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 endeavor 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
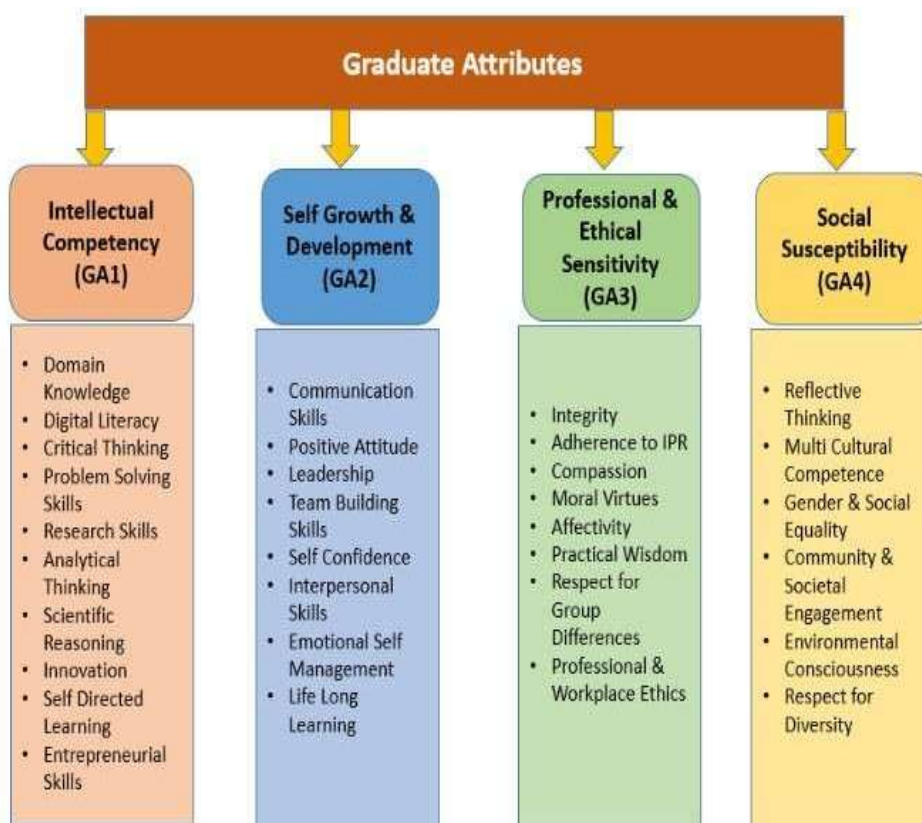
Program Educational Objectives (PEOs)

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	CATE GORY	CODE	COURSE TITLE	Periods			Evaluation Scheme				Subjec t Total	Cr edi t
				L	T	P	Assignm ent	T A	Tot al	ES E		
1	Basic Science Course	BSC101	Physics I	3	1	0	20	10	30	70	100	4
2	Basic Science Course	BSC102	Mathematics I	3	1	0	20	10	30	70	100	4
3	Enginee ring Science Course	ESC101	Basic ElectricalEnginee ring	3	1	0	20	10	30	70	100	4
4	Enginee ring Science Course	ESC102	Engineering Graphics & Design	1	0	0	20	10	30	70	100	1
5	Humani ties andSoci al Science s	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	Enginee ring Science Course	ESC101P	Basic Electrical Engineering Lab	0	0	2			30	20	50	1
3	Enginee ring Science Course	ESC102P	EngineeringGraph ics & 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 Science Course	BSC103	Chemistry I	3	1	0	20	10	30	70	100	4
2	Basic Science Course	BSC104	Mathematics II	3	1	0	20	10	30	70	100	4
3	Engineering Science Course	ESC103	Programming forProblem Solving	3	0	0	20	10	30	70	100	3
4	Engineering Science Course	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 Science Course	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 Science Course	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 Science Course	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**	**UMCBT CSE102**	**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	ComputerOrganization & 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 CoreCourse	3PCCCS203	Object Oriented Programming with JAVA	3	0	0	20	10	30	70	100	3
3	Professional CoreCourse	3PCCCS204	Discrete Mathematics	3	1	0	20	10	30	70	100	4
4	Professional CoreCo	3PCCCS205	Design & Analysis of Algorithms	3	0	0	20	10	30	70	100	3

S.No	CATEGORY	CODE	COURSE TITLE	L	T	P	Assignment	TA	Total	ESE	Subject Total	Credit
5	Humanities and Social Science	HSMC202	Professional Practice, Laws and Ethics	3	0	0	20	10	30	70	100	3
6	Humanities andSocial Sciences	HSMC203	Entrepreneurship	3	0	0	20	10	30	70	100	3
7	**Mandatory Course**	**MC201**	****DisasterManagement**	**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	3PCCCS205P	Design & Analysis of Algorithms Lab	0	0	4			30	20	50	2
3	Professional Core Course	3PCCCS203P	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	ESE		
1	Professional Core Course	3PCCCS301	DatabaseManagement 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		Track Elective - 1	3	0	2	20	10	30	70	100	4

S. No.	CATEGORY	CODE	COURSE TITLE	L	T	P	Assignment	TA	Total	ESE	Subject Total	Credit
	Elective											
6	**Mandatory Course**	**MC301**	****Constitution of India**	**2**	**0**	**0**	**20**	**10**	**30**	**70**	**100**	**0**

