the characteristics of different computing elements and select the most appropriate one for an embedded system.(LEVEL 4)
CS404.3	model the operation of a given embedded system. (LEVEL 4)
CS404.4	substantiate the role of different software modules in the development of an embedded system.(LEVEL 4)
CS404.5	develop simple tasks to run on an RTOS. (LEVEL 5)
CS404.6	examine the latest trends prevalent in embedded system design.(LEVEL 4)

CO-PO AND CO-PSO MAPPING

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	P0 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CS404.1	3	3	2	1	2	2	2	-	-	2	-	3	2	3	2
CS404.2	3	3	3	2	3	2	2	-	-	2	-	3	3	3	2
CS404.3	3	3	3	2	3	2	2	-	-	3	-	3	3	3	2
CS404.4	2	2	2	2	2	2	2	-	-	3	-	3	2	3	2
CS404.5	3	3	3	3	2	2	2	-	-	2	-	2	2	2	2
CS404.6	2	2	2	2	2	2	2	-	-	2	-	2	2	2	2

CS404(ov erall level)	3	3	2	2	2	2	2	-	-	2	-	3	2	3	2

JUSTIFICATIONS FOR CO-PO MAPPING

Mapping	LOW/MEDIUM/HIGH	Justification
C404.1-PO1	H	The knowledge in different embedded systems components helps in designing solutions for complex engineering problems.
C404.1-PO2	H	The knowledge in different embedded systems components helps in analysis of performance of solutions to complex problems
C404.1-PO3	M	The knowledge in different embedded systems components help in designing solutions and analyzing its complexity.
C404.1-PO4	L	This knowledge helps to identify the best embedded component.
C404.1-PO5	M	This knowledge helps in identifying the best tools needed to develop the embedded system
C404.1-PO6	M	This knowledge helps us to use effective engineering practices such as requirement gathering and specification etc. before choosing the best components for embedded system.
C404.1-PO7	M	This knowledge helps as to do research in different embedded component effectively.
C404.1-PO10	M	This knowledge helps to communicate our ideas and suggestion in a more effective manner to the community.
C404.1-PO12	H	These concepts are fundamental to CS and can be used in research and other innovative ideas.
C404.1-PSO1	M	The knowledge in different components in embedded system can be applied to design solutions to complex engineering problems in multidisciplinary areas. They belong to the core concepts of CS.
C404.1-PSO2	H	The knowledge of embedded system can be used to have products of industry standard
C404.1-PSO3	M	The knowledge of embedded system helps in research areas such as designing & developing different embedded products etc.
C404.2-PO1	H	The knowledge in different embedded systems components helps in designing solutions for complex engineering problems.
C404.2-PO2	H	The knowledge in different embedded systems components helps in analysis of performance of solutions to complex problems
C404.2-PO3	H	The knowledge in different embedded systems components help in designing solutions and analyzing its complexity.
C404.2-PO4	M	This knowledge helps to identify the best embedded component.
C404.2-PO5	H	This knowledge helps in identifying the best tools needed to develop the embedded system
C404.2-PO6	M	This knowledge helps us to use effective engineering practices such as requirement gathering and specification etc. before choosing the best components for embedded system.

C404.2-PO7	M	This knowledge helps as to do research in different embedded component effectively.
C404.2-PO10	M	This knowledge helps to communicate our ideas and suggestion in a more effective manner to the community.
C404.2-PO12	H	These concepts are fundamental to CS and can be used in research and other innovative ideas.
C404.2-PSO1	H	The knowledge in different components in embedded system can be applied to design solutions to complex engineering problems in multidisciplinary areas. They belong to the core concepts of CS.
C404.2-PSO2	H	The knowledge of embedded system can be used to have products of industry standard
C404.2-PSO3	M	The knowledge of embedded system helps in research areas such as designing & developing different embedded products etc.
C404.3-PO1	H	The knowledge in different embedded systems components helps in designing solutions for complex engineering problems.
C404.3-PO2	H	The knowledge in different embedded systems components helps in analysis of performance of solutions to complex problems
C404.3-PO3	H	The knowledge in different embedded systems components help in designing solutions and analyzing its complexity.
C404.3-PO4	M	This knowledge helps to identify the best embedded component.
C404.3-PO5	H	This knowledge helps in identifying the best tools needed to develop the embedded system
C404.3-PO6	M	This knowledge helps us to use effective engineering practices such as requirement gathering and specification etc. before choosing the best components for embedded system.
C404.3-PO7	M	This knowledge helps as to do research in different embedded component effectively.
C404.3-PO10	H	This knowledge helps to communicate our ideas and suggestion in a more effective manner to the community.
C404.3-PO12	H	These concepts are fundamental to CS and can be used in research and other innovative ideas.
C404.3-PSO1	H	The knowledge in different components in embedded system can be applied to design solutions to complex engineering problems in multidisciplinary areas. They belong to the core concepts of CS.
C404.3-PSO2	H	The knowledge of embedded system can be used to have products of industry standard
C404.3-PSO3	M	The knowledge of embedded system helps in research areas such as designing & developing different embedded products etc.
C404.4-PO1	M	The knowledge in different embedded systems components helps in designing solutions for complex engineering problems.
C404.4-PO2	M	The knowledge in different embedded systems components helps in analysis of performance of solutions to complex problems
C404.4-PO3	M	The knowledge in different embedded systems components help in designing solutions and analyzing its complexity.
C404.4-PO4	M	This knowledge helps to identify the best embedded component.
C404.4-PO5	M	This knowledge helps in identifying the best tools needed to

		develop the embedded system
C404.4-PO6	M	This knowledge helps us to use effective engineering practices such as requirement gathering and specification etc. before choosing the best components for embedded system.
C404.4-PO7	M	This knowledge helps as to do research in different embedded component effectively.
C404.4-PO10	H	This knowledge helps to communicate our ideas and suggestion in a more effective manner to the community.
C404.4-PO12	H	These concepts are fundamental to CS and can be used in research and other innovative ideas.
C404.4-PSO1	M	The knowledge in different components in embedded system can be applied to design solutions to complex engineering problems in multidisciplinary areas. They belong to the core concepts of CS.
C404.4-PSO2	H	The knowledge of embedded system can be used to have products of industry standard
C404.4-PSO3	M	The knowledge of embedded system helps in research areas such as designing & developing different embedded products etc.
C404.5-PO1	H	The knowledge in different embedded systems components helps in designing solutions for complex engineering problems.
C404.5-PO2	H	The knowledge in different embedded systems components helps in analysis of performance of solutions to complex problems
C404.5-PO3	H	The knowledge in different embedded systems components help in designing solutions and analyzing its complexity.
C404.5-PO4	H	This knowledge helps to identify the best embedded component.
C404.5-PO5	M	This knowledge helps in identifying the best tools needed to develop the embedded system
C404.5-PO6	M	This knowledge helps us to use effective engineering practices such as requirement gathering and specification etc. before choosing the best components for embedded system.
C404.5-PO7	M	This knowledge helps as to do research in different embedded component effectively.
C404.5-PO10	M	This knowledge helps to communicate our ideas and suggestion in a more effective manner to the community.
C404.5-PO12	M	These concepts are fundamental to CS and can be used in research and other innovative ideas.
C404.5-PSO1	M	The knowledge in different components in embedded system can be applied to design solutions to complex engineering problems in multidisciplinary areas. They belong to the core concepts of CS.
C404.5-PSO2	M	The knowledge of embedded system can be used to have products of industry standard
C404.5-PSO3	M	The knowledge of embedded system helps in research areas such as designing & developing different embedded products etc.
C404.6-PO1	M	The knowledge in different embedded systems components helps in designing solutions for complex engineering problems.
C404.6-PO2	M	The knowledge in different embedded systems components helps in analysis of performance of solutions to complex problems

