



# **B.Tech- Computer Science & Engg.**

Academic Year: 2021-2025

Syllabus

## **Vision**

To develop the Department of Computer Science & Information Technology as a Center for Excellence to produce leading Professionals who can serve the society with innovative skills, Computer Experts, Researchers to meet the needs of the software industry in national /global scenario responding to the challenges of ever changing world.

## **Mission**

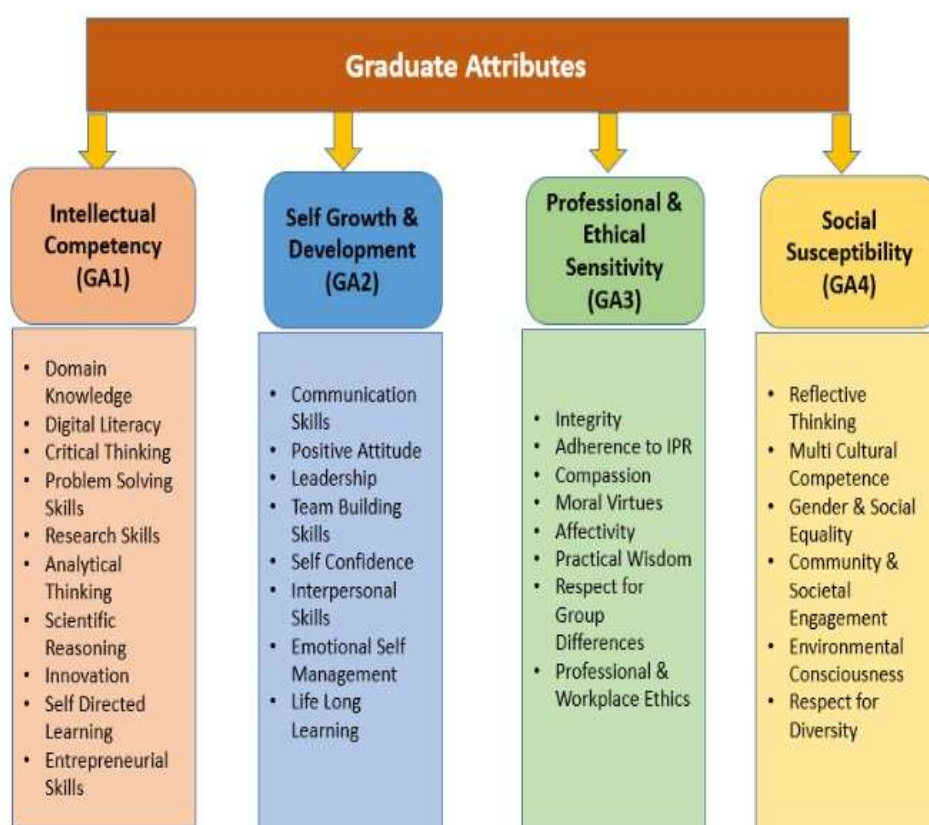
- We endeavour to provide the best possible learning environment to enhance innovations, research capabilities, problem solving skills, leadership qualities, team spirit and ethical responsibilities.
- To nurture the talent of the students to be successful, ethical and effective problem solvers who will contribute positively to the economic growth of the nation and prepare to respond to the challenges.

## Graduate Attributes

Jharkhand Rai University is a mecca of transformative education which strongly believes in the holistic development of students. The university provides the cutting-edge of holistic learning to develop promising youngsters into leaders of tomorrow with globally relevant, future-ready and actionable intelligence. The objective of the Department is to make each student proficient in synthesizing/analysing information and be ethical, socially responsible, and just when making decisions. JRU ensures inclusive and equitable quality education and promote lifelong learning opportunities for all.

**Every graduate of the Department will be developed to possess the following attributes:**

1. Intellectual Competency
2. Self-Growth & Development
3. Professional & Ethical Sensitivity
4. Social Susceptibility



## **Program Educational Objectives (PEOs)**

PEOs (Program Educational Objectives) relate to the career and professional accomplishments of passed out students after their graduation from the program. However, keeping the significance of contribution of the curriculum and the assessment opportunities such as examination and evaluation results, placement data, employer feedback and higher education entrance performance etc. are taken as tools for supplementary evidence to assess PEOs.

The program educational objectives of the undergraduate program in Computer Science Engineering take into consideration the university mission and the constituents' needs by producing graduates who will be able to:

**PEO1:** Develop foundational knowledge, technical skills and competency related to the various core and related areas of IT and ITeS in order to demonstrate good analytical, design and implementation skills.

**PEO2:** Establish their career in Creativity & Design of Computer Support Systems and impart knowledge and skills with proficiency in analysis, design, coding, testing, deployment, maintenance of the system and application software.

**PEO3:** Communicate effectively, recognize and incorporate societal needs and constraints in their professional endeavors, and practice their profession with high regard to ethical responsibilities.

**PEO4:** Drive scientific and societal advancement through technological innovation and entrepreneurship.

**PEO5 :** Recognize the need for adapting to change & engage themselves in independent life-long learning.

## Program Outcome (POs)

Engineering Graduates will be able to:

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

## Program Specific Outcome (PSOs)

The students shall have the

1. **PSO1: Professional Skills:** Ability to understand, analyze and develop computer programs/ application software in the areas related to Software Engineering, Web and Mobile Application, Artificial Intelligence, Cyber Security & Networking and Data Analysis.
2. **PSO2: Problem Solving Skills:** Ability to apply and implement standard practices and strategies in software project development using open-ended programming environments to deliver a quality product for business success.
3. **PSO3: Successful Career:** Ability to become employable in a variety of IT companies and government sectors and for the betterment of an individual and society at large.
4. **PSO4: Entrepreneurship:** Preparedness to adopt new technology with unprecedented ideas to be a successful entrepreneur or zest for higher studies.

## Mapping between PEO and PSO

Program Specific Outcome (PSO)	Program Educational Objective (PEO)				
	PEO1	PEO2	PEO3	PEO4	PEO5
PSO1	✓				
PSO2	✓	✓		✓	✓
PSO3			✓		✓
PSO4	✓	✓		✓	

## Mapping of PEO and PO

Program Outcome (PO)	Program Educational Objective (PEO)				
	PEO1	PEO2	PEO3	PEO4	PEO5
PO1	✓			✓	✓
PO2	✓			✓	✓
PO3		✓			
PO4		✓			
PO5			✓		
PO6		✓	✓		
PO7		✓	✓	✓	
PO8			✓		
PO9	✓			✓	✓
PO10	✓		✓		
PO11			✓	✓	
PO12		✓			✓



# Course Scheme

COURSE SCHEME												
BATCH 2021-2025												
BTECH IN COMPUTER SCIENCE AND ENGINEERING												
CHOICE BASED CREDIT SYSTEM												
SEMESTER I												
S. No	CATEGORY	CODE	COURSE TITLE	Periods			Evaluation Scheme				Subject Total	Credit
				L	T	P	Assignment	TA	Total	ESE		
1	Basic ScienceCourse	BSC101	Physics I	3	1	0	20	10	30	70	100	4
2	Basic ScienceCourse	BSC102	Mathematics I	3	1	0	20	10	30	70	100	4
3	Engineering ScienceCourse	ESC101	Basic ElectricalEngineering	3	1	0	20	10	30	70	100	4
4	Engineering Science Course	ESC102	Engineering Graphics & Design	1	0	0	20	10	30	70	100	1
5	Humanities andSocial Sciences	HSMC101	English	2	0	2	20	10	30	70	100	3
PRACTICAL /SESSIONAL												
1	Basic Science Course	BSC101P	Physics I Lab	0	0	2			30	20	50	1
2	Engineering Science Course	ESC101P	Basic Electrical Engineering Lab	0	0	2			30	20	50	1
3	Engineering Science Course	ESC102P	EngineeringGrap hics & Design Lab	0	0	2			30	20	50	1
									TOTAL		650	19
SEMESTER II												
S. No.	CATEGORY	CODE	COURSE TITLE	Periods			Evaluation Scheme				Subject Total	Credit
				L	T	P	Assignment	TA	Total	ESE		
1	Basic ScienceC	BSC103	Chemistry I	3	1	0	20	10	30	70	100	4