PRACTICAL /SESSIONAL

S. No.	CATEGORY	CODE	COURSE TITLE	L	T	P	Assignment	TA	Total	ESE	Subject Total	Credit
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 CoreCourse	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	ESE		
1	Professional CoreCourse	3PCCCS306	Compiler Design	3	0	0	20	10	30	70	100	3
2	Professional CoreCourse	3PCCCS307	Computer Networks	3	0	0	20	10	30	70	100	3
3	Professional CoreCourse	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

S. No.	CATEGORY	CODE	COURSE TITLE	L	T	P	Assignment	TA	Total	ESE	Subject Total	Credit
1	Professional CoreCourse	3PCCCS306P	Compiler DesignLab	0	0	4			30	20	50	2
2	Professional CoreCo	3PCCCS307P	Computer NetworksLab	0	0	4			30	20	50	2

S.No	CATEGORY	CODE	COURSE TITLE	L	T	P	Assignment	TA	Total	ESE	Subject Total	Credit
			urse									
3	Project	3PROJCS 301	Project-I	0	0	6	20	10	50	50	100	3
									TOTAL		**700**	**26**

SEMESTER VII

S. No	CATEGORY	CODE	COURSE TITLE	Periods			Evaluation Scheme				Subject Total	Credit
				L	T	P	Assignment	TA	Total	ESE		
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

PRACTICAL /SESSIONAL

S.No	CATEGORY	CODE	COURSE TITLE	L	T	P	Assignment	TA	Total	ESE	Subject Total	Credit
2	Project	3PROJCS 401	Project-II	0	0	8			100	100	200	4
									TOTAL		**600**	**17**

SEMESTER VIII

S. No.	CATEGORY	CODE	COURSE TITLE	Periods			Evaluation Scheme				Subject Total	Credit
				L	T	P	Assignment	TA	Total	ESE		
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
4	**Humanities and Social Sciences**	**HSMC402**	****Human Values& Ethics**	**3**	**0**	**0**	**20**	**10**	**30**	**70**	**100**	**3**

PRACTICAL /SESSIONAL

S.No	CATEGORY	CODE	COURSE TITLE	L	T	P	Assignment	TA	Total	ESE	Subject Total	Credit
1	Project	3PROJCS 402	Project-III	0	0	16			100	100	200	8
									TOTAL		**500**	**18**

** NOTE: Qualifying Non Credit Course			
NOTE: 20% credit earned through MOOC(SWAYAM) in the course			
B.Tech(CSE)			
CHOICE BASED CREDIT SYSTEM			
Semester Wise Credit Distribution			
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
Total Credits			**165**

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

	3TECCS3 14	Object Oriented Modelling and Design	3	0	0	3
	3TECCS3 15	Software Design	3	0	0	3
	3TECCS3 16	Soft Computing	3	0	0	3
SEM VII	3TECCS4 01	Internet -of- Things	3	0	0	3
	3TECCS4 02	Artificial Intelligence	3	0	2	4
	3TECCS4 03	Software Quality Assurance	3	0	0	3
	3TECCS4 04	Cryptography and Network Security	3	0	0	3
	3TECCS4 05	Cloud Computing	3	0	0	3
	3TECCS4 06	AI for games	3	0	2	4
SEM VIII	3TECCS4 14	Software Security	4	0	0	4
	3TECCS4 15	Software Testing	4	0	0	4
	3TECCS4 16	Software Maintenance	4	0	0	4
	3TECCS4 17	Software Engineering Management	4	0	0	4
	CODE	**Specialisation in CYBER SECURITY**	**L**	**T**	**P**	**C**
SEM V	3TECCS3 01	Introduction to Python Programming	3	0	2	4
	3TECCS3 02	Fundamentals of Software Engineering	3	0	2	4
	3TECCS3 05	Malware Analysis	4	0	0	4
	3TECCS3 06	Network Security	4	0	0	4
SEM VI	3TECCS3 11	Relational Database Management System	3	0	2	4
	3TECCS3 12	Machine Learning	3	0	0	3
	3TECCS3 13	Web Technology	3	0	2	4
	3TECCS3 17	Cryptography Fundamentals	3	0	0	3
	3TECCS3 18	Data Mining	3	0	0	3
	3TECCS3 16	Soft Computing	3	0	0	3

	CODE		L	T	P	C
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
	CODE	**Specialisation in ARTIFICIAL INTELLIGENCE**	**L**	**T**	**P**	**C**
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	3TECCS311	Relational Database Management System	3	0	2	4
	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

			L	T	P	C
	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
	CODE	**Specialisation in WEB AND MOBILE APPLICATION**	**L**	**T**	**P**	**C**
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
	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	Credits
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 V

SEMESTER V												
S.No	CATEGORY	CODE	COURSE TITLE	Periods			Evaluation Scheme				Subject Total	Credit
				L	T	P	Assignment	TA	Total	ESE		
1	Professional Core Course	3PCCCS301	DatabaseManagement 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 CoreCourse	3PCCCS305P	Operating Systems Lab	0	0	4			30	20	50	2
									TOTAL		750	20

Program: B T E C H
Semester: Fifth
Course: Database Management Systems
Course Code: 3PCCCS301

L	T	P	C
3	0	0	3

Course Objective:
The objectives of this course are:
- To understand the different issues involved in the design and implementation of a database system.
- To study the physical and logical database designs, database modeling, relational, hierarchical, and network models
- To understand and use data manipulation language to query, update, and manage a database
- To develop an understanding of essential DBMS concepts such as: database security, integrity, concurrency, distributed database, and intelligent database, Client/Server (Database Server), Data Warehousing.
- To design and build a simple database system and demonstrate competence with the fundamental tasks involved with modeling, designing, and implementing a DBMS.