C404.6-PO3	M	The knowledge in different embedded systems components help in designing solutions and analyzing its complexity.
C404.6-PO4	M	This knowledge helps to identify the best embedded component.
C404.6-PO5	M	This knowledge helps in identifying the best tools needed to develop the embedded system
C404.6-PO6	M	This knowledge helps us to use effective engineering practices such as requirement gathering and specification etc. before choosing the best components for embedded system.
C404.6-PO7	M	This knowledge helps as to do research in different embedded component effectively.
C404.6-PO10	M	This knowledge helps to communicate our ideas and suggestion in a more effective manner to the community.
C404.6-PO12	M	These concepts are fundamental to CS and can be used in research and other innovative ideas.
C404.6-PSO1	M	The knowledge in different components in embedded system can be applied to design solutions to complex engineering problems in multidisciplinary areas. They belong to the core concepts of CS.
C404.6-PSO2	M	The knowledge of embedded system can be used to have products of industry standard
C404.6-PSO3	M	The knowledge of embedded system helps in research areas such as designing & developing different embedded products etc.

GAPS IN THE SYLLABUS - TO MEET INDUSTRY/PROFESSIONAL REQUIREMENTS:

SNO	DESCRIPTION	PROPOSED ACTIONS
1	HARDWARE-SOFTWARE TRADEOFF	Learning materials provided

PROPOSED ACTIONS: TOPICS BEYOND SYLLABUS/ASSIGNMENT/INDUSTRY VISIT/GUEST LECTURER/NPTEL ETC

TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN:

1	Progamming using emebedded C	workshop

WEB SOURCE REFERENCES:

1	https://onlinecourses.nptel.ac.in/noc19_cs22/preview
2.	https://nptel.ac.in/noc/individual_course.php?id=noc18-cs12

DELIVERY/INSTRUCTIONAL METHODOLOGIES:

✓ CHALK & TALK	✓ STUD. ASSIGNMENT	✓ WEB RESOURCES	
✓ LCD/SMART BOARDS	STUD. SEMINARS	☐ ADD-ON COURSES	

ASSESSMENT METHODOLOGIES-DIRECT

✓ ASSIGNMENTS	☐ STUD. SEMINARS	✓ TESTS/MODEL EXAMS	✓ UNIV. EXAMINATION
STUD. LAB PRACTICES	✓ STUD. VIVA	☐ MINI/MAJOR PROJECTS	☐ CERTIFICATIONS
☐ ADD-ON COURSES	☐ OTHERS		

ASSESSMENT METHODOLOGIES-INDIRECT

✓ ASSESSMENT OF COURSE OUTCOMES (BY FEEDBACK, ONCE)	✓ STUDENT FEEDBACK ON FACULTY (TWICE)
☐ ASSESSMENT OF MINI/MAJOR PROJECTS BY EXT. EXPERTS	☐ OTHERS

Prepared by   **Approved by**

SANDY JOSEPH   **HOD**

UDAY BABU P

CS462 Fuzzy Set Theory and Applications

COURSE INFORMATION SHEET

PROGRAMME: ENGINEERING	DEGREE: B.TECH
COURSE- FUZZY SET THEORY AND APPLICATIONS	SEMESTER-1V CREDITS-4
COURSE CODE- CS462 Year of introduction - 2016	COURSE TYPE - ELECTIVE
COURSE AREA/DOMAIN- MATHEMATICS	CONTACT HOURS: 3-0-0
CORRESPONDING LAB COURSE CODE (IF ANY): NIL	LAB COURSE NAME: NA

SYLLABUS:

MODULE	DETAILS	HOURS
I	Classical sets vs Fuzzy Sets - Need for fuzzy sets - Definition and Mathematical representations - Level Sets - Fuzzy functions - Zadeh's Extension Principle.	6
II	Operations on [0,1] - Fuzzy negation, triangular norms, t-conorms, fuzzy implications, Aggregation Operations, Fuzzy Functional Equations	6
III	Fuzzy Binary and n-ary relations - composition of fuzzy relations - Fuzzy Equivalence Relations - Fuzzy Compatibility Relations - Fuzzy Relational Equations	7
IV	Fuzzy Measures - Evidence Theory - Necessity and Belief Measures - Probability Measures vs Possibility Measures	7
V	Fuzzy Decision Making - Fuzzy Relational Inference - Compositional Rule of Inference - Efficiency of Inference - Hierarchical	8
VI	Fuzzy If-Then Rule Base - Inference Engine - Takagi-Sugeno Fuzzy Systems - Function Approximation Applications *Advanced topics: Adaptive fuzzy inference systems: Adaptive networks - Architectures - Learning rules.* *Adaptive neuro-fuzzy inference systems (ANFIS) - Architectures - Hybrid learning rules.*	8

Total hours – 40

Text /Reference books

TEXT/REFERENCE BOOKS:

T/R	BOOK TITLE/AUTHORS/PUBLICATION
T	**Text Books:** 1. George J Klir and Bo Yuan, "*Fuzzy Sets and Fuzzy Logic : Theory and Applications*", 2. Timothy J. Ross, "Fuzzy Logic with Engineering Applications", 3rd Edition, Willey, 2010.
R	1. E P Klement, R Mesiar and E. Pap, Triangular norms, Kluwer Academic Press, Dordrecht, 2000.
R	2. H.J. Zimmermann, *Fuzzy Set Theory and its Applications*, Allied Publishers, New Delhi 1991.
R	3. Kevin M Passino and Stephen Yurkovich, *Fuzzy Control*, Addison Wesley Longman, 1998.
R	4. M Grabisch et al., *Aggregation Functions*, Series - Encyclopedia Of Mathematics And Its Applications, Cambridge University Press, 2009
R	5. Michal Baczynski and Balasubramaniam Jayaram, *Fuzzy Implications*, Springer Verlag, Heidelberg, 2008

Course Objectives

• To introduce the theory of fuzzy sets.
• To discuss theoretical differences between fuzzy sets and classical sets.
• To discuss fuzzy logic inference
• To introduce fuzzy arithmetic concepts.
• To discuss fuzzy inference applications in the area of control

.**Course Outcomes**

1	Students will be able to interpret fuzzy set theory and uncertainty concepts
2	Students will be able to identify the similarities and differences between probability theory and fuzzy set theory and their application conditions
3	Students will get the concept of fuzzy relations
4	Students are introduced to fuzzy logic
5	Students will be able to apply fuzzy set theory in modeling and analyzing uncertainty in a decision problem
6	Students will be able to apply fuzzy control by examining simple control problem examples