	course											
2	Basic ScienceCourse	BSC104	Mathematics II	3	1	0	20	10	30	70	100	4
3	Engineering ScienceCourse	ESC103	Programming forProblem Solving	3	0	0	20	10	30	70	100	3
4	Engineering ScienceCourse	ESC104	Workshop Practice	1	0	0	20	10	30	70	100	1
5	Mandatory Course	MC101	**EnvironmentalScience	3	0	0	20	10	30	70	100	0
PRACTICAL /SESSIONAL												
1	Basic ScienceCourse	BSC103P	Chemistry I Lab	0	0	2			30	20	50	1
2	Engineering Science Course	ESC103P	Programming for Problem SolvingLab	0	0	2			30	20	50	1
3	Engineering ScienceCourse	ESC104P	Workshop PracticeLab	0	0	2			30	20	50	1
									TOTAL		650	15
SEMESTER III												
S. No	CATEGORY	CODE	COURSE TITLE	Periods			Evaluation Scheme				Subject Total	Credit
				L	T	P	Assignment	TA	Total	ESE		
1	Basic Science Course	BSC201	MathematicsIII(Probability & Statistics)	2	0	0	20	10	30	70	100	2
2	Basic ScienceCourse	BSC202	Biological Science for Engineers	3	0	0	20	10	30	70	100	3
3	Engineering Science Course	ESC201	Analog Electronics Circuit	3	0	0	20	10	30	70	100	3
4	Professional CoreCourse	3PCCCS201	Data Structure AndAlgorithms	3	0	0	20	10	30	70	100	3
5	Professional Core Course	3PCCCS202	Computer Organization &Architecture	3	0	0	20	10	30	70	100	3
6	Humanities and Social Science	HSMC201	Effective Technical Communication	3	0	0	20	10	30	70	100	3

7	Mandatory Course	UMCBTC SE102	Community Engagement and Social Responsibility	1	0	2	40	10	50	50	100	2
PRACTICAL /SESSIONAL												
1	Engineering Science Course	ESC201P	Analog Electronics Circuit Lab	0	0	4			30	20	50	2
2	Professional Core Course	3PCCCS201P	Data Structure And Algorithms Lab	0	0	4			30	20	50	2
3	Professional Core Course	3PCCCS202P	Computer Organization & Architecture Lab	0	0	4			30	20	50	2
									TOTAL		750	25
SEMESTER IV												
S. No.	CATEGORY	CODE	COURSE TITLE	Periods			Evaluation Scheme				Subject Total	Credit
				L	T	P	Assignment	TA	Total	ESE		
1	Engineering Science Course	ESC202	Digital Electronics	3	0	0	20	10	30	70	100	3
2	Professional Core Course	3PCCCS203	Object Oriented Programming with JAVA	3	0	0	20	10	30	70	100	3
3	Professional Core Course	3PCCCS204	Discrete Mathematics	3	1	0	20	10	30	70	100	4
4	Professional Core Course	3PCCCS205	Design & Analysis of Algorithms	3	0	0	20	10	30	70	100	3
5	Humanities and Social Science	HSMC202	Professional Practice, Laws and Ethics	3	0	0	20	10	30	70	100	3
6	Humanities and Social Sciences	HSMC203	Entrepreneurship	3	0	0	20	10	30	70	100	3
7	Mandatory Course	MC201	**Disaster Management	2	0	0	20	10	30	70	100	0
PRACTICAL /SESSIONAL												
1	Engineering Science Course	ESC202P	Digital Electronics Lab	0	0	4			30	20	50	2
2	Professional Core Course	3PCCCS20	Design &	0	0	4			30	20	50	2

	nal Core Course	5P	Analysis of Algorithms Lab								
3	Profession al Core Course	3PCCCS20 3P	Object Oriented Programming with JAVA	0	0	4		30	20	50	2
								TOTAL		850	25

### SEMESTER V

S. No	CATEGORY	CODE	COURSE TITLE	Periods			Evaluation Scheme				Subject Total	Credit
				L	T	P	Assignment	TA	Total	ES		
1	Professional Core Course	3PCCCS301	Database Management Systems	3	0	0	20	10	30	70	100	3
2	Professional Core Course	3PCCCS302	Formal Language & Automata Theory	3	0	0	20	10	30	70	100	3
3	Professional Core Course	3PCCCS304	IT Workshop (Sci Lab/MATLAB)	2	0	0	20	10	30	70	100	2
4	Professional Core Course	3PCCCS305	Operating Systems	3	0	0	20	10	30	70	100	3
5	Track Elective		Track Elective - 1	3	0	2	20	10	30	70	100	4
6	Mandatory Course	MC301	**Constitution of India	2	0	0	20	10	30	70	100	0

### PRACTICAL /SESSIONAL

1	Professional Core Course	3PCCCS301P	Database Management Systems Lab	0	0	4			30	20	50	2
3	Professional Core Course	3PCCCS304P	IT Workshop (Sci Lab/MATLAB)	0	0	2			30	20	50	1
4	Professional Core Course	3PCCCS305P	Operating Systems Lab	0	0	4			30	20	50	2
									TOTAL		750	20

### SEMESTER VI

S. No.	CATEGORY	CODE	COURSE TITLE	Periods			Evaluation Scheme				Subject Total	Credit
				L	T	P	Assignment	TA	Total	ES		
1	Professional Core Course	3PCCCS306	Compiler Design	3	0	0	20	10	30	70	100	3
2	Professional Core Course	3PCCCS307	Computer Networks	3	0	0	20	10	30	70	100	3

	se											
3	Professional Core Course	3PCCCS308	Fundamentals of Software Engineering	3	0	0	20	10	30	70	100	3
4	Track Elective		Track Elective II	3	0	0	20	10	30	70	100	3
5	Track Elective		Track Elective III	3	0	0	20	10	30	70	100	3
6	Open Elective Course		Open Elective I / MOOCs I	3	0	0	20	10	30	70	100	3
<b>PRACTICAL /SESSIONAL</b>												
1	Professional Core Course	3PCCCS306P	Compiler Design Lab	0	0	4			30	20	50	2
2	Professional Core Course	3PCCCS307P	Computer Networks Lab	0	0	4			30	20	50	2
3	Project	3PROJCS301	Project-I	0	0	6	20	10	50	50	100	3
									<b>TOTAL</b>		<b>700</b>	<b>26</b>

<b>SEMESTER VII</b>												
S. No	CATEGORY	CODE	COURSE TITLE	Periods			Evaluation Scheme				Subject Total	Credit
				L	T	P	Assignment	TA	Total	ES		
1	Track Elective		Track Elective IV	3	0	0	20	10	30	70	100	3
2	Track Elective		Track Elective V	3	0	2	20	10	30	70	100	4
3	Track Elective		Track Elective VI	3	0	0	20	10	30	70	100	3
4	Open Elective Course		Open Elective II / MOOCs II	3	0	0	20	10	30	70	100	3
<b>PRACTICAL /SESSIONAL</b>												
2	Project	3PROJCS401	Project-II	0	0	8			100	100	200	4
									<b>TOTAL</b>		<b>600</b>	<b>17</b>

<b>SEMESTER VIII</b>												
S. No.	CATEGORY	CODE	COURSE TITLE	Periods			Evaluation Scheme				Subject Total	Credit
				L	T	P	Assignment	TA	Total	ES		
1	Track Elective		Track Elective VII	4	0	0	20	10	30	70	100	4
2	Open Elective Course		Open Elective-III / MOOCs III	3	0	0	20	10	30	70	100	3

	course											
4	Humanities and Social Sciences	HSMC402	**Human Values & Ethics	3	0	0	20	10	30	70	100	3
<b>PRACTICAL /SESSIONAL</b>												
1	Project	3PROJCS402	Project-III	0	0	16			100	100	200	8
									<b>TOTAL</b>		<b>500</b>	<b>18</b>

<b>** NOTE: Qualifying Non Credit Course</b>			
<b>NOTE: 20% credit earned through MOOC(SWAYAM) in the course</b>			
<b>B.Tech(CSE)</b>			
<b>CHOICE BASED CREDIT SYSTEM</b>			
<b>Semester Wise Credit Distribution</b>			
1		Semester 1	19
2		Semester 2	15
3		Semester 3	25
4		Semester 4	25
5		Semester 5	20
6		Semester 6	26
7		Semester 7	17
8		Semester 8	18
<b>Total Credits</b>			<b>165</b>