Course Outcome:
On completion of the course students will be able to:

- For a given query write relational algebra expressions for that query and optimize the developed expressions
- For a given specification of the requirement design the databases using E-R method and normalization.
- For a given specification construct the SQL queries for Open source and Commercial DBMS -MYSQL, ORACLE, and DB2.
- For a given query optimize its execution using Query optimization algorithms For a given transaction-processing system, determine the transaction atomicity, consistency, isolation, and durability.
- Implement the isolation property, including locking, time stamping based on concurrency control and Serializability of scheduling.

Course Content:

Topics	Hours
UNIT I	
Database system architecture: Data Abstraction, Data Independence, Data Definition Language (DDL), Data Manipulation Language (DML). **Data models:** Entity-relationship model, network model, relational and object oriented datamodels, integrity constraints, data manipulation operations.	6
UNIT II	
Relational query languages: Relational algebra, Tuple and domain relational calculus, SQL3,DDL and DML constructs, Open source and Commercial DBMS - MYSQL, ORACLE, DB2,SQL server. **Relational database design:** Domain and data dependency, Armstrong's axioms, Normal forms, Dependency preservation, Lossless design. **Query processing and optimization:** Evaluation of relational algebra expressions, Query equivalence, Join strategies, Query optimization algorithms.	8
UNIT -III	
Storage strategies: Indices, B-trees, hashing.	5
UNIT IV	
Transaction processing: Concurrency control, ACID property, Serializability of scheduling, Locking and timestamp based schedulers, Multi-version and optimistic Concurrency Control schemes, Database recovery.	6
UNIT V	
Database Security: Authentication, Authorization and access control, DAC, MAC and RBACmodels, Intrusion detection, SQL injection.	5

Suggested books:

1. "Database System Concepts", 6th Edition by Abraham Silberschatz, Henry F.Korth, S.Sudarshan, McGraw-Hill.

2. Introduction to Database. Systems. Bipin C. Desai. Concordia University. Montreal, Canada. West Publishing Company. St. Paul New York Los Angeles San

Suggested reference books

1   "Principles of Database and Knowledge – Base Systems", Vol 1 by J. D.Ullman, Computer Science Press.
2   "Fundamentals of Database Systems", 5th Edition by R. Elmasri and S.Navathe, Pearson Education
3   "Foundations of Databases", Reprint by Serge Abiteboul, Richard Hull, Victor Vianu, Addison-Wesley

Program: B T E C H
Semester: Fifth
Course: Database Management Systems Lab
Course Code: 3PCCCS301P

L	T	P	C
0	0	4	2

Course Objective:
The objectives of this course are:
- To Learn and practice data modeling using the entity-relationship and developing database
- Understand the use of Structured Query Language (SQL) and learn SQL syntax
- Understanding the basic principles of modeling of database using UML and apply normalization techniques to normalize the database system.
- Learn Multidimensional schemas suitable for data warehousing. And learn the Difference between OLTP (Online Transaction Processing) and OLAP (Online Analytical Processing).
- To demonstrate the principles behind the logical database design and Data Warehouse Modeling.

Course Outcome:
On completion of the course students will be able to:

- Describe the fundamental elements of relational database management systems.
- Explain the basic concepts of relational data model, entity-relationship model, relational database design, relational algebra and SQL.
- Design ER-models to represent simple database application scenarios.
- Convert the ER-model to relational tables, populate relational database and formulate SQL.
- Improve the database design by normalization.

SYLLABUS

List of Programs as Assignments:

Lab Assignment No: 1
Objective: Implementation of DDL commands of SQL with suitable examples
• Create table
• Alter table
• Drop Table

Lab Assignment No: 2
Objective: Implementation of DML commands of SQL with suitable examples
• Insert
• Update
• Delete

Lab Assignment No: 3
Objective: Implementation of different types of function with suitable examples
• Number function
• Aggregate Function
• Character Function
• Conversion Function
• Date Function

Lab Assignment No: 4
Objective: Study & Implementation of PL/SQL.

Lab Assignment No: 5
Objective Implementation of different types of operators in SQL
• Arithmetic Operators
• Logical Operators
• Comparison Operator
• Special Operator
• Set Operation

Lab Assignment No: 6
Objective: Implementation of different types of Joins
• Inner Join
• Outer Join
• Natural Join etc..

Lab Assignment No: 7
Objective: Study & Implementation of SQL Triggers.

Lab Assignment No: 8

Objective:
• Creating Database /Table Space
• Managing Users: Create User, Delete User
• Managing roles:-Grant, Revoke.