CO-PO AND CO-PSO MAPPING

	PO1	*PO2*	*PO3*	*PO4*	*PO5*	*PO6*	*PO7*	*PO8*	*PO9*	*PO10*	*PO11*	*PO12*	*PSO1*	*PSO2*	*PSO3*
C01	2	2	-	-	-	-	-	-	-	-	-	-	3	-	-
CO2		2	-	-	-	-	-	-	-	-	-	-	2	2	-
CO3	3	-	1	-	-	-	-	-	-	-	-	-	-	-	-
CO4	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO5	3	-		-	-	-	-	-	-	-	-	-	-	3	-
CO6	3	1	-	-	-	-	-	-	-	-	-	-	-	-	-

JUSTIFICATIONS FOR CO-PO MAPPING

MAPPING	*LOW/MEDIUM/ HIGH*	*JUSTIFICATION*
C01-PO1	M	Fundamental knowledge of fuzzy set theory and uncertainty concepts will help the students in analyzing and apply it in various engineering problems.
C01-PO2	M	Engineering problems can be formulated and analyze using the fuzzy set theory and uncertainty concepts.
CO2-PO2	M	Various complex Engineering problems can solved using the concept of probability theory and fuzzy set theory and their application conditions
CO3-PO1	H	Fundamental knowledge of fuzzy relations help the students in finding the solutions to complicated engineering problems.
CO3-PO3	L	Various composition rules are used in designing solutions to various engineering problems.
CO4-PO1	M	To understand the concept of Fuzzy logic and apply them to model fuzzy systems.
CO5-PO1	H	Use the fuzzy set theory to solve decision making problems
CO6-PO1	H	To use the concept of fuzzy control and their applications to solve control problems.
CO6-PO2	L	Fuzzy set theory and their applications help the students in identifying suitable solutions for complex engineering problems.

JUSTIFICATIONS FOR CO-PSO MAPPING

MAPPING	*LOW/MEDIUM/ HIGH*	*JUSTIFICATION*
CO1-PSO1	H	Students will use basic knowledge in mathematics in the domain of Fuzzy set theory and Fuzzy logic, to solve engineering problems.
CO1-PSO2	M	Principles of fuzzy logic operations are used in design of decision making models.
CO2-PSO1	M	The concepts of fuzzy relation and composition are used in solving various decision problems.
CO5-PSO2	H	Students will use concept of fuzzy sets to develop and implement new ideas on product design and analysis of fuzzy systems.

GAPS IN THE SYLLABUS- TO MEET INDUSTRY / PROFESSION

REQUIREMENT

Sl no	Description	Proposed actions	Relevance
1	Extension of fuzzy sets to algebraic structures.	Seminar	PO2, PO3

WEB SOURCES

WEB SOURCE REFERENCES:

1	https://www.thesisscientist.com/docs/Study%20Notes/66860129-5a91-459d-810f-54e0fc41175d
2	https://ocw.mit.edu/courses/health-sciences-and-technology/hst-951j-medical-decision-support-spring-2003/lecture-notes/lecture4.pdf
3	https://www.iitk.ac.in/eeold/archive/courses/2013/intel-info/d1pdf3.pdf
4	https://www.it.uu.se/edu/course/homepage/bild2/ht11/Lectures/Fuzzy_lecture.pdf
5	https://nptel.ac.in/courses/106105173/2
6	https://www.cse.iitb.ac.in/~cs621-2011/lectures_2009/cs621-lect38-fuzzy-logic-2009-11-11.ppt
7	https://www.scss.tcd.ie/khurshid.ahmad/Teaching/Lectures_on_Fuzzy_Logic/FuzzyLogicSystems.html

DELIVERY/INSTRUCTIONAL METHODOLOGIES:

□ CHALK & TALK	□ STUD. ASSIGNMENT	□ WEB RESOURCES	□LCD/SMART BOARDS
□ STUD. SEMINARS	□ ADD-ON COURSES		

ASSESSMENT METHODOLOGIES-DIRECT

□ ASSIGNMENTS	□ STUD. SEMINARS	□ TESTS/MODEL EXAMS	□ UNIV. EXAMINATION □
□ STUD. LAB PRACTICES	□ STUD. VIVA	□ MINI/MAJOR PROJECTS	□ CERTIFICATIONS
□ ADD-ON COURSES	□ OTHERS		

ASSESSMENT METHODOLOGIES-INDIRECT

□ ASSESSMENT OF COURSE OUTCOMES (BY FEEDBACK, ONCE)	□ STUDENT FEEDBACK ON FACULTY (TWICE)
□ ASSESSMENT OF MINI/MAJOR PROJECTS BY EXT. EXPERTS	□ OTHERS

Prepared by   **Approved by**
Dr.Ramkumar P.B   **Dr. Antony V Varghese**

CS464 Artificial Intelligence

COURSE INFORMATION SHEET

PROGRAMME: **COMPUTER SCIENCE & ENGINEERING**	DEGREE: **B TECH**
COURSE: **ARTIFICIAL INTELLIGENCE**	SEMESTER: **8** CREDITS: **3**
COURSE CODE: **CS464** REGULATION: **2016**	COURSE TYPE: **ELECTIVE**
COURSE AREA/DOMAIN:**MACHINE LEARNING**	CONTACT HOURS: **3**
CORRESPONDING LAB COURSE CODE (IF ANY): **NA**	LAB COURSE NAME:

SYLLABUS:

UNIT	DETAILS	HOURS
I	**Introduction**: What is AI, The foundations of AI, History and applications, Production systems. Structures and strategies for state space search. Informed and Uninformed searches.	5
II	**Search Methods:** data driven and goal driven search. Depth first and breadth first search, DFS with iterative deepening. Heuristic search-best first search, A * algorithm.AO* algorithm, Constraint Satisfaction. Crypt Arithmetic Problems	8
III	**AI representational schemes**- Semantic nets, conceptual dependency, scripts, frames, introduction to agent based problem solving, Machine learning-symbol based-a frame work for symbol based learning.	6
IV	**Advanced Search:** Heuristics in Games, Design of good heuristic-an example. Min-Max Search Procedure, Alpha Beta pruning,	6
V	**Learning Concepts:** Version space search. Back propagation learning. Social and emergent models of learning-genetic algorithm, classifier systems and genetic programming.	9
VI	**Expert Systems:** rule based expert systems. Natural language processing-natural language understanding problem, deconstructing language. Syntax stochastic tools for language analysis, natural language applications	9
	TOTAL HOURS	43

TEXT/REFERENCE BOOKS:

T/R	BOOK TITLE/AUTHORS/PUBLICATION

T1	E Rich, K Knight, Artificial Intelligence, 3/e, Tata McGraw Hil, 2009.
T2	George.F.Luger, Artificial Intelligence- Structures and Strategies for Complex Problem Solving, 4/e, Pearson Education. 2002.
R1	D. Poole and A. Mackworth. Artificial Intelligence: Foundations of Computational Agents, Cambridge University Press, 2010
R2	Dan W Patterson, Introduction to Artificial Intelligence,Pearson,2009
R3	Deepak Khemeni,A First course in Artificial Intelligence,Tata McGraw Hill,2013
R4	Maja J. Mataric ,Robotics Primer,MIT press,2007
R5	Patrick Henry Winston,Artificial intelligence,Addisson wessley,1992
R6	Stefan Edelkamp, Stefan Schroedl, Heuristic Search: Theory and Applications, Morgan Kaufman, 2011.
R7	Stuart Jonathan Russell, Peter Norvig, Artificial intelligence, A modern approach,3rd edition, pearson,2010