# Track Elective

	CODE	Specialisation in SOFTWARE ENGINEERING	L	T	P	C
SEM V	3TECCS301	Introduction to Python Programming	3	0	2	4
	3TECCS302	Fundamentals of Software Engineering	3	0	2	4
	3TECCS303	Software System Architecture	4	0	0	4
	3TECCS304	Economics of Software Engineering	4	0	0	4
SEM VI	3TE3CCS11	Relational Database Management System	3	0	2	4
	3TECCS312	Machine Learning	3	0	0	3
	3TECCS313	Web Technology	3	0	2	4
	3TECCS314	Object Oriented Modelling and Design	3	0	0	3
	3TECCS315	Software Design	3	0	0	3
	3TECCS316	Soft Computing	3	0	0	3
SEM VII	3TECCS401	Internet -of- Things	3	0	0	3
	3TECCS402	Artificial Intelligence	3	0	2	4
	3TECCS403	Software Quality Assurance	3	0	0	3
	3TECCS404	Cryptography and Network Security	3	0	0	3
	3TECCS405	Cloud Computing	3	0	0	3
	3TECCS406	AI for games	3	0	2	4
SEM VIII	3TECCS414	Software Security	4	0	0	4
	3TECCS415	Software Testing	4	0	0	4
	3TECCS416	Software Maintenance	4	0	0	4
	3TECCS417	Software Engineering Management	4	0	0	4
	CODE	Specialisation in CYBER SECURITY	L	T	P	C
SEM V	3TECCS30	Introduction to	3	0	2	4

	1	Python Programming				
	3TECCS302	Fundamentals of Software Engineering	3	0	2	4
	3TECCS305	Malware Analysis	4	0	0	4
	3TECCS306	Network Security	4	0	0	4
SEM VI	3TECCS311	Relational Database Management System	3	0	2	4
	3TECCS312	Machine Learning	3	0	0	3
	3TECCS313	Web Technology	3	0	2	4
	3TECCS317	Cryptography Fundamentals	3	0	0	3
	3TECCS318	Data Mining	3	0	0	3
	3TECCS316	Soft Computing	3	0	0	3
SEM VII	3TECCS401	Internet -of- Things	3	0	0	3
	3TECCS402	Artificial Intelligence	3	0	2	4
	3TECCS407	Cyber Security	3	0	2	4
	3TECCS408	Biometrics	3	0	0	3
	3TECCS405	Cloud Computing	3	0	0	3
	3TECCS409	Cyber Forensics and Investigations	3	0	0	3
SEM VIII	3TECCS418	Web Security	4	0	0	4
	3TECCS419	Android Security	4	0	0	4
	3TECCS411	Deep Learning	4	0	0	4
	3TECCS420	High Speed Networks	4	0	0	4
	<b>CODE</b>	<b>Specialisation in ARTIFICIAL INTELLIGENCE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
SEM V	3TECCS301	Introduction to Python Programming	3	0	2	4
	3TECCS302	Fundamentals of Software Engineering	3	0	2	4
	3TECCS307	Pattern Recognition	4	0	0	4
	3TECCS308	Intelligent systems	4	0	0	4
SEM VI	3TECCS31	Relational	3	0	2	4



	1	Database Management System				
	3TECCS312	Machine Learning	3	0	0	3
	3TECCS313	Web Technology	3	0	2	4
	3TECCS319	Statistics for Artificial Intelligence	3	0	0	3
	3TECCS318	Data Mining	3	0	0	3
	3TECCS320	Knowledge Representation	3	0	0	3
SEM VII	3TECCS401	Internet -of- Things	3	0	0	3
	3TECCS402	Artificial Intelligence	3	0	2	4
	3TECCS410	Supervised Machine Learning	3	0	0	3
	3TECCS411	Deep Learning	3	0	0	3
	3TECCS412	Natural Language Processing	3	0	0	3
	3TECCS406	AI for games	3	0	2	4
SEM VIII	3TECCS421	Computer Vision	4	0	0	4
	3TECCS422	UnSupervised Machine Learning	4	0	0	4
	3TECCS423	Introduction to Robotics	4	0	0	4
	3TECCS424	AI/ML Analyst	4	0	0	4
	<b>CODE</b>	<b>Specialisation in WEB AND MOBILE APPLICATION</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
SEM V	3TECCS301	Introduction to Python Programming	3	0	2	4
	3TECCS302	Fundamentals of Software Engineering	3	0	2	4
	3TECCS309	Multimedia	3	0	2	4
	3TECCS310	Internet and Website Management	3	0	2	4
SEM VI	3TECCS311	Relational Database Management System	3	0	2	4
	3TECCS312	Machine Learning	3	0	0	3
	3TECCS313	Web Technology	3	0	2	4

	3					
	3TECCS314	Object Oriented Modelling and Design	3	0	0	3
	3TECCS321	Computer Graphics	2	0	2	3
	3TECCS322	Introduction to PHP	2	0	2	3
SEM VII	3TECCS401	Internet -of- Things	3	0	0	3
	3TECCS402	Artificial Intelligence	3	0	2	4
	3TECCS413	Introduction to Android Studio	2	0	2	3
	3TECCS411	Deep Learning	3	0	0	3
	3TECCS405	Cloud Computing	3	0	0	3
	3TECCS406	AI for games	3	0	2	4
SEM VIII	3TECCS425	Computer Vision	4	0	0	4
	3TECCS419	Android Security	4	0	0	4
	3TECCS418	Web Security	4	0	0	4
	3TECCS417	Software Engineering Management	4	0	0	4

Open Electives					
Select any one in VI, VII, VIII semester					
Code	Course Title	L	T	P	Cred its
OEC	Cryptography and Network Security	3	0	0	3
OEC	Cyber Law and Ethics	3	0	0	3

**Open Elective can be opted by MOOCs**

**The students of B.Tech CSE can opt for any of the courses offered by the other Departments / Programs in the same semester**

## Detailed Assessment Scheme

Assessment Scheme					
CIA- Continuous Internal Assessment (30 Marks)					
Assessment Parameters	Assessment Tools	Marks	Percentage (%)	Bloom's Taxonomy Category	Bloom's Taxonomy Level LOT/HOT
Assignment 1	Assignment consisting of minimum 5 Questions	10	33.33	Remember, Understand, Apply	LOT
Assignment 2	Assignment consisting of minimum 2 Questions	10	33.33	Analyze, Evaluate, Create	HOT
Class Participation	Brainstorming, Discussion, Attendance, Extempore or any other activity	10	33.33		

(LOT: Low Order Thinking, HOT: High Order Thinking)

'ESE- End Semester Examination (70 Marks)			
Bloom's Taxonomy Category	ESE Question Paper Section	Percentage (%)	Bloom's Taxonomy Level LOT/HOT
Remember	A	30	LOT
Understand	A		
Apply	B	40	LOT/ HOT
Analyse	B		
Evaluate & Create	C	30	HOT

# Semester VI

SEMESTER VI												
S.No.	CATEGORY	CODE	COURSE TITLE	Periods			Evaluation Scheme				Subject Total	Credit
				L	T	P	Assignment	TA	Total	ESE		
1	Professional Core Course	3PCCCS306	Compiler Design	3	0	0	20	10	30	70	100	3
2	Professional Core Course	3PCCCS307	Computer Networks	3	0	0	20	10	30	70	100	3
3	Professional Core Course	3PCCCS308	Fundamentals of Software Engineering	3	0	0	20	10	30	70	100	3
4	Track Elective		Track Elective II	3	0	0	20	10	30	70	100	3
5	Track Elective		Track Elective III	3	0	0	20	10	30	70	100	3
6	Open Elective Course		Open Elective I / MOOCs I	3	0	0	20	10	30	70	100	3
PRACTICAL /SESSIONAL												
1	Professional Core Course	3PCCCS306P	Compiler Design Lab	0	0	4			30	20	50	2
2	Professional Core Course	3PCCCS307P	Computer Networks Lab	0	0	4			30	20	50	2
3	Project	3PROJCS301	Project-I	0	0	6	20	10	50	50	100	3
									TOTAL		700	26

**Program:** B T E C H  
**Semester:** Sixth  
**Course:** Compiler Design  
**Course Code:** 3PCCCS306

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L	T	P	C
3	0	0	3

### **Course Objective:**

The objectives of this course are:

1. Understand the need of compiler in Computer Engineering.
2. Provide a thorough understanding of design, working, and implementation of programming languages.
3. Trace the major concept areas of language translation and compiler design.
4. Create an awareness of the functioning and complexity of modern compilers

### **Course Outcome:**

On completion of the course students will be able to:

1. Analyze the need of compiler for interfacing between user and machine.
2. Explain the role of several phases of compilation process.
3. Create an awareness of the function and complexity of modern compilers.
4. Outline the major concept areas of languages translation and Compiler design.
5. Develop a comprehensive Compiler for a given language.
6. Apply knowledge for developing tool for natural language processing.

