JHARKHAND
Rai University
UGC RECOGNISED UNIVERSITY
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B. TECH (CSE)
Syllabus
Academic Year: (2024-2028)

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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.

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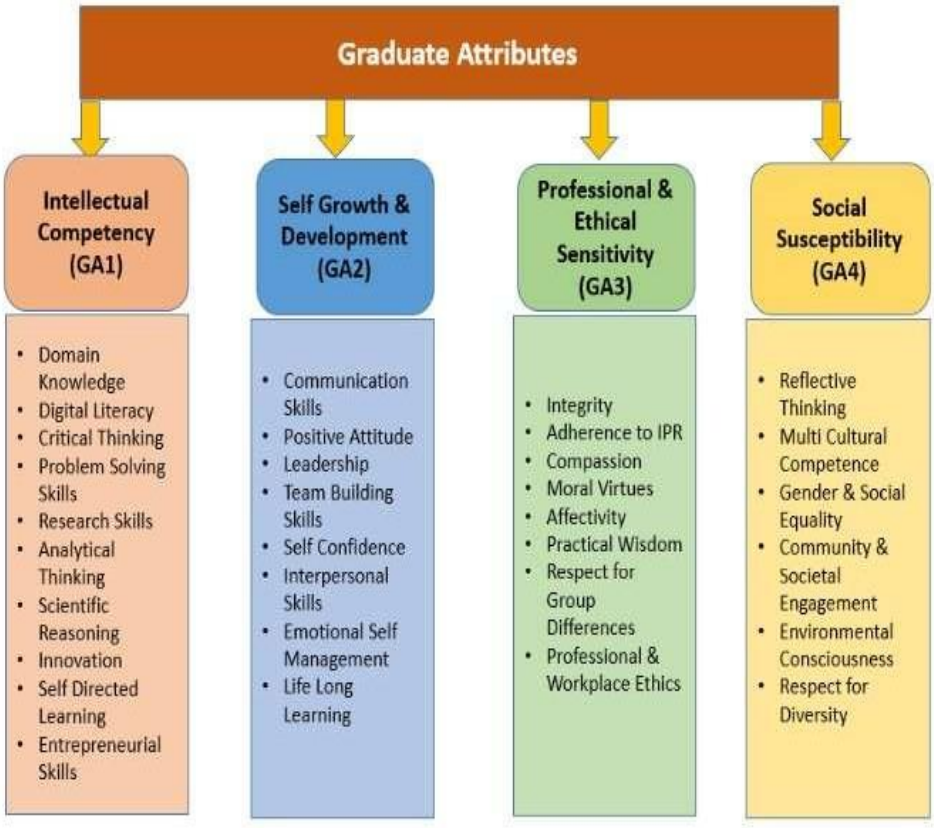
Graduate Attributes

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 ofpassed out students after their graduation from the program. However, keeping the significanceof 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 intheir professional endeavors, and practice their profession with high regard to ethical responsibilities.

PEO4: Drive scientific and societal advancement through technological innovation andentrepreneurship.

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

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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 theinformation 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 tothe 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 inindependent 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.

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Mapping between PEO and PSO

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

Mapping of PEO and PO

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

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COURSE SCHEME

BATCH 2024-2028

BTECH IN COMPUTER SCIENCE & 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	3BSC101	Physics I	3	1	0	20	10	30	70	100	4
2	Basic ScienceCourse	3BSC102	Mathematics I	3	1	0	20	10	30	70	100	4
3	Engineering ScienceCourse	3ESC101	Basic ElectricalEngineering	3	1	0	20	10	30	70	100	4
4	Engineering Science Course	3ESC102	Engineering Graphics & Design	1	0	0	20	10	30	70	100	1
5	Humanities andSocial Sciences	3HSMC101	English	2	0	0	20	10	30	70	100	2
PRACTICAL /SESSIONAL												
1	Basic Science Course	3BSC101P	Physics I Lab	0	0	2			30	20	50	1
2	Engineering Science Course	3ESC101P	Basic Electrical Engineering Lab	0	0	2			30	20	50	1
3	Engineering Science Course	3ESC102P	EngineeringGraphics & Design Lab	0	0	2			30	20	50	1
									TOTAL		**650**	**18**

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SEMESTER II												
S.No.	**CATEGORY**	**CODE**	**COURSE TITLE**	**Periods**			**Evaluation Scheme**				**Subject Total**	**Credit**
				L	**T**	**P**	**Assignment**	**TA**	**Total**	**ESE**		
1	Basic ScienceCourse	3BSC103	Chemistry I	3	1	0	20	10	30	70	100	4
2	Basic ScienceCourse	3BSC104	Mathematics II	3	1	0	20	10	30	70	100	4
3	Engineering ScienceCourse	3ESC103	Programming forProblem Solving	3	0	0	20	10	30	70	100	3
4	Engineering ScienceCourse	3ESC105	Computer Assembly and Repair	1	0	0	20	10	30	70	100	1
5	Mandatory Course	3MC101	**Environmental Science	3	0	0	20	10	30	70	100	0
6	Value Added Course	3VAC101	Character Building & Holistic Development of Personality-I (Spiritual & Mental Health)	2	0	0	20	10	30	70	100	2
PRACTICAL /SESSIONAL												
1	Basic ScienceCourse	3BSC103P	Chemistry I Lab	0	0	2			30	20	50	1
2	Engineering Science Course	3ESC103P	Programming for Problem SolvingLab	0	0	2			30	20	50	1
3	Engineering ScienceCourse	3ESC105P	Computer Assembly and Repair Lab	0	0	2			30	20	50	1
									TOTAL		**650**	**17**

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	3BSC201	MathematicsIII(Probability & Statistics)	2	0	0	20	10	30	70	100	2
2	Basic ScienceCourse	3BSC202	Biological Science for Engineers	3	0	0	20	10	30	70	100	3
3	Engineering Science Course	3ESC201	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	3HSMC201	Effective Technical Communication	2	0	0	20	10	30	70	100	2
8	**Mandatory Course**	**3UMC102**	**Community Engagement and Social Responsibility**	**1**	**0**	**2**	**40**	**10**	**50**	**50**	**100**	**2**
PRACTICAL /SESSIONAL												
1	Engineering Science Course	3ESC201P	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		**850**	**24**

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SEMESTER IV													
S.No.	**CATEGORY**	**CODE**	**COURSE TITLE**	**Periods**			**Evaluation Scheme**				**Subject Total**	**Credit**
				L	**T**	**P**	**Assignment**	**TA**	**Total**	**ESE**		
1	Engineering ScienceCourse	3ESC202	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 CoreCourse	3PCCCS205	Design & Analysis of Algorithms	3	0	0	20	10	30	70	100	3
5	Humanities andSocial Sciences	3HSMC203	Entrepreneurship	3	0	0	20	10	30	70	100	3
6	Value Added Course	3VAC201	Character Building & Holistic Development of Personality- II (Yoga and Physical Fitness)	2	0	0	20	10	30	70	100	2
7	**Mandatory Course**	**3MC201**	****DisasterManagement**	**2**	**0**	**0**	**20**	**10**	**30**	**70**	**100**	**0**
PRACTICAL /SESSIONAL												
1	Engineering ScienceCourse	3ESC202P	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**	**24**

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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	150	4
6	Value Added Course	3VAC301	Character Building & Holistic Development of Personality- III (Universal Human Values and Ethics)	2	0	0	20	10	30	70	100	**2**
PRACTICAL /SESSIONAL												
1	Professional Core Course	3PCCCS301 P	Database Management Systems Lab	0	0	4			30	20	50	2
3	Professional Core Course	3PCCCS304 P	IT Workshop (Sci Lab/MATLAB)	0	0	2			30	20	50	1
4	Professional CoreCourse	3PCCCS305 P	Operating Systems Lab	0	0	4			30	20	50	2
									TOTAL		**800**	**22**

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SEMESTER VI												
S.No.	**CATEGORY**	**CODE**	**COURSE TITLE**	**Periods**			**Evaluation Scheme**				**SubjectTotal**	**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 ElectiveCourse		Open Elective I / MOOCs I	3	0	0	20	10	30	70	100	3
PRACTICAL /SESSIONAL												
1	Professional CoreCourse	3PCCCS306P	Compiler DesignLab	0	0	4			30	20	50	2
2	Professional CoreCourse	3PCCCS307P	Computer NetworksLab	0	0	4			30	20	50	2
	Professional CoreCourse	3PCCCS308P	Fundamentals of Software Engineering Lab	0	0	2			30	20	50	1
3	Project	3PROJCS301	Project-I	0	0	6	20	10	50	50	100	3
									TOTAL		**800**	**26**

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SEMESTER VII												
S. No	CATEGORY	CODE	COURSE TITLE	Periods			Evaluation Scheme				SubjectTotal	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	150	4
3	Track Elective		Track Elective VI	3	0	0	20	10	30	70	100	3
4	Open ElectiveCourse		Open Elective II / MOOCs II	3	0	0	20	10	30	70	100	3
PRACTICAL /SESSIONAL												
2	Project	3PROJCS401	Project-II	0	0	8			100	100	200	4
									TOTAL		**650**	**17**

SEMESTER VIII												
S.No.	CATEGORY	CODE	COURSE TITLE	Periods			Evaluation Scheme				SubjectTotal	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 ElectiveCourse		Open Elective-III / MOOCs III	3	0	0	20	10	30	70	100	3
3		3UMC101	Managing Personal Finance##	2	0	0			50	0	50	0
PRACTICAL /SESSIONAL												
1	Project	3PROJCS402	Project-III	0	0	16			100	100	200	8
									TOTAL		**500**	**15**

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** NOTE: Qualifying Non Credit Course			
NOTE: 20% credit earned through MOOC(SWAYAM) in the course			
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CHOICE BASED CREDIT SYSTEM			
Semester Wise Credit Distribution			
1		Semester 1	18
2		Semester 2	17
3		Semester 3	24
4		Semester 4	24
5		Semester 5	22
6		Semester 6	26
7		Semester 7	17
8		Semester 8	15
Total Credits			**163**

Track Elective

	CODE	Specialisation in ARTIFICIAL INTELLIGENCE	L	T	P	C
SEM V	3TECCS301	Introduction to Python Programming	3	0	2	4
	3TECCS302	Advanced Software Engineering	3	0	2	4
	3TECCS307	Pattern Recognition	4	0	0	4
	3TECCS308	Intelligent systems	4	0	0	4
SEM VI	3TECCS311	Distributed 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
	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

Open Electives					
Select any one in VI, VII, VIII semester					
Code	**Course Title**	**L**	**T**	**P**	**Credits**
3OEC101	Cryptography and Network Security	3	0	0	3
3OEC102	Cyber Law and Ethics	3	0	0	3
3OEC103	Indian Knowledge System	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

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Detailed Assessment Scheme

Assessment Scheme					
CIA- Continuous Internal Assessment (50 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	20	Remember, Understand, Apply	LOT
Assignment 2	Assignment consisting of minimum 2 Questions	10	20	Analyze, Evaluate, Create	HOT
Teacher Assessment/ Class Participation					
Teacher Assessment 1	Quiz, Case Studies, Presentations, Group Discussion, Lab work, Project or any other activity	10	20	Remember, Understand, Apply	LOT
Teacher Assessment 2	Quiz, Case Studies, Presentations, Group Discussion, Lab work, Project or any other activity	10	20	Analyse, Evaluate, Create	HOT
Class Participation	B rainstorming, Discussion, Attendance, Extempore or any other activity	10	20		

(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

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Semester I

Program: B.Tech
Semester: First
Course: Physics I
Course Code: 3BSC101

L	T	P	C
3	1	0	4

Course Objective:
The objective of this course is

- To equip the students with standard concepts of Physics and applications of Physics.
- To understand the concept of various types of Electromagnetic Theory.
- Detail study of Quantum Mechanics.
- To understand Laws and different Phenomena of Wave Optics.
- Detail study of Laser, types of Laser and applications of Laser.
- To understand the concept of Semiconductor Physics and Semiconductor devices.

Course Outcome:
After studying the course, the student will be able to:

- **CO1:** Know the basic concepts of electromagnetic theory and their application.
- **CO2:** Know about the dual nature of matter and wave equation.
- **CO3:** Demonstrate the types of motion and different types of forces.
- **CO4:** Design the concept of wave optics, types of lasers, classification of laser and their application.
- **CO5:** Know about the different types of diodes and their characteristics.

Module 1: Introduction to Electromagnetic Theory (10)
Laplace's and Poisson's equations for electrostatic potential and. Boundary conditions of electricfield and electrostatic Potential. Energy of a charge distribution and its expression in terms of electric field. Solving simple electrostatics problems in presence of dielectrics – Point charge at the centre of a dielectric sphere, Bio-Savart law, Divergence and curl of static magnetic field; Magnetization magnetic susceptibility and ferromagnetic, paramagnetic and diamagnetic materials. Faraday's law in terms of EMF produced by changing magnetic flux, Lenz's law. Differential form of Faraday's law Displacement current and Maxwell's equations.

Module II: Quantum Mechanics (7)
Introduction to Quantum mechanics, Wave nature of Particles, Time-dependent and time independent Schrodinger equation for wave function, Uncertainty principle. Solution of stationary-state Schrodinger equation for one dimensional problems– particle in a box, particle inthree dimensional box.

Module III: Introduction to Mechanics (8)
Scalars and vectors Forces in Nature; Newton's laws and its completeness in describing particle motion; Form invariance of Newton's Second Law; Solving Newton's equations of motion in polar coordinates; F = - Grad V; Definition and motion of a rigid body in the plane; Rotation in

the plane; Kinematics in a coordinate system rotating and translating in the plane; Angular momentum about a point of a rigid body in planar motion; Euler's laws of motion, theirindependence from Newton's laws, and their necessity in describing rigid body motion; Examples.

Module IV: Oscillation, Waves and Optics (8)

Mechanical and electrical simple harmonic oscillators. Brewster's Law, total internal reflection, Mirrors & lenses and optical instruments based on them. Amplification of light by population inversion, different types of lasers: gas lasers (He-Ne), solid-state lasers (ruby Laser).Properties of laser beams, applications of lasers in science, engineering and medicine.

Module V: Semiconductor Physics (7)

P-N junction, Metal-semiconductor junction (Ohmic and Schottky); Carrier transport, generation, and recombination; Semiconductor materials of interest for optoelectronic devices. Rates of optical transitions LED: device structure, materials, characteristics, and figures of merit. Types ofsemiconductor photodetectors -p-n junction, PIN, and Avalanche.

Suggested Reading:

1. *Engineering Physics: R.K.Gaur & S.L. Gupta*
2. *Engineering Physics: G.S. Raghuvanshi*
3. *Modern Engineering Physics: A.S.Vasudeva*
4. *David Griffiths, Introduction to Electrodynamics*
5. *Halliday and Resnick, Physics*
6. *D. J. Griffiths, Quantum*
7. *Engineering Mechanics, 2nd ed. — MK Harbola*
8. *D. J. Griffiths, "Quantum mechanics", Pearson Education.*
9. *S. M. Sze, Semiconductor Devices: Physics and Technology.*

Program: B.Tech
Semester: First
Course: Physics I Lab
Course Code: 3BSC101P

L	T	P	C
0	0	2	1

List of Laboratory Experiments/Demonstrations:

1. Find the acceleration due to gravity using Kater's pendulum.
2. Find the resistance of a given wire using Meter Bridge.
3. To establish the current voltage relationship for a metallic conductor and find its resistance.
4. To determine the unknown resistance of given wire using Potentiometer.
5. Find the acceleration due to gravity using Simple pendulum.
6. To determine Young' modulus of the material of a given wire using Searle's Apparatus
7. To determine the unknown resistance of given wire using Potentiometer.
8. To determine the wavelength of sodium light by Newton's ring method.
9. To measure the wavelength of Mercury spectrum using Spectrometer grating.
10. To study the variation of magnetic field with distances using Helmholtz Galvanometer.

Program: B.Tech
Semester: First
Course: Mathematics I
Course Code: 3BSC102

L	T	P	C
3	1	0	4

Course Objective:

To familiarize the student with:

- The mathematical tools needed in evaluating multiple integrals and their usage.
- To apply differential and integral calculus to notions of curvature and to improperintegrals. Apart from some other applications they will have a basic understanding ofBeta and Gamma functions.
- The fallouts of Rolle's Theorem that is fundamental to application of analysis to Engineering problems.
- The tool of power series and Fourier series for learning advanced Engineering Mathematics.
- To deal with functions of several variables that are essential in most branches of engineering.
- The essential tool of matrices and linear algebra in a comprehensive manner.

Course Outcome:

- Learn the evaluation policy of some special function like gamma & Beta function & theirrelation which is helpful to evaluate some definite integral arising in various branch of Engineering.
- Able to calculate rank of matrix, characteristic equation & characteristic roots & use the applicability of Caylay Hamilton Theorem to find inverse of matrix which is very important in many engineering applications.
- Develops the ability to trace the curve for a given equation of a curve & its nature.
- Gain knowledge about calculus and multiple calculus which is helpful in Engineering & it is alsouseful in Research & Development.

Module 1: Matrices:

System of linear equations; rank of a matrix, rank-nullity theorem; Symmetric, skew symmetric and orthogonal matrices; Eigen values and eigenvectors; Diagonalization of matrices; Cayley- Hamilton Theorem, and Orthogonal transformation; Cramers rule.

Module 2: Calculus:

Rolle's Theorem, Mean value theorems, Taylor's and Maclaurin theorems with remainders; indeterminate forms and L'Hospital's rule, Evalution of definite and improper integrals; Beta and Gamma functions and their properties.

Module 3: Multivariable Calculus (Differentiation):

Partial derivatives, directional derivatives, total derivative; Tangent plane and normal line; Maxima, minima and saddle points, Method of Lagrange multipliers.

Module 4: Multivariable Calculus (Integration):

Multiple Integration: Double integrals (Cartesian), change of order of integration in double integrals,

change of variables (Cartesian to polar), Applications: areas and volumes, Triple integrals (Cartesian), orthogonal curvilinear coordinates, Simple applications involving cubesand sphere.

Module 5: Sequences and series:
Convergence of sequence and series, tests for convergence; Power series, Taylor's series, series for exponential, trigonometric and Logarithm functions; Fourier series: Half range sine and cosine series, Parseval's theorem.

Suggested Reading:

1. *H.K. Dass, "Advance Engineering Mathematics''; S.Chand &Co., 9th Revised Ed., 2001.*
2. *B.S. Grewal, "Higher Engineering Mathematics''.*
3. *E. Kreyszig, "Advance Engineering*

L	T	P	C
3	1	0	4

Program: B.Tech
Semester: First
Course: Basic Electrical Engineering
Course Code: 3ESC101

Course Objective:

- To understand and analyze basic Electric and Magnetic circuits
- To study the working principles of Electrical Machines and Power Converters.
- To introduce components of Low Voltage Electrical Installations

Course Outcome:

After studying the course students will be able to:

- analyze basic electric circuit and able to find various parameters
- Design the basic electrical circuits.
- apply the simple principles to troubleshoot basic electrical circuits

Unit 1: D.C. Circuits (8 lectures)

Electrical circuit elements (R, L and C), voltage and current sources, Kirchoff current and voltage laws, analysis of simple circuits with dc excitation. Superposition, Thevenin and NortonTheorems. Time-domain analysis of first-order RL and RC circuits.

Unit2: A.C. Circuits (8 lectures)

Representation of sinusoidal waveforms, peak and rms values, phasor representation, realpower, reactive power, apparent power, power factor, Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), resonance.
Three-phase balanced circuits, voltage and current relations in star and delta connections.

Unit3: Transformers (6 lectures)

Magnetic materials, BH characteristics, ideal and practical transformer, equivalent circuit, lossesin transformers, regulation and efficiency.
Auto-transformer and three-phase transformer connections.