Lab Assignment No: 9

Objective: Study and Implementation of
• Group By & having clause
• Order by clause
• Indexing

Lab Assignment No: 10

Objective: Study & Implementation of
• Sub queries
• Views

Lab Assignment No: 11

Objective: Study & Implementation of different types of constraints.

Books recommended:

TEXT BOOKS
1. A.Silberschatz et.al - Database System Concepts, 5thEdn, Tata Mc-Graw Hill, New Delhi − 2000.

REFERENCE BOOKS
1. Date C.J. - An Introduction to Database System, Pearson Education, New Delhi, 2005.
2. R.Elmasri, Fundamentals of Database Systems, Pearson Education, New Delhi, 2005.

Program: B T E C H
Semester: Fifth
Course: Formal Language & Automata Theory
Course Code: 3PCCCS302

L	T	P	C
3	0	0	3

Course Objective:

Students will be able to

1. Define a system and recognize the behavior of a system.
2. Design finite state machines and the equivalent regular expressions.
3. Construct pushdown automata and the equivalent context free grammars
4. Design Turing machines and Post machines
5. Learn about the issues in finite representations for languages and machines, as well as gain a more formal understanding of algorithms and procedures

Course Outcome:

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

1. Relate formal languages and mathematical models of computation
2. Analyze different types of languages and the corresponding machines
3. Analyze the Pushdown machine and its role in compiler construction
4. Find the capability of real computers and learn examples of unsolvable problems.
5. Analyze classes of P, NP, NP-C and NP-Hard problems

Course Content:

Topics	Hours
Unit I	
Introduction to Automata: (mathematical model of digital devices, including real computer), State Transition Graph, Finite Automaton (FA) and its types, Deterministic Finite Automaton (DFA), Non-deterministic Finite Automaton (NDFA), Complement, Union, Intersection of FA's , Conversion Strategy from NDFA to DFA , Minimization of FA, Finite Automaton with Output, Applications of FA.	5
Unit II	
Regular Expressions(RE): Introduction , R.E.'s and basic operations, Algebraic laws on Regular Expression, Finite and Infinite Languages, Equivalence of finite Automaton and regular expressions, Constructing NDFA from Regular Expression , Pumping Lemma for Regular Language, Closure properties of Regular Languages, Non-regular languages, Applications of Regular Expression.	7
Unit III	
Grammar:Introduction, Formal Definition of Grammar, The Chomsky Hierarchy of Grammar, Designing Regular grammar from DFA, Context Free Grammar, Closure properties of Context Free Languages, , CFG and Normal form: Chomsky Normal Form, Greibach Normal Form, Non-Context Free Language, Applications of CFGs.	6
Unit IV	
Push Down Automation (PDA): Introduction, Definition of PDA, Types of Pushdown Automata (DPDA and NPDA), Converting CFG to PDA, Derivation (Parsing), Parsing Techniques, Ambiguous and Unambiguous Grammar, Demerits of Ambiguous Grammar.	7
Unit V	
Turing Machine(TM): Single Tape TM, Variations of TM, Halting Problem, Turing Machine and Languages, Enumerable Languages, Decidable, Recognizable and Undecidable languages,Solvable and Unsolvable problems, Post Correspondence Problems(PCP), Classes of Problems:P, NP, NP-C and NP-Hard	5

Text Books:
1. Martin John "Introduction to Languages and the Theory of Computation", 3rd Edition, TMH.

Reference Books:
1. Mishra K.L.P &Chandrasekharan N., "Theory of Computer Science", PHI.
2. Hopcroft John E. And Ullman Jeffrey D., "Introduction to Automata Theory, Languages & Computation", 3rd Edition, Narosa, 2008.
3. Lewis H. R. and Papadimitrou C. H, "Elements of the theory of Computation", PHI.

Program: B T E C H
Semester: Fifth
Course: IT Workshop (Sci Lab/MATLAB)
Course Code: 3PCCCS304

L	T	P	C
2	0	0	2

Course Objective:

1. Students will be able to
2. Understand and use the basic Matlab functions and understand its environment and variables.
3. Know about handling operations and advanced features like menus and toolbars.
4. Implement programs with the use of arrays, strings and graphical data representations.
5. Understand Python, Data Types, Operators, Arrays.
6. Implement Functions and loops, object oriented programming using Python.

Course Outcome:

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

1. Apply features of Matlab and algorithms to solve problems
2. Develop application programs with the help of various tool boxes available in Matlab.
3. Apply data analysis through graphical data representations
4. Implement programs with the use of arrays, strings in Matlab
5. Implement Functions and loops, using Python

Course Content:

Topics	Hours
Unit I: Introduction to MATLAB and Basics Part I:	
Introduction, Advantage, Disadvantage of MATLAB, MATLAB Environment, Variables and Array, Built-in Functions of MATLAB, Subarrays, Multidimensional Arrays, Data Files.	4
Unit II: MATLAB Basic Part II:	
Scalar and Array Operations, Hierarchy of Operations, Introduction to Plotting, Polar Plots, Subplots, MATLAB profiler. String Functions, Complex Data, Three-Dimensional Plot	4
Unit III: MATLAB Advanced Features:	
Sparse Arrays, Cell Arrays,Structure Arrays, I/O Functions, Object Handles, Position and Units, Graphical User Interface: Dialog Boxes, Menus, Toolbars.	4
Unit IV: Introduction to Python Basics	
Basics, I Python, Data Types, Operators, Arrays, Plotting	4
Unit V: Python Programming Part 2:	
Functions and loops, object oriented programming, Numerical Formalism	4

Text Books:
1. Martin John "Introduction to Languages and the Theory of Computation", 3rd Edition, TMH.