**Course Content:**

Topics	Hours
<b>UNIT I</b>	6
<b>Introduction to Compilers</b> and its Cousins, Structure of a Compiler, Science of building Compiler and its Application, Lexical Analyzer, Input Buffering, Specification and Recognition of Tokens, Introduction to Lex.	
<b>UNIT II</b>	8
Introduction to Syntax Analysis, Elimination of Ambiguity, Left Recursion and Left Factoring, Recursive and Non-Recursive Top-Down Parsers, Bottom-up Parsers: Shift Reduce Parser techniques and conflicts, all variants of LR Parsers, Handling Ambiguous grammar in Bottom-Up Parsing, Error handling while parsing, The Parser generator YACC.	
<b>UNIT -III</b>	5
Syntax-Directed Definition(SDD), Evaluation Order of SDD's and its application, SyntaxDirected Translation Schemes and their Implementation.	
<b>UNIT IV</b>	6
<b>Intermediate code Generation:</b> Variants of Syntax Tree, Three Address Code, Translation of Expressions, Control flow, Back Patching , Run Time Environment: Storage Organization.	
<b>UNIT V</b>	5
<b>Code Generation:</b> Issues in its Design, Target Language, Addresses in Target Code, Basic Blocks and Flow Graphs, Optimization of Basic BlocksMachine Independent Optimization: Sources of Optimization, Data Flow analysis.	

**Suggested books:**

1. Aho A. V., Lam M. S., Sethi R., Ullman J. D., Compilers, Principles, Techniques, and Tool, 2nd Edition, Pearson Education Asia.

**Suggested reference books**

1. Fischer C. N., LeBlanc R. J., Crafting a Compiler with C, Pearson Education Asia.
2. Louden K. C., Compiler Construction, Principles and Practice, Thomson, Brooks/Cole.

**Program:** B T E C H

**Semester:** Sixth

**Course:** Compiler Design Lab

**Course Code:** 3PCCCS306P

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0	0	4	2

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**Course Objective:**

The objectives of this course are:

1. To understand the basic component of Natural Language Processing.
2. To explore the application areas of Natural Language Processing.
3. To understand the idea of Language Modeling.
4. To explore the basic concepts of Parts-of-speech Tagging.
5. To understand the concepts of language modeling.

**Course Outcome:**

On completion of the course students will be able to:

1. Apply different compiler writing tools to implement the different Phases.
2. Analyze the data flow and control flow.
3. Construct the intermediate representation.
4. Design and develop various modules of a compiler.
5. Develop modules of compiler using Lex and Yacc tools.

## Syllabus

### List of Programs as Assignments:

#### 1. Lab Assignment No: 1

Objective: To Understand the concept of tokens.

Q1. C program to count white spaces, numbers, words in a file./

#### 2. Lab Assignment No: 2

Objective: To Understand the process of identification of tokens.

Q1. C program to design Finite automata to identify different tokens (identifiers, constants, Operators, etc.).

#### 3. Lab Assignment No: 3

Objective: To have a brief Understanding to lex programming.

Q1. Count number of a's in given string.

Q2. Identify different patterns like aa, ab, not containing a, etc. in given string .

#### 4. Lab Assignment No: 4

Objective: To Understand lex programming tool.

Q1. Lex program to Identify all tokens of C programs.

#### 5. Lab Assignment No: 5

Objective: To Understand and Implement structure of any programming language.

Q1.Design and Code individual programming code with all possible tokens in programming language.

#### 6. Lab Assignment No: 6

Objective: To Understand lex programming tool in depth.

Q1. Starting and ending with 'a'.

Q2. # a's divisible by 2 or b's divisible by 3.

Q3. 4th Symbol 'a' from RHS.

Q4. Output code after removing white spaces and comment.

#### 7. Lab Assignment No: 7

Objective: To Understand and Implement Parser using yacc.

Q1. Build parsers using yacc for  $L(G)=\{a^n b\}$



$n$

$| n \geq 1 \}$  over  $\{a,b\}$

### **8. Lab Assignment No: 8**

Objective: To Understand and Implement parser for different grammars.

Q1. Build Parser using yacc for  $L(G)$  where rule set of  $G$  is  $\{ S \rightarrow aSb, S \rightarrow bSa, S \rightarrow c \}$  over  $\{a,b,c\}$ .

### **9. Lab Assignment No: 9**

Objective: To Understand and Implement parser coding.

Q1. Build parser using yacc to convert the infix expression to postfix expression.

### **10. Lab Assignment No: 10**

Objective: To Understand and Implement parser coding.

Q1. Build a calculator in yacc which takes expression in postfix notation.

Q2. Build parsers using yacc to convert the prefix expression into the postfix expression.

### **11. Lab Assignment No: 11**

Objective: To Understand and Implement parser for validation and operations.

Q1. Build parsers using yacc to validate the C statements. E.g `int a,b,c;(valid)`

Q2. Build calculator in yacc.

### **Books recommended:**

#### **Text books**

lex&yacc (2nd ed.) :O'Reilly & Associates, Inc. Sebastopol, CA, USA ©1992 .

#### **Reference books**

Lex &Yacc:O'Reilly & Associates, Inc. Sebastopol, CA, USA ©1992.

**Program:** B T E C H  
**Semester:** Sixth  
**Course:** Computer Networks  
**Course Code:** 3PCCCS307

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L	T	P	C
3	0	0	3

**Course Objective:**

The objectives of this course are:

1. To develop an understanding of modern network architectures from a design and performance perspective.
2. To introduce the student to the major concepts involved in wide-area networks (WANs), local area networks (LANs) and Wireless LANs (WLANs).
3. To provide an opportunity to do network programming
4. To provide a WLAN measurement ideas.

**Course Outcome:**

On completion of the course students will be able to:

1. Explain the functions of the different layer of the OSI Protocol.
2. Draw the functional block diagram of wide-area networks (WANs), local area networks (LANs) and Wireless LANs (WLANs) describe the function of each block.
3. For a given requirement (small scale) of wide-area networks (WANs), local area networks (LANs) and Wireless LANs (WLANs) design it based on the market available component
4. For a given problem related TCP/IP protocol developed the network programming. Configure DNS DDNS, TELNET, EMAIL, File Transfer Protocol (FTP), WWW, HTTP, SNMP, Bluetooth, Firewalls using open source available software and tools.

**Course Content:**

Topics	Hours
<b>UNIT I</b>	
<b>Data communication Components:</b> Representation of data and its flow Networks , Various Connection Topology, Protocols and Standards, OSI model, Transmission Media, LAN: Wired LAN, Wireless LANs, Connecting LAN and Virtual LAN, Techniques for Bandwidthutilization: Multiplexing - Frequency division, Time division and Wave division, Concepts on spread spectrum.	6
<b>UNIT II</b>	
<b>Data Link Layer and Medium Access Sub Layer:</b> Error Detection and Error Correction - Fundamentals, Block coding, Hamming Distance, CRC; Flow Control and Error control protocols - Stop and Wait, Go back – N ARQ, Selective Repeat ARQ, Sliding Window, Piggybacking, Random Access, Multiple access protocols -Pure ALOHA, Slotted ALOHA,CSMA/CD,CDMA/CA	8
<b>UNIT -III</b>	
<b>Network Layer:</b> Switching, Logical addressing – IPV4, IPV6; Address mapping – ARP,RARP, BOOTP and DHCP–Delivery, Forwarding and Unicast Routing protocols.	5
<b>UNIT IV</b>	
<b>Transport Layer:</b> Process to Process Communication, User Datagram Protocol (UDP), Transmission Control Protocol (TCP), SCTP Congestion Control; Quality of Service, QoS improving techniques: Leaky Bucket and Token Bucket algorithm.	6
<b>UNIT V</b>	
<b>Application Layer:</b> Domain Name Space (DNS), DDNS, TELNET, EMAIL, File Transfer Protocol (FTP), WWW, HTTP, SNMP, Bluetooth, Firewalls, Basic concepts of Cryptography	5

**Suggested books:**

1. Data Communication and Networking, 4th Edition, Behrouz A. Forouzan, McGraw-Hill.
2. Data and Computer Communication, 8th Edition, William Stallings, PearsonPrentice Hall India.