Unit4: Electrical Machines (8 lectures)

Generation of rotating magnetic fields, Construction and working of a three-phase induction motor, Significance of torque-slip characteristic. Loss components and efficiency, starting and speed control of induction motor. Single-phase induction motor.

Construction, working, torque-speed characteristic and speed control of separately excited dcmotor. Construction and working of synchronous generators.

Unit 5: Power Converters (6 lectures)
DC-DC buck and boost converters, duty ratio control. Single-phase and three-phase voltagesource inverters; sinusoidal modulation.

Unit 6: Electrical Installations (6 lectures)
Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wiresand Cables, Earthing. Types of Batteries, Important Characteristics for Batteries. Elementary calculations for energy consumption, power factor improvement and battery backup.

Suggested Reading:

1. *Basic Electrical Engineering - D.P. Kothari and I.J. Nagrath, 3rd edition 2010, Tata McGraw Hill.*
2. *Basic Electrical Engineering - D.C. Kulshreshtha, 2009, Tata McGraw Hill.*
3. *Fundamentals of Electrical Engineering, L.S. Bobrow, Oxford University Press, 2011*
4. *Electrical and Electronics Technology, E. Hughes, 10th Edition, Pearson, 2010*
5. *Electrical Engineering Fundamentals, Vincent Deltoro, Second Edition, Prentice Hall India, 1989*

Program: B.Tech
Semester: First
Course: Basic Electrical Engineering Lab
Course Code: 3ESC101P

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List of Laboratory Experiments/Demonstrations:

1. Basic safety precautions. Introduction and use of measuring instruments – voltmeter, ammeter, multi-meter, oscilloscope. Real-life resistors, capacitors and inductors.

2. Measuring the steady-state and transient time-response of R-L, R-C, and R-L-C circuits to a step change in voltage (transient may be observed on a storage oscilloscope). Sinusoidalsteady state response of R-L, and R-C circuits – impedance calculation and verification. Observation of phase differences between current and voltage. Resonance in R-L-C circuits.

3. Transformers: Observation of the no-load current waveform on an oscilloscope (non- sinusoidal wave-shape due to B-H curve nonlinearity should be shown along with a discussion about harmonics). Loading of a transformer: measurement of primary and secondary voltages and currents, and power.

4. Three-phase transformers: Star and Delta connections. Voltage and Current relationships (line-line voltage, phase-to-neutral voltage, line and phase currents). Phase-shifts betweenthe primary and secondary side. Cumulative three-phase power in balanced three-phase circuits.

5. Demonstration of cut-out sections of machines: dc machine (commutator-brush arrangement), induction machine (squirrel cage rotor), synchronous machine (field winging - slip ring arrangement) and single-phase induction machine.

6. Torque Speed Characteristic of separately excited dc motor.

7. Synchronous speed of two and four-pole, three-phase induction motors. Direction reversalby change of phase-sequence of connections. Torque-Slip Characteristic of an induction motor. Generator operation of an induction machine driven at super-synchronous speed.

8. Synchronous Machine operating as a generator: stand-alone operation with a load. Controlof voltage through field excitation.

9. Demonstration of (a) dc-dc converters (b) dc-ac converters – PWM waveform (c) the useof dc-ac converter for speed control of an induction motor and (d) Components of LT switchgear.

Program: B.Tech
Semester: First
Course: Engineering Graphics & Design
Course Code: 3ESC102

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Course Objective:

- Introduction to engineering design and its place in society
- Exposure to the visual aspects of engineering design
- Exposure to engineering graphics standards
- Exposure to solid modeling
- Exposure to computer-aided geometric design
- Exposure to creating working drawings
- Exposure to engineering communication

Course Outcome:

After learning the course, the students should be able to

- To know and understand the conventions and the method of engineering drawing.
- Interpret engineering drawings using fundamental technical mathematics.
- Construct basic and intermediate geometry.
- To improve their visualization skills so that they can apply this skill in developing new products.
- To improve their technical communication skill in the form of communicative drawings.
- Comprehend the theory of projection.

Traditional Engineering Graphics: Principles of Engineering Graphics; Orthographic Projection; Descriptive Geometry; Drawing Principles; Isometric Projection; Surface Development; Perspective; Reading a Drawing; Sectional Views; Dimensioning & Tolerances; True Length, Angle; intersection, Shortest Distance.

Computer Graphics: Engineering Graphics Software; -Spatial Transformations; Orthographic Projections; Model Viewing; Co-ordinate Systems; Multi-view Projection; Exploded Assembly; Model Viewing; Animation; Spatial Manipulation; Surface Modelling; Solid Modelling; Introduction to Building Information Modelling (BIM)

Module 1: Introduction to Engineering Drawing covering, Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, Conic sections including the Rectangular Hyperbola (General method only); Cycloid, Epicycloid, Hypocycloid and Involute; Scales – Plain, Diagonal and Vernier Scales;

Module 2: Orthographic Projections covering, Principles of Orthographic Projections-Conventions - Projections of Points and lines inclined to both planes; Projections of planes inclined Planes - Auxiliary Planes;

Module 3: Projections of Regular Solids covering, those inclined to both the Planes-Auxiliary Views; Draw simple annotation, dimensioning and scale. Floor plans that include: windows, doors, and fixtures such as WC, bath, sink, shower, etc.

Module 4: Sections and Sectional Views of Right Angular Solids covering, Prism, Cylinder, Pyramid, Cone – Auxiliary Views; Development of surfaces of Right Regular Solids - Prism, Pyramid, Cylinder and Cone; Draw the sectional orthographic views of geometrical solids, objects from industry and dwellings (foundation to slab only)

Module 5: Isometric Projections covering, Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes, Simple and compound Solids; Conversion of Isometric Views to Orthographic Views and Vice-versa, Conventions;

Module 6: Overview of Computer Graphics covering, listing the computer technologies that impact on graphical communication, Demonstrating knowledge of the theory of CAD software [such as: The Menu System, Toolbars (Standard, Object Properties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs, Coordinate System), Dialog boxes and windows, Shortcut menus (Button Bars), The Command Line (where applicable), The StatusBar, Different methods of zoom as used in CAD, Select and erase objects.; Isometric Views of lines, Planes, Simple and compound Solids];

Module 7: Customisation & CAD Drawing consisting of set up of the drawing page and the printer, including scale settings, setting up of units and drawing limits; ISO and ANSI standards for coordinate dimensioning and tolerancing; Orthographic constraints, Snap to objects manually and automatically; Producing drawings by using various coordinate input entry methods to draw straight lines, Applying various ways of drawing circles;

Module 8: Annotations, layering & other functions covering applying dimensions to objects, applying annotations to drawings; Setting up and use of Layers, layers to create drawings, Create, edit and use customized layers; Changing line lengths through modifying existing lines (extend/lengthen); Printing documents to paper using the print command; orthographic projection techniques; Drawing sectional views of composite right regular geometric solids and project the true shape of the sectioned surface; Drawing annotation, Computer-aided design (CAD) software modeling of parts and assemblies. Parametric and non-parametric solid, surface, and wireframe models. Part editing and two-dimensional documentation of models. Planar projection theory, including sketching of perspective, isometric, multiview, auxiliary, and section views. Spatial visualization exercises. Dimensioning guidelines, tolerancing techniques; dimensioning and scale multi views of dwelling;

Module 9: Demonstration of a simple team design project that illustrates Geometry and topology of engineered components: creation of engineering models and their presentation in standard 2D blueprint form and as 3D wire-frame and shaded solids; meshed topologies for engineering analysis and tool-path generation for component manufacture; geometric dimensioning and tolerancing; Use of solid-modeling software for creating associative models at the component and assembly levels; floor plans that include: windows, doors, and fixtures such as WC, bath,

sink, shower, etc. Applying colour coding according to building drawing practice; Drawing sectional elevation showing foundation to ceiling; Introduction to Building Information Modelling (BIM).

Suggested Reading:

1. *Engineering Drawing textbook Intro By : N D Bhatt*
2. *Bhatt N.D., Panchal V.M. & Ingle P.R., (2014), Engineering Drawing, Charotar Publishing House*
3. *Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education*
4. *Agrawal B. & Agrawal C. M. (2012), Engineering Graphics, TMH Publication*
5. *Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers*
6. *(Corresponding set of) CAD Software Theory and User Manuals By: R K Dhavan*
7. *Bhatt N.D., Panchal V.M. & Ingle P.R., (2014), Engineering Drawing, Charotar Publishing House*
8. *Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education*
9. *Agrawal B. & Agrawal C. M. (2012), Engineering Graphics, TMH Publication*
10. *Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers*
11. *Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education*
12. *Agrawal B. & Agrawal C. M. (2012), Engineering Graphics, TMH Publication*

Program: B.Tech
Semester: First
Course: Engineering Graphics & Design Lab
Course Code: 3ESC102P

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Laboratory Experiments/Demonstrations is to be conducted as per module content.

Program: B.Tech
Semester: First
Course: English
Course Code: 3HSMC101

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Course Objective:
The objectives of the course are:

- To enhance Professional competence in reading, writing, listening and speaking.
- Switch the approach from providing information about the language to use the language.
- To use English effectively for study purpose across the curriculum;
- To revise and reinforce structure already learnt.
- Introduce Communicative Method of ELT and focusing the teaching pedagogy on the student-centred learning rather than on the teacher-centred learning.
- Ability to master three major forms of communications which are vital in academic and professional settings namely professional presentations, interviews and group communications respectively.
- Providing a deep insight into the techniques for delivering effective presentations,winning job interviews, and actively participating in various forms of group communication.

Course Outcome:
At the end of the course learners will be able to:

- To design a language component or process to meet desired need within realistic,constraints.
- To analyze the usage of English words in different contexts.
- Develop an understanding of technical and academic articles' comprehension.
- To present oneself at multinational levels knowing the type of different standards of English

Detailed contents

1. Vocabulary Building
1.1 The concept of Word Formation
1.2 Root words from foreign languages and their use in English
1.3 Acquaintance with prefixes and suffixes from foreign languages in English to form derivatives.
1.4 Synonyms, antonyms, and standard abbreviations.

2. Basic Writing Skills
2.1 Sentence Structures
2.2 Use of phrases and clauses in sentences
2.3 Importance of proper punctuation
2.4 Creating coherence
2.5 Organizing principles of paragraphs in documents
2.6 Techniques for writing precisely

3. Identifying Common Errors in Writing 3.1 Subject-verb agreement
3.2 Noun-pronoun agreement
3.3 Misplaced modifiers
3.4 Articles
3.5 Prepositions
3.6 Redundancies
3.7 Clichés

4.Nature and Style of sensible Writing
4.1 Describing
4.2 Defining
4.3 Classifying
4.4 Providing examples or evidence
4.5 Writing introduction and conclusion

5. Writing Practices
5.1 Comprehension
5.2 Précis Writing
5.3 Essay Writing

6.Oral Communication
(This unit involves interactive practice sessions in Language Lab)
6.1 Listening Comprehension
6.2 Pronunciation, Intonation, Stress and Rhythm
6.3 Common Everyday Situations: Conversations and Dialogues
6.4 Communication at Workplace
6.5 Interviews
6.6 Formal Presentations

Suggested Readings:

1. *Practical English Usage. Michael Swan. OUP. 1995.*
2. *Remedial English Grammar. F.T. Wood. Macmillan.2007*
3. *On Writing Well. William Zinsser. Harper Resource Book. 2001*
4. *Study Writing. Liz Hamp-Lyons and Ben Heasly. Cambridge University Press. 2006.*
5. *Communication Skills. Sanjay Kumar and PushpLata. Oxford University Press. 2011.*
6. *Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad. Oxford University Press*

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Semester II

Program: B.Tech
Semester: Second
Course: Chemistry I
Course Code: 3BSC103

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Course Objective:

- To bring adaptability to new developments in Engineering Chemistry and to acquire the skills required to become a perfect engineer.
- To include the importance of water in industrial usage, significance of corrosion control to protect the structures, polymers and their controlled usage.
- To acquire knowledge of elements, their periodic properties and engineering materials and about fuels and batteries.
- To acquire required knowledge about few drug molecules and their synthesis and composites.
- The knowledge gained on polymer chemistry, thermodynamics, spectroscopy, stereochemistry will provide a strong platform to understand the concepts on these subjects for further learning.

Course Outcome:

On successful completion of this course students will be able to:

- Demonstrate knowledge of science behind common impurities in water and methods to treat them.
- Students will be able to analyze the basic knowledge of various types of Fuels, their properties and Industrial Applications.
- Knowledge of methods to determine the calorific value of fuels, perform flue gas analysis and combustion analysis.
- Apply the science for understanding corrosion and its prevention.
- Demonstrate knowledge of superconducting and organic electronic materials.
- Rationalize periodic properties such as ionization potential, electro negativity, oxidation states.

Module I: Atomic and molecular structure (8)

Schrodinger equation. Molecular orbitals of diatomic molecules and plots of the multicentre orbitals. Equations for atomic and molecular orbitals. Energy level diagrams of diatomics. Pi- molecular orbitals of butadiene and benzene and aromaticity. Crystal field theory and the energy level diagrams for transition metal ions and their magnetic properties. Band structure of solids and the role of doping on band structures.

Module II: Spectroscopic techniques and applications (7 lectures)

Principles of spectroscopy. Fluorescence and its applications in medicine. Vibrational and rotational spectroscopy of diatomic molecules. Applications. Nuclear magnetic resonance and magnetic resonance imaging.

Module III: Intermolecular forces and potential energy surfaces (4 lectures)

Ionic, dipolar and van Der Waals interactions. Equations of state of real gases and critical phenomena.

Module IV: Use of free energy in chemical equilibria (6 lectures)

Thermodynamic functions: energy, entropy and free energy. Estimations of entropy and free energies.

Free energy and emf. Cell potentials, the Nernst equation and applications. Acid base, oxidation reduction and solubility equilibria. Water chemistry. Corrosion.

Module V: Periodic properties (6 Lectures)

Effective nuclear charge, penetration of orbitals, variations of s, p, d and f orbital energies of atoms in the periodic table, electronic configurations, atomic and ionic sizes, ionization energies, electron affinity and electronegativity, polarizability, oxidation states, coordination numbers and geometries, hard soft acids and bases, molecular geometries

Module VI: Stereochemistry (5 lectures)

Representations of 3 dimensional structures, structural isomers and stereoisomers, configurations and symmetry and chirality, enantiomers, diastereomers, optical activity, absolute configurations and conformational analysis. Isomerism in transitional metal compounds.

Module VII: Organic reactions and synthesis of a drug molecule (4 lectures)

Introduction to reactions involving substitution, addition, elimination, oxidation, reduction, cyclization and ring openings. Synthesis of a commonly used drug molecule.

Suggested Reading:

(i) *University chemistry, by B. H. Mahan*
(ii) *Chemistry: Principles and Applications, by M. J. Sienko and R. A. Plane*
(iii) *Fundamentals of Molecular Spectroscopy, by C. N. Banwell*
(iv) *Engineering Chemistry (NPTEL Web-book), by B. L. Tembe, Kamaluddin and M. S. Krishnan*
(v) *Physical Chemistry, by P. W. Atkins*
(vi) *Organic Chemistry: Structure and Function by K. P. C. Volhardt and N. E. Schore.*
(vii) *Engineering Chemistry by Jain & Jain.*
(viii) *Engineering Chemistry by O P Agarwal.*

Program: B.Tech
Semester: Second
Course: Chemistry I Lab
Course Code: 3BSC103P

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List of Laboratory Experiments/Demonstrations:

1. Determination of surface tension and viscosity
2. Thin layer chromatography
3. Ion exchange column for removal of hardness of water
4. Determination of chloride content of water
5. Colligative properties using freezing point depression
6. Determination of the rate constant of a reaction
7. Determination of cell constant and conductance of solutions
8. Potentiometry - determination of redox potentials and emfs.
9. Synthesis of a polymer/drug
10. Saponification/acid value of an oil
11. Chemical analysis of a salt
12. Lattice structures and packing of spheres
13. Models of potential energy surfaces
14. Chemical oscillations- Iodine clock reaction
15. Estimation of Hcl solution supplied titrating it against N/10 Hcl solution.
16. Adsorption of acetic acid by charcoal
17. Use of the capillary viscosimeters to the demonstrate of the isoelectric point as the pH of minimum viscosity for gelatin sols and/or coagulatio n of the white part of egg

Program: B.Tech
Semester: Second
Course: Mathematics II
Course Code: 3BSC104

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Course Objective:

- The subject helps the students to develop the fundamentals and basic concepts in Laplace transform. Students will be able to solve problems related to engineering applications by using these techniques.
- Apply the principles of Differential Calculus to solve a variety of practical problems in Engineering and Applied Science.
- Apply the principles of Partial Differentiation, Directional Derivatives, and Double integral.

Course Outcome:

- To introduce the basic concepts required to understand, construct, solve and interpret differential equations.
- To teach methods to solve differential equations of various types.
- To give an ability to apply knowledge of mathematics on engineering problems.
- Formulate and solve differential equation problems in the field of Industrial Organization Engineering.
- To give an idea about Power series solutions; Legendre polynomials, Bessel functions.

Module 1: First order ordinary differential equations:
Exact, linear and Bernoulli's equations, Euler's equations, Equations not of first degree: equations solvable for p, equations solvable for y, equations solvable for x and Clairaut's type.

Module 2: Ordinary differential equations of higher orders:
Second order linear differential equations with variable coefficients, method of variation of parameters, Cauchy-Euler equation.

Module 3*:* Power series
Power series solutions; Legendre polynomials, Bessel functions of the first kind and their properties.

Module 4: Partial Differential Equations
Definition of Partial Differential Equations, First order partial differential equations, solutions of first order linear PDEs; Solution to homogenous and non-homogenous linear partial differential equations of second order by complimentary function and particular integral method. Second-order linear equations and their classification, Initial and boundary conditions, D'Alembert's solution of the wave equation; Heat diffusion and vibration problems, Separation of variables method to simple problems in Cartesian coordinates.

Module 5: Vector calculus
Gradient, curl and divergence ; Scalar line integrals, vector line integrals, scalar surface integrals, vector surface integrals, Theorems of Green, Gauss and Stokes.

Suggested Readings:

1. *G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.*
2. *Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.*
3. *W. E. Boyce and R. C. DiPrima, Elementary Differential Equations and Boundary Value Problems, 9th Edn., Wiley India, 2009.*
4. *S. L. Ross, Differential Equations, 3rd Ed., Wiley India, 1984.*
5. *E. A. Coddington, An Introduction to Ordinary Differential Equations, Prentice Hall India, 1995.*
6. *E. L. Ince, Ordinary Differential Equations, Dover Publications, 1958.*
7. *J. W. Brown and R. V. Churchill, Complex Variables and Applications, 7th Ed., Mc- Graw Hill, 2004.*
8. *N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.*
9. *B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.*

Program: B.Tech
Semester: Second
Course: Programming for Problem Solving
Course Code: 3ESC103

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Course Objective:
The course will enable the students to learn

- Understand the fundamentals of C programming
- The basics and syntax of C programming
- Array, Structure, Pointer and File concept
- Be able to apply concepts to solve real world problems
- Able to program in C programming for a given application.

Course Outcome:

- Students will learn about fundamentals of computer and programming language, draw flow chart to solve given problem logically and develop algorithm to solve given program.
- Students will be able to choose the loops and decision-making statements to solve the problem.
- Students will be able to understands the concepts of function, array, pointer and structure.
- Students will be able to Implement file Operations in C programming for a given application.

Unit 1: Introduction to Programming (2 hrs)

Introduction to Programming (Flow chart/pseudocode, compilation etc.), Variables (including data types)

Unit 2: Arithmetic expressions and precedence (2 hrs)

Unit 3: Conditional Branching and Loops (8 hrs)

Writing and evaluation of conditionals and consequent branching, Iteration and loops

Unit 4: Arrays (6 hrs)

Arrays (1-D, 2-D), Character arrays and Strings

Unit 5: Basic Algorithms (6 hrs)

Searching, Basic Sorting Algorithms, Finding roots of equations, idea of time complexity

Unit 6: Function and Recursion (8 hrs)

Functions (including using built in libraries), Recursion with example programs such as Quick sort, Ackerman function etc.