Reference Books:
1. Mishra K.L.P &Chandrasekharan N., "Theory of Computer Science", PHI.
2. Hopcroft John E. And Ullman Jeffrey D., "Introduction to Automata Theory, Languages & Computation", 3rd Edition, Narosa, 2008.
3. Lewis H. R. and Papadimitrou C. H, "Elements of the theory of Computation", PHI.

Program: B T E C H
Semester: Fifth
Course: IT Workshop (Sci Lab/MATLAB)
Course Code: 3PCCCS304P

L	T	P	C
0	0	2	1

Course Objective:

Students will be able to

1. Understand and use the basic Matlab functions and understand its environment and variables.
2. Know about handling operations and advanced features like menus and toolbars.
3. Implement programs with the use of arrays, strings and graphical data representations.
4. Understand Python, Data Types, Operators, Arrays.
5. Implement Functions and loops, object oriented programming using Python.

Course Outcome:

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

1. Apply features of Matlab and algorithms to solve problems
2. Develop application programs with the help of various tool boxes available in Matlab.
3. Apply data analysis through graphical data representations
4. Implement programs with the use of arrays, strings in Matlab
5. Implement Functions and loops, using Python

LIST OF EXPERIMENTS

1. Practicing SCILAB environment with simple exercises to familiarize Command Window, History, Workspace, Current Directory, Figure window, Edit window, Shortcuts, Help files.
2. Data types, Constants and Variables, Character constants, operators, Assignment statements using python
3. Control Structures: For loops, While, If control structures, Switch, Break, Continue statements using python
4. Input-Output functions, Reading and Storing Data using python
5. Vectors and Matrices, commands to operate on vectors and matrices, matrix Manipulations.
6. Arithmetic operations on Matrices, Relational operations on Matrices, Logical Operations on Matrices.
7. Polynomial Evaluation, Roots of Polynomial, Arithmetic operations on Polynomials.
8. Graphics: 2D plots, Printing labels, Grid & Axes box, Text in plot, Bar and Pie chart.

TEXT BOOK

1. Bansal R.K, Goel A.K., Sharma M.K., "MATLAB and its Applications in Engineering", Pearson Education, 2012.

REFERENCES

1. Amos Gilat,"MATLAB-An Introduction with Applications", Wiley India, 2009.
2. Stephen.J.Chapman,"Programming in MATLAB for Engineers", Cengage Learning, 201

Program: B T E C H
Semester: Fifth
Course: Operating Systems
Course Code: 3PCCCS305

L	T	P	C
3	0	0	3

Course Objective:

1. To learn the mechanisms of OS to handle processes and threads and their communication
2. To learn the mechanisms involved in memory management in contemporary OS To gain knowledge on distributed operating system concepts that includes architecture, Mutual exclusion algorithms, deadlock detection algorithms and agreement protocols
3. To know the components and management aspects of concurrency management To learn to implement simple OS mechanisms

Course Outcome:

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

1. Create processes and threads.
2. Develop algorithms for process scheduling for a given specification of CPU utilization, Throughput, Turnaround Time, Waiting Time, Response Time.
3. For a given specification of memory organization develop the techniques for optimally allocating memory to processes by increasing memory utilization and for improving the access time.
4. Design and implement file management system.

Course Content:

Topics	Hours
Unit I	
Introduction: Concept of Operating Systems, Generations of Operating systems, Types of Operating Systems, OS Services, System Calls, Structure of an OS-Layered, Monolithic, Microkernel Operating Systems, Concept of Virtual Machine. Case study on UNIX and WINDOWS Operating System.	5
Unit II	
Processes: Definition, Process Relationship, Different states of a Process, Process Statetransitions, Process Control Block (PCB), Context switching **Thread:** Definition, Various states, Benefits of threads, Types of threads, Concept ofmultithreads, **Process Scheduling**: Foundation and Scheduling objectives, Types of Schedulers, Schedulingcriteria: CPU utilization, Throughput, Turnaround Time, Waiting Time, Response Time; Scheduling algorithms: Pre-emptive and Non pre-emptive, FCFS, SJF, RR; Multiprocessor scheduling: Real Time scheduling: RM and EDF.	7
Unit III	
Inter-process Communication: Critical Section, Race Conditions, Mutual Exclusion, Hardware Solution, Strict Alternation, Peterson's Solution, The Producer\ Consumer Problem, Semaphores, Event Counters, Monitors, Message Passing, Classical IPC Problems: Reader's & Writer Problem, Dinning Philosopher Problem etc. **Deadlocks:** Definition, Necessary and sufficient conditions for Deadlock, DeadlockPrevention, Deadlock Avoidance: Banker's algorithm, Deadlock detection and Recovery.	5
Unit IV	
Memory Management: Basic concept, Logical and Physical address map, Memory allocation: Contiguous Memory allocation – Fixed and variable partition–Internal and External fragmentation and Compaction; Paging: Principle of operation – Page allocation – Hardware support for paging, Protection and sharing, Disadvantages of paging. **Virtual Memory:** Basics of Virtual Memory – Hardware and control structures – Locality of reference, Page fault , Working Set , Dirty page/Dirty bit – Demand paging, Page Replacement algorithms: Optimal, First in First Out (FIFO), Second Chance (SC), Not recently used (NRU) and Least Recently used (LRU).	7
Unit V	
I/O Hardware: I/O devices, Device controllers, Direct memory access Principles of I/OSoftware: Goals of Interrupt handlers, Device drivers, Device independent I/O software,Secondary-Storage Structure: Disk structure, Disk scheduling algorithms	6