COURSE OBJECTIVES:

1	To introduce basic principles that drive complex real world intelligence applications.
2	To introduce and discuss the basic concepts of AI Techniques and Learning
3	

COURSE OUTCOMES:

SNO	DESCRIPTION	Bloom's Taxonomy Level
469.1	The Student will be able to identify the scope and limits of the artificial intelligence (AI) field	Identify(Level 1)
469.2	The Student will be able to assess the applicability, strengths, and weaknesses of the basic knowledge representation	Assess(Level 6)
469.3	The Student will be able to interpret the role of knowledge representation, problem solving, and learning	Interpret(Level 2)
469.4	The Student will be able to explain various search algorithms (uninformed, informed, and heuristic) for problem solving	explain(Level 2)
469.5	The Student will be able to comprehend the fundamentals of Natural Language Processing	comprehend(Level 2)

CO-PO AND CO-PSO MAPPING

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	P0 10	PO 11	PO 12	PSO 1	PS 02	PSO3
CS464.1	3	3	3	3	-	-	-	-	-	-	-	-	3	-	-
CS464.2	2	-	2	2	-	2	-	-	-	-	-	-	2	-	-
CS464.3	2	-	2	2	-	2	-	-	-	-	-	-	2	-	-
CS464.4	2	2	2	-	-	-	-	-	-	-	-	-	2	-	-
CS464.5	-	2	2	2	-	2	-	-	-	-	-	-	2	-	-

LOW/MEDIUM/HIGH→1/2/3

JUSTIFICATIONS FOR CO-PO MAPPING

Mapping	LOW/MEDIUM/ HIGH	Justification
CS464.1-PO1	H	By knowing the scope and limits of AI Students can identify the solvable and unsolvable problems..
CS464.1-PO2	H	With suitable state space representation complex engineering problems can be solved easily.
CS464.1-PO3	H	By knowing the scope and limits of AI students can develop creative solutions for problems.
CS464.1-PSO1	H	Students can identify, analyze and design complex engineering problems by knowing the basic concepts of AI.
CS464.2/3-PO1	M	Students can apply knowledge of mathematics and engineering fundamentals to strengthen AI knowledge representations.
CS464.2/3-PO3	M	Good knowledge representation helps to design/develop solutions in better ways.
CS464.2/3-PO4	M	Different properties of knowledge representation help for better analysis and interpretation of data hence to provide valid conclusions.
CS464.2/3-PO6	M	Knowledge representations like semantic nets, conceptual dependency helps to asses societal, health, safety etc in systematic way.
CS464.2/3-PSO1	M	Good knowledge representation helps to make good solution to complex problems.
CS464.4-PO1	M	To implement search algorithm mathematical knowledge is needed
CS464.4-PO2	M	To reach substantiated conclusions to different problems ,students should have an idea about different search techniques.
CS464.4-PO3	M	Idea about heuristic type searching is required to develop optimal solutions.
CS464.4-PSO1	M	Idea about different search algorithms helps to design good solution for complex engineering problems.
CS464.5-PO2	M	Natural language understanding required for problem analysis.
CS464.5-PO3	M	Natural language understanding required to design solutions to problems.
CS464.5-PO4	M	I conduct investigation on problems idea about NLP is needed.
CS464.6-PO6	M	To apply reasoning informed by the contextual knowledge to asses societal needs student should have an idea about language processing.
CS464.5-PSO1	M	Natural Language understanding is required to anlyse and design solutions.

GAPS IN THE SYLLABUS - TO MEET INDUSTRY/PROFESSION REQUIREMENTS:

S. NO	DESCRIPTION	PROPOSED ACTIONS	PO MAPPING
1	Planning and learning methods	Reading assignment	2,3,4

PROPOSED ACTIONS: TOPICS BEYOND SYLLABUS/ASSIGNMENT/INDUSTRY VISIT/GUEST LECTURER/NPTEL ETC

TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN:

S. NO	TOPIC	PO MAPPING
1	Design of agents and intelligent Agents	3,4,5

WEB SOURCE REFERENCES:

1	http://code.google.com/p/aima-python/
2	http://www.aispace.org/mainTools.shtml
3	http://www.wiziq.com/tutorials/artificial-intelligence

DELIVERY/INSTRUCTIONAL METHODOLOGIES:

☑ CHALK & TALK	☑ STUD. ASSIGNMENT	☑ WEB RESOURCES	
☐ LCD/SMART BOARDS	☐ STUD. SEMINARS	☐ ADD-ON COURSES	

ASSESSMENT METHODOLOGIES-DIRECT

☑ ASSIGNMENTS	☐ STUD. SEMINARS	☑ TESTS/MODEL EXAMS	☑ UNIV. EXAMINATION
☑ STUD. LAB PRACTICES	☐ STUD. VIVA	☐ MINI/MAJOR PROJECTS	☐ CERTIFICATIONS
☐ ADD-ON COURSES	☐ OTHERS		

ASSESSMENT METHODOLOGIES-INDIRECT

☑ ASSESSMENT OF COURSE OUTCOMES (BY FEEDBACK, ONCE)	☑ STUDENT FEEDBACK ON FACULTY (ONCE)
☐ ASSESSMENT OF MINI/MAJOR PROJECTS BY EXT. EXPERTS	☐ OTHERS

Prepared by   **Approved by**

                                                                  Dr SMINU IZUDHEEN
MEERA M.   **(HOD)**

CS468 Cloud Computing

COURSE INFORMATION SHEET

PROGRAMME: **COMPUTER SCIENCE & ENGINEERING**	DEGREE: **B TECH**
COURSE: **CLOUD COMPUTING**	SEMESTER: **8** CREDITS: **3**
COURSE CODE: **CS468** REGULATION: **2016**	COURSE TYPE: **ELECTIVE**
COURSE AREA/DOMAIN:**CLOUD COMPUTING**	CONTACT HOURS: **3**
CORRESPONDING LAB COURSE CODE (IF ANY): **NA**	LAB COURSE NAME: **NA**

SYLLABUS:

UNIT	DETAILS	HOURS
I	**INTRODUCTION TO VIRTUALIZATION** Virtual Machines and Virtualization Middleware – Data Center Virtualization for Cloud Computing – Implementation Levels of Virtualization – Virtualization Structures/Tools and Mechanisms– Virtualization of CPU – Memory – I/O Devices	7
II	**INTRODUCTION TO CLOUD COMPUTING** System Models for Distributed and Cloud Computing – Software Environments for Distributed Systems and Clouds – Cloud Computing and Service Models – Public – Private – Hybrid Clouds – Infrastructure-as-a-Service (IaaS) – Platform-as-a-Service (PaaS) - Software-as-a-Service (SaaS)-Different Service Providers	8
III	**CLOUD ARCHITECTURE AND RESOURCE MANAGEMENT** Architectural Design of Compute and Storage Clouds – Public Cloud Platforms: GAE – AWS – Azure-Emerging Cloud Software Environments – Eucalyptus-Nimbus – Open Stack – Extended Cloud Computing Services – Resource Provisioning and Platform Deployment – Virtual Machine Creation and Management.	8
IV	**CLOUD PROGRAMMING** Parallel Computing and Programming Paradigms – Map Reduce –Twister – Iterative Map Reduce – Hadoop Library from Apache –Pig Latin High Level Languages- Mapping Applications to Parallel and Distributed Systems – Programming the Google App Engine – Google File System (GFS) – Big Table – Google's NOSQL System	7
V	**SECURITY IN THE CLOUD** Security Overview – Cloud Security Challenges – Security -as-a-Service – Security Governance – Risk Management – Security Monitoring – Security Architecture Design – Data Security –Application Security – Virtual Machine Security.	6
VI	**USING CLOUD SERVICES :** Email Communications – Collaborating on To-Do Lists –Contact Lists – Cloud Computing for the Community- Collaborating on Calendars – Schedules and Task Management – Exploring Online Scheduling Applications – Exploring Online Planning and Task Management – Collaborating on Event Management – Project Management -Word Processing – Databases	6
	TOTAL HOURS	42

TEXT/REFERENCE BOOKS:

T/R	BOOK TITLE/AUTHORS/PUBLICATION
T1	Kai Hwang , Geoffrey C Fox, Jack J Dongarra : Distributed and Cloud Computing – From Parallel Processing to the Internet of Things , Morgan Kaufmann Publishers – 2012.
R1	Alex Amies, Harm Sluiman, Qiang Guo Tong and Guo Ning Liu: Developing and Hosting Applications on the cloud, IBM Press, 2012.
R2	George Reese: Cloud Application Architectures: Building Applications and Infrastructure in the Cloud (Theory in Practice), O'Reilly Publications, 2009.
R3	Haley Beard: Cloud Computing Best Practices for Managing and Measuring Processes for On-demand Computing – applications and Data Centers in the Cloud with SLAs, Emereo Pty Limited, July 2008
R4	James E. Smith and Ravi Nair: Virtual Machines: Versatile Platforms for Systems and Processes, Morgan Kaufmann, ELSEVIER Publication, 2006.
R5	John W Rittinghouse and James F Ransome : Cloud Computing: Implementation – Management – and Security, CRC Press, 2010.
R6	Michael Miller: Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online, Pearson Education, 2009.
R7	Richard N. Katz: The Tower and The Cloud, Higher Education in the Age of Cloud Computing, 2008.
R8	Toby Velte, Anthony Velte and Robert Elsenpeter: Cloud Computing – A Practical Approach, TMH, 2009.

COURSE OBJECTIVES:

1	To impart the fundamentals of virtualization techniques.
2	To introduce concepts and security issues of cloud paradigm.
3	To introduce cloud computing based programming techniques and cloud services.

COURSE OUTCOMES:

SNO	DESCRIPTION	Bloom's Taxonomy Level
468.1	The students will be able to identify the significance of implementing virtualization techniques.	Identify (Level 2)
468.2	The students will able to interpret the various cloud computing models and services.	Interpret (Level 3)
468.3	The students will able to compare the various public cloud platforms and software environments.	Compare (Level 2)
468.4	The students will able to apply appropriate cloud programming methods to solve big data problems.	Apply (Level 3)
468.5	The students will able to appreciate the need of security mechanisms in cloud.	Appreciate (Level 4)
468.6	The students will be able to illustrate the use of various cloud services available online.	Illustrate (Level 2)

CO-PO AND CO-PSO MAPPING

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	P0 10	PO 11	PO 12	PSO 1	PS O2	PSO3
CS468.1	-	2	-	-	-	-	-	-	-	-	-	-	1	-	-
CS468.2	1	-	-	-	-	-	-	-	-	-	-	-	2	-	-
CS468.3	-	2	-	-	-	-	-	-	-	-	-	-	2	-	-
CS468.4	-	2	2	-	-	-	-	-	-	-	-	-	2	2	-
CS468.5	-	2	-	-	-	-	-	-	-	-	-	-	2	-	-
CS468.6	-	2	-	-	-	-	-	-	-	-	-	-	2	-	-
CS468	1	2	2	-	-	-	-	-	-	-	-	-	2	2	-

LOW/MEDIUM/HIGH→1/2/3

JUSTIFICATIONS FOR CO-PO MAPPING

Mapping	LOW/MEDIUM/ HIGH	Justification
CS468.1-PO2	M	Using basic concepts of computer engineering students can identify the concept of virtualization
CS468.2-PO1	L	Students can understand the various cloud computing models
CS468.3-PO2	M	Can compare and understand the various public cloud platforms available and also their corresponding software environment
CS468.4-PO2	M	Can analyze Big Data problems for developing potential solutions
CS468.4-PO3	M	Solutions can be developed for complex Big Data problems.
CS468.5-PO2	M	Appraise, correlate and conclude the need for Cloud Security mechanisms
CS468.6-PO2	M	Students can use the knowledge gained to work on various cloud applications

GAPS IN THE SYLLABUS - TO MEET INDUSTRY/PROFESSION REQUIREMENTS:

S. NO	DESCRIPTION	PROPOSED ACTIONS	PO MAPPING
1	Hands on workshop on Hadoop	Workshop	1,3,5
2	Cloud Implementation	Workshop	1,3,5

PROPOSED ACTIONS: TOPICS BEYOND SYLLABUS/ASSIGNMENT/INDUSTRY VISIT/GUEST LECTURER/NPTEL ETC

TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN:

S. NO	TOPIC	PO MAPPING
1	Performance of Cloud	1,2,3
2	Cloud for HPC and HTC	1,3,5

WEB SOURCE REFERENCES:

1	https://csrc.nist.gov/publications/detail/sp/800-145/final

2	https://docs.aws.amazon.com/index.html?nc2=h_ql_doc#lang/en_us
3	https://docs.microsoft.com/en-in/azure/
4	https://cloud.google.com/docs/

DELIVERY/INSTRUCTIONAL METHODOLOGIES:

☑ CHALK & TALK	☑ STUD. ASSIGNMENT	☑ WEB RESOURCES	
☐ LCD/SMART BOARDS	☐ STUD. SEMINARS	☑ ADD-ON COURSES	

ASSESSMENT METHODOLOGIES-DIRECT

☑ ASSIGNMENTS	☐ STUD. SEMINARS	☑ TESTS/MODEL EXAMS	☑ UNIV. EXAMINATION
☐ STUD. LAB PRACTICES	☐ STUD. VIVA	☐ MINI/MAJOR PROJECTS	☐ CERTIFICATIONS
☐ ADD-ON COURSES	☐ OTHERS		

ASSESSMENT METHODOLOGIES-INDIRECT

☑ ASSESSMENT OF COURSE OUTCOMES (BY FEEDBACK, ONCE)	☑ STUDENT FEEDBACK ON FACULTY (ONCE)
☐ ASSESSMENT OF MINI/MAJOR PROJECTS BY EXT. EXPERTS	☐ OTHERS