Unit 7: Structure and Pointers (6 hrs)

Pointers, Structures (including self-referential structures e.g., linked list, notional introduction)

Unit 8: File handling (2 hrs)

Suggested Reading:

1. E. Balagurusamy – Programming in ANSI C, 3rd Edn. , TMH, New Delhi, 2004
2. Programming with C, B.S.Gottfried (TMH)
3. Y. Kanetkar – Let us C, 4th Edition, BPB Publication, New Delhi; 2002
4. The C Programming Language, B.W. Kernighan, Dennis M.Ritchie, PHI/Pearson Education
5. C Programming with problem solving, J.A. Jones & K. Harrow, Dreamtech Press
6. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice

Program: B.Tech
Semester: Second
Course: Programming for Problem Solving Lab
Course Code: 3ESC103P

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Tutorial and Lab:

Tutorial 1: Problem solving using computers: Lab1: Familiarization with programming environment

Tutorial 2: Variable types and type conversions: Lab 2: Simple computational problems using arithmetic expressions

Tutorial 3: Branching and logical expressions: Lab 3: Problems involving if-then-else structures

Tutorial 4: Loops, while and for loops: Lab 4: Iterative problems e.g., sum of series

Tutorial 5: 1D Arrays: searching, sorting: Lab 5: 1D Array manipulation

Tutorial 6: 2D arrays and Strings, memory structure: Lab 6: Matrix problems, String operations

Tutorial 7: Functions, call by value: Lab 7: Simple functions

Tutorial 8 &9: Numerical methods (Root finding, numerical differentiation, numerical integration): Lab 8 and 9: Numerical methods problems

Tutorial 10: Recursion, structure of recursive calls: Lab 10: Recursive functions

Tutorial 11: Pointers, structures and dynamic memory allocation Lab 11: Pointers and structures

Tutorial 12: File handling: Lab 12: File operations

Program: B.Tech CSE
Semester: Second
Course: Computer Assembly and Repair
Course Code: 3ESC105

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1. Demonstration of Hardware peripherals: CPU, RAM, SMPS, Motherboard, NIC card, Processor, Processor cooling fan, PCI card, HDD.
2. Demonstration of various ports: CPU , VGA port, PS/2 (keyboard, mouse) ,USB, LAN, Speaker, Audio.
3. Identify the Computer Name and Hardware Specification (RAM capacity, Processor type, HDD, 32 bit/ 64 bit)
4. Identify and Troubleshoot the problems of RAM (beep sound with blue screen), SMPS and motherboard (CPU is not switched ON)
5. Configure BIOS settings- disable and enable USB and LAN.
6. Identify, how to recover the hidden files from corrupted pendrive using command.
7. Recover the contents from crashed Hard Disk using Disk Drill software.
8. Install Operating System – Windows family (Windows 7/ Windows 10) and also make partitions.
9. Install Operating System - Unix family (Linux/UBUNTU)
10. Install Application software – python 3.8, MS- Office 2010/2013, MySQL, TOAD, Openoffice, etc.,
11. Install any one of the antivirus software (Avast, Kaspersky, etc.,) and observe the variations before and after installation.
12. Add new Hardware device (keyboard, mouse, Speaker, Microphone)
13. Connect the LCD Projector with Laptop / CPU.
14. Adding additional RAM to the system.(expanding RAM size).
15. Graphic Card insertion.
16. Assemble and Disassemble Desktop System.

References:

1. Dan Gookin ,Troubleshooting & Maintaining Your PC ALL-IN-ONE, 3rd Edition,2017, John Wiley & Sons.
2. Mike Meyers, Scott Jernigan, Dan Lachance, ”CompTIA Fundamentals + Exam Guide (All-in-One), 2nd Edition, 2019, Mc Graw Hill Education.

Web References:

1. https://www.youtube.com/watch?v=ItxwyMR0SnY&list=PLeH4ngtDM7eE-1_mdWuXWyZrI_FMHnyJ0&index=5
2. https://www.cleverfiles.com/howto/crashed-hard-drive-recovery.html

Program: B.Tech
Semester: Second
Course: Environmental Science
Course Code: 3MC101

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Course Objective:

- Students understand key concepts from economic, political, and social analysis as they pertain to the design and evaluation of environmental policies and institutions.
- Students appreciate concepts and methods from ecological and physical sciences and their application in environmental problem solving.
- Reflect critically about their roles and identities as citizens, consumers and environmental actors in a complex, interconnected world.
- Master core concepts and methods from ecological and physical sciences and their application in environmental problem solving.
- Appreciate the ethical, cross-cultural, and historical context of environmental issues and the links between human and natural systems.
- Apply systems concepts and methodologies to analyze and understand interactions between social and environmental processes.

Course Outcome:

- On successful completion of this course students will be able to:
- Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
- Understand environmental problems arising due to developmental activities.
- Identify the natural resources and suitable methods for conservation and sustainable development
- Realize the importance of ecosystem and biodiversity for maintaining ecological balance.
- Identify the environmental pollutants and abatement devices.

Unit I

Multidisciplinary nature of environmental studies, Natural Resources

Definition, scope and importance need for public awareness. Renewable and non-renewable resources:
Natural resources and associated problems.

a) Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people.

b) Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems

c) Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies.

d) Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.

e) Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources, Case studies.

f) Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification.

- Role of an individual in conservation of natural resources.
- Equitable use of resources for sustainable lifestyles.

Unit II

Ecosystems, Biodiversity and its conservation

- Concept of an ecosystem.
- Structure and function of an ecosystem.
- Producers, consumers and decomposers.
- Energy flow in the ecosystem.
- Ecological succession.
- Food chains, food webs and ecological pyramids.
- Introduction, types, characteristic features, structure and function of the following ecosystem: -a. Forest ecosystem

b. Grassland ecosystem

c. Desert ecosystem

d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

- Introduction – Definition: genetic, species and ecosystem diversity.
- Bio geographical classification of India
- Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values
- Biodiversity at global, National and local levels.
- India as a mega-diversity nation
- Hot-sports of biodiversity.
- Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts.
- Endangered and endemic species of India
- Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

Unit III:

Environmental Pollution, Social Issues and the Environment Definition, Cause, effects and control measures of: -

a. Air pollution
b. Water pollution

b. Soil pollution

c. Marine pollution

d. Noise pollution

e. Thermal pollution

f. Nuclear hazards

- Solid waste Management: Causes, effects and control measures of urban and industrial wastes.
- Role of an individual in prevention of pollution.
- Pollution case studies.
- Disaster management: floods, earthquake, cyclone and landslides.
- From Unsustainable to Sustainable development

- Urban problems related to energy
- Water conservation, rain water harvesting, watershed management
- Resettlement and rehabilitation of people; its problems and concerns. Case Studies
- Environmental ethics: Issues and possible solutions.
- Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust Case Studies.
- Wasteland reclamation.
- Consumerism and waste products.
- Environment Protection Act.
- Air (Prevention and Control of Pollution) Act.
- Water (Prevention and control of Pollution) Act
- Wildlife Protection Act
- Forest Conservation Act
- Issues involved in enforcement of environmental legislation.
- Public awareness.

Unit IV

Human Population and the Environment, Field work

- Population growth, variation among nations.
- Population explosion – Family Welfare Programme.
- Environment and human health.
- Human Rights.
- Value Education.
- HIV/AIDS.
- Women and Child Welfare.
- Role of Information Technology in Environment and human health.
- Case Studies.
- Visit to a local area to document environmental assets-river/forest/grassland/hill/mountain
- Visit to a local polluted site-Urban/Rural/Industrial/Agricultural
- Study of common plants, insects, birds.
- Study of simple ecosystems-pond, river, hill slopes, etc.

Suggested Reading:

1. *G. Kiely, Environmental Engineering, Irwin/ McGraw Hill International Edition, 1997*
2. *M. L. Davisand S. J. Masen, Principles of Environmental Engineering and Science, McGraw Hill International Edition 2004*
3. *D. D. Mishra, Fundamental Concepts in Environmental Studies, S. Chand and company PVT. LTD., 2014*

Program: B. Tech
Semester: Second
Course: Character Building & Holistic Development of Personality-I (Spiritual & Mental Health)
Course Code: 3VAC101

L	T	P	C
2	0	0	2

Course Learning Objective:

CLO 1: To prepare the student to build spiritual and mental health

CLO 2: To enable them to play constructive roles for family, society, nation and the world.

CLO 3: To develop an understanding of the implications of behavioral aspect.

CLO 4: To help the students in understanding the virtue of Vasudhaiva-Kutumbakam (the whole world is one family)

CLO 5: To transform students into ideal personalities by inculcating sanskaaras,

CLO 6. To develop Manomaya Kosha (Development of mind), Vijnanamaya Kosha (Intellectual Development) and Anandmaya Kosha (Spiritual Development)

Course Outcome:

On completion of the Course, the students will be able to:

CO 1: Develop a good understanding of spiritual and mental health.

CO 2: Adapt the concept of constructive roles.

CO3: Analyze the concept of behavioral aspect of an individual.

CO4: Correlate the importance of world as a family.

CO5: Explain the importance of adopting sanskaaras.

CO6: Enable to develop Manomaya Kosha, Vijnanamaya Kosha**,** Anandmaya Kosha.

Course Content:

Topics	Hours
Unit I: Cognitive Intellectual Development (Manomaya Kosha)	10
• Character Building : Meaning, Concept, Constituent elements of character and means/ways of character building. • Manomaya Kosha : General Introduction, Meaning and Concept. • Manomaya Kosha : Objectives, Characteristics and Significance. • Benefits of developed Manomaya Kosha and deficiencies due to underdeveloped Manomaya Kosha. • Means, Activities and Programmes to develop Manomaya Kosha.	

Unit II: Cognitive Intellectual Development (Vijnanamaya Kosha)	**10**
• Vijnanamaya Kosha : General Introduction, Meaning and Concept. • Objectives, Characteristics and Significance. • Benefits of developed Vijnanamaya Kosha and deficiencies due to underdeveloped Vijnanamaya Kosha. • Means, Activities and Programmes to develop Vijnanamaya Kosha.	
Unit III: Cognitive Intellectual Development (Anandamaya Kosha)	10
• Anandamaya Kosha : General Introduction, Meaning and Concept. • Objectives, Characteristics and Significance. • Benefits of developed Anandamaya Kosha and deficiencies due to underdeveloped Anandamaya Kosha. • Means, Activities and Programmes to develop Anandamaya Kosha.	
Unit IV: Moral Spiritual Development (To draw inspiration from important events of the lives of great men of India to serve the society and nation).	15
• **Social and National Awakening** : Chanakya, Birsa Munda, Lala Lajpat Rai, Jyotiba Phule. • **Women from other countries dedicated to India** : Annie Besant, Emily Shankle Bose, Mary Reed. • **Leading Scientists:** Acharya Sushruta, Acharya Charak, Aryabhatta, Jagdish Chandra Basu, Homi Jahangir Bhabha. • **Women's Awakening :** Lakshmi Bai, Rani Durgavati, Amrita Devi, Maata Gujri • **Those who sacrificed all:** Udham Singh, Khudiram Bose, Chandrashekhar Azad, Madanlal Dhingra • **Seekers of Self-reliant India**: Vinoba Bhave, Jai Prakash Narayan, Verghese Kurian, Pt. Madan Mohan Malviya	

Suggested Reading:

- My Idea of Education, Swami Vivekanand, Advaita Ashram, Kolkata
- Rabindranath Tagore : An Interpretation, Sabyasachi Bhattacharya, Penguin Delhi
- Women Who Created History, NCERT, New Delhi

JHARKHAND
Rai University
UGC RECOGNISED UNIVERSITY
ACCREDITED BY NAAC

Semester III

Program: B.Tech
Semester: Second
Course: Mathematics III (Probability & Statistics)
Course Code: 3BSC201

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2	0	0	2

Course Objective:

The objectives of this course are:

- To tabulate statistical information given in descriptive form and to use graphical techniques to interpret
- To compute various measures of central tendency, dispersion, skewness and kurtosis.
- To find the probabilities of events.
- To analyze data pertaining to discrete and continuous variables and to interpret the results.
- To obtain a probability distribution of random variable (one or two dimensional) in the given situation.

Course Outcome:

On completion of the course students will be able to:

- Acquaintance with various methods of collecting data and get familiar with some elementary methods of data viz. Measures of central tendency, dispersion, skewness and kurtosis and to interpret them.
- Understanding the basic concepts of probability and to find probabilities of various events.
- Understand types of random variables, concepts of conditional probability and ability to distinguish between univariate and bi variate probability distributions; transformation of continuous random variable and its application.
- Knowledge of characteristics of random variables such as expectation, variance and also to compute various generating functions.

Topics	Hours
Unit I: Probability	9
Probability spaces, conditional probability, independence, Bayes‟ rule, Discrete & Continuous random variables and their properties, Independent random variables, the multinomial distribution, Probability distributions: Binomial, Poisson and Normal distributions, sums of independent random variables; Expectation of Discrete Random Variables, Moments, Variance of a sum, Chebyshev's Inequality.	
Unit II: Statistics	6
Basic Statistics, Measures of Central tendency: Moments, Skewness and Kurtosis, Correlation and regression – Rank correlation. Curve fitting by the method of least squares- fitting of straight lines, second degree parabolas and more general curves.	

Suggested Text/Reference Books

1. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons,2006.
2. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, LaxmiPublications, Reprint, 2010.
3. P. G. Hoel, S. C. Port and C. J. Stone, Introduction to Probability Theory, UniversalBook Stall, 2003 (Reprint).

Program: B.Tech
Semester: Third
Course: Biological Science for Engineers
Course Code: 3BSC202

L	T	P	C
3	0	0	3

Course Objective:

- To develop the individual's sensitiveness to nature and make him feels at home withit.
- To understand all living beings on the earth emerged from one being to another which inculcates „oneness" of all living beings.
- To explain the living world in terms of scientific principles and appreciating all organisms which behave indifferent ways.
- To show capabilities, which differ from one another.

Course Outcome:

After studying the course, the student will be able to:

- Describe how biological observations of 18th Century that lead to major discoveries.
- Convey that classification per se is not what biology is all about but highlight theunderlying criteria, such as morphological, biochemical and ecological
- Highlight the concepts of recessiveness and dominance during the passage of genetic material from parent to offspring
- Convey that all forms of life have the same building blocks and yet the manifestations are as diverse as one can imagine
- Classify enzymes and distinguish between different mechanisms of enzyme action.
- Identify DNA as a genetic material in the molecular basis of information transfer.
- Analyse biological processes at the reductionistic level
- Apply thermodynamic principles to biological systems.
- Identify and classify microorganisms.

Course Content:

Topics	Hours
UNIT I- Introduction	
Purpose: To convey that Biology is as important a scientific discipline as Mathematics, Physics and Chemistry Bring out the fundamental differences between science and engineering by drawing a comparison between eye and camera, Bird flying and aircraft. Mention the most exciting aspect of biology as an independent scientific discipline. Why we need to study biology? Discuss how biological observations of 18th Century that lead to major discoveries. Examples from Brownian motion and the origin of thermodynamics by referring to the original observation of Robert Brown and Julius Mayor. These examples will highlight the fundamental importance of observations in any scientific inquiry.	2
UNIT II – Classification	
Purpose: To convey that classification per seis not what biology is all about. The underlying criterion, such as morphological, biochemical or ecological be highlighted. Hierarchy of life forms at phenomenological level. A common thread weaves this hierarchy Classification. Discuss classification based on (a) cellularity- Unicellular or multicellular (b) ultrastructure- prokaryotes or eucaryotes. (c) energy and Carbon utilization - Autotrophs, heterotrophs, lithotropes (d) Ammonia excretion – aminotelic, uricoteliec, ureotelic (e) Habitata- acquatic or terrestrial (e) Molecular taxonomy- three major kingdoms of life. A given organism can come under different category based on classification. Model organisms for the study of biology come from different groups. E.coli, S.cerevisiae, D. Melanogaster, C. elegance, A. Thaliana, M. musculus	3
UNIT III - Genetics	
Purpose: To convey that "Genetics is to biology what Newton"s laws are to Physical Sciences" Mendel"s laws, Concept of segregation and independent assortment. Concept of allele. Gene mapping, Gene interaction, Epistasis. Meiosis and Mitosis be taught as a part of genetics. Emphasis to be give not to the mechanics of cell division nor the phases but how genetic material passes from parent to offspring. Concepts of recessiveness and dominance. Concept of mapping of phenotype to genes. Discuss about the single gene disorders in humans. Discuss the concept of complementation using human genetics.	4

UNIT IV- Biomolecules	
Purpose: To convey that all forms of life has the same building blocks and yet the manifestations are as diverse as one can imagine Molecules of life. In this context discuss monomeric units and polymeric structures. Discuss about sugars, starch and cellulose. Amino acids and proteins. Nucleotides and DNA/RNA. Two carbon units and lipids.	4
UNIT V - Enzymes	
Purpose: To convey that without catalysis life would not have existed on earth Enzymology: How to monitor enzyme catalyzed reactions. How does an enzyme catalyzereactions. Enzyme classification. Mechanism of enzyme action. Discuss at least two examples. Enzyme kinetics and kinetic parameters. Why should we know these parameters to understand biology? RNA catalysis.	
UNIT VI - Information Transfer	
Purpose: The molecular basis of coding and decoding genetic information is universal Molecular basis of information transfer. DNA as a genetic material. Hierarchy of DNA structure- from single stranded to double helixto nucleosomes. Concept of genetic code. Universality and degeneracy of genetic code. Define gene in terms of complementation and recombination.	
UNIT VII - Macromolecular analysis	
Purpose: How to analyses biological processes at the reductionist level Proteins- structure and function. Hierarch in protein structure. Primary secondary, tertiary and quaternary structure. Proteins as enzymes, transporters, receptors and structural elements.	
UNIT VIII - Metabolism	
Purpose: The fundamental principles of energy transactions are the same in physical and biological world. Thermodynamics as applied to biological systems. Exothermic and endothermic versus endergonic and exergonic reactions. Concept of K_{eq} and its relation to standard free energy. Spontaneity. ATP as an energy currency. This should include the breakdown of glucose to CO_2+ H_2O (Glycolysis and Krebs cycle) and synthesis of glucose from $CO_2$and H_2O (Photosynthesis). Energy yielding and energy consuming reactions. Concept of Energy charge	

UNIT IX- Microbiology
Concept of single celled organisms. Concept of species and strains. Identification and classification of microorganisms. Microscopy. Ecological aspects of single celled organisms. Sterilization and media compositions. Growth kinetics. pose: How to analyses biological processes at the reductionist level Proteins- structure and function. Hierarch in protein structure. Primary secondary, tertiary and quaternary structure. Proteins as enzymes, transporters, receptors and structural elements.

References:

1) Biology: A global approach: Campbell, N. A.; Reece, J. B.; Urry, Lisa; Cain, M, L.; Wasserman, S. A.; Minorsky, P. V.; Jackson, R. B. Pearson Education Ltd
2) Outlines of Biochemistry, Conn, E.E; Stumpf, P.K; Bruening, G; Doi, R.H., JohnWiley and Sons
3) Principles of Biochemistry (V Edition), By Nelson, D. L.; and Cox, M. M.W.H.Freeman and Company
4) Molecular Genetics (Second edition), Stent, G. S.; and Calender, R.W.H. Freeman and company, Distributed by Satish Kumar Jain for CBS Publisher
5) Microbiology, Prescott, L.M J.P. Harley and C.A. Klein 1995. 2ndedition Wm, C. Brown Publishers

Program: B.Tech
Semester: Third
Course: Analog Electronic Circuits
Course Code: 3ECS201

L	T	P	C
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Course Objectives:

- The goal of this course is to introduce and verify basic principles, operation and applications of the various Analog Electronic circuits of Diode, BJT and MOSFET for various functions.
- To make students understand and analyze the design and working of Operational amplifiers and their configurations.