File Management: Concept of File, Access methods, File types, File operation, Directory structure, File System structure, Allocation methods (contiguous, linked, indexed), Free- space management (bit vector, linked list, grouping), directory implementation (linear list, hash table), efficiency and performance.

Disk Management: Disk structure, Disk scheduling - FCFS, SSTF, SCAN, C-SCAN, Disk reliability, Disk formatting, Boot-block, Bad blocks

Text Books:
1. Operating System Concepts Essentials, 9th Edition by AviSilberschatz, Peter Galvin, Greg Gagne, Wiley Asia Student Edition.
2. Operating Systems: Internals and Design Principles, 5th Edition, William Stallings, Prentice Hall of India.

Reference Books:
1. Operating System: A Design-oriented Approach, 1st Edition by Charles Crowley, Irwin Publishing
2. Operating Systems: A Modern Perspective, 2nd Edition by Gary J. Nutt, Addison-Wesley
3. Design of the Unix Operating Systems, 8th Edition by Maurice Bach, Prentice-Hall of India
4. Understanding the Linux Kernel, 3rd Edition, Daniel P. Bovet, Marco Cesati, O'Reilly and Associates

Program: B T E C H
Semester: Fifth
Course: Operating Systems Lab
Course Code: 3PCCCS305P

L	T	P	C
0	0	4	2

Course Objective:

1. To learn the mechanisms of OS to handle processes and threads and their communication
2. To learn the mechanisms involved in memory management in contemporary OS To gain knowledge on distributed operating system concepts that includes architecture, Mutual exclusion algorithms, deadlock detection algorithms and agreement protocols
3. To know the components and management aspects of concurrency management To learn to implement simple OS mechanisms

Course Outcome:

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

1. Create processes and threads.
2. Develop algorithms for process scheduling for a given specification of CPU utilization, Throughput, Turnaround Time, Waiting Time, Response Time.
3. For a given specification of memory organization develop the techniques for optimally allocating memory to processes by increasing memory utilization and for improving the access time.
4. Design and implement file management system.

List of Programs as Assignments:

1. Lab Assignment No: 1
Objective: To Understand and Implement Directory Structure
Q1. WAP to create a File directory system.

2. Lab Assignment No: 2
Objective: To Understand and Implement Scheduling processes
Q1. WAP to schedule various processes

3. Lab Assignment No: 3
Objective: To Understand and Implement FCFS
Q1. WAP to implement FCFS CPU Scheduling

4. Lab Assignment No: 4
Objective: To Understand and Implement SJF
Q1. WAP to implement SJF CPU scheduling.

5. Lab Assignment No: 5
Objective: To Understand and Implement SRTF
Q1.WAP to implement SRTF CPU scheduling.

6. Lab Assignment No: 6
Objective: To Understand and Implement Scheduling algorithms
Q1. WAP to implement Round Robin Scheduling

7. Lab Assignment No: 7
Objective: To Understand and Implement Scheduling algorithms
Q1 WAP to implement SRTF scheduling .

8. Lab Assignment No: 8
Objective: To Understand and Implement context switching
Q1. WAP to implement Round Robin Scheduling with context switching.

9. Lab Assignment No: 9
Objective: To Understand and Implement context switching.
Q1.WAP to implement SRTF with context switching.

10. Lab Assignment No: 10
Objective: To Understand and Implement Page Replacement Techniques
Q1. WAP to implement FCFS page replacement algorithm.
Q2. WAP to implement Optimal page replacement algorithm.

Program: B T E C H
Semester: Fifth
Course: Constitution of India
Course Code: MC301

L	T	P	C
2	0	0	0

Course Objective:

1. To describe the importance and role of Constitution of India.
2. To resolve the social problems and issues.
3. To maintain and bolster the unity and integrity in the society.
4. To formulate and design policies in accordance with the constitutional provisions.

Course Outcome:

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

1. Outline the need and importance of the Indian constitution.
2. Explain the fundamental rights and duties of the citizens of India.
3. Relate appropriate constitutional provisions with relevant social issues
4. Describe the role of different departments of government.
5. Criticize the Government policies and programmes designed for the society at large.