Prepared by   **Approved by**

ANU MARIA JOYKUTTY   **SMINU IZUDHEEN**
                                                                                        HOD, DCS

CS472 Principles of Information Security

COURSE INFORMATION SHEET

PROGRAMME: **COMPUTER SCIENCE & ENGINEERING**	DEGREE: **BTECH**
COURSE: **PRINCIPLES OF INFORMATION SECURITY**	SEMESTER: **VIII** CREDITS: **3**
COURSE CODE: **CS472**	COURSE TYPE: **ELECTIVE**
COURSE AREA/DOMAIN: **SECURITY**	CONTACT HOURS: **3-0-0(L-T-P) hours/Week**.
CORRESPONDING LAB COURSE CODE: **NIL**	LAB COURSE NAME: **NIL**

SYLLABUS:

UNIT	DETAILS	HOURS
I	**Introduction**: Overview of computer security, Security concepts, Need of Security- Threats- Deliberate software attacks, Deviation in quality of service, Attacks- malicious code, brute force, Timing attack, sniffers. **Access Control Mechanisms** - Access Control, Access control matrix, Access control in OS-Discretionary and Mandatory access control, Role-based access control, case study SELinux	7
II	**Security policies and models**: confidentiality policies, Bell- LaPadula model, Integrity policies, Biba model, Clark-Wilson models, Chinese wall model, waterfall model	7
III	**Software vulnerabilities**: Buffer and stack overflow, Crosssite scripting(XSS), and vulnerabilities, SQL injection and vulnerabilities, Phishing.	6
IV	**Malware**: Viruses, Worms and Trojans. Topological worms. Internet propagation models for worms.	6
V	**Security in current domains:** Wireless LAN security – WEP details. wireless LAN vulnerabilities – frame spoofing. Cellphone security - GSM and UMTS security. Mobile malware - bluetooth security issues.	8
VI	**Secure Electronic transactions:** Framework, strength and weakness, Security in current applications: Online banking, Credit Card Payment Systems. **Web Services security**: XML, SOAP, SAML, RFID	8
	TOTAL HOURS	**42**

TEXT/REFERENCE BOOKS:

T/R	BOOK TITLE/AUTHORS/PUBLICATION
	Text Books: 1. Bernard Menezes, Network security and Cryptography, Cengage Learning India, 2010. 2. M Bishop, Computer Security: Art and Science, Pearson Education, 2003.
	References: 1. E Whiteman and J Mattord, Principles of information security 4th edn, Cengage Learning 2. V K Pachghare, Cryptography and information security, PHI 3. Behrousz A Forouzan, D Mukhopadhyay, Cryptography and network Security, McGraw Hill 4. W Mao, Modern Cryptography: Theory & Practice, Pearson Education, 2004. 5. C P. Fleeger and S L Fleeger, Security in Computing, 3/e, Pearson Education, 2003.

COURSE PRE-REQUISITES: NIL

COURSE OBJECTIVES:

• To introduce fundamental concepts of security. • To introduce and discuss the relevance of security in operating system, web services etc. • To introduce fundamental concepts of secure electronic transactions.

COURSE OUTCOMES:

CS472.1	appreciate the common threats faced today
CS472.2	interpret the foundational theory behind information security
CS472.3	design a secure system
CS472.4	identify the potential vulnerabilities in software
CS472.5	appreciate the relevance of security in various domains
CS472.6	develop secure web services and perform secure e-transactions

CO-PO AND CO-PSO MAPPING

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CS472.1	1			1									2		
CS472.2		3		2									2		
CS472.3			3										2		2
CS472.4	1			3									2		
CS472.5	1			1									2		
CS472.6			3		2								2		2
CS472 (overall level)	1	3	3	2	2								2		2

JUSTIFATIONS FOR CO-PO MAPPING

Mapping	LOW/MEDIUM /HIGH	Justification
CS472.1-PO1	L	Students will be able to use engineering knowledge to identify and appreciate the common threats faced today.
CS472.1-PO4	L	Students will be able to research based knowledge to identify threats in the information system.
CS472.1-PSO1	M	Students gain knowledge on identifying threats in a computer system.
CS472.2-PO2	H	Students gain the capability to identify, formulate and review the theory behind information security.
CS472.2-PO4	M	Students can conduct investigations to analyze and understand the theory behind information security.
CS472.2-PSO1	M	Students gain knowledge on foundational theory behind computer science systems security.
CS472.3-PO3	H	Students gain enough knowledge on designing a secure system.
CS472.3-PSO1	M	Students attain the capability to design a computer science specific skill of designing a secure system.
CS472.3-PSO3	M	Students are made able to design innovative and secure systems.
CS472.4-PO1	L	Students are able to use engineering knowledge to identify potential vulnerabilities in software.
CS472.4-PO4	H	Students are able to conduct investigations in software to identify vulnerabilities in them.
CS472.4-PSO1	M	Students are able to identify vulnerabilities in computer science specific software systems.

CS472.5-PO1	L	Students are able to apply engineering knowledge to determine the relevance of security.
CS472.5-PO4	L	Students are able to conduct investigations to problems sos as to identify the relevance of security in them.
CS472.5-PSO1	M	Students are able to apply their knowledge in identifying the relevance of security in computer science.
CS472.6-PO3	H	Students will be able to design and develop secure web services.
CS472.6-PO5	M	Students will be able to use modern tools to develop secure web services and transactions.
CS472.6-PSO1	M	Students will be able to apply computer science knowledge to develop services and transactions that are secure.
CS472.6-PSO3	M	Students can develop innovative products using their knowledge in security.

GAPS IN THE SYLLABUS - TO MEET INDUSTRY/PROFESSION REQUIREMENTS:

SNO	TOPICS	PROPOSED ACTIONS	PO MAPPING
1	Hybrid models of security	Reading assignment	PO1,PSO1

TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN:

SNO	TOPICS	PROPOSED ACTIONS	PO MAPPING
1	Concepts of Block chain technology	Reading assignment	PO5,PSO1

WEB SOURCE REFERENCES:

1	https://nptel.ac.in/courses/106106129/28
2	https://nptel.ac.in/courses/106106141/
3	https://nptel.ac.in/courses/106106157/

DELIVERY/INSTRUCTIONAL METHODOLOGIES:

CHALK & TALK✓	STUD. ASSIGNMENT✓	WEB RESOURCES✓
LCD/SMART BOARDS✓	STUD. SEMINARS✓	ADD-ON COURSES✓

ASSESSMENT METHODOLOGIES-DIRECT

ASSIGNMENTS✓	STUD. SEMINARS✓	TESTS/MODEL EXAMS✓	UNIV. EXAMINATION✓
STUD. LAB PRACTICES	STUD. VIVA	MINI/MAJOR PROJECTS	CERTIFICATIONS
ADD-ON COURSES	OTHERS		

ASSESSMENT METHODOLOGIES-INDIRECT

ASSESSMENT OF COURSE OUTCOMES (BY FEEDBACK, ONCE) ✓	STUDENT FEEDBACK ON FACULTY (ONCE) ✓
ASSESSMENT OF MINI/MAJOR PROJECTS BY EXT. EXPERTS	OTHERS