Course Outcomes

- The ability to understand the characteristics of transistors.
- Design and analyse various rectifier and amplifier circuits.
- Design sinusoidal and non-sinusoidal oscillators.

Topics	Hours
Unit I	
Diode circuits P-N junction diode, I-V characteristics of a diode; review of half-wave and full-wave rectifiers, Zener diodes, clamping and clipping circuits.	4
Unit II	
BJT circuits Structure and I- V characteristics of a BJT; BJT as a switch. BJT as an amplifier: small-signal model, biasing circuits, current mirror; common- emitter, common-base and common-collector amplifiers; Small signal equivalent circuits, high-frequency equivalent circuits	8
Unit III	
MOSFET circuits MOSFET structure and I-V characteristics. MOSFET as a switch. MOSFET as an amplifier: small-signal model and biasing circuits, common-source, common-gate and common-drain amplifiers; small signal equivalent circuits - gain, input and output impedances, trans-conductance, high frequency equivalent circuit.	8
Unit IV	
Differential, multi-stage and operational amplifiers Differential amplifier; power amplifier; direct coupled multi-stage amplifier; internal structure of an operational amplifier, ideal op-amp, non-idealities in an op-amp (Output offset voltage, input bias current, input offset current, slew rate, gain bandwidth product)	8
Unit V	
Linear applications of op-amp Idealized analysis of op-amp circuits. Inverting and non- inverting amplifier, differential amplifier, instrumentation amplifier, integrator, active filter, P, PI and PID controllers and lead/lag compensator using an op-amp, voltage regulator, oscillators (Wein bridge and phase shift). Analog to Digital Conversion.	8
Unit VI **Nonlinear applications of op-amp** Hysteretic Comparator, Zero Crossing Detector, Square-wave and triangular-wave generators. Precision rectifier, peak detector. Monoshot.	6

Text/References:

1. S. Sedra and K. C. Smith, “Microelectronic Circuits”, New York, Oxford University Press,1998.
2. J. V. Wait, L. P. Huelsman and G. A. Korn, “Introduction to Operational Amplifier theory and applications”, McGraw Hill U. S., 1992.
3. J. Millman and A. Grabel, “Microelectronics”, McGraw Hill Education, 1988.
4. P. Horowitz and W. Hill, “The Art of Electronics”, Cambridge University Press, 1989.
5. P.R. Gray, R.G. Meyer and S. Lewis, “Analysis and Design of Analog Integrated Circuits”,John Wiley & Sons, 2001.

Program: B.Tech
Semester: Third
Course: Analog Electronic Circuits Lab
Course Code: 3ECS201P

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Course Objective:

1. The goal of this course is to introduce and verify basic principles, operation and applications of the various Analog Electronic circuits of Diode, BJT and MOSFET for various functions.
2. To make students understand and analyze the design and working of Operational amplifiers and their configurations.

List of Experiment (Analog Electronics Circuit)

1. Verify & simulate the Ohm's Law for Resistance in series by using LabVIEW.
2. Design and simulate P-N junction diode circuit to verify its I-V characteristics byusing simulation software LabVIEW.
3. Design & Verify the Bipolar Junction Transistor for both Common Emitter &common Base.
4. Design and simulate Zener diode circuit to plot Volt-Ampere characteristics by using LabVIEW.
5. Study of basic properties of operational Amplifier:
   A. Inverting
   B. Non- Inverting Amplifier
6. Design & Simulate the Differentiator & Integrator using operational Amplifier byusing LabVIEW.
7. Study the input and output Characteristics of MOSFET.
8. Design & plot the graph of RC Differentiator and Integrator by using LabVIEW.

Program: B.Tech
Semester: Third
Course: Data Structure & Algorithms
Course Code: 3PCCCS201

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Course Objective

- To impart the basic concepts of data structures and algorithms.
- To understand concepts about searching and sorting techniques
- To understand basic concepts about stacks, queues, lists, trees and graphs.
- To enable them to write algorithms for solving problems with thehelp of fundamental data structures

Course Outcome

On completion of this course, the students will be able to:

- Learn the basic types for data structure, implementation and application.
- Know the strength and weakness of different data structures.
- Use the appropriate data structure in context of solution of given problem.
- Develop programming skills which require to solve given problem.

Course Content:

Topics	Hours
Unit I	
Introduction: Basic Terminologies: Elementary Data Organizations, Data Structure Operations: insertion, deletion, traversal etc.; Analysis of an Algorithm, Asymptotic Notations, Time-Space trade off. **Searching:** Linear Search and Binary Search Techniques and their complexity analysis.	8
Unit II	
Stacks and Queues: ADT Stack and its operations: Algorithms and their complexity analysis, Applications of Stacks: Expression Conversion and evaluation – corresponding algorithms and complexity analysis. ADT queue, Types of Queues: Simple Queue, Circular Queue, Priority Queue; Operations on each type of Queues: Algorithms and their analysis.	8
Unit III	
Linked Lists: Singly linked lists: Representation in memory, Algorithms of several operations: Traversing, Searching, Insertioninto, Deletion from linked list; Linked representation of Stack and Queue, Header nodes, Doubly linked list: operations on it and algorithmic analysis; Circular Linked Lists: all operations their algorithms and the complexity analysis.	9

Trees: Basic Tree Terminologies, Different types of Trees: Binary Tree, Threaded Binary Tree, Binary Search Tree, AVL Tree; Tree operations on each of the trees and their algorithms with complexity analysis. Applications of Binary Trees. B Tree, B+ Tree: definitions, algorithms and analysis	
Unit IV	5
Sorting and Hashing: Objective and properties of different sorting algorithms: Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort; Performance and Comparison among all the methods, Hashing. **Graph:** Basic Terminologies and Representations, Graph search and traversal algorithms and complexity analysis.	

Suggested books:

1. "Fundamentals of Data Structures", Illustrated Edition by Ellis Horowitz, SartajSahni, Computer Science Press.
2. Algorithms, Data Structures, and Problem Solving with C++", Illustrated Edition by Mark Allen Weiss, Addison-Wesley Publishing Company "How to Solve it by Computer", 2nd Impression by R.G. Dromey, PearsonEducation.

Program: B.Tech
Semester: Third
Course: Data Structure & Algorithms Lab
Course Code: 3PCCCS201P

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Program:

1. To read and display n numbers using an array.
2. To find transpose a 3 X 3 matrix.
3. To insert a number at a given location in an array.
4. To delete a number from a given location in an array.
5. To create a linked list
6. To create a linked list and perform insertions:
   a) at beginning b) at end c) before a given node
7. To create a linked list and perform deletions:
   a) from beginning b) from end c) at a given node
8. To create a circular linked list and perform insertion at the beginning of list.
9. To create a circular linked list and perform insertion at the end of list.
10. To perform Push, Pop and Peep operations on a stack.
11. To implement a linear queue.
12. To implement a priority queue.
13. To search an element in an array using linear search technique.
14. To search an element in an array using binary search technique.
15. To sort an array using insertion sort algorithm.
16. To implement quick sort algorithm.
17. To sort an array using bubble sort algorithm.

Program: B.Tech
Semester: Third
Course: Computer Organization & Architecture
Course Code: 3PCCCS202

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Course Objective:

- How Computer Systems work & the basic principles Instruction Level Architecture and Instruction Execution The current state of art in memory systemdesign
- How I/O devices are accessed and its principles.
- To provide the knowledge on Instruction Level Parallelism To impart theknowledge on micro programming
- Concepts of advanced pipelining techniques.

Course Outcome:

By the end of the course students will be able to:

- Draw the functional block diagram of a single bus **architecture of a computer and describe the function of the** instruction execution cycle, RTL interpretation of instructions, addressing modes, instruction set.
- **Write** assembly language program for specified microprocessor for computing 16 bit multiplication, division and I/O device interface (ADC, Control circuit, serial port communication).
- Write a flowchart for Concurrent access to memory and cache coherency in **Parallel Processors** and describe the process.
- Given a CPU organization and instruction, design a memory module and analyze its operation by interfacing with the CPU.
- Given a CPU organization, assess its performance, and apply design techniques toenhance performance using pipelining, parallelism and RISC methodology

Course Content:

Topics	Hours
Unit I	10
Functional blocks of a computer: CPU, memory, input-output subsystems, control unit. Instruction set architecture of a CPU–registers, instruction execution cycle, RTL interpretation of instructions, addressing modes, instruction set. Case study – instruction sets of some common CPUs **Data representation**: signed number representation, fixed and floating-point representations, character representation. Computer arithmetic – integer addition and subtraction, ripple carry adder, carry look- ahead adder, etc. multiplication – shift-and add, Booth multiplier, carry save multiplier, etc. Division restoring and non-restoring techniques, floating point arithmetic.	
Unit II	9
Introduction to x86 architecture. **CPU control unit design**: hardwired and micro-programmed design approaches, Case study – design of a simple hypothetical CPU. **Memory system design**: semiconductor memory technologies, memory organization. **Peripheral devices and their characteristics**: Input-output subsystems, I/O device interface, I/O transfers–program controlled, interrupt driven and DMA, privileged and non- privileged instructions, software interrupts and exceptions. Programs and processes–role of interrupts in process state transitions, I/O device interfaces – SCII, USB	
Unit III	6
Pipelining: Basic concepts of pipelining, throughput and speedup, pipeline hazards. **Parallel Processors**: Introduction to parallel processors, Concurrent access to memory and cache coherency.	
Unit IV	5
Memory organization: Memory interleaving, concept of hierarchical memory organization, cache memory, cache size vs. block size, mapping functions, replacement algorithms, write policies.	

Suggested books:

"Computer Organization and Design: The Hardware/Software Interface",5th Edition by David A. Patterson and John L. Hennessy, Elsevier.
"Computer Organization and Embedded Systems", 6th Edition byCarlHamacher, McGraw Hill Higher Education.

Suggested reference books:

"Computer Architecture and Organization", 3rd Edition by John P. Hayes, WCB/McGraw-Hill
"Computer Organization and Architecture: Designing for Performance",10th Edition by William Stallings, Pearson Education.
"Computer System Design and Architecture", 2nd Edition by Vincent P.Heuring and Harry F. Jordan, Pearson Education.

Program: B.Tech
Semester: Third
Course: Computer Organization & Architecture Lab
Course Code: 3PCCCS202P

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List of Experiments:

1. To design the circuit of half adder.
2. To design the circuit of full adder.
3. To design the circuit of half subtractor.
4. To design the circuit of full subtractor.
5. To design an 8×1 Multiplexer.
6. To design a 4 bit combinational shifter.
7. To design a BCD adder.
8. To design a 4-bit adder subtractor.
9. To design 2:4 Decoder
10. Write the working of 8085 simulator GNUsim8085 and basic architecture of 8085along with small introduction.
11. Study the complete instruction set of 8085 and write the instructions in the instructionset of 8085 along with examples.
12. Write an assembly language code in GNUsim8085 to implement data transfer instruction.
13. Write an assembly language code in GNUsim8085 to store numbers in reverse orderin memory location.
14. Write an assembly language code in GNUsim8085 to implement arithmetic instruction.
15. Write an assembly language code in GNUsim8085 to find the factorial of a number.

Program: B.Tech
Semester: Third
Course: Effective Technical Communication
Course Code: 3HSMC201

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Course Objective:

1. To teach students the principles of technical communication for their academic and professional needs, focusing on essential written and oral skills for presenting technical information effectively.
2. To make the students aware of the basic principles, which include the analysis of context, purpose and audience.
3. To enhance fundamentals of technical report writing.
4. To equip their effective technical presentations.

Course Outcome:

1. Develop an effective technical report, displaying the ability to employ appropriaterhetorical strategies.
2. Write an effective technical abstract, displaying the ability to select important piecesof information of synthesize them into an accurate preview of report.
3. Illustrate and examine the knowledge of ethical aspects of engineering.
4. Communication in diverse formal situations taking place in organization.

Course Content:

Topics	Hours
Unit I	
Information Design and Development- Different kinds of technical documents, Information development life cycle, Organization structures, factors affecting information and document design, Strategies for organization, Information design and writing for print and for online media.	10
Unit II	
Technical Writing, Grammar and Editing- Technical writing process, forms of discourse, writing drafts and revising, Collaborative writing, creating indexes, technical writing style and language. Basics of grammar, study of advanced grammar, editing strategies to achieve appropriate technical style. Introduction to advanced technical communication, usability, Human factors, Managing technical communication projects, time estimation, single sourcing, localization.	7
Unit III	
Self-development and Assessment- Self assessment, Awareness, Perception and Attitudes, Values and belief, Personal goal setting, career planning, Self-esteem. Managing Time; Personal memory, Rapid reading, Taking notes; Complex problem solving; Creativity	5
Unit IV	
Communication and Technical Writing- Public speaking, Group discussion, Oral; presentation, Interviews, Graphic presentation, Presentation aids, Personality Development. Writing reports, project proposals, brochures, newsletters, technical articles, manuals, official notes, business letters, memos, progress reports, minutes of meetings, event report.	4
Unit V	
Ethics- Business ethics, Etiquettes in social and office settings, Email etiquettes, Telephone Etiquettes, engineering ethics, Managing time, Role and responsibility of engineer, Work culture in jobs, Personal memory, Rapid reading, taking notes, Complex problem solving, creativity.	4

Text/Reference Books:

1. David F. Beer and David McMurrey, Guide to writing as an Engineer, John Willey. NewYork, 2004
2. Diane Hacker, Pocket Style Manual, Bedford Publication, New York, 2003. (ISBN 0312406843)
3. Shiv Khera, You Can Win, Macmillan Books, New York, 2003.
4. Raman Sharma, Technical Communications, Oxford Publication, London, 2004.
5. Dale Jungk, Applied Writing for Technicians, McGraw Hill, New York, 2004. (ISBN: 07828357-4)
6. Sharma, R. and Mohan, K. Business Correspondence and Report Writing, TMH NewDelhi 2002.

Program: B.Tech
Semester: Third
Course: Community Engagement and SocialResponsibility
Course Code: UMC102

L	T	P	C
1	0	2	2

Course Objective:

- CLO 1: To develop an appreciation of rural culture, life-style and wisdom amongst students.
- CLO 2: To learn about the status of various agricultural and rural development programmes.
- CLO 3: To understand causes for rural distress and poverty and explore solutions for thesame.
- CLO 4: To apply classroom knowledge of courses to field realities and thereby improve quality of learning.

Course Outcomes:

On the completion of the Course, the students will be able to:

- CO 1: Gain an understanding of rural life, culture and social realities.
- CO 2: Develop a sense of empathy and bonds of mutuality with local community.
- CO 3: Appreciate significant contributions of local communities to Indian society and economy.
- CO 4: Learn to value the local knowledge and wisdom of the community. CO 5: Identify opportunities for contributing to community‟s socio-economic improvements.

Course Content:

Topics	Hours
Unit 1: Appreciation of Rural Society	8
Rural life style, rural society, caste and gender relations, rural values with respect to community, nature and resources, elaboration of “soul of Indialies in villages‟ (Gandhi), rural infrastructure.	
ASSIGNMENT: Prepare a map (physical, visual or digital) of the villageyou visited and write an essay about inter-family relations in that village.	
Unit II: Understanding rural economy & livelihood	
Agriculture, farming, landownership, water management, animal husbandry, non-farm livelihoods and artisans, rural entrepreneurs, rural markets.	
ASSIGNMENT: Describe your analysis of rural h o u s e h o l d economy, its challenges and possible pathways to address them.	
Unit III: Rural Institutions	8
Traditional rural organisations, Self-help Groups, Panchayati raj institutions (Gram Sabha, Gram Panchayat, Standing Committees), localcivil society, local administration.	
ASSIGNMENT: How effectively are Panchayati raj institutions functioning in the village? What would you suggest to improve their effectiveness? Present a case study (written or audio- visual)	

Unit IV: Rural Development Programmes	
History of rural development in India, current national programmes: Sarva Shiksha Abhiyan, Beti Bachao, Beti Padhao, Ayushman Bharat, Swatchh Bharat, PM Awaas Yojana, Skill India, Gram Panchayat Decentralized Planning, NRLM, MNREGA, etc	8
ASSIGNMENT: Describe the benefits received and challenges faced inthe delivery of one of these programmes in the rural community; give suggestions about improving Implementation of the programme for the rural poor.	

Suggested Readings:

1. Singh, Katar, Rural Development: Principles, Policies and Management, Sage Publications, New Delhi, 2015.
3. A Hand book on Village Panchayat Administration, Rajiv Gandhi Chair for Panchayati
4. Raj Studies, 2002.
5. United Nations, Sustainable Development Goals, 2015 un.org/sdgs/
6. M.P.Boraian, Best Practices in Rural Development, Shanlax Publishers, 2016

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SEMESTER IV

Program: B.Tech
Semester: Fourth
Course: Digital Electronics
Course Code: 3ESC202

L	T	P	C
3	0	0	3

Course Objective:
The objective of this course is:

- Introduce the concept of digital and binary systems.
- Able to design and analyze sequential and combinational logic circuits.
- Reinforce the concepts, working principles and key applications of memory devices.

Course Outcome:
After studying the course, the student will be able to:

- **CO1:** Understand working of logic families andlogic gates.
- **CO2:** Design and implement Combinational and Sequential logic circuits.
- **CO3:** Understand the process of Analog to Digital conversion and Digital to Analogconversion.
- **CO4:** Be able to use PLDs to implement the given logical problem.

Course Content:

Topics	Hours
Module 1: Fundamentals of Digital Systems and logic families	
Digital signals, digital circuits, AND, OR, NOT, NAND, NOR and Exclusive- OR operations, Boolean algebra, examples ofICgates, number systems-binary, signed binary, octal hexadecimal number, binaryarithmetic,one's and two's complements arithmetic, codes, error detecting and correctingcodes, characteristics of digital lCs, digital logic families, TTL, Schottky TTL and CMOS logic, interfacing CMOS and TTL, Tri-statelogic	7
Module II: Combinational DigitalCircuits	
Standard representation for logic functions, K-map representation, simplification of logic functionsusing K-map, minimization of logical functions. Don't care conditions, Multiplexer, De-Multiplexer/Decoders, Adders, Subtractors, BCD arithmetic, carry look ahead adder, serial adder, ALU, elementary ALU design, popular MSI chips, digital comparator, parity checker/generator, code converters, priority encoders, decoders/drivers for display devices, Q-M method of function realization	7
Module III: Sequential circuits and systems	
A 1-bit memory, the circuit properties of Bistable latch, the clocked SR flip flop, J- K-T andD-typesflipflops,applicationsofflipflops,shiftregisters,applicationsofshiftregisters ,serialtoparallel converter, parallel to serial converter, ring counter, sequence generator,ripple(Asynchronous) counters, synchronous counters, counters design using flip flops,specialcounter IC's, asynchronous sequential counters, applications ofcounters.	7
Module IV: A/D and D/A Converters	
Digital to analog converters: weighted resistor/converter, R-2R Ladder D/A converter, specifications for D/A converters, examples of D/A converter lCs, sample and holdcircuit, analogto digital converters: quantization and encoding, parallel comparator A/D converter, successive approximation A/D converter, counting A/D converter, dual slope A/D converter, A/D converter using voltagetofrequencyandvoltagetotimeconversion,specificationsofA/Dconverters, example of A/Dconverter ICs	7
Module V: Semiconductor memories and Programmable logic devices	
Memory organization and operation, expanding memory size, classificationand characteristicsof memories, sequential memory, read only memory (ROM),	7
read and write memory (RAM), content addressable memory (CAM), charge de coupled device memory (CCD), commonly used memorychips, ROM as a PLD, Programmable logic array, Programmable array logic, complex Programmable logic devices (CPLDS), Field Programmable Gate Array (FPGA).	