Course Content:

Topics	Hours
Unit I	
Introduction to the Constitution of India, Salient Features of the Constitution: Sources and constitutional history, Features: Citizenship, Preamble, Fundamental Rights and Duties, Directive Principles of State Policy	4
Unit II	
Union and State Executives: President and Prime Minister, Council of Ministers, Cabinet and Central Secretariat, Lok Sabha, Rajya Sabha.Governor: Role and Position, Chief Ministers and Council of ministers.	4
Unit III	
The Indian Judicial System – The Supreme Court and The High Court's – composition, Jurisdiction and functions, The Role of the Judiciary.	4
Unit IV	
Local Government- District's Administration: Role and Importance, The Panchayatas – Gram Sabha, Constitution and Composition of Panchayatas ,Constitution and Composition of Municipalities	4
Unit V	
Miscellaneous- Election Commission: Role and Functioning, Chief Election Commissioner and Election Commissioners. State Election Commission: Role and Functioning, Institute and Bodies for the welfare of SC/ST/OBC and women.	4

Text Books:
1. The Constitution of India by " Ministry of Law India" Kindle Edition
2. Constitutional History of India by Prof.M.V.PYLEE-S.Chand Publishing
3. Indian Administration by Avasti and Avasti-Lakshmi Narain Agarwal Educational Publishers.2017 edition.
4. Introduction to the Constitution of India by D DBasu by Lexis Nexis : 20th edition.
5. Constitution of India V.N.Shukla's EBC Explorer Edition 13th ,2017

SPECIALIZATION IN ARTIFICIAL INTELLIGENCE

TRACK ELECTIVE - I

Program: BTECH
Semester: Fifth
Course: Introduction to Python Programming
Course Code: 3TECCS301

L	T	P	C
3	0	0	3

Course Objective:
Students will be able to

1. To learn and understand Python programming basics and paradigm.
2. To learn and understand python looping, control statements and string manipulations. 3. Students should be made familiar with the concepts of GUI controls and designing GUI applications.
4. To learn and know the concepts of file handling, exception handling and database connectivity.

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

1. Define and demonstrate the use of built-in data structures "lists" and "dictionary".
2. Design and implement a program to solve a real world problem.
3. Design and implement GUI application and how to handle exceptions and files.
4. Make database connectivity in python programming language.

Course Content:

Topics	Hours
Unit I	
Introduction to Python: Python variables, Python basic Operators, Understanding python blocks. Python Data Types, Declaring and using Numeric data types: int, float etc.	6
Unit II	
Python Program Flow Control Conditional blocks: if, else and else if, Simple for loops in python, For loop using ranges, string, list and dictionaries. Use of while loops in python, Loop manipulation using pass, continue, break and else. Programming using Python conditional and loop blocks.	8
Unit III	
Python Complex data types: Using string data type and string operations, Defining list and list slicing, Use of Tuple data type. String, List and Dictionary, Manipulations Building blocks of python programs, string manipulation methods, List manipulation. Dictionary manipulation, Programming using string, list and dictionary in-built functions. Python Functions, Organizing python codes using functions.	9
Unit IV	
Python File Operations: Reading files, Writing files in python, Understanding read functions, read(), readline(), readlines(). Understanding write functions, write() and writelines() Manipulating file pointer using seek Programming, using file operations. Database Programming: Connecting to a database, Creating Tables,INSERT, UPDATE, DELETE and READ operations, Transaction Control,Disconnecting from a database, Exception Handling in Databases.	7

Suggested readings:

1. Python Crash Course: A Hands-On, Project-Based Introduction to Programming (2nd Edition)
2. Head-First Python: A Brain-Friendly Guide (2nd Edition)
3. Learn Python the Hard Way: 3rd Edition
4. Python Programming: An Introduction to Computer Science (3rd Edition)

L	T	P	C
0	0	2	1

Program: BTECH
Semester: Fifth
Course: Introduction to Python Programming Lab
Course code: 3TECCS301P

Course Objective:
Students will be able to

1. To learn and understand Python programming basics and paradigm.
2. To learn and understand python looping, control statements and string manipulations.
3. Students should be made familiar with the concepts of GUI controls and designing GUI applications.
4. To learn and know the concepts of file handling, exception handling.

Course Content:

List of experiments:

1. Write a program to demonstrate different number datatypes in python.
2. Write a program to perform different arithmetic operations on numbers in python.
3. Write a program to create, concatenate and print a string and accessing substring from a given string.
4. Write a python script to print the current date
5. Write a python program to create, append and remove lists in python.
6. Write a program to demonstrate working with tuples in python.
7. Write a program to demonstrate working with dictionaries in python.
8. Write a python program to find largest of three numbers
9. Write a python program to convert temperature to and from Celsius to Fahrenheit.
10. Write a python program to print prim numbers less than 20.
11. Write a python program to find factorial of a number using recursion.
12. Write a python program to define a module and import a specific function in that module to another program.
13. Write a Python class to implement pow (x, n).
14. Write a Python class to reverse a string word by word.

Program: BTECH
Semester: Fifth
Course: Pattern Recognition
Course Code: 3TECCS307

L	T	P	C
4	0	0	4

Course Objective:
Students will be able to

1. To understand basic concepts in pattern recognition

2. To gain knowledge about state-of-the-art algorithms used in pattern recognition research
3. To understand pattern recognition theories, such as Bayes classifier, linear discriminant analysis.
4. To apply pattern recognition techniques in practical problems.