**Suggested reference books**

1. Computer Networks, 8th Edition, Andrew S. Tanenbaum, Pearson New International Edition.
2. Internetworking with TCP/IP, Volume 1, 6th Edition Douglas Comer, Prentice Hall of India.
3. TCP/IP Illustrated, Volume 1, W. Richard Stevens, Addison-Wesley, United States of America.

**Program:** B T E C H

**Semester:** Sixth

**Course:** Computer Networks Lab

**Course Code:** 3PCCCS307P

L	T	P	C
0	0	4	2

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### **Course Objective:**

The objectives of this course are:

1. To familiarize the student in introducing and exploring various Network topologies and networking protocols
2. To understand the use of client/server architecture in application
3. To enable the student on how to approach for networking problems using networking simulation tools.
4. To Design reliable servers using both TCP and UDP sockets
5. Familiar with network tools and network programming.

### **Course Outcome:**

On completion of the course students will be able to:

1. Express programming & simulation for networking problems.
2. Understand of various aspects of networking devices
3. Design and implement simulation of a simple LAN and a WAN that meet a specific set of criteria
4. Identify the elements of a communication network
5. Simulate various OSI layer protocols using C/C++/ Java

## **Syllabus**

### **List of Programs as Assignments:**

#### **1. Lab Assignment No: 1**

Q1. To familiarize with the Lab Network Topology, Locating different interfaces, routers and switches. Studying different pools of IP addresses.

Q2. Implement the data link layer framing methods such as character, character stuffing, and bit stuffing.

Q3. To learn and observe the usage of different networking commands e.g. PING, TRACEROUTE. Learning remote login using telnet session. Measuring typical average delays between different locations of the network.

#### **2. Lab Assignment No: 2**

Q1. What is the IP of the machine you are using? Compare it with the IP of your neighbors. Are the IPs of your neighbors same? Why or Why not?

Q2. Ping” is a tool used to determine if a server is responding and to estimate the round trip time of a message sent to that server. Use the ping command for the following URLs and record the success or failure statistics along with the average round trip time.

a) google.com

b) facebook.com

c) jru.edu.in

Q3. Trace the route that is taken when you try to access:

a) google.com

b) facebook.com

c) jru.edu.in

Q4. Network Commands on Linux / Unix

#### **3. Lab Assignment No: 3**

Q1. Implement on a data set of characters the three CRC polynomials – CRC 12, CRC 16 and CRC 32.

Q2. Implementation of Sub-netting and Super-netting.

Q3. To study different types of transmission media, various topologies, and configure modem of computer HUB and Switches.

#### **4. Lab Assignment No: 4**

Q1. Write a C/C++ program to determine if the IP address is in Class A, B, C, D, or E.

Q2. Write a C/C++ program to determine if the IP address is in Class A, B, or C.

Q3. Write a C/C++ program to translate dotted decimal IP address into 32 bit address.

Q4. To implement a routing protocol and check its connectivity in a variable length subnet masked network

Q5. Write a C/C++ program to perform bit stuffing and de-stuffing.

### **5. Lab Assignment No: 5**

Q1. Implement Dijkstra's algorithm to compute the Shortest path through a graph.

Q2. Take an example subnet graph with weights indicating delay between nodes.

Now obtain Routing table at each node using distance vector routing algorithm

Q3. Take an example subnet of hosts. Obtain broadcast tree for it.

### **6. Lab Assignment No: 6**

Q1. Build implementations of the Internet protocols

Q2. Implementation of Stop and Wait Protocol and Sliding Window Protocol.

Q3. Write a code simulating ARP /RARP protocols.

### **7. Lab Assignment No: 7**

Q1. Create a socket for HTTP for web page upload and download

Q2. Write a code simulating PING and TRACEROUTE commands.

### **Books recommended:**

#### **Suggested books:**

1. William Stallings, Data and Computer Communication, Prentice Hall of India.
2. Behrouz A. Forouzan, Data Communication and Networking, McGraw-Hill.
3. Andrew S. Tanenbaum, Computer Networks, Prentice Hall.

#### **Suggested reference books**

1. W. Richard Stevens, TCP/IP Illustrated, Volume 1, Addison-Wesley.
2. Douglas Comer, Internetworking with TCP/IP, Volume 1, Prentice Hall of India.

Program: B.TECH

Semester: Fifth

Course: Fundamentals of Software

Engineering Course Code: 3PCCCS308

L	T	P	C
3	0	0	3

Course Objective:

Students will be able to

1. Understand about effective team members, aware of cultural diversity, who conduct themselves ethically and professionally.
2. Use effective communication skills and technical skills to assure production of quality software, on time and within budget.
3. Build upon and adapt knowledge of science, mathematics, and engineering to take on more expansive tasks.
4. Increase level of self-reliance, technical expertise, and leadership.

Course Outcome:

After the successful completion of the course, the students will be able to:

1. Explain the software engineering principles and techniques.
2. Apply Software Project Management Practices.
3. Apply the knowledge gained for their project work as well as to develop software following software engineering standards.
4. Develop self-reliance, technical expertise, and leadership.

Course Content:

Topics	Hours
<b>Unit I</b>	
<b>Introduction</b> Some Definitions, FAQs about software engineering, the evolving role of software, Software process models, Waterfall model, the prototyping model, spiral model, RAD and Incremental model, Management activities, Project planning and Project Scheduling.	6
<b>Unit II</b>	
<b>Software Requirements</b> Functional and non-functional requirements, User requirements, System requirements, the software requirements document. IEEE standard of SRS, Quality of good SRS. <b>Requirement Engineering Process:</b> Feasibility study, Requirements elicitation and analysis, Requirements validation, Requirement management.	7
<b>Unit III</b>	

<b>Design Engineering</b> Design Process and Design Quality, Design Concepts, Design Models, Object oriented Design, UML: Class diagram, Sequence diagram, Collaboration diagram.	5
<b>Unit IV</b>	6
<b>Verification and Validation</b> Verification and Validation Planning, S/W inspection, static analysis. <b>Software Testing</b> Testing functions, Test case design, White Box testing, Black box testing, Unit testing, Integration Testing, System testing, Reliability.	
<b>Unit V</b>	
Process metrics, Software Measurement, Software Project Estimation, Decomposition Techniques, Empirical Estimation Models, Quality assurance and standards, Quality planning, Quality control, S/W Maintenance in detail.	6

### **Suggested Text Book:**

1. Sommerville, Software Engineering, 7<sup>th</sup> Edition, Pearson Education Publication.

### **Suggested Reference Books:**

1. Pressman R. S., Software Engineering: A Practitioners Approach, 5th Edition., TMA, New Delhi.
2. Mall Rajib, Fundamental of Software Engineering, 4<sup>th</sup> Edition, PHI Learning Private
3. Limited.
4. Peters J. F. & Pedrycz W., Software Engineering, John Wiley & Sons, Inc. 2000.
5. Behforooz A. & Hudson F.J., Software Engineering Fundamentals, Oxford Univ.Press, New York, 2000.



**Program:** B T E C H

**Semester:** Fifth

**Course:** Fundamentals of Software Engineering Lab

**Course Code:** 3TECCS302P

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0	0	2	1

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**Course Objective:**

1. Familiarize the students with the fundamental concepts of Software Engineering.
2. Impart state-of-the-art knowledge on SRS and UML.
3. Explore case studies to demonstrate practical applications of different concepts.
4. Provide a platform where they can solve real life problems.

**Course Outcome:**

After the successful completion of the course, the students will be able to:

1. Prepare efficient models for development of software for various projects.
2. Collect the requirements the client wants for the software being produced.
3. Design the UML diagrams necessary for the software being developed.
4. Create and specify feasible software designs based on the requirements/specifications.
5. Assess the extent and costs of a project with the help of several different assessment methods.

**SYLLABUS**

**List of Programs as Assignments:**

**1. Lab Assignment No: 1**

Objective: To Understand and Implement Identification of Requirements from Problem Statements

Q1. To consider the problem statement for a project to be developed and list out the ambiguities, inconsistencies and incompleteness of the problem statement.