Prepared by   **Approved by**

Ms. Jisha Mary Jose (Faculty)   **Dr. Sminu Izudheen**
(HOD)

CS484 Computer Graphics

COURSE INFORMATION SHEET

PROGRAMME: **COMPUTER SCIENCE & ENGINEERING**	DEGREE: **BTECH**
COURSE: **COMPUTER GRAPHICS**	SEMESTER: **VIII** CREDITS: **4**
COURSE CODE: **CS484**	COURSE TYPE:**CORE**
COURSE AREA/DOMAIN: **RECENT TRENDS IN COMPUTING**	CONTACT HOURS: **4-0-0(L-T-P) hours/Week**.
CORRESPONDING LAB COURSE CODE (IF ANY): NIL	LAB COURSE NAME: NIL

SYLLABUS:

UNIT	DETAILS	HOURS
I	Basic concepts in Computer Graphics – Types of Graphic Devices – Interactive Graphic inputs – Raster Scan and Random Scan Displays.	7
II	Line Drawing Algorithm- DDA, Bresenham's algorithm – Circle Generation Algorithms –Mid point circle algorithm, Bresenham's algorithm- Scan Conversion-frame buffers – solid area scan conversion – polygon filling algorithms	8
III	Two dimensional transformations. Homogeneous coordinate systems – matrix formulation and concatenation of transformations. Windowing concepts –Window to Viewport Transformation- Two dimensional clipping-Line clipping – Cohen Sutherland, Midpoint Subdivision algorithm	8
IV	Polygon clipping-Sutherland Hodgeman algorithm, Weiler-Atherton algorithm, Three dimensional object representation-Polygon surfaces, Quadric surfaces – Basic 3D transformations	8
V	Projections – Parallel and perspective projections – vanishing points. Visible surface detection methods– Back face removal- Z-Buffer algorithm, A-buffer algorithm, Depth-sorting method, Scan line algorithm.	9
VI	Image processing – Introduction - Fundamental steps in image processing – digital image representations – relationship between pixels – gray level histogram –spatial convolution and correlation – edge detection – Robert, Prewitt, Sobel.	8
	TOTAL HOURS	**48**

TEXT/REFERENCE BOOKS:

T/R	BOOK TITLE/AUTHORS/PUBLICATION
	Text Books: 1. Donald Hearn and M. Pauline Baker, Computer Graphics, PHI, 2e, 1996 2. E. Gose, R. Johnsonbaugh and S. Jost., Pattern Recognition and Image Analysis, PHI PTR, 1996 (Module VI – Image Processing part) 3. William M. Newman and Robert F. Sproull , Principles of Interactive Computer Graphics. McGraw Hill, 2e, 1979 4. Zhigang Xiang and Roy Plastock, Computer Graphics (Schaum's outline Series), McGraw Hill, 1986.
	References: 1. David F. Rogers , Procedural Elements for Computer Graphics, Tata McGraw Hill, 2001. 2. M. Sonka, V. Hlavac, and R. Boyle, Image Processing, Analysis, and Machine Vision, Thomson India Edition, 2007. 3. Rafael C. Gonzalez and Richard E. Woods, Digital Image Processing. Pearson, 2017

COURSE PRE-REQUISITES:

C.CODE	COURSE NAME	DESCRIPTION	SEM
MA 101	Engineering Mathematic I	Basic familiarity with calculus and linear algebra	S1

COURSE OBJECTIVES:

- To introduce concepts of graphics input and display devices.
- To discuss line and circle drawing algorithms.
- To introduce 2D and 3D transformations and projections.
- To introduce fundamentals of image processing.

COURSE OUTCOMES:

CS4084.1	The Students will be able to compare various graphics devices
CS484.2	The Students will be able to analyze and implement algorithms for line drawing, circle drawing and polygon filling
CS484.3	The Students will be able to apply geometrical transformation on 2D and 3D objects
CS484.4	The Students will be able to analyze and implement algorithms for clipping
CS484.5	The Students will be able to apply various projection techniques on 3D objects
CS484.6	The Students will be able to summarize visible surface detection methods
CS484.7	The Students will be able to interpret various concepts and basic operations of image processing

CO-PO AND CO-PSO MAPPING

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CS484.1	3				1								3		
CS484.2		3	2										3	3	
CS484.3	3		2										3		
CS484.4	3		2										3	3	
CS484.5	3	2	2										3		
CS484.6	2	2											3		
CS484.7	2		2	1	1								3		2
CS401 (overall level)	**3**	**2**	**2**	**1**	**1**	**1**							**3**	**3**	2

JUSTIFATIONS FOR CO-PO MAPPING

Mapping	LOW/MEDIUM /HIGH	Justification
CS484.1- PO1	H	Students will be able to understand the basic working principles of graphics devices.
CS484.1- PO6	L	They can use the knowledge on graphics devices to select resources to various engineering activities.
CS484.1-	H	Students will be able to understand the concepts of computer graphics

PSO1		and the devices used.
CS484.2-PO2	H	Students can analyzing various algorithms of circle and line drawing by considering principles of mathematics.
CS484.2-PO3	M	Students can use the algorithms to design various graphics applications
CS484.2-PSO1	H	Students will be able to understand the concepts of drawing basic primitives like line, circle etc.
CS484.2-PSO2	H	Students will get the ability to acquire programming efficiency by studying the basic primitive drawing algorithms in software project development.
CS484.3-PO1	H	Students will be able to apply the basics of mathematics to study the concepts of geometric transformation on objects.
CS484.3-PO3	M	Students can design graphics applications like animation by applying the transformation steps on objects.
CS484.3-PSO1	H	Students will be able to understand the concepts transformation on 2d and 3d objects
CS484.4-PO1	H	Students can apply mathematics and engineering fundamentals to study the concept of clipping.
CS484.4-PO3	M	Students will be able to apply the process of clipping to graphics applications.
CS484.4-PS01	H	Students can analyze various clipping techniques and can understand the concept of clipping on different type of objects.
CS484.4-PSO2	H	Students will be able to implement the clipping algorithm using graphics programming languages and can use this to design various applications.
CS484.5-PO1	H	Students can apply mathematics and engineering fundamentals to study the concept projection of 3D objects to 2D plane.
CS484.5-PO2	M	Students can analyze the projection techniques using the principles of mathematics.
CS484.5-PO3	M	Projection techniques can be used for designing software and hardware graphics systems.
CS484.6-PO1	M	Students will be able to understand the basic concepts in visible surface detection techniques.
CS484.6-PO2	M	Students can analyze various techniques of visible surface detection using the principles of mathematics.
CS484.6-PSO1	H	Students can analyze various surface detection techniques and able to understand the concept of eliminating hidden surface
CS484.7-PO1	M	Students will be able to understand the basic concept of image processing and its application by using the basic engineering and mathematics principles.
CS484.7-PO3	M	Students can design various image processing application system using the basic knowledge on image processing

CS484.7-PO5	L	Students will be able to use image processing tools like MATLAB, OpenCV to design application programs.
CS484.7-PSO1	H	Students will be able to understand the concepts of image processing techniques.
CS484.7-PSO3	M	Students will be able to design and develop innovative products by applying the concepts of image processing.