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

1. To apply knowledge of advanced principals to the analysis of electrical and computer engineering problems.
2. To apply knowledge of advanced techniques to the design of electrical and computer engineering systems.
3. To apply the appropriate industry practices, emerging technologies, state-of- the-are design techniques, software tools, and research methods of solving electrical and computer engineering problems.
4. To use the appropriate state-of-the art engineering references and resources, including research journals and industry publications, needed to find the best solutions to electrical and computer engineering problems

Course Content:

Topics	Hours
Unit I	
Basics of Probability, Random Processes and Linear Algebra: Probability: independence of events, conditional and joint probability, Bayes' theorem; Random Processes: Stationary and nonstationary processes, Expectation, Autocorrelation, Cross-Correlation, spectra; Linear Algebra: Inner product, outer product, inverses, eigen values, eigen vectors; Bayes Decision Theory	6
Unit II	
Bayes Decision Theory: Minimum-error-rate classification, Classifiers, Discriminant functions, Decision surfaces, Normal density and discriminant functions, discrete features • **Parameter Estimation Methods**: Maximum-Likelihood estimation: Gaussian case; Maximum a Posteriori estimation; Bayesian estimation: Gaussian case.	7
Unit III	
Unsupervised learning and clustering: Criterion functions for clustering; Algorithms for clustering: K-Means, Hierarchical and other methods; Cluster validation; Gaussian mixture models; Expectation-Maximization method for parameter estimation; Maximum entropy estimation **Sequential Pattern Recognition:** Hidden Markov Models (HMMs); Discrete HMMs; Continuous HMMs	5
Unit IV	
Nonparametric techniques for density estimation: Parzen-window method; K-Nearest Neighbour method **Dimensionality reduction:** Fisher discriminant analysis; Principal component analysis; Factor Analysis	6
Unit V	
Linear discriminant functions: Gradient descent procedures; Perceptron; Support vector machines **Non-metric methods for pattern classification:** Non-numeric data or nominal data; Decision trees: CART	6

Textbooks and Suggested Readings:

1. R.O.Duda, P.E.Hart and D.G.Stork, Pattern Classification, John Wiley, 2001

2. S.Theodoridis and K.Koutroumbas, Pattern Recognition, 4th Ed., Academic Press, 2009

3. C.M.Bishop, Pattern Recognition and Machine Learning, Springer, 2006

Program: BTECH
Semester: Fifth
Course: Intelligent Systems
Course Code: 3TECCS308

L	T	P	C
4	0	0	4

Course Objective:
Students will be able to:
1. To introduce the basic intelligent system concepts.
2. To describe and learn various algorithms in the neural networks for optimizing real world problems
3. To learn fuzzy logic and its implementation methods.

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

1. To understand the basics of Neurons and Perceptron.
2. To apply the concepts of Back Propagation Neural Networks and Multilayer perceptron.
3. To apply the applications of Neural Networks and understand the types of neural networks.
4. To understand the fuzzy set theory and its operations.
5. To understand and apply the concepts of Fuzzy Inference System and Fuzzy Controller.

Course Content:

Topics	Hours
UNIT I: INTRODUCTION AND BASIC CONCEPTS	
Introduction- Humans and Computers, The structure of the brain, Learning in machines and the differences. The basic neuron- Introduction, Modeling the single neuron, learning in simple neurons, The perception: a vectorial perspective, The perception learning rule, Proof of perceptron, Limitations of perceptrons	6
UNIT II - MULTILAYER NETWORKS	
The multilayer perceptron: Introduction, Altering the perception model, The new model, the new learning rule, Multilayer perception algorithm, XOR problem. Multilayer feed forward networks, error back propagation training algorithm, Problems with back propagation, Boltzman training, Combined back propagation, Cauchy training.	7
UNIT III - RESONANT NETWORKS AND APPLICATIONS	
Hop-field networks, Recurrent and bi-directional associative memories, Problems on BAM, Counter propagation network, Problems on counter propagation network, Artificial Resonance Theory (ART), Application of neural network: Hand written digit recognition, Application of neural network: character recognition, Traveling sales man problem, a neuro-controller.	5
Unit IV - FUZZY SET THEORY	
Introduction to fuzzy set theory, Fuzzy set vs Crisp set, Problems on fuzzy set and crisp sets, Properties of fuzzy sets, Operations on fuzzy set, Fuzzy compliments, Fuzzy intersection, Fuzzy union ,Fuzzy relations.	6
Unit V - FUZZY LOGIC AND SYSTEMS	
Fuzzy Logic: Classical logic, multi valued logic, Fuzzy propositions, Fuzzy quantifiers, Linguistic hedges and their inferences. Fuzzy systems: fuzzy controllers, Fuzzy systems and neural networks, Fuzzy automata, Fuzzy dynamic system.	6

Textbooks and Suggested Readings:

1. G.J.Klir& Bo Yuan, "Fuzzy Sets and Fuzzy Logic Theory and Applications", Prentice Hall of India, 2009.
2. Timothy S.Ross, "Fuzzy Logic with engineering applications", Weily India Pvt. Ltd., 2011.
3. Kosko B, "Neural Networks and Fuzzy Systems: A dynamical system approach to machine intelligence", Prentice Hall of India, 2009.
4. R Beale & T Jackson, "Neural Computing, An Introduction", AdamHilger, 1990.
5. Rao V.B and Rao H.V., "C++, Neural Networks and Fuzzy Logic", BPB Publications, 2003.
6. Simon Kendal, Malcolm Creen, "An Introduction to KnowledgeEngineering", Springer-Verlag Limited, 2007.