Q2. To identify different functionalities to be obtained from a system and characteristics that a system should have, but not possessed by the system itself

**2. Lab Assignment No: 2**

Objective: To Understand and Implement Estimation of Project Metrics

Q1. To estimate the minimum size of the team one would require to develop a project through application of intermediate COCOMO.

Q2. To use Halstead's metrics to estimate the effort required to recreate a program in JAVA from C.

### **3. Lab Assignment No: 3**

Objective: To Understand and Implement Modeling UML Use Case Diagrams and Capturing Use Case Scenarios

Q1. To draw a use case diagram for the given case study.

Q2. To identify the primary and secondary actors for the system and generalization of usecases and «include» stereotypes to prevent redundancy in the coding phase.

### **4. Lab Assignment No: 4**

Objective: To Understand and Implement E-R Modeling from the Problem Statements

Q1. To identify the possible entity sets, their attributes, and relationships for the given case study.

Q2. To draw an ER diagram for the given case study.

### **5. Lab Assignment No: 5**

Objective: To Understand and Implement Identification of Domain Classes from the Problem Statements

Q1. To identify potential classes and their attributes for the given case study.

Q2. To utilize expert knowledge on the subject matter to identify other relevant classes.

### **6. Lab Assignment No: 6**

Objective: To Understand and Implement Identification of Components from the Problem Statements

Q1. To identify potential components for the given case study. Q2. To draw component diagram for the given case study

### **7. Lab Assignment No: 7**

Objective: To Understand and Implement State Chart and Activity

Modeling Q1. To draw a statechart diagram to graphically represent the given case study.

Q2. To draw an activity diagram to graphically represent the workflow of the given casestudy.

### **8. Lab Assignment No: 8**

Objective: To Understand and Implement Modeling UML Class Diagrams and Sequencediagrams

Q1. To draw class diagram for the given case study.

Q2. To draw sequence diagram for the given case study.

### **9. Lab Assignment No: 9**

Objective: To Understand and Implement Modeling Data Flow

Diagrams Q1. To draw data flow diagram (Level 0, 1 and 2) for the given case study.

### **10. Lab Assignment No: 10**

Objective: To Understand and Implement Estimation of Test Coverage Metrics and StructuralComplexity

Q1. To identify the basic blocks for a given

programQ2. To draw a CFG using the basic blocks

Q3. To determine McCabe's complexity from a CFG.

### **11. Lab Assignment No: 11**

Objective: To Understand and Implement Designing

Test SuitesQ1. To design a test suite for the given case study.

Q2. To verify implementation of functional requirements by writing

test cases.Q3. To analyze results of testing to ascertain the current state of the project.

### **12. Lab Assignment No: 12**

Objective: To Understand and Implement Forward and Reverse

EngineeringQ1. To obtain programs from UML diagrams.

Q2. To obtain UML diagrams from programs.

Suggested Text Books:

1. Software Engineering, Ian Sommerville, Pearson, 10th Edition, 2016.
2. Software Engineering: A Practioner's Approach, Roger S. Pressman, McGraw Hills, 7<sup>th</sup> Edition, 2009.

**Suggested Reference Books:**

- 1.** Fundamentals of Software Engineering, Rajib Mall, Prentice-Hall of India, 3rd Edition, 2009.

**Program:** B T E C H  
**Semester:** Sixth  
**Course:** Project-I  
**Course Code:** 3PROJCS301

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The knowledge gained in previous courses are to be applied to a practical problem in various disciplines Demonstrate their ability to work independently and collaboratively.

# **SPECIALIZATION IN ARTIFICIAL INTELLIGENCE**

**TRACK ELECTIVE – II**

**TRACK ELECTIVE – III**

**Program:** B T E C H

**Semester:** Sixth

**Course:** Distributed Database Management System

**Course Code:** 3TECCS311

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**Course Objective:**

The objectives of this course are:

1. To develop conceptual understanding of database management system.
2. To understand how a real world problem can be mapped to schemas.
3. To solve different industry level problems & to learn its applications

**Course Outcome:**

On completion of the course students will be able to:

1. Understand theoretical and practical aspects of distributed database systems.
2. Study and identify various issues related to the development of distributed database system.
3. Understand the design aspects of object-oriented database system and related development.

**Course Content:**

Topics	Hours
<b>UNIT I - Introduction</b>	6
<b>Introduction;</b> Distributed Data Processing, Distributed Database System, Promises of DDBSs, Problem areas. <b>Distributed DBMS Architecture:</b> Architectural Models for Distributed DBMS, DDMBS Architecture. <b>Distributed Database Design:</b> Alternative Design Strategies, Distribution Design issues, Fragmentation, Allocation.	
<b>UNIT II - Query Processing and Decomposition</b>	
<b>Query processing and decomposition:</b> Query processing objectives, characterization of query processors, layers of query processing, query decomposition, localization of distributed data. <b>Distributed query Optimization:</b> Query optimization, centralized query optimization, distributed query optimization algorithms.	6
<b>UNIT III - Transaction Management</b>	6
<b>Transaction Management:</b> Definition, properties of transaction, types of transactions, distributed concurrency control: serializability, concurrency control mechanisms & algorithms, time - stamped & optimistic concurrency control Algorithms, deadlock Management.	
<b>UNIT IV - Distributed DBMS Reliability</b>	6
<b>Distributed DBMS Reliability:</b> Reliability concepts and measures, fault-tolerance in distributed systems, failures in Distributed DBMS, local & distributed reliability protocols, site failures and network partitioning. <b>Parallel Database Systems:</b> Parallel database system architectures, parallel data placement, parallel query processing, load balancing, database clusters.	
<b>UNIT V - Distributed object Database Management Systems</b>	6
<b>Distributed object Database Management Systems:</b> Fundamental object concepts and models, object distributed design, architectural issues, object management, distributed object storage, object query Processing. <b>Object Oriented Data Model:</b> Inheritance, object identity, persistent programming languages, persistence of objects, comparison OODBMS and ORDBMS	

**Suggested books:**

1. M. Tamer OZSU and Patuck Valduriez: Principles of Distributed Database Systems, Pearson Edn. Asia, 2001.
2. Stefano Ceri and Giuseppe Pelagatti: Distributed Databases, McGraw Hill.

**Suggested reference books**

1. Hector Garcia-Molina, Jeffrey D. Ullman, Jennifer Widom: "Database Systems: The Complete Book", Second Edition, Pearson International Edition



**Program:** B T E C H

**Semester:** Sixth

**Course:** Distributed Database Management System Lab

**Course Code:** 3TECCS311P

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0	0	2	1

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### Course Objectives:

Students will be able to

1. To design and implement a database schema for a given problem domain
2. To create and manipulate tables using SQL queries
3. To prepare a Database for a given problem
4. To develop applications using PL/SQL

### Course Outcomes:

After the successful completion of the course, the students will be able to:

1. Understand, analyze and apply common SQL statements including DDL, DML and DCL statements to perform different operations.
2. Design different views of tables for different users and to apply embedded and nested queries.
3. Design and implement a database for a given problem according to well-known design principles that balance data retrieval performance with data consistency.
4. Apply normalization techniques to avoid redundancy

### **List of Experiments:**

1. A) Introduction of Database management systems, Oracle concepts and Create a table.  
B) How to insert data in a table using insert and display the records in a table.
2. A) Update or Delete records of a table and modifying structure of a table using Alter and Drop command.  
B) Study of character functions for manipulation of data items.
3. To perform join operation between various tables.
4. Applying constraint using two tables.
5. How to retrieve data from different tables using sub queries and correlated queries.
6. Create two databases either on single DBMS and Design Database to fragment and share the fragments from both database and write single query for creating view.
7. Understanding of Database Objects: synonym, sequence, index and view.
8. To study the concepts of Normalization.
9. Case study on noSQL.
10. Case study on hadoop.

**Program:** B T E C H  
**Semester:** Sixth  
**Course:** Machine Learning  
**Course Code:** 3TECCS312

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L	T	P	C
3	0	0	3

**Course Objective:**

The objectives of this course are:

1. To understand the basic concept of machine learning.
2. To explore the application of machine learning.
3. To understand the concept of supervised learning.
4. To learn the advantage of neural network.
5. To learn the utility of clustering techniques.