Suggested Reading:

1. R. P. Jain, "Modern Digital Electronics", McGraw Hill Education, 2009.
2. M. M. Mano, "Digital logic and Computer design", Pearson Education India,2016.
3. A.Kumar, "Fundamentals of Digital Circuits", Prentice Hall India

Program: B.Tech
Semester: Fourth
Course: Digital Electronics Lab
Course Code: 3ESC202P

L	T	P	C
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List of Experiment:

1. To illustrate & verify the working of AND, OR & NOT GATE.
2. To illustrate & verify the working of Exclusive OR & Exclusive NOR GATE
3. To illustrate & verify the working of NAND & NOR GATE
4. To Demonstrate the De-Morgan's Theorm.
5. To illustrate the working of Full adder & Half adder using various logic GATES.
6. To illustrate the working of Full subtractor & Half subtractor using various logic GATES.
7. To study IC 7404, IC 7432& IC 740 and verify the AND, OR & NOT GATE presence init.

Program: B.Tech
Semester: Fourth
Course: Object Oriented Programming with Java
Course Code: 3PCCCS203

L	T	P	C
3	0	0	3

Course Objective:

- Knowledge of the structure and model of the Java programming language
- Use the Java programming language for various programming technologies
- Evaluate user requirements for software functionality required to decide whether the Java programming language can meet user requirements
- Propose the use of certain technologies, development of code/ software by implementing them in the Java Programming language to solve the given problem

Course Outcome:

After successful completion of the course, the students are able to

- Use the syntax and semantics of java programming language and basic concepts ofOOP.
- Develop reusable programs using the concepts of inheritance, polymorphism,interfaces and packages.
- Apply the concepts of Multithreading and Exception handling to develop efficientand error free codes.
- Design event driven GUI and web related applications which mimic the real word scenarios.

Course Content:

Topics	Hours
Module 1:	05
VA environment. JAVA program structure, Tokens, Statements, JAVA virtual machine, Constant & Variables, Data Types, declaration of Variables, Scope of Variables, Symbolic Constants, Type Casting. Operators: Arithmetic, Relational, Logical Assignments, Increment and Decrement, Conditional, Bitwise, Special.	
Module 2:	06
pressions & its evaluation. If statement, if…else… statement, Nesting of if…else… statements, else…if Ladder, Switch, ?operators, Loops –While, Do, For, Jumps in Loops, Labeled Loops. Defining a Class, Adding Variables and Methods.	
Module 3:	10
eating Objects, Accessing Class Members, Constructors, Methods Overloading, Static Members, Nesting of Methods. Inheritance: Extending a Class, Overriding Methods, Final Variables and Methods, Final Classes, Finalize Methods, Abstract methods and Classes, Visibility Control. Arrays: One Dimensional & two Dimensional, strings, Vectors, wrapper Classes, Defining Interface Extending erface, Implementing Interface, Accessing Interface Variable, System Packages, Using System Package Adding a Class to a Package, Hiding Classes.	
Module 4:	09
eating Threads, Extending the Threads Class, Stopping and Blocking a Thread, Life Cycle of a Thread, Using Thread Methods, Thread Exceptions, Thread Priority, Synchronization, Implementing the Executable Interface. Local and Remote Applets Vs Applications, Writing Applets, Applets Life Cycle, Creating an Executable Applet, Designing a Web Page, Applet Tag, Adding Applet to HTML File, Running the Applet, Passing Parameters to Applets, Aligning the Display, HTML Tags & Applets ,Getting Input from the User.	

Suggested Readings:

1. Programming with Java, E.Balaguruswamy, TMH.
2. Core Javafor beginners, RASHMI Kanta Das, Vikas pub.

Program: B.Tech
Semester: Fourth
Course: Object Oriented Programming with Java Lab
Course Code: 3PCCCS203P

L	T	P	C
0	0	4	2

List of Experiment:

1. Program to find square root of given number
2. Program to enter principal, rate & time and find simple interest
3. Program to find whether a year is leap year or not
4. Program to enter a number from keyboard and find out Fibonacci series
5. Program to enter a number from keyboard and find out factorial of the number
6. Program to enter a number from keyboard and check whether the number is palindrome ornot
7. Program to enter a number from keyboard and print the prime numbers present within it
8. Program to enter a number from keyboard and determine whether it is Armstrong or not.
9. Program to demonstrate switch statement
10. To swap two numbers without using third variable
11. To find the greatest among 3 numbers
12. Program to sort an array in an ascending order
13. Program to find out the sum and average of the elements present in an array
14. Program to add the elements of two different two dimensional array.
15. Program to find out the biggest and smallest number from a matrix.
16. Program to implement the concept of final class
17. Program to o implement the concept of interface
18. Program to reverse a specified string.
19. Write a program in java to show the user defined package.
20. Program to create an applet
21. Program to implement the concept of thread

Program: B.Tech
Semester: Fourth
Course: Discrete mathematics
Course Code: 3PCCCS204

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Course Objectives:

To expose the students to the following:

- Propositional function, quantifiers, rules of inference.
- Binary relations, posets, Hasse diagram, lattice, Functions, and pigeonhole principle.
- How to generate various types of set, relation and functions recursively and solvethem.
- Various concepts in graphs like its representation, planar graphs, graph coloring andtrees

Course Outcomes

After successful completion of course the student should be able to:

- **CO1:** Know how to represent various statements using set, relations, functions, permutationsand combinations, groups, graphs and trees
- **CO2**: Use logical notations to formulate and reason about fundamental mathematicalconcepts such as sets, relations, functions and algebraic structures
- **CO3:** Analyse the growth of functions and real world problems using various concepts like recurrence relations, graph coloring, etc.
- **CO4:** Model and solve real world problems using graphs and trees.

Course Content:

Topics	Hours
Module 1: Sets, Relation and Function	10
Operations and Laws of Sets, Cartesian Products, Binary Relation, Partial Ordering Relation, Equivalence Relation, Image of a Set, Sum and Product of Functions, Bijective functions, Inverse and Composite Function, Size of a Set, Finite and infinite Sets, Countable and uncountable Sets, Cantor's diagonal argument and The Power Set theorem, Schroeder-Bernstein theorem.	
Module 2: ***Principles of Mathematical Induction***	08
The Well-Ordering Principle, Recursivedefinition, The Division algorithm: Prime Numbers, The Greatest Common Divisor: Euclidean Algorithm, The Fundamental Theorem of Arithmetic. Basic counting techniques-inclusion and exclusion, pigeon-hole principle, permutation andcombination.	
Module 3: Propositional Logic	07
Syntax, Semantics, Validity and Satisfiability, Basic Connectives and Truth Tables, Logical Equivalence: The Laws of Logic, Logical Implication, Rules of Inference, The use of Quantifiers. **Proof Techniques:** Some Terminology, Proof Methods and Strategies, Forward Proof, Proof by Contradiction, Proof by Contraposition, Proof of Necessityand Sufficiency.	
Module 4: Algebraic Structures and Morphism	09
Algebraic Structures with one Binary Operation, Semi Groups, Monoids, Groups, Congruence Relation and Quotient Structures, Free and Cyclic Monoids and Groups, Permutation Groups, Substructures, Normal Subgroups, Algebraic Structures with two Binary Operation, Rings, Integral Domain and Fields. Boolean Algebra and Boolean Ring, Identities of Boolean Algebra, Duality, Representation of Boolean Function,Disjunctive and Conjunctive Normal Form	
Module 5: Graphs and Trees	06
Graphs and their properties, Degree, Connectivity, Path, Cycle, Sub Graph, Isomorphism, Eulerian and Hamiltonian Walks, Graph Colouring, Colouring maps and Planar Graphs, Colouring Vertices, Colouring Edges, List Colouring, Perfect Graph, definitionproperties and Example, rooted trees, trees and sorting, weighted trees and prefix codes, Bi- connected component and Articulation Points, Shortest distances.	

Suggested readings:

- J.P. Tremblay and R. Manohar, Discrete Mathematical Structure and It's Applicationto Computer Science‖, TMG Edition, TataMcgraw-Hill
- Norman L. Biggs, Discrete Mathematics, 2nd Edition, Oxford University Press. Schaum's Outlines Series, Seymour Lipschutz, Marc Lipson,
- Discrete Mathematics, Tata McGraw - Hill

Program: B.Tech
Semester: Fourth
Course: Design and Analysis of Algorithms
Course Code: 3PCCCS205

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Course Objectives:

- Analyze the asymptotic performance of algorithms. Write rigorous correctness proofsfor algorithms. To understand concepts about searching and sorting techniques
- Demonstrate a familiarity with major algorithms and data structures.
- Apply important algorithmic design paradigms and methods of analysis.
- Synthesize efficient algorithms in common engineering design situations.

Course Outcome:

- **CO1:** For a given algorithms analyze worst-case running times of algorithms basedon asymptotic analysis and justify the correctness of algorithms.
- **CO2:** Describe the greedy paradigm and explain when an algorithmic design situation calls for it. For a given problem develop the greedy algorithms.
- **CO3:** Describe the divide-and-conquer paradigm and explain when an algorithmic design situation calls for it. Synthesize divide-and-conquer algorithms. Derive and solve recurrence relation.
- **CO4:** Describe the dynamic-programming paradigm and explain when an algorithmic design situation calls for it. For a given problems of dynamic-programming and develop the dynamic programming algorithms, and analyze it to determine its computational complexity.
- **CO5:** For a given model engineering problem model it using graph and write the corresponding algorithm to solve the problems. Explain the ways to analyze randomized algorithms (expected running time, probability of error).Explain what an approximation algorithm is. Compute the approximation factor of an approximation algorithm (PTAS and FPTAS).

Course Content:

Topics	Hours
Module 1: Introduction	08
Introduction: Characteristics of algorithm. Analysis of algorithm: Asymptotic analysis of complexity bounds – best, average and worst-case behavior; Performance measurements of Algorithm, Time and space trade- offs, Analysis of recursive algorithms through recurrence relations: Substitution method, Recursion tree method and Masters' theorem	
Module 2: Fundamental Algorithmic Strategies	08
Fundamental Algorithmic Strategies: Brute -Force, Greedy, Dynamic Programming, Branch-and-Bound and Backtracking methodologies for the design of algorithms; Illustrations of these techniques for Problem-Solving , Bin Packing, Knap Sack TSP. Heuristics – characteristics and their application domains.	
Module 3: Graph and Tree Algorithms	05
Graph and Tree Algorithms:Traversal algorithms:Depth First Search (DFS) and Breadth First Search(BFS), Shortest path algorithms, Transitive closure, Minimum Spanning Tree,Topological sorting, Network Flow Algorithm.	
Module 4: Tractable and Intractable Problems	04
Tractable and Intractable Problems: Computability of Algorithms, Computability classes – P, NP, NP-complete and NP-hard. Cook's theorem, Standard NP-complete problems and Reduction techniques.	
Module 5: Advanced Topics	05
Advanced Topics: Approximation algorithms, Randomized algorithms, Class of problems beyond NP – P SPACE	

Text/Reference Books:

- Introduction to Algorithms, 4TH Edition, Thomas H Cormen, Charles E Lieserson,Ronald L Rivest and Clifford Stein, MIT Press/McGraw-Hill. Fundamentals of Algorithms – E. Horowitz et al.
- Algorithm Design, 1ST Edition, Jon Kleinberg and ÉvaTardos, Pearson. AlgorithmDesign: Foundations, Analysis, and Internet Examples, Second Edition, Michael T Goodrich and Roberto Tamassia, Wiley. Algorithms—A Creative Approach, 3RD Edition, UdiManber, Addison-Wesley, Reading, MA.

Program: B.Tech
Semester: Fourth
Course: Design and Analysis of Algorithms Lab
Course Code: 3PCCCS205P

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List of Experiment:

1. To implement Binary Search.
2. To implement Longest Common Subsequence (LCS).
3. To implement Matrix Chain Multiplication (MCM).
4. To implement Travelling Salesman Problem (TSP)
5. To implement MST using Kruskal's algorithm.
6. To implement MST using Prim's algorithm.
7. To implement DFS on a graph.
8. To implement BFS on a graph
9. To implement Dijkstra algorithm.
10. To implement 0/1 knapsack problem.
11. To implement Quick sort.
12. To implement Merge sort.
13. To implement Huffman Coding technique.
14. To implement All Pairs Shortest Path Problem(i.e Floyd-Warshall Algorithm)

Program: B.Tech
Semester: Fourth
Course: Character Building & Holistic Development of Personality- II (Yoga and Physical Fitness)
Course Code: 3VAC201

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Course Learning Objective:

CLO 1: To generate awareness among students about health and yoga.

CLO 2: To encourage students to be environmentally conscious, conserve water and practise good hygiene.

CLO 3: To acquaint the students with the fundamental principles of national unity and integration through practicing yoga.

CLO 4: To develop Annamaya Kosha (Physical Development) and Pranamaya Kosha (Development of Prana).

Course Outcome:

On completion of the Course, the students will be able to:

CO 1: Develop a good understanding of spiritual and mental health.

CO 2: Adapt the concept of sustainability and development.

CO3: Understand the importance of Yoga and practice it in day to day life.

CO4 : Enable to develop Annamaya Kosha and Pranamaya Kosha.

Course Content:

Topics	Hours
Unit I: Physical Vital Development	10
• Health: Meaning, Concept, Dimensions of health (mental, physical, social and spiritual) and health related general habits. • Ideal daily routine/ Lifestyle : Meaning, Concept, Principles and its related practice • Balanced Diet : Meaning, Concept, Benefits, Alkali and Acid, Balanced Diet according to Desh (location), Kaal (time), Ayu (age) and Ritu (season) • Ritucharya (Seasonal Habits) : Meaning, general Introduction, Concept, Month and Festivities according to season, Nature of Earth, Lifestyle according to Shishir Season. • Sukshama Vyayama and Surya Namaskara : General Introduction, Precautions and Practice.	
Unit II: Yoga and its Importance	**10**
• Yoga: Meaning, Concept, Aims and Objectives, Types. • Diet and Health : Conditions, Malnutrition (Undernutrition and Over Nutrition) causes, Problems and Solutions, Common points of consideration for nutrition. • Vasant Ritucharya: Lifestyle according to Spring season; Lifestyle- General Introduction, Concept, Month and Festivities according to season. • Pranayama: General Introduction (Bandh, Nadi and Chakra), Importance, Eligibility, Time, Place, position, Principles of Practice and Precautions • Asana: General Introduction, Types, Benefits, Precaution and Practice (Asanas in Standing position) • Practice of Sukshama Vyayama and Surya Namaskara	
Unit III: Yoga and Physical Fitness	10
• Ashtanga Yoga: General Introduction, Parts, Meaning of Yama and Niyama, Concept, aims and Objectives. • Diet and Health: Nutrients of Food -Carbohydrates, Proteins and Fats – Structure/Elements, Requirement/Utility & Sources • Grisham Ritucharya: Lifestyle according to summer season- General Introduction, Concept, Month and Festivities according to season, Nature of the Earth. • Pranayama: Importance, Rules, Precautions and Practice of Inhalation (Purak) Exhalation (Rechak) and Holding of Breath • Asanas: (Bending Asanas)- General Introduction, Benefits, Precautions and practice of Padhastasana, Utkataana, Garudasana, Tulasana and Ardg-Chandrasana • Practice of Sukshama Vyayama and Surya Namaskara • Varsha Ritucharya: Lifestyle according to rainy season- General Introduction, Concept, Month and Festivities according to season, Nature of the Earth. • Diet and Health: Nutrients of Food – Vitamins, Mineral and Water structures/elements, Requirement & Sources. • Pranayama: Importance, Rules, Precautions and Practice of Anuloma-Viloma, Bhramari and	

Kapalbhati Pranayama • Asanas: (In Sitting Position) - General Introduction, Benefits, Precautions and practice . • Practice of Sukshama Vyayama and Surya Namaskara	
Unit IV: Practices of Yoga	15
• Sharad Ritucharya: Lifestyle according to Autumn season- General Introduction, Concept, Month and Festivities according to season, Nature of the Earth. • Pranayama: Importance, Rules, Precautions and Practice of Chandrabhedi, Suryabhedi and Ujjai Pranayama. • Asanas: (asanas performed in Supine position) - General Introduction, Benefits, Precautions and practice. • Practice of Sukshama Vyayama and Surya Namaskara. • Hemant Ritucharya: According to Hemant season- Meaning, General Introduction, Concept, Month and Festivities according to season, Nature of the Earth. • Pranayama: Importance, Rules, Precautions and Practices of Sheetali, Sheetkari and Nadi Shodhan Pranayama. • Asanas: (asanas performed in Prone position) - General Introduction, Benefits, Precautions and practice . • Practice of Sukshama Vyayama and Surya Namaskara • Self Defense: Meaning, Purpose, Required Capabilities; • Relaxation: Shoulder-movement exercise for Spine & maintaining the balance • Marmasthala – Common Vulnerable/Vital Points • Prahara : Meaning, Striking Organs, Types of Strikes, Precautions. • Preventing possible strikes, Preventing Organs and types/uses • Fall and Roll – Types and Precautions.	

Suggested Reading:

- Yoga for Everyone, B.K.S.Iyengar, Dorling Kindersley Ltd; New Delhi
- Yoga the Path to Holistic Health, .B.K.S.Iyengar, Dorling Kindersley Ltd; New Delhi
- Science of Yoga, Ann Swanson, Dorling Kindersley Ltd; New Delhi

Program: B.Tech
Semester: Fourth
Course: Entrepreneurship
Course Code: 3HSMC203

L	T	P	C
3	0	0	3

Course Objective:

- To develop an understanding of the concepts of project, types of projects, project identification, and Project's life cycle, Forms of Project Organization and human aspectsof Project Management.
- To help students understand the importance of social cost and benefit analysis and its UNIDO approach. It also includes network technique for project management, scheduling, PERT, CPM model and network cost system.
- To incorporate the understanding of capital budgeting of an organization, including discounted and nondiscounted techniques, cost over- run, Project control and information system.
- To enable learners to understand the Significance of entrepreneurship in economic development qualities of entrepreneur, Entrepreneurship development programs and roleof various institutions in developing entrepreneurship, life cycles of new business and steps for setting up a new industry.

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

- **CO 1:** Understand the Concept of project, characteristics of projects, Identify the type of project and Project's life cycle, as well as steps for Successful Project Implementation.
- **CO 2:** Analyse the project from technical, financial, market- demand and economic feasibility and analyse the difference between the CBA and SCBA. Create and formulate linear programming and integer programming model, project network and estimation of time and critical path in PERT and CPM model.
- **CO 3:** Evaluate capital budgeting system of an organization through discounted and non-discounted techniques like NPV, IRR, Profitability index, ARR and Payback period.
- **CO 4:** Understand entrepreneurship Development and role of institution like SIDO, MDI, EDI, AISSIB, NIESBUD etc. Also the students will analyze all the factors for success and failure of a new business.

