RCOEM

Shri Ramdeobaba College of Engineering and Management, Nagpur

SHRI RAMDEOBABA COLLEGE OF ENGINEERING AND MANAGEMENT, NAGPUR – 440013

An Autonomous College affiliated to Rashtrasant Tukdoji Maharaj Nagpur University,
Nagpur, Maharashtra (INDIA)

PROGRAMME SCHEME

2022-2023

B. TECH. (INFORMATION TECHNOLOGY)

Teaching Scheme for B.Tech. Information Technology

SEMESTER -I											
								Maximum Marks			ESE Duration (Hrs)
Sr. No.	Category	Course Code	Course Name	Hours/week			Credit	Continuous Evaluation	End Sem Exam	Total	
				L	T	P					
01	BSC	PHT159	Introduction to Quantum Computing	3	1	0	4	40	60	100	03
02	BSC	PHP159	Introduction to Quantum Computing Lab	0	0	2	1	25	25	50	-
03	BSC	MAT153	Mathematics-I	3	0	0	3	40	60	100	03
04	BSC	MAP153	Mathematics-I Lab	0	0	2	1	25	25	50	-
05	ESC	ITT151	Fundamentals of Programming	3	0	0	3	40	60	100	03
06	ESC	ITP151	Fundamentals of Programming Lab	0	0	2	1	25	25	50	-
07	ESC	ITT152	Digital Circuits	2	1	0	3	40	60	100	03
08	ESC	ITP152	Digital Circuits Lab	