**Course Outcome:**

On completion of the course students will be able to:

1. Formulate machine learning problems corresponding to different applications: data, model selection, model complexity
2. Demonstrate understanding of a range of machine learning algorithms along with their strengths and weaknesses
3. Implement machine learning solutions to classification, regression, and clustering problems
4. Design and implement various machine learning algorithms in a range of real-world applications
5. Evaluate and analyse the performance of machine learning algorithm or a system based on machine learning algorithm.

**Course Content:**

Topics	Hours
<b>UNIT I</b>	
<b>Introduction to Machine learning</b> Machine Learning – what and why? Basics of Linear Algebra and Statistics, Overview of target function representations; Linear Regression.	6
<b>UNIT II</b>	
<b>Supervised Learning</b> Basics of Feature Selection and Evaluation, Decision Tree, Overfitting and Pruning, Logistic regression, Support Vector Machine and Kernel; Noise, bias-variance trade-off, under-fitting and over-fitting concepts	7
<b>UNIT -III</b>	
<b>Neural Networks</b> Perceptions: representational limitation and gradient descent training. Multilayer networks and back propagation. Hidden layers and constructing intermediate, distributed representations. Overfitting, learning network structure, recurrent networks.	6
<b>UNIT IV</b>	
<b>Unsupervised and Semi Supervised Learning</b> Learning from unclassified data. Clustering. Hierarchical Agglomerative Clustering. kmeans partitional clustering. Expectation maximization (EM) for soft clustering. Semisupervised learning with EM using labelled and unlabeled data.	5
<b>UNIT V</b>	
<b>Ensemble</b> Committees of multiple hypotheses, bagging, boosting, active learning with ensembles,	6

**Suggested Text Books:**

1. Mitchell Tom, Machine Learning, Latest Edition, Mc-Graw Hill.

**Suggested Reference Books:**

1. Shalev-Shwartz Shai and Ben-David Shai, Understanding Machine Learning, Cambridge University Press. 2017.
2. Bishop Christopher, Pattern Recognition and Machine Learning, Springer, 2006.

**Program:** B T E C H  
**Semester:** Sixth  
**Course:** Web Technology  
**Course Code:** 3TECCS313

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L	T	P	C
3	0	0	3

**Course Objective:**

The objectives of this course are:

1. To make student familiar with client server architecture
2. To make student able to develop a web application using java technologies.
3. To gain the skills and project-based experience needed for entry into web application and development careers.

**Course Outcome:**

On completion of the course students will be able to:

1. Students are able to develop a dynamic webpage by the use of java script and DHTML.
2. Students will be able to write a well formed / valid XML document.
3. Students will be able to connect a java program to a DBMS and perform insert, update and delete operations on DBMS table.
4. Students will be able to write a server side java application called Servlet to catch form data sent from client, process it and store it on database.
5. Students will be able to write a server side java application called JSP to catch form data sent from client and store it on database.

**Course Content:**

Topics	Hours
<b>UNIT I</b>	
<b>Introduction to HTML :</b> HTML Common tags- Block Level and Inline Elements, Lists, Tables, Images, Forms, Frames; Cascading Style sheets, CSS Properties; <b>Java Script:</b> Introduction to Java Script, Objects in Java Script, Dynamic HTML with Java Script	6
<b>UNIT II</b>	
<b>JDBC:</b> Data Base, Database Schema, A Brief Overview Of The JDBC Process, JDBC Driver Types, JDBC Packages, Database Connection, Associating The JDBC-ODBC Bridge With Database, Creating, Inserting, Updating And Deleting Data In Database Tables, Result Set, Metadata.	6
<b>UNIT -III</b>	
<b>Web Servers and Servlets:</b> Tomcat web server, Introduction to Servlets: Servlets, the Advantage of Servlets over “Traditional” CGI, Basic Servlet Structure, Simple Servlet Generating Plain Text, Compiling and Installing the Servlet, Invoking the Servlet, Lifecycle of a Servlet, The Servlet API, Reading Servlet parameters, Reading Initialization parameters, Context Parameters, Handling Http Request & Responses, Using Cookies-Session Tracking, Servlet with JDBC.	8
<b>UNIT IV</b>	
<b>Introduction to JSP:</b> The Problem with Servlet. The Anatomy of a JSP Page, JSP Processing, JSP Application Development: Generating Dynamic Content, Using Scripting Elements, Implicit JSP Objects, Declaring Variables and Methods , Sharing Data Between JSP pages, Users Passing Control and Data between Pages, JSP application design with JDBC, JSP Application Design with MVC.	6
<b>UNIT V</b>	
<b>Introduction to PHP:</b> Basics of PHP, Functions, Error Handling, Interaction between PHP and MySQL, Database using Forms, Using PHP to manipulate and Retrieve Data in MySQL.	4

**Suggested books:**

1. Jon Duckett “Beginning Web Programming” WROX.
2. Marty Hall and Larry Brown “Core Servlets and Java Server pages Vol. 1: Core Technologies”, Pearson.

**Suggested reference books**

1. DanWoods and Gautam Guliani, “Open Source for the Enterprise: Managing Risks, Reaping Rewards”, O’Reilly, Shroff Publishers and Distributors, 2005.
2. Sebesta, “Programming world wide web” Pearson.
3. Dietel and Nieto, “Internet and World Wide Web – How to program”, PHI/Pearson Education Asia.

**Program:** B T E C H  
**Semester:** Sixth  
**Course:** Web Technology Lab  
**Course Code:** 3TECCS313P

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L	T	P	C
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**Course Objective:**

The objectives of this course are:

1. To make student familiar with client server architecture
2. To make student able to develop a web application using java technologies.
3. To gain the skills and project-based experience needed for entry into web application and development careers.

**Course Outcome:**

On completion of the course students will be able to:

1. Students are able to develop a dynamic webpage by the use of java script and DHTML.
2. Students will be able to write a well formed / valid XML document.
3. Students will be able to connect a java program to a DBMS and perform insert, update and delete operations on DBMS table.
4. Students will be able to write a server side java application called Servlet to catch form data sent from client, process it and store it on database.
5. Students will be able to write a server side java application called JSP to catch form data sent from client and store it on database.

## **Lab Exercises**

1. Write a HTML program for the demonstration of Lists.
  - a. Unordered List
  - b. Ordered List
  - c. Definition List
  - d. Nested List
2. Write a HTML program for demonstrating Hyperlinks.
  - a. Navigation from one page to another.
  - b. Navigation within the page.
3. Write a HTML program for time-table using tables.
4. Write a HTML program to develop a static Home Page using frames.
5. Write a HTML program to develop a static Registration Form.
6. Write a HTML program to develop a static Login Page.
7. Write a HTML program to develop a static Web Page for Catalog.
8. Write a HTML program to develop a static Web Page for Shopping Cart.
9. Write HTML for demonstration of cascading stylesheets.
  - a. Embedded stylesheets.
  - b. External stylesheets.
  - c. Inline styles.
10. Write a javascript program to validate USER LOGIN page.
11. Write a javascript program for validating REGISTRATION FORM
12. Write a program for implementing XML document for CUSTOMER DETAILS.
13. Write an internal Document Type Definition to validate XML for CUSTOMER DETAILS?
14. Write an external Document Type Definition to validate XML for CUSTOMER DETAILS?
15. Write an XML for person information and access the data using XSL.
16. Write an XML for student information and access second students data using DOM.
17. Write a program to display contents of XML file in a table using Extensible Style Sheets.

## **WEB TECHNOLOGIES LAB MANUAL**

18. Write a simple servlet that displays a message.
19. Write a servlet that reads parameters from employee login page.
20. Write a servlet for creating a cookie and retrieving it.
21. Write a servlet for session tracking.
22. Write a JSP that reads parameters from user login page.
23. Write a JSP that reads a value, creates a cookie and retrieves it.
24. Write a JSP for session tracking.
25. Write a servlet that connects to the database and retrieves the data and displays it.



**Program:** B T E C H

**Semester:** Sixth

**Course:** Statistics for Artificial Intelligence

**Course Code:** 3TECCS319

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**Course Objective:**

The objectives of this course are:

1. To become familiar with Data exploration
2. To understand the measure of Central Tendency, measure of Positions, measure of Dispersion
3. To investigate the relationship between attributes: Covariance, Correlation Coefficient
4. To understand Heuristic search techniques

**Course Outcome:**

On completion of the course students will be able to:

1. Demonstrate fundamental understanding of the measure of distribution
2. Demonstrate the basic principles of AI in solutions that require problem solving.
3. Demonstrate the validation ,Feature Reduction/Dimensionality reduction ,Principal components analysis
4. Demonstrate the procedure for statistical testing, test of hypothesis, Chi-Square test

**Course Content:**

Topics	Hours
<b>UNIT I - Basics of Statistics</b>	8
<ul style="list-style-type: none"> <li>• Data exploration (histograms, bar chart, box plot, line graph, scatter plot)</li> <li>• Qualitative and Quantitative Data</li> <li>• Measure of Central Tendency (Mean, Median and Mode),</li> <li>• Measure of Positions (Quartiles, Percentiles and Quantiles),</li> <li>• Measure of Dispersion (Range, Median, Variance , and Standard deviation)</li> </ul>	
<b>UNIT II - Statistical Analysis</b>	8
<ul style="list-style-type: none"> <li>• Relationship between attributes: Covariance, Correlation Coefficient</li> <li>• Measure of Distribution (Skewness and Kurtosis)</li> <li>• Conditional probability</li> <li>• Probability distributions (Continuous and Discrete)</li> <li>• Density Functions and Cumulative functions</li> </ul>	
<b>UNIT III - Inferential Statistics</b>	8
<ul style="list-style-type: none"> <li>• Procedure for statistical testing</li> <li>• Test of Hypothesis (Concept of Hypothesis testing, Null Hypothesis and Alternative Hypothesis)</li> <li>• Chi-Square test</li> <li>• Validation Techniques (Cross-Validations- Kfold, Stratified kfold)</li> <li>• Feature Reduction/Dimensionality reduction</li> <li>• Principal components analysis (Eigen values, Eigen vectors, Orthogonality)</li> </ul>	
<b>UNIT IV - Foundations of AI</b>	6
<ul style="list-style-type: none"> <li>• Introduction to AI</li> <li>• Importance of AI</li> <li>• AI and its related field</li> <li>• AI Techniques</li> <li>• Problem space and search: Defining the problem as a state space search</li> <li>• Heuristic search techniques- best first search &amp; depth first search</li> <li>• Hill climbing</li> </ul>	

**Suggested books:**

1. T. Veerarajan – Probability, Statistical, Random Processes 2nd Ed., TMH, New Delhi, 2003
2. Artificial Intelligence: A Modern Approach, 4th US edition by Stuart Russell and Peter Norvig

**Suggested reference books**

1. Basic Probability Theory - Robert B. Ash, Department of Mathematics, University of Illinois
2. E. Rich and K. Knight, "Artificial intelligence", TMH, 2nd ed., 1999.

**Program:** B T E C H  
**Semester:** Sixth  
**Course:** Data Mining  
**Course Code:** 3TECCS318

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**Course Objective:**

The objectives of this course are:

1. To introduce data warehouse and its components
2. To introduce knowledge discovery process, data mining and its functionalities
3. To develop understanding of various algorithms for association rule mining and their differences
4. To introduce various classification techniques
5. To introduce various clustering algorithms.

**Course Outcome:**

On completion of the course students will be able to:

1. Demonstrate an understanding of the importance of data warehousing and OLAP technology
2. Organize and Prepare the data needed for data mining using pre preprocessing techniques
3. Implement the appropriate data mining methods like classification, clustering or Frequent Pattern mining on various data sets.
4. Define and apply metrics to measure the performance of various data mining algorithms.
5. Demonstrate an understanding of data mining on various types of data like web data and spatial data.

**Course Content:**

Topics	Hours
<b>UNIT I</b>	
<b>Data Warehousing:</b> Need for data warehousing , Basic elements of data warehousing, Data Mart, Data Warehouse Architecture, extract and load Process, Clean and Transform data, Star ,Snowflake and Galaxy Schemas for Multidimensional databases, Fact and dimension data, Partitioning Strategy- Horizontal and Vertical Partitioning, Data Warehouse and OLAP technology, Multidimensional data models and different OLAP Operations, OLAPServer: ROLAP, MOLAP, Data Warehouse implementation, Efficient Computation of Data Cubes, Processing of OLAP queries, Indexing data.	6
<b>UNIT II</b>	
<b>Data Mining:</b> Data Preprocessing, Data Integration and Transformation, Data Reduction, Discretizaion and Concept Hierarchy Generation, Basics of data mining, Data mining techniques, KDP (Knowledge Discovery Process), Application and Challenges of Data Mining.	6
<b>UNIT -III</b>	
<b>Mining Association Rules in Large Databases:</b> Association Rule Mining, Single-Dimensional Boolean Association Rules, Multi-Level Association Rule, Apriori Algorithm, Fp- Growth Algorithm, Time series mining association rules, latest trends in association rules mining.	8
<b>UNIT IV</b>	
<b>Classification and Clustering:</b> Distance Measures, Types of Clustering Algorithms, K-Means Algorithm, Decision Tree, Bayesian Classification, Other Classification Methods, Prediction, Classifier Accuracy, Categorization of methods, Outlier Analysis.	6
<b>UNIT V</b>	
Introduction of Web Mining and its types, Spatial Mining, Temporal Mining, Text Mining, Security Issue, Privacy Issue, Ethical Issue.	4

**Suggested books:**

1. Arun k Pujari “Data Mining Technique” University Press
2. Han,Kamber, “Data Mining Concepts & Techniques”,

**Suggested reference books**

1. M.Kaufman., P.Ponnian, “Data Warehousing Fundamentals”, John Wiley.
2. 4, M.H.Dunham, “Data Mining Introductory & Advanced Topics”, Pearson Education.
3. Ralph Kimball, “The Data Warehouse Lifecycle Tool Kit”, JohnWiley.
4. E.G. Mallach , “The Decision Support & Data Warehouse Systems”, TMH

**Program:** B T E C H

**Semester:** Sixth

**Course:** Knowledge Representation

**Course Code:** 3TECCS320

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### **Course Objective:**

The objectives of this course are:

1. Introduce the techniques used to represent knowledge & associated methods for knowledge representation.
2. Identifying knowledge-based techniques which are appropriate for specific tasks
3. Enable students to design and apply knowledge-based systems

### **Course Outcome:**

On completion of the course students will be able to:

1. Discuss the foundations of Knowledge Representation using FOL
2. Understand how the knowledge can be used to represent commonsense worlds and key reasoning technique of Resolution theorem-proving
3. Design the Rule based system
4. Represent the knowledge using Object oriented approach
5. Apply Knowledge Representation systems for challenging real-world problems

**Course Content:**

Topics	Hours
<b>UNIT I - Knowledge representation and First Order Logic</b>	
Introduction - Use of Knowledge Representation in AI Systems, Methods for Knowledge Representation, Knowledge-based system - Knowledge representation-Reasoning - Role of Logic. Introduction to FOL - Syntax – Semantics-Pragmatics - Explicit and Implicit Belief	6
<b>UNIT II - Expressing Knowledge</b>	
Knowledge Engineering - Vocabulary - Basic Facts - Complex Facts - Terminological Facts Entailments - Abstract Individuals - Other Sorts of Facts.	5
<b>UNIT –III - Resolution</b>	
Resolution - The Propositional Case - Handling Variables and Quantifiers- Dealing with Computational Intractability	5
<b>UNIT IV - Structured Descriptions</b>	
Object-Oriented Representation- Objects and Frames, Description Language - Meaning and Entailment - Truth in an Interpretation – Entailment - Computing Entailments -Simplifying the Knowledge Base - Normalization - Structure Matching - The Correctness of the Subsumption Computation -Computing Satisfaction -	8
<b>UNIT V - Actions and Planning</b>	
Actions- The Situation Calculus- A Simple Solution to the Frame Problem-Complex Actions Planning - Planning in the Situation Calculus- The STRIPS Representation- Planning as a Reasoning Task, The Tradeoff between Expressiveness and Tractability	6

**Suggested books:**

1. Ronald J. Brachman, Hector J. Levesque: Knowledge Representation and Reasoning, MorganKaufmann, 2004.
2. Deepak Khemani. A First Course in Artificial Intelligence, McGraw Hill Education (India), 2013

**Suggested reference books**

1. Murray Shanahan: A Circumscriptive Calculus of Events. Artificial Intelligence 77(2), pp. 249-284, 1995.