Course Content:

Topics	Hours
Module 1: Introduction to Project Management	
Concept, characteristics of projects, types of projects, project identification, and Project's life cycle, Forms of Project Organization, Human Aspects of Project Management, Pre-requisites for Successful Project Implementation	04
Module 2: Project Feasibility	
Market feasibility, technical feasibility, financial feasibility, and economic feasibility, social cost-benefit analysis, project risk analysis Network Analysis, Requirements for Network Analysis, Critical Path Method (CPM), Programme Evaluation and Review Technique (PERT)	08
Module 3: Financial appraisal/evaluation techniques	
Estimation of Cash Flows, discounted/non-discounted cash flows; Net present values,profitability index, Internal rate of returns; Cost benefits ratio; Accounting rate of return, Payback period, Project implementation; Cost overrun, Project control and information system	08
Module 4: Entrepreneurship Development	
Significance of entrepreneurship in economic development qualities of entrepreneur, entrepreneurship development programs and role of various institutions in developing entrepreneurship, life cycles of new business, environmental factors affecting success of a new business, reasons for the failure and visible problems for business, Developing effective business plans, Procedural steps in setting up of an industry	10

Suggested Reading:

1. Chandra P. 2005. Project Management. Tata McGraw Hill.13
2. Gopal Krishan P & Nagarajan K. 2005. Project Management. New Age.
3. Hisrich RD & Peters MP. 2002. Entrepreneurship. Tata McGraw Hill.
4. Kaplan JM. 2003. Patterns of Entrepreneurship. John Wiley & Sons.
5. Nandan H. 2007. Fundamentals of Entrepreneurship Management. Prentice Hall.
6. Ramamoorthy VE. 2005. Textbook of Project Management. MacMillan

Program: B.Tech
Semester: Fourth
Course: Disaster Management
Course Code: 3MC201

L	T	P	C
2	0	0	0

Course Objective:

- Develop an understanding of the key concepts, definitions a key perspectives of All HazardsEmergency Management
- Understand the Emergency/Disaster Management Cycle
- Have a basic understanding for the history of Emergency Management
- Develop a basic under understanding of Prevention, Mitigation, Preparedness, Response andRecovery
- Develop a basic understanding for the role of public a private partnerships.

Course Outcome:

- **CO1:** Understanding foundations of hazards, disasters and associated natural/socialphenomena.
- **CO 2:** Familiarity with disaster management theory (cycle, phases)
- **CO 3:** Knowledge about existing global frameworks and existing agreements (e.g.Sendai)
- **CO 4:** Methods of community involvement as an essential part of successful DRR.

Course Content:

Topics	Hours
Module 1:	04
Understanding Disasters: Understanding the concepts and definitions of disaster, hazard, vulnerability, risk, importance, dimensions & scope of Disaster Management, Disaster Management cycle and disaster profile of India.	
Module 2:Project Feasibility	08
Types, Trends, Causes, Consequences and Control of Disaster: Geological Disasters (earthquakes, landslides, tsunami, mining);Hydro-Meteorological Disasters (floods, cyclones, lightning, thunder-storms, hail storms, avalanches, droughts, cold and heat waves); Biological Disasters (epidemics, pest attacks, forest fire); Technological Disasters (chemical, industrial, radiological, nuclear, bomb threat, explosion) and Man-made Disasters (building collapse, rural and urban fire, road and rail accidents, nuclear, radiological, chemicals and biological disasters; terrorist attack, , sudden shooting);Global Disaster Trends–Emerging Risks of Disasters–Climate Change and Urban Disasters; Financial emergency(risk of eviction, risk in arrears, sudden health emergency, family emergency, unexpected loss of income).	
Module 3:	08
Prevention and Mitigation of Disaster: Disaster Mitigation: meaning and concept, Disaster Mitigation Strategies Emerging Trends in Disaster Mitigation, Mitigation management, Role of Team and Coordination. Disaster Preparedness: Concept & Nature, Disaster Preparedness Plan, Preventions. Roles & Responsibilities of Different Agencies and Government, Technologies for Disaster Management. Early Warning System; Preparedness, Capacity Development; Awareness during Disaster.	
Module 4:	10
Applications of Science and Technology for Disaster Management & Mitigation: Geo-informatics in Disaster Management (RS, GIS, GPS and RS) Disaster CommunicationSystem (Early Warning and Its Dissemination) Land Use Planning and Development, Regulations, Disaster Safe Designs and Constructions, Structural and Non Structural Mitigation of Disasters.	

Suggested Reading:

1. Disaster Management- J. P. Singhal, Laxmi Publications.
2. Disaster Management - Dr. Mrinalini Pandey, Wiley India Pvt. Ltd.
3. Disaster Science and Management- Tushar Bhattacharya, McGraw Hill Education (India) Pvt.Ltd.
4. Disaster Management: Future Challenges and Opportunities - Jagbir Singh, K W PublishersPvt. Ltd.

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Semester V

Program: B.Tech
Semester: Fifth
Course: Database Management Systems
Course Code: 3PCCCS301

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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 methodand 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	6
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.	
UNIT II	8
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.	
UNIT -III	5
Storage strategies: Indices, B-trees, hashing.	
UNIT IV	6
Transaction processing: Concurrency control, ACID property, Serializability of scheduling, Locking and timestamp based schedulers, Multi-version andoptimistic Concurrency Control schemes, Database recovery.	
UNIT V	5
Database Security: Authentication, Authorization and access control, DAC, MAC and RBACmodels, Intrusion detection, SQL injection.	

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.Tech
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.

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.Tech
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

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

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

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

Course Content:

Topics	Hours
Unit I	5
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.	
Unit II	7
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.	
Unit III	6
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.	
Unit IV	7
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.	
Unit V	5
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	

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.Tech
Semester: Fifth
Course: IT Workshop (Sci Lab/MATLAB)
Course Code: 3PCCCS304

L	T	P	C
2	0	0	2

Course Objective:
Students will be able to

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

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

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

Course Content:

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

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.Tech
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

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

Course Outcome:

- After the successful completion of the course, the students will be able to:Apply features of Matlab and algorithms to solve problems
- Develop application programs with the help of various tool boxes available in Matlab.
- Apply data analysis through graphical data representations
- Implement programs with the use of arrays, strings in Matlab
- 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, matrixManipulations.
6. Arithmetic operations on Matrices, Relational operations on Matrices, LogicalOperations 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.Tech
Semester: Fifth
Course: Operating Systems
Course Code: 3PCCCS305

L	T	P	C
3	0	0	3

Course Objective:

- To learn the mechanisms of OS to handle processes and threads and their communication
- 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
- 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:

- Create processes and threads.
- Develop algorithms for process scheduling for a given specification of CPU utilization, Throughput, Turnaround Time, Waiting Time, Response Time.
- 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.
- Design and implement file management system.

Course Content:

Topics	Hours
Unit I	5
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.	
Unit II	7
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.	
Unit III	5
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.	
Unit IV	7
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).	

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, PeterGalvin, 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 ofIndia
4. Understanding the Linux Kernel, 3rd Edition, Daniel P. Bovet, Marco Cesati, O'Reillyand Associates

Program: B.Tech
Semester: Fifth
Course: Operating Systems Lab
Course Code: 3PCCCS305P

L	T	P	C
0	0	4	2

Course Objective:

- To learn the mechanisms of OS to handle processes and threads and their communication
- 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
- 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:

- Create processes and threads.
- Develop algorithms for process scheduling for a given specification of CPU utilization, Throughput, Turnaround Time, Waiting Time, Response Time.
- 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.
- Design and implement file management system.

List of Programs as Assignments:

1. Lab Assignment No: 1
Objective: To Understand and Implement Directory StructureQ1. WAP to create a File directory system.

2. Lab Assignment No: 2
Objective: To Understand and Implement Scheduling processesQ1. WAP to schedule various processes

3. Lab Assignment No: 3
Objective: To Understand and Implement FCFSQ1. WAP to implement FCFS CPU Scheduling

4. Lab Assignment No: 4
Objective: To Understand and Implement SJFQ1. WAP to implement SJF CPU scheduling.

5. Lab Assignment No: 5
Objective: To Understand and Implement SRTFQ1.WAP to implement SRTF CPU scheduling.

6. Lab Assignment No: 6
Objective: To Understand and Implement Scheduling algorithmsQ1. WAP to implement Round Robin Scheduling

7. Lab Assignment No: 7
Objective: To Understand and Implement Scheduling algorithmsQ1 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
TechniquesQ1. WAP to implement FCFS page replacement
algorithm.
Q2. WAP to implement Optimal page replacement algorithm.

Program: B.Tech
Semester: Fifth
Course: Character Building & Holistic Development of Personality- III (Universal Human Values and Ethics)
Course Code: 2VAC301

L	T	P	C
2	0	0	2

Course Learning Objective:

CLO 1: To familiarize students with Indian cultural values.

CLO 2: To inspire students to preserve and protect values and ethics.

CLO 3: To build moral, ethical, energetic individual dedicated towards the service of humanity.

CLO 4: To focus on holistic development of an individual.

Course Outcome:

On completion of the Course, the students will be able to:

CO 1: Understand the importance of Indian cultural values.

CO 2: Learn to adapt, protect and preserve values and ethics.

CO3: Become a responsible citizen for serving the mankind.

CO4 : Develop one's personality holistically in a balanced manner.

Course Content:

Topics	Hours
Unit I: Personality Development	10
• Personality Development: Meaning, Concept, Constituent elements of personality and Means/Ways of Personality Development. • Panchakosha: General Introduction, Meaning, Objectives, Characteristics and Significance. • Benefits of Panchakosha, development and deficiencies due to underdevelopment of Panchkosha.	
Unit II: Mental Emotional Development	**10**
• Values and Individual: Non-Possession, Non- Stealing, Self Restrain, Enthusiasm, Dutifulnes, Reticence, Silence, Self-study, Considerateness and Self-respect. • Values and Family: Respectful Salutation, Obedience, Contentment, Patienc, hospitality, Parent Service, Rectitude, Good Behaviour, Family feeling and worship.	
Unit III: Indian Values	10
• Values and Society: Discipline, Social Responsibility and Duties of Citizens, Altruism/ Charity, Keeping good company, Gratefulness, Fraternity/ Friendship, Courtesy, Tactfulness, Soft Spoken and Feeling for the Oppressed. • Values and Constitution: Dignity of an Individual, Fundamental Duties, Fundamental rights, Directive Principles of State Policies, Social Equality, Democracy, Justice, Freedom, Sarva-Pantha Samman and Scientific Approach.	
Unit IV: Practice of Values and Ethics	15
• Values and Indian Culture: Integrity of the nation, Glory of the Past, Swadeshi, Nation Building, Patriotism, Mother Tongue, National Unity, Public Welfare, Equality and Spirituality. • Values and Vision of the World: Humanity, Integrity, Human rights, The Highest or Most Sublime Good, Vasudhaiva Kutumbakam, Tolerance, Peaceful Coexistence, World-Welfare, Environmental Protection, Swavalamban/Self-reliance	

Suggested Reading:

- My Idea of Education, Swami Vivekanand, Advaita Ashram, Kolkata
- Personality Development, Swami Vivekananda, Advaita Ashram, Kolkata.
- The Man India Missed the Most; Subhash Chandra Bose, huvan Lall, Notion Press, Chennai

JHARKHAND
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SPECIALIZATION IN ARTIFICIAL INTELLIGENCE

TRACK ELECTIVE - I

Program: B.Tech
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

- To learn and understand Python programming basics and paradigm.
- 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.
- 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:

- Define and demonstrate the use of built-in data structures “lists” and “dictionary”.
- Design and implement a program to solve a real world problem.
- Design and implement GUI application and how to handle exceptions and files.
- 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 (2ndEdition)
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)

Program: B.Tech
Semester: Fifth
Course: Introduction to Python Programming Lab
Course Code: 3TECCS301P

L	T	P	C
0	0	2	1

Course Objective:
Students will be able to

- To learn and understand Python programming basics and paradigm.
- To learn and understand python looping, control statements and string manipulations.
- Students should be made familiar with the concepts of GUI controls and designingGUI applications.
- 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 agiven 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 moduleto 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: B.Tech
Semester: Fifth
Course: Pattern Recognition
Course Code: 3TECCS307

L	T	P	C
4	0	0	4

Course Objective:
Students will be able to

- To understand basic concepts in pattern recognition
- To gain knowledge about state-of-the-art algorithms used in pattern recognitionresearch
- To understand pattern recognition theories, such as Bayes classifier, lineardiscriminant analysis.
- To apply pattern recognition techniques in practical problems.

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

- To apply knowledge of advanced principals to the analysis of electrical and computer engineering problems.
- To apply knowledge of advanced techniques to the design of electrical and computer engineering systems.
- 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.
- 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	6
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	
Unit II	7
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.	
Unit III	5
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	
Unit IV	6
Nonparametric techniques for density estimation: Parzen-window method; K-Nearest Neighbour method **Dimensionality reduction:** Fisher discriminant analysis; Principal component analysis; Factor Analysis	
Unit V	6
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	

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: B.Tech
Semester: Fifth
Course: Intelligent Systems
Course Code: 3TECCS308

L	T	P	C
4	0	0	4

Course Objective:
Students will be able to:

- To introduce the basic intelligent system concepts.
- To describe and learn various algorithms in the neural networks for optimizing real worldproblems
- To learn fuzzy logic and its implementation methods.

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

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

Course Content:

Topics	Hours
UNIT I: INTRODUCTION AND BASIC CONCEPTS	6
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	
UNIT II - MULTILAYER NETWORKS	7
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.	
UNIT III - RESONANT NETWORKS AND APPLICATIONS	5
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.	
Unit IV - FUZZY SET THEORY	6
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.	
Unit V - FUZZY LOGIC AND SYSTEMS	6
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.	

Textbooks and Suggested Readings:

1. G.J.Klir& Bo Yuan, “Fuzzy Sets and Fuzzy Logic Theory and Applications”, Prentice Hallof 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 tomachine 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.

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Semester VI

Program: B.Tech
Semester: Sixth
Course: Compiler Design
Course Code: 3PCCCS306

L	T	P	C
3	0	0	3

Course Objective:

The objectives of this course are:

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

Course Outcome:

On completion of the course students will be able to:

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

Course Content:

Topics	Hours
UNIT I	
Introduction to Compilers 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.	
UNIT II	
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 YAAC.	
UNIT -III	
Syntax-Directed Definition(SDD), Evaluation Order of SDD‟s and its application, SyntaxDirected Translation Schemes and their Implementation.	
UNIT IV	
Intermediate code Generation: Variants of Syntax Tree, Three Address Code, Translation of Expressions, Control flow, Back Patching , Run Time Environment: Storage Organization.	
UNIT V	
Code Generation: 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.Tech
Semester: Sixth
Course: Compiler Design Lab
Course Code: 3PCCCS306P

L	T	P	C
0	0	4	2

Course Objective:

The objectives of this course are:

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

Course Outcome:

On completion of the course students will be able to:

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

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 divisble 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

nb

n

| n >= 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 ->aSb, S->bSa, S->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.Tech
Semester: Sixth
Course: Computer Networks
Course Code: 3PCCCS307

L	T	P	C
3	0	0	3

Course Objective:
The objectives of this course are:

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

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

- Explain the functions of the different layer of the OSI Protocol.
- Draw the functional block diagram of wide-area networks (WANs), local area networks (LANs) and Wireless LANs (WLANs) describe the function of each block.
- 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
- 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
UNIT I	
Data communication Components: 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.	
UNIT II	
Data Link Layer and Medium Access Sub Layer: 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	
UNIT -III	
Network Layer: Switching, Logical addressing – IPV4, IPV6; Address mapping – ARP,RARP, BOOTP and DHCP–Delivery, Forwarding and Unicast Routing protocols.	
UNIT IV	
Transport Layer: 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.	
UNIT V	
Application Layer: Domain Name Space (DNS), DDNS, TELNET, EMAIL, File Transfer Protocol (FTP), WWW, HTTP, SNMP, Bluetooth, Firewalls, Basic concepts of Cryptography	

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.Tech
Semester: Sixth
Course: Computer Networks Lab
Course Code: 3PCCCS307P

L	T	P	C
0	0	4	2

Course Objective:

The objectives of this course are:

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

Course Outcome:

On completion of the course students will be able to:

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

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 art 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: Sixth
Course: Fundamentals of Software Engineering
Course Code: 3PCCCS308

L	T	P	C
3	0	0	3

Course Objective:
Students will be able to

- Understand about effective team members, aware of cultural diversity, who conductthemselves ethically and professionally.
- Use effective communication skills and technical skills to assure production of qualitysoftware, on time and within budget.
- Build upon and adapt knowledge of science, mathematics, and engineering to take onmore expansive tasks.
- Increase level of self-reliance, technical expertise, and leadership.

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

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

Course Content:

Topics	Hours
Unit I	
Introduction 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.	
Unit II	
Software Requirements Functional and non-functional requirements, User requirements, System requirements, the software requirements document. IEEE standard of SRS, Quality of good SRS. **Requirement Engineering Process**: Feasibility study, Requirements elicitation and analysis, Requirements validation, Requirement management.	
Unit III	
Design Engineering Design Process and Design Quality, Design Concepts, Design Models, Object oriented Design, UML: Class diagram, Sequence diagram, Collaboration diagram.	
Unit IV	
Verification and Validation Verification and Validation Planning, S/W inspection, static analysis. **Software Testing** Testing functions, Test care design, White Box testing, Black box testing, Unit testing, Integration Testing, System testing, Reliability.	
Unit V	
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.	

Suggested Text Book:

1. Sommerville, Software Engineering, 7th Edition, Pearson Education Publication.

Suggested Reference Books:

1. Pressman R. S.,Software Engineering: A Practiioners Approach, 5th Edition., TMA,New Delhi.
2. Mall Rajib, Fundamental of Software Engineering, 4th 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.Tech
Semester: Sixth
Course: Fundamentals of Software Engineering Lab
Course Code: 3PCCCS308P

L	T	P	C
0	0	2	1

Course Objective:
Students will be able to

- Familiarize the students with the fundamental concepts of Software Engineering
- Impart state-of-the-art knowledge on SRSand UML
- Explore case studies to demonstrate practical applications of different concepts
- 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:

- Prepare efficient models for development of software for various projects
- Collect the requirements the client wants for the software being produced
- Design the UML diagrams necessary for the software being developed
- Create and specify feasible software designs based on the requirements/specifications
- 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 ProblemStatements

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 functionaries to be obtained from a system and characteristics that asystem should have, but not possessed by the system itself

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

Objective: To Understand and Implement Estimation ofProject Metrics

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

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

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

Objective: To Understand and Implement Modeling UML Use Case Diagrams and Capturing UseCase 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 use casesand «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 casestudy.

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 ProblemStatements

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 ProblemStatements

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 case study.

8. Lab Assignment No: 8

Objective: To Understand and Implement Modeling UML Class Diagrams and Sequence diagramsQ1. 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 Structural Complexity

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.

Program: B.Tech
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.

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SPECIALIZATION IN ARTIFICIAL INTELLIGENCE

TRACK ELECTIVE – II

TRACK ELECTIVE – III

Program: B.Tech
Semester: Sixth
Course: Distributed Database Management System
Course Code: 3TECCS311

L	T	P	C
3	0	0	3

Course Objective:
The objectives of this course are:

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

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

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

Course Content:

Topics	Hours
UNIT I - Introduction	
Introduction; Distributed Data Processing, Distributed Database System, Promises of DDBSs, Problem areas. **Distributed DBMS Architecture:** Architectural Models for Distributed DBMS, DDMBS Architecture. **Distributed Database Design:** Alternative Design Strategies, Distribution Design issues, Fragmentation, Allocation.	
UNIT II - Query Processing and Decomposition	
Query processing and decomposition: Query processing objectives, characterization of query processors, layers of query processing, query decomposition, localization of distributed data. **Distributed query Optimization:** Query optimization, centralized query optimization, distributed query optimization algorithms.	
UNIT III - Transaction Management	
Transaction Management: Definition, properties of transaction, types of transactions, distributed concurrency control: serializability, concurrency control mechanisms & algorithms, time - stamped & optimistic concurrency control Algorithms, deadlock Management.	
UNIT IV - Distributed DBMS Reliability	
Distributed DBMS Reliability: Reliability concepts and measures, fault-tolerance in distributed systems, failures in Distributed DBMS, local & distributed reliability protocols, site failures and network partitioning. **Parallel Database Systems:** Parallel database system architectures, parallel data placement, parallel query processing, load balancing, database clusters.	
UNIT V - Distributed object Database Management Systems	
Distributed object Database Management Systems: Fundamental object concepts and models, object distributed design, architectural issues, object management, distributed object storage, object query Processing. **Object Oriented Data Model:** 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.Tech
Semester: Sixth
Course: Distributed Database Management System Lab
Course Code: 3TECCS311P

L	T	P	C
0	0	2	1

Course Objectives:

Students will be able to

- To design and implement a database schema for a given problem domain
- To create and manipulate tables using SQL queries
- To prepare a Database for a given problem
- To develop applications using PL/SQL

Course Outcomes:

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

- Understand, analyze and apply common SQL statements including DDL, DML and DCL statements to perform different operations.
- Design different views of tables for different users and to apply embedded and nested queries.
- Design and implement a database for a given problem according to well-known design principles that balance data retrieval performance with data consistency.
- 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.Tech
Semester: Sixth
Course: Machine Learning
Course Code: 3TECCS312

L	T	P	C
3	0	0	3

Course Objective:
The objectives of this course are:

- To understand the basic concept of machine learning.
- To explore the application of machine learning.
- To understand the concept of supervised learning.
- To learn the advantage of neural network.
- To learn the utility of clustering techniques.