GAPS IN THE SYLLABUS - TO MEET INDUSTRY/PROFESSION REQUIREMENTS:

SNO	DESCRIPTION	PROPOSED ACTIONS	PO MAPPING
1	Overview of Graphics tools	Learning Material Provided	PO5
2	OpenGL programming	Demonstration of program	PO3

PROPOSED ACTIONS: TOPICS BEYOND SYLLABUS/ASSIGNMENT/INDUSTRY VISIT/GUEST LECTURER/NPTEL ETC

TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN:

SNO	TOPICS	PROPOSED ACTIONS	PO MAPPING
1	Spline Representation - Bezier Curve and B Spline Curve	Assignment	PO1
2	Graphics and human perception	Learning Material Provided	PO3
3	Concepts on Computer Vision	Learning Material Provided	PO1

WEB SOURCE REFERENCES:

1	http://classes.soe.ucsc.edu/cmps203/Fall04/finalreports/ProjectPaper_JerryYee.pdf
2	cs.brown.edu/~morgan/evolver/ESOP_Talk.ppt

3	http://oreilly.com/news/graphics/prog_lang_poster.pdf
4	http://en.wikipedia.org/wiki/List_of_3D_graphics_libraries
5	http://www.youtube.com/watch?v=U2fa8-TtV0w
6	http://www.mit.edu/~jpfautz/jpfautz-thesis.pdf
7	http://groups.csail.mit.edu/graphics/pubs/thesis_jcyang.pdf
8	http://www.cs.umd.edu/~djacobs/CMSC427/ImageBasedRendering.pdf
9	http://graphics.stanford.edu/papers/light/light-lores-corrected.pdf
10	http://inst.eecs.berkeley.edu/~cs294-13/fa09/lectures/scribe-lecture8.pdf

DELIVERY/INSTRUCTIONAL METHODOLOGIES:

☐CHALK & TALK✓	☐STUD. ASSIGNMENT✓	☐WEB RESOURCES✓
☐LCD/SMART BOARDS✓	☐STUD. SEMINARS✓	☐ ADD-ON COURSES✓

ASSESSMENT METHODOLOGIES-DIRECT

☐ASSIGNMENTS✓	☐STUD. SEMINARS✓	☐TESTS/MODEL EXAMS✓	☐UNIV. EXAMINATION✓
☐ STUD. LAB PRACTICES✓	☐ STUD. VIVA	☐ MINI/MAJOR PROJECTS	☐ CERTIFICATIONS
☐ ADD-ON COURSES	☐ OTHERS		

ASSESSMENT METHODOLOGIES-INDIRECT

☐ASSESSMENT OF COURSE OUTCOMES (BY FEEDBACK, ONCE) ✓	☐STUDENT FEEDBACK ON FACULTY (ONCE) ✓

☐ ASSESSMENT OF MINI/MAJOR PROJECTS BY EXT. EXPERTS	☐ OTHERS

Prepared by   **Approved by**

Mr. Ajith.S   **Mr. Sminu Izudheen(HOD)**

CS492 Project

COURSE INFORMATION SHEET

PROGRAMME: COMPUTER SCIENCE & ENGINEERING	DEGREE: BTECH
COURSE: MAIN PROJECT	SEMESTER: VIII CREDITS: 6
COURSE CODE : CS492 REGULATION: 2016	COURSE TYPE: CORE
COURSE AREA/DOMAIN: Software Design	CONTACT HOURS: 18 hours/Week.
CORRESPONDING LAB COURSE CODE (IF ANY):	LAB COURSE NAME:

SYLLABUS:

UNIT	DETAILS	HOURS
	In depth study of the topic assigned in the light of the preliminary report prepared in the seventh semester Review and finalization of the approach to the problem relating to the assigned topic Preparing a detailed action plan for conducting the investigation, including team work Detailed Analysis/Modelling/Simulation/Design/Problem Solving/Experiment as needed Final development of product/process, testing, results, conclusions and future directions Preparing a paper for Conference presentation/Publication in Journals, if possible Preparing a report in the standard format for being evaluated by the dept. assessment board Final project presentation and viva voce by the assessment board including external expert	
	TOTAL HOURS	18

TEXT/REFERENCE BOOKS:

T/R	BOOK TITLE/AUTHORS/PUBLICATION
	Seven latest international journal papers having high impact factor.
	MOOC Courses from Course ERA, NPTEL etc.

COURSE PRE-REQUISITES:

C.CODE	COURSE NAME	DESCRIPTION	SEM
NIL			

COURSE OBJECTIVES:

1	To apply engineering knowledge in practical problem solving
2	To foster innovation in design of products, processes or systems
3	To develop creative thinking in finding viable solutions to engineering problems

COURSE OUTCOMES:

SNO	DESCRIPTION
1	The students will be able to think innovatively on the development of components, products, processes or technologies in the engineering field
2	The students will be able to apply knowledge gained in solving real life engineering problems

CO-PO AND CO-PSO MAPPING

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	P0 10	PO 11	PO 12	PSO 1	PSO 2	PS O3
CS492.1	1	2		2	2				1				2		
CS492.2			2	1										1	2

JUSTIFICATIONS FOR CO-PO MAPPING

Mapping	LOW/ME DIUM/HI GH	Justification
CS451.1 - P02	L	Students do a literature survey while preparing for the seminar and project
CS451.1 - PO4	M	They reach valid conclusions after the literature survey
CS451.1- PO10	M	Seminar presentations help them to develop public speaking skills
CS451.2- PO4	H	They do a detailed research in their area of interest which help them to analyse and synthesis data .
CS451.2- PO5	M	They understand the limitations of the existing techniques and can use the engineering techniques to arrive at valid conclusions
CS451.2- PO10	H	Writing seminar report help them to develop technical report writing skills.
CS451.2- PSO1	M	By comparing different techniques they can identify ,analyse and design complex engineering problems .

WEB SOURCE REFERENCES:

1	ieee.org
2	dl.acm.org
3	Elsevier
4	Springer

DELIVERY/INSTRUCTIONAL METHODOLOGIES:

✓ CHALK & TALK	STUD. ASSIGNMENT	✓ WEB RESOURCES	
☐LCD/SMART BOARDS	✓ STUD. SEMINARS	✓ ADD-ON COURSES	

ASSESSMENT METHODOLOGIES-DIRECT

☐ ASSIGNMENTS	**m.** STUD. SEMINARS	☐TESTS/MODEL EXAMS	☐ UNIV. EXAMINATION
✓ STUD. LAB PRACTICES	**n.** STUD. VIVA	☐MINI/MAJOR PROJECTS	☐ CERTIFICATIONS
✓ ADD-ON COURSES	☐ OTHERS		

ASSESSMENT METHODOLOGIES-INDIRECT

✓ ASSESSMENT OF COURSE OUTCOMES (BY FEEDBACK, ONCE)	✓ STUDENT FEEDBACK ON FACULTY (TWICE)
✓ ASSESSMENT OF MINI/MAJOR PROJECTS BY EXT. EXPERTS	☐OTHERS

Prepared by ,   **Approved by**

Ms. Jomina John,Ms. Sangeetha Jamal,Mr. Paul Augustine   **(HOD)**