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

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

Course Content:

Topics	Hours
UNIT I	
Introduction to Machine learning Machine Learning – what and why? Basics of Linear Algebra and Statistics, Overview of target function representations; Linear Regression.	
UNIT II	
Supervised Learning 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	
UNIT -III	
Neural Networks 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.	
UNIT IV	
Unsupervised and Semi Supervised Learning 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.	
UNIT V	
Ensemble Committees of multiple hypotheses, bagging, boosting, active learning with ensembles,	

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.Tech
Semester: Sixth
Course: Web Technology
Course Code: 3TECCS313

L	T	P	C
3	0	0	3

Course Objective:

The objectives of this course are:

- To make student familiar with client server architecture
- To make student able to develop a web application using java technologies.
- 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:

- Students are able to develop a dynamic webpage by the use of java script and DHTML.
- Students will be able to write a well formed / valid XML document.
- Students will be able to connect a java program to a DBMS and perform insert, update and delete operations on DBMS table.
- 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.
- 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
UNIT I	
Introduction to HTML : HTML Common tags- Block Level and Inline Elements, Lists, Tables, Images, Forms, Frames; Cascading Style sheets, CSS Properties; **Java Script:** Introduction to Java Script, Objects in Java Script, Dynamic HTML with Java Script	
UNIT II	
JDBC: 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.	
UNIT -III	
Web Servers and Servlets: 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.	
UNIT IV	
Introduction to JSP: 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.	
UNIT V	
Introduction to PHP: Basics of PHP, Functions, Error Handling, Interaction between PHP and MySQL, Database using Forms,Using PHP to manipulate and Retrieve Data in MySQL.	

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.Tech
Semester: Sixth
Course: Web Technology Lab
Course Code: 3TECCS313P

L	T	P	C
0	0	2	1

Course Objective:

The objectives of this course are:

- To make student familiar with client server architecture
- To make student able to develop a web application using java technologies.
- 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:

- Students are able to develop a dynamic webpage by the use of java script and DHTML.
- Students will be able to write a well formed / valid XML document.
- Students will be able to connect a java program to a DBMS and perform insert, update and delete operations on DBMS table.
- 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.
- 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.Tech
Semester: Sixth
Course: Statistics for Artificial Intelligence
Course Code: 3TECCS319

L	T	P	C
3	0	0	3

Course Objective:
The objectives of this course are:

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

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

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

Course Content:

Topics	Hours
UNIT I - Basics of Statistics	
• Data exploration (histograms, bar chart, box plot, line graph, scatter plot) • Qualitative and Quantitative Data • Measure of Central Tendency (Mean, Median and Mode), • Measure of Positions (Quartiles, Percentiles and Quantiles), • Measure of Dispersion (Range, Median, Variance , and Standard deviation)	
UNIT II - Statistical Analysis	
• Relationship between attributes: Covariance, Correlation Coefficient • Measure of Distribution (Skewness and Kurtosis) • Conditional probability • Probability distributions (Continuous and Discrete) • Density Functions and Cumulative functions	
UNIT III - Inferential Statistics	
• Procedure for statistical testing • Test of Hypothesis (Concept of Hypothesis testing, Null Hypothesis and Alternative • Hypothesis) • Chi-Square test • Validation Techniques (Cross-Validations- Kfold, Stratified kfold) • Feature Reduction/Dimensionality reduction • Principal components analysis (Eigen values, Eigen vectors, Orthogonality)	
UNIT IV - Foundations of AI	
• Introduction to AI • Importance of AI • AI and its related field • AI Techniques • Problem space and search: Defining the problem as a state space search • Heuristic search techniques- best first search & depth first search • Hill climbing	

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.Tech
Semester: Sixth
Course: Data Mining
Course Code: 3TECCS318

L	T	P	C
3	0	0	3

Course Objective:
The objectives of this course are:

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

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

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

Course Content:

Topics	Hours
UNIT I	
Data Warehousing: 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.	
UNIT II	
Data Mining: 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.	
UNIT -III	
Mining Association Rules in Large Databases: 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.	
UNIT IV	
Classification and Clustering: Distance Measures, Types of Clustering Algorithms, K-Means Algorithm, Decision Tree, Bayesian Classification, Other Classification Methods, Prediction, Classifier Accuracy, Categorization of methods, Outlier Analysis.	
UNIT V	
Introduction of Web Mining and its types, Spatial Mining, Temporal Mining, Text Mining, Security Issue, Privacy Issue, Ethical Issue.	

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.Tech
Semester: Sixth
Course: Knowledge Representation
Course Code: 3TECCS320

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Course Objective:
The objectives of this course are:

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

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

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

Course Content:

Topics	Hours
UNIT I - Knowledge representation and First Order Logic	
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	
UNIT II - Expressing Knowledge	
Knowledge Engineering - Vocabulary - Basic Facts - Complex Facts - Terminological Facts Entailments - Abstract Individuals - Other Sorts of Facts.	
UNIT –III - Resolution	
Resolution - The Propositional Case - Handling Variables and Quantifiers- Dealing with Computational Intractability	
UNIT IV - Structured Descriptions	
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 -	
UNIT V - Actions and Planning	
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	

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.

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Semester VII

Program: B. Tech

Semester: Seven

Course: Internet of Things

Course code: 3TECCS401

L	T	P	C
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Objectives of the course:

- To focus on significant components of the Internet of Things.
- To cover the prototype and key components of networking for development of applications based on the concept of Internet of Things.
- To design and implement IoT circuits and solutions.

Course outcomes:

Upon completion of the course, the student shall be able to

CO1: Understand general concepts of Internet of Things.

CO2: Understand different IoT Architecture and Communication Protocol

CO3: Identify different sensor networks, Networking Protocol which can measure different parameters or activity.

CO4: Learn genesis and impact of IoT applications in the real world.

Course Content:

Topics	Hours
Unit I: Introduction to IoT:	6
Introduction and Definition of Internet of Things, IoT growth – A statistical view, Application areas of IoT, Characteristics of IoT,Things in IoT, IoT stack, Enabling technologies, IoT challenges, IoT levels.	
Unit II:	8
Internet of Things– Architecture and Communication Protocol Layered Architecture for IoT, Protocol Architecture of IoT, Infrastructure Protocols: MAC protocols for sensor network, S-MAC, IEEE 802.15.4, Near Field Communication **(**NFC), RFID, ZigBee, Bluetooth Low Energy (BLE),IPv6 over LowPower Wireless Personal Area Networks (6LoWPAN), Long Term Evolution-Advanced, Z-Wave, Components of ZWave Network, Protocols for IoT Service Discovery: DNS service discovery, multicast domain name system.	
Unit III:	8
Internet of Things – Networking Protocol Constrained Application Protocol (CoAP), Message Queue Telemetry Transport (MQTT), Extensible Messaging and Presence Protocol (XMPP), Advanced Message Queuing Protocol (AMQP), Data Distribution Service (DDS), Service Discovery Protocols, Routing Protocol for Low Power and Lossy Networks (RPL), sensor networks, unique constraints and challenges, advantages of ad-hoc/sensor network, sensor network architecture, data dissemination and gathering protocol.	
Unit IV:	8
Platforms for IOT Applications and Analytics Role of the cloud and fog resources in the delivery of IoT services**,** The IoT Building Blocks, Connected Devices, IoT or Sensor Data Gateway, The IoT Data Analytics Platforms: IBM Watson IoT Platform, Splunk Software for IoT Data, Amazon Web Service IoT Platform, Azure IoT Hub, The IoT Data Virtualization Platforms, IoT Data Visualization Platform, Security and Privacy in IoT	

Text books:

1. Vasudevan, Nagrajan and Sundaram - “Internet of Things”, Wiley India.
2. Pethuru Raj and Anupama C. Raman, “The Internet of Things: Enabling Technologies, Platforms, and Use Cases", CRC Press, 2017.

Reference books:

1. Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle – “From Machine-To-Machine to The Internet of Things: Introduction to A New Age of Intelligence”, Academic Press.
2. Micheael M. – “Arduino Cookbook” - O’reilly Publication.
3. Olivier Hersent, David Boswarthick, Omar Elloumi - “The Internet of Things – Key applications and Protocols”, Wiley.

Program: B.Tech

Semester: Seven

Course: Artificial Intelligence

Course code: 3TECCS402

L	T	P	C
3	0	0	3

Objectives of the course:

- To unfold the foundational principles of artificial intelligence and aligned branches.
- To provide breadth and depth of several approaches required to design artificially intelligent systems.
- To gain a basic idea of AI and AI related problem solving, inference, perception, knowledge representation, and learning.
- To know about the Heuristic search techniques and about knowledge representation in AI
- To know about Predicate Logic and about Reasoning in AI

Course outcomes:

Upon successful completion of this course the students would be able:

CO1: To understand the basic idea of artificial intelligence and its application areas.

CO2: To apply basic principles of AI in solutions that requires problem solving, inference, perception, knowledge representation, and learning.

CO3: To demonstrate awareness and a fundamental understanding of various applications of AI techniques.

CO4: To understand about Logic programming and about Reasoning related to AI.

CO5: To know about the different representational techniques in AI.

Course Content:	
Topics	**Hours**
Unit I:	6
History and Foundations of AI, Rational Intelligent Agents, Agents and Environments, Nature of Environments, Structure of Agents.	
Unit II:	8
Problem Solving by Search: Uninformed and Informed Search Strategies, Heuristic Functions; Adversarial Search: Games, Optimal Decisions in Games, Alpha-Beta Pruning. Heuristic Search Techniques: Generate and Test – Hill Climbing – Best-First Search – Problem Reduction.	
Unit III:	8
Constraint Satisfaction Problems, Inference in CSPs, Backtracking Search; Knowledge-Based Agents, Propositional and First-Order Logic, Resolution Theorem Proving, Unification Forward and Backward Chaining. . Statistical Reasoning: Probability and Baye's Theorem – Certainty Factors and Rule- based Systems – Bayesian Networks – Dempster-Shafer Theory – Fuzzy Logic	
Unit IV:	8
Classical Planning: Algorithms for Planning, Planning Graphs, Hierarchical Planning, Planning and Acting in Nondeterministic Domain, Multi-Agent Planning; Knowledge Representation: Ontological Engineering, Categories and Objects, Events, Reasoning with Default Information.	

Text books

1. *Russell, Stuart Jonathan, Norvig, Peter, Davis, Ernest. Artificial Intelligence: A Modern Approach. United Kingdom: Pearson, 2010.*
2. *Deepak Khemani. A First Course in Artificial Intelligence. McGraw Hill Education (India), 2013. Denis Rothman. Artificial Intelligence by Example, Packt, 2018.*

References:

1. E. Rich and K. Knight, Artificial Intelligence, Addison Wesley, 1990
2. Ian Goodfellow, Yoshua Bengio and Aaron Courville, Deep Learnng, MIT Press, 2016
3. Daphne Koller and Nir Friedman, Probabilistic Graphical Models: Principles and Techniques, MIT
Press, 2009.
4. Sutton and Barto. Reinforcement Learning: An Introduction. Available free online.
5. Hastie, Tibshirani, and Friedman. The elements of statistical learning. Available free online

Program: B.Tech

Semester: Seven

Course: Artificial Intelligence Lab

Course code: 3TECCS402P

L	T	P	C
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Course Objectives:

The objectives of this course are:

- To impart knowledge about the practical aspects in Artificial Intelligence related problems
- To program different AI methods using a programming language
- To know how the logical operations and reason based AI problems are used using programming

Course Outcomes:

Upon successful completion of this course the students would be able:

CO1: Solve various kinds of problems using AI techniques.
CO2: Solve basic AI based problems using any programming language.
CO3: Understand to implement the various kinds of AI based algorithms.
CO4: Apply AI techniques to real-world problems to develop intelligent systems.
CO5: To understand problems related to AI

Artificial Intelligence Lab:

1. Write a program to implement the Hill Climbing problem
2. Write a program to implement the Towers of Hanoi problem
3. Write a program to implement the Missionaries and Cannibals problem
4. Write a program to implement the 8 queen's problem
5. Write a program to implement the A* Algorithm
6. Write a program to implement the Breadth first algorithm
7. Write a program to implement the Depth first algorithm
8. Write a program to implement the predicate logic
9. To study various datasets used to train the AI models.
10. To implement linear classification.
11. To implement non-linear classification.
12. To implement feed-forward neural network.
13. To implement back-propagation neural network.
14. To study and implement CNN.
15. To study and implement RNN and LSTM based sequence learning models.
16. To study and implement transformers.

Program: B.Tech

Semester: Seven

Course: Supervised Machine Learning

Course code: 3TECCS410

L	T	P	C
3	0	0	3

Course Objectives:

- To facilitate the basics of machine learning concepts.
- To learn building a machine learning model from the scratch
- To understand the evaluation of models.

Course Outcomes:

At the end of the course the students will be able to:

- CO1: Understanding of the basic concepts, fundamental issues and challenges of machine learning.
- CO2: Comprehend the principle and techniques of supervised learning.
- CO3: Explain the basic concepts and techniques of unsupervised learning.
- CO4: Understanding of the basic concepts and challenges of reinforced learning.
- CO5: Ability to apply the concepts of machine learning in different domains.

Course Content:

Topics	Hours
Unit I: Introduction to Supervised Learning	8
Introduction : Objectives and expectations ,Introduction to Machine Learning .**Types of Machine Learning:** Supervised, Unsupervised, and Reinforcement Learning, **Fundamentals of Supervised Learning :** Definition and concepts of supervised learning ,Applications of supervised learning , **Data Preprocessing and Exploration :** Data collection and data sources, Data cleaning and handling missing values ,Exploratory data analysis (EDA) , **Performance Metrics and Evaluation:** Evaluation metrics for classification: accuracy, precision, recall, ,**Evaluation metrics for regression:** MSE, RMSE, MAE, R^2 score ,Cross-validation techniques	
Unit II: Linear Models and Optimization	8
Linear Regression : Simple and multiple linear regression ,Assumptions of linear regression ,Least squares method ,Model evaluation and interpretation , **Logistic Regression:** Logistic regression for binary classification , Regularization techniques: L1 (Lasso) and L2 (Ridge) , **Gradient Descent and Optimization :** Introduction to optimization algorithms ,Gradient descent: batch, stochastic, Cost functions for regression and classification , **Regularization and Model Selection:** Over fitting and under fitting ,**Regularization Techniques**: Lasso, Ridge, and Elastic Net ,Model selection and hyper parameter tuning ,Grid search and random search	
Unit III: Non-Linear Models and Ensembles	8
Decision Trees: Introduction to decision trees ,**Splitting criteria**: entropy ,Pruning techniques ,Advantages and limitations of decision trees ,**Ensemble Methods :** Introduction to ensemble learning ,Bagging and Bootstrap Aggregating ,**Random Forests:** construction and parameter tuning , **Boosting**: AdaBoost , Gradient Boosting , **Support Vector Machines:** Introduction to Support Vector Machines (SVMs) ,Linear SVM and kernel trick ,Non-linear SVM with kernel functions , **k-Nearest Neighbors :** Introduction to k-Nearest Neighbors (k-NN) ,**Distance metrics:** Euclidean, Manhattan ,Choosing the value of k ,Pros and cons of k-NN	
Unit IV: Neural Networks and Deep Learning	6
Neural Networks and Deep Learning: Basics of neural Networks, Introduction to deep Learning, **Training neural networks:** forward and backward Propagation, Activation functions and loss functions, **Model Interpretability and Explain ability:** Importance of Model Interpretability, **Techniques for model interpretability**: SHAP, LIME, Fairness and ethics in machine learning, Bias and variance trade-off	

Text Book:

1) Saikat Dutt, Subramanian Chandramouli, Amit Kumar Das, “Machine Learning”, Pearson Education
2) Anuradha Srinivarasaraghavan, Vincy Joseph, “Machine Learning”, Wiley India

Reference Books:

1) Tom M Mitchell, “Machine Learning”, McGraw Hill
2) "Introduction to Statistical Learning" by Gareth James, Daniela Witten, Trevor Hastie, and Robert Tibshirani
3) "Pattern Recognition and Machine Learning" by Christopher M. Bishop

Program: B.Tech

Semester: Seven

Course: Deep Learning

Course code: 3TECCS411

L	T	P	C
3	0	0	3

Course objectives:

- To provide the fundamental concepts in deep learning.
- It provides the massive datasets and affordable computing, enabling new applications in computer vision and natural language processing.
- Students can able to design, implement, and train these models to solve real world problems.

Course Outcomes

After completion of course, students would be able to:

CO1: Explore feed forward networks and Deep Neural networks.

CO2: Mathematically understand the deep learning approaches and paradigms

CO3: Complex feature extraction with CNN and RNNs

CO4: Apply the deep learning techniques for various applications.

Course Content:

Topics	Hours
Unit I: Introduction to Deep Learning	8
Foundations of Neural Networks: Introduction to artificial neural networks (ANNs) Perceptions and activation functions, Training neural networks: gradient descent and back propagation, **Deep Neural Networks (DNNs):** Architectural principles of DNNs, Deep learning frameworks (TensorFlow, PyTorch) ,Regularization techniques (dropout, L2 regularization) **Convolution Neural Networks (CNNs) :** CNN basics and architecture ,Applications of CNNs in image recognition and computer vision ,Advanced CNN architectures (e.g., ResNet, VGG).	
Unit II: Recurrent Neural Networks (RNNs)	8
Recurrent Neural Networks (RNNs) : Introduction to sequence modeling ,LSTM and GRU networks ,Applications of RNNs in natural language processing (NLP) , **Generative Adversarial Networks (GANs):**Introduction to generative models ,GAN architecture and training process ,Applications of GANs in image generation and synthesis , **Transfer Learning and Fine-Tuning :** Transfer learning principles ,Pre-trained models (e.g., BERT, GPT) and their applications ,Fine-tuning strategies for specific tasks.	
Unit III: Deep Learning for Natural Language Processing (NLP)	7
Deep Learning for Natural Language Processing (NLP) : Word embeddings (Word2Vec, GloVe) ,Text classification and sentiment analysis ,Sequence-to-sequence models and attention mechanisms , **Deep Reinforcement Learning :** Introduction to reinforcement learning (RL) ,Deep Q-learning and policy gradients ,Applications of RL in gaming and robotics	
Unit IV: Autoencoders and Variation Autoencoders (VAEs)	7
Autoencoders and Variation Autoencoders (VAEs): Principles of auto encoders, Variational autoencoders and generative modeling, Applications in dimensionality reduction and anomaly detection, **Ethical Considerations and Future Trends:** Ethical implications of deep learning, Bias and fairness in AI, Future trends in deep learning research and applications	

Text Book:

1. "Deep Learning", Ian Goodfellow, Yoshua Bengio and Aaron Courville, published by MIT Press,UK, 2017 Series
2. Deep Learning with Keras: The Textbook by Antonio Gulli and Sujit Pal, PacktPublishing Ltd, Birmingham, UK, April 2017

Reference Book:

1. Deep Learning with Tensor Flow, The Textbook by Giancarlo Zaccone, Md. Rezaul Karim, and Ahmed Menshawy, Packt Publishing Ltd, Birmingham, UK, April 2017.

Program: B. Tech
Semester: Seven
Course: Natural Language Processing
Course code: 3TECCS412

L	T	P	C
3	0	0	3

Course Objectives:

- To learn the fundamentals of natural language processing
- To understand the use of CFG and PCFG in NLP
- To understand the role of semantics of sentences and pragmatics and to apply the NLP techniques to IR applications.

Course Outcomes:

Upon successful completion of this course the students would be able:

CO1: To tag a given text with basic Language features
CO2: To design an innovative application using NLP components
CO3: To implement a rule based system to tackle morphology/syntax of a language
CO4: To design a tag set to be used for statistical processing for real-time applications
CO5: To compare and contrast the use of different statistical approaches for different types of NLP applications.

Course Content:

Topics	Hours
Unit I: Introduction	5
Origins and challenges of NLP – Language Modeling: Grammar based LM, Statistical LM - Regular Expressions, Finite-State Automata – English Morphology, Transducers for lexicon and rules, Tokenization, Detecting and Correcting Spelling Errors, Minimum Edit Distance.	
Unit II: Word Level Analysis	7
Unsmoothed N-grams, Evaluating N-grams, Smoothing, Interpolation and Backoff – Word Classes, Part-of-Speech Tagging, Rule-based, Stochastic and Transformation-based tagging, Issues in PoS tagging – Hidden Markov and Maximum Entropy models.	
Unit III: Syntactic Analysis	6
Context-Free Grammars, Grammar rules for English, Tree banks, Normal Forms for grammar – Dependency Grammar – Syntactic Parsing, Ambiguity, Dynamic Programming parsing – Shallow parsing – Probabilistic CFG, Probabilistic CYK, Probabilistic Lexicalized CFGs - Feature structures, Unification of feature structures.	
Unit IV: Semantics and Pragmatics	7
Requirements for representation, First-Order Logic, Description Logics – Syntax-Driven Semantic analysis, Semantic attachments – Word Senses, Relations between Senses, Thematic Roles, sectional restrictions – Word Sense Disambiguation, WSD using Supervised, Dictionary & Thesaurus, Bootstrapping methods – Word Similarity using Thesaurus and Distributional methods.	
Unit V: Discourse Analysis and Lexical Resources	5
Discourse segmentation, Coherence – Reference Phenomena, Anaphora Resolution using Hobbs and Centering Algorithm – Co-reference Resolution – Resources: Porter Stemmer, Lemmatizer, Penn Treebank, Brill's Tagger, Word Net, Prop Bank, Frame Net, Brown Corpus, British National Corpus (BNC).	

Textbook:

1. Daniel Jurafsky and James H Martin. *Speech and Language Processing, 2e*, Pearson Education, 2009

***Reference Books*:**

1. James A.. *Natural language Understanding 2e*, Pearson Education, 1994
2. Bharati A., Sangal R., Chaitanya V.. *Natural language processing: a Paninian perspective*, PHI, 2000
3. Steven Bird, Ewan Klein, Edward Loper, *Natural Language Processing with Python – Analyzing Text with the Natural Language Toolkit* **(O'Reilly 2009, website 2018)**

Program: B.Tech

Semester: Seven

Course: AI for Games

Course code: 3TECCS406

L	T	P	C
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Course Objectives:

The objectives of this course is to:

- Traditional artificial intelligence techniques within computer game design and development, which focus on non-player character movement and behavior.
- Modern artificial intelligence techniques within computer game design and development of interest to students, practitioners, and academics.
- How to evaluate computer game artificial intelligence techniques in terms of runtime performance and overall effect to the player's experience.
- Important and developing industry cases for the development of artificial intelligence techniques in computer games.

Course Outcomes:

At the end of this course, you will be able to:

CO1: Develop software code for a range of artificial intelligence techniques used in traditional and modern computer games.

CO2: Describe the performance of artificial intelligence techniques used in traditional and modern computer games.

CO3: Choose, develop, explain, and defend the use of particular artificial intelligence techniques for solving particular game design problems.

CO4: Evaluate the relative benefits and drawbacks of different artificial intelligence techniques that can be used to solve computer game design problems.

CO5: Identify and examine state-of-the-art artificial intelligence techniques from the industry and academia to solve computer game design problems.

Course Content:

Topics	Hours
Unit I: Introduction to Game AI	5
Introduction to Artificial Intelligence, Roles of AI in Game design, Game AI Interfaces (Movement, Path finding, Decision Making, Strategy), Complexity (Artificial Stupidity, Intelligent Mistakes) ,Game AI Inputs, Outputs, and Behaviors, The 2D Rigid body Agent, Steering Output, Variable Matching....	
Unit II: Classical Techniques Movement Algorithms	5
Position Matching: Kinematic and Dynamic-Seek Flee, Arrive, Orientation, Align, Wander, Velocity and Rotation Matching, **Delegation and Combination-**Interfaces, Blending, Arbitration. **Advanced Position and Orientation Matching-**Pursue, Evade, Face, Group **Movement-**Separation, Flocking.	
Unit III: Path finding Algorithms	6
Structure of Path finding Algorithms- Directed Weighted Graphs, The Family of Search Algorithms ,**A* and Heuristics-**Performance, Design, **Abstraction Schemes-**Lifting and Grounding (Tile Graph, Navmesh), Path Follow Movement, **From Path finding to Movement-**The Steering Pipeline, Obstacle and Collision Avoidance.	
Unit IV: Decision Making Algorithms and Strategy Algorithms	7
Structure of Decision Making Algorithms-Actions, Action Manager, **Decision Trees-**Nodes (Decisions, Actions), Design, Performance ,**Behavior Trees-**Architecture, Nodes, Design ,**Goal Oriented Action Planning-**States, Goals, Algorithm **,Structure of Strategy Algorithms-**Blackboard, Utility Theory, Game Playing-Minimax, Alpha-beta Pruning, **Monte-Carlo Tree Search-**Algorithm, Improving Performance, **Coordinated Action-**Multi-tier AI, Influence Maps.	
Unit V: Modern Techniques	7
Structure of Procedural Content Generators-Content Selection v. Generation, Expressive Range, **Pseudorandom Number Generation-**Halton Sequence, Poisson Disk, Kaleidoscope Effect , **Content Selection-**L-systems, Grammars, Randomness, **Content Generation-**Parametric Systems, Search-based Methods ,**Decision Tree Learning-**ID3 Algorithm, **Artificial Neural Networks-**Credit Assignment, Feed forward and Back propagation, Error Term, **Deep Learning-**Overview, Architectures.	

Textbooks and printed resources (Recommended):

1. Millington, Ian. Artificial Intelligence for Games (3rd Ed.). CRC Press, 2019.

2. Funge, John Artificial Intelligence for Games. CRC Press 2009
3. Buckland, Matt Programming Game AI by Example. Wordware Publishing. 2005.

Suggested books:

- Millington's Artificial Intelligence for Games

Program: B. Tech
Semester: Seven
Course: AI for Games Lab
Course code: 3TECCS406P

L	T	P	C
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This lab will introduce students to the basic principles and techniques of artificial intelligence (AI) in the context of game development. Students will learn about different AI strategies and how to implement them to create intelligent behaviors in games.

Learning Objectives

- Understand the basics of AI in game development.
- Implement path finding algorithms using A*.
- Create NPC behaviors using finite state machines (FSM).
- Develop decision-making processes using behavior trees.

Prerequisites

- Basic knowledge of programming (preferably in C# or Python).
- Familiarity with a game development platform (Unity or Unreal Engine).

Detailed of Lab Practices

1. Write a program to implement Path finding with A* Algorithm
2. Write a program to implement Finite State Machines (FSM) for NPC Behavior
3. Write a program to implement Decision-Making with Behavior Trees
4. Write a program to implement First Person Shooter Game
5. Write a program to implement Real Time Strategy (RTS) Game
6. Write a program to implement Role Playing Games (RPGs)
7. Write a program to implement Plat former Game
8. Write a program to implement Tic Tac Toe Game
9. Write a program to implement God Games
10. Write a program to implement Sports Games
11. Write a program to implement Hidden Door Games
12. Write a program of The Case of 'Angry Pumpkins' Games
13. Write a program to implement **Storytelling** Games
14. Write a program to implement Decision-Making with Behavior Trees

Program: B. Tech
Semester: Seven
Course: Project-II
Course code: 3PROJCS401

L	T	P	C
0	0	8	4

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.

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Semester VIII

Program: B. Tech
Semester: Eight
Course: Computer Vision
Course code: 3TECCS421

L	T	P	C
4	0	0	4

Course Objective:

To Recognize and describe both the theoretical and practical aspects of computing with images and to Connect issues from Computer Vision to Human Vision

Course Outcomes:

CO1 : Provide an introduction to computer vision including fundamentals of image formation
CO2 : Enumerate the concepts of Feature detection and Matching
CO3 : Evaluate the Image Segmentation Techniques
CO4 : Define the applications of Feature based alignment like pose estimation
CO5 : Discuss different recognition techniques.

Course Content:

Topics	Hours
Unit I: Introduction	8
What is computer vision, a brief history, Image Formation, Geometric primitives and transformations, Photometric image formation, the digital camera.	
Unit II: Feature detection and matching	10
Points and patches, Feature detectors, Feature descriptors, Feature matching, Feature tracking, Application: Performance-driven animation, Edges, Application: Edge editing and enhancement, Lines, Application: Rectangle detection.	
Unit III: Segmentation	12
Active contours, Split and merge, Mean shift and mode finding, Normalized cuts, Graph cuts and energy-based methods, Application: Medical image segmentation. **Feature-based alignment:** 2D and 3D feature-based alignment, Pose estimation, Geometric intrinsic calibration, Calibration patterns, Vanishing points, Application: Single view metrology, Rotational motion, Radial distortion.	
Unit IV: Recognition	10
Object detection, Face detection, Pedestrian detection, Face recognition, Eigen faces, Active appearance and 3D shape models, Application: Personal photo collections, Instance recognition, Category recognition, Context and scene understanding.	

Text Books:

1. Richard Szeliski," Computer Vision: Algorithms and Applications", Springer,2010.
2. Rafael C. Gonzalez "Digital Image Processing", Pearson Education; Fourth edition (2018)

Reference Books:

1. Forsyth/Ponce," Computer Vision: A Modern Approach",Pearson Education India;2ndedition(2015)
2. S.Nagabhushana,"Computer Vision and Image Processing", New Age International Pvt Ltd; First Edition(2005)

Program: B. Tech
Semester: Eight
Course: Unsupervised Machine Learning
Course code: 3TECCS422

L	T	P	C
4	0	0	4

Course Objectives:

- Understand the Fundamentals of Unsupervised Learning
- Explore Core Algorithms and Techniques
- Implement Unsupervised Learning Models
- Evaluate Model Performance and Effectiveness
- Apply Unsupervised Learning to Real-World Data

Course Outcomes:

CO1 : Able to explain the principles of the unsupervised feature learning algorithms.
CO2 : Able to implement popular clustering algorithms.
CO3 : Able to design unsupervised learning networks from unlabeled data.
CO4 : Able to employ unsupervised learning networks for real applications.

Course Content:

Topics	Hours
Unit 1: Introduction to Unsupervised Learning	8
Overview of Machine Learning : Definition and types of machine learning (supervised, unsupervised, reinforcement learning) ,Importance and applications of unsupervised learning, **Clustering Algorithms :** K-means clustering ,Hierarchical clustering ,Density-based clustering (e.g., DBSCAN) ,**Evaluation Metrics for Clustering :** Internal metrics (e.g., silhouette score) ,External metrics (e.g., Adjusted Rand Index)	
Unit 2: Dimensionality Reduction Techniques	10
Principal Component Analysis (PCA) : Principles and mathematical formulation ,Applications and interpretation of PCA results ,**Manifold Learning Techniques :** Isomap ,t-SNE (t-Distributed Stochastic Neighbor Embedding) ,**Evaluation of Dimensionality Reduction :** Assessing the quality of dimensionality reduction ,Understanding variance explained and reconstruction error	
Unit 3: Anomaly Detection and Novelty Detection	12
Anomaly Detection: Types of anomalies (point anomalies, contextual anomalies, collective anomalies), One-class SVM (Support Vector Machine), **Novelty Detection:** Overview of novelty detection Methods, Local Outlier Factor (LOF) Algorithm, Applications **of Anomaly and Novelty Detection:** Real-world use cases (e.g., fraud detection, fault detection in industrial systems)	
Unit 4: Advanced Unsupervised Learning	10

Density Estimation : Gaussian Mixture Models (GMM) ,Kernel Density Estimation (KDE) ,**Association Rule Learning :** Apriori algorithm ,FP-growth algorithm ,**Clustering in High-Dimensional Data :** Challenges and techniques for clustering high-dimensional data ,Applications and case studies.	

References

- Bishop, C. M. (2006). Pattern Recognition and Machine Learning. Springer.
- Hastie, T., Tibshirani, R., & Friedman, J. (2009). The Elements of Statistical Learning: Data Mining, Inference, and Prediction. Springer.

Program: B.Tech
Semester: Eight
Course: Introduction to Robotics
Course code: 3TECCS423

L	T	P	C
4	0	0	4

Course Objectives

The objectives of this course are Identify robots and its peripherals for satisfactory operation and control of robots for industrial and non-industrial applications.

Course Outcomes:

At the end of the course the students will be able to:

CO1: Gain knowledge of basic mechanical designing, electrical wiring, robotic sensors and actuators, PCB design and communication protocols.

CO2: Gain an understanding of the theoretical background necessary to understand advanced robotic technologies and their specific applications.

CO3: Demonstrate proficiency in design, construction, and operation of robotic systems.

CO4: Develop problem-solving skills by applying principles of robotics engineering to real-world problems.

CO5: Communicate effectively about robotics engineering technologies, their workings and potential applications.

Course Content:

Topics	Hours
Unit I: Introduction to Robotics	8
Introduction to Robotics: basic principles of robotics, engineering design processes, computer science and robotics. Robot Elements: End effectors-Classification, Types of Mechanical actuation, Gripper design, Robot drive system Types, Position and velocity feedback devices-Robot joints and links-Types, Motion interpolation	
Unit II: Robot Kinematics and Dynamics	10
Fundamentals of Robot programming languages and machine logic, Robot kinematics – Basics of direct and inverse kinematics, Robot trajectories, 2D and 3D Transformation-Scaling, Rotation, Translation Homogeneous transformation. Control of robot manipulators – Point to point, Continuous Path Control, Robot programming, Dynamic Modeling: Equations of motion, Euler-Lagrange formulation.	
Unit III: Sensors and Vision System	12
Introduction to Machine Vision and Artificial Intelligence, Sensor: Contact and Proximity, Position, Velocity, Force, Tactile etc, Introduction to Cameras: Camera calibration, Geometry of Image formation ,Euclidean transformations, Vision applications in robotics, Kinds of Sensors Used in Robotics : Acoustic Sensors -Optic Sensors –Pneumatic Sensors -Force /Torque Sensors, Optical Encoders.	
Unit IV: Robot Control & Robot Actuation Systems	10
Basics of control: Transfer functions, Control laws: P, PD, PID, Non-linear and advanced controls, Actuators: Electric, Hydraulic and Pneumatic; Transmission: Gears, Timing Belts and Bearings, Parameters for selection of actuators, Fundamentals of kinematics: Line Following Algorithms; Feedback Systems.	

Text Books:

1. Stuart Russell, Peter Norvig, ―Artificial Intelligence: A modern approach, Pearson Education, India 2009.
2. Negnevitsky, M, ―Artificial Intelligence: A guide to Intelligent Systems‖,. Harlow: Addison-Wesley, 2011

References:

1. S. K. Saha, “Introduction to Robotics”, Tata McGraw Hill Education Pvt. Ltd., New Delhi.
2. R. K. Mittal, I. J. Nagrath, “Robotics and Control”, Tata McGraw-Hill Publishing Company Ltd.
3. J. J. Graig, “Introduction to Robotics – Mechanics and Control”, 2nd edition, Pearson Education, Inc.
4. Saeed Niku, “Introduction to Robotics – Analysis, Control, Applications”, John Wiley & Sons.

Program: B.Tech
Semester: Eight
Course: AI / ML Analyst
Course code: 3TECCS424

L	T	P	C
4	0	0	4

Course Objectives:

- Gain a historical perspective of Artificial Intelligence (AI) and its foundations.
- To introduce constraints, logic, and inference techniques, introduce planning, acting, and multi-agent systems.
- Investigate applications of AI techniques in intelligent agents, expert systems, artificial
- neural networks and other machine learning models.
- To introduce students to the basic concepts and techniques of Machine Learning.
- To develop skills of using recent machine learning software for solving practical problems, application of machine learning in robotics

Course Outcomes:
At the end of the course, student will be able to
CO1: Demonstrate knowledge of the building blocks of AI as presented in terms of intelligent agents.
CO2: Analyze and formalize the problem as a state space, graph, design heuristics and select amongst different search or game-based techniques to solve them.
CO3: Develop intelligent algorithms for constraint satisfaction problems and design intelligent systems for Game Playing.
CO4: Implement unsupervised machine learning algorithms for different datasets
CO5: Analyze the error to improve the performance of the machine learning models

Course Content:

Topics	Hours
Unit I:	10
Introduction to Artificial Intelligence: Definition and history of AI, Basic concepts and goals of AI, Applications and impact of AI in various fields **Problem-Solving and Search Algorithms:** Problem-solving methods in AI, Search algorithms: breadth-first search, depth-first, search, A* search, etc., Heuristic search techniques	
Unit II:	10
Knowledge Representation and Reasoning: Representing knowledge in AI systems, Propositional and predicate logic, Inference rules and reasoning techniques. **Machine Learning Fundamentals:** Introduction to machine learning, supervised learning, unsupervised learning, and reinforcement learning, Evaluation metrics in machine learning.	
Unit III:	10
Regression and Classification Algorithms: Linear regression, Logistic regression, Decision trees and random forests, Support Vector Machines (SVM), Naive Bayes classifier. **Clustering and Dimensionality Reduction:** K-means clustering, Hierarchical clustering, Principal Component Analysis (PCA),t-Distributed Stochastic Neighbor Embedding (t-SNE).	
Unit IV:	10
Neural Networks and Deep Learning: Introduction to neural networks, Feedforward neural networks, Convolution Neural Networks (CNNs), Recurrent Neural Networks (RNNs),Training deep learning models. **Natural Language Processing (NLP):** Introduction to NLP, Text preprocessing techniques, Sentiment analysis, Named Entity Recognition (NER)- Text generation.	

Text Book:

1) Saikat Dutt, Subramanian Chandramouli, Amit Kumar Das, “Machine Learning”, Pearson Education

2) Russell, Stuart Jonathan, Norvig, Peter, Davis, Ernest. Artificial Intelligence: A Modern Approach. United Kingdom: Pearson, 2010.

Reference Books:

1. Tom M Mitchell, “Machine Learning”, McGraw Hill
2. Anuradha Srinivarasaraghavan, Vincy Joseph, “Machine Learning”, Wiley India
3. Deepak Khemani. A First Course in Artificial Intelligence. McGraw Hill Education (India), 2013. Denis Rothman. Artificial Intelligence by Example, Packt, 2018.

Program: B. Tech
Semester: Eight
Course: Project-III
Course code: 3PROJCS402

L	T	P	C
0	0	16	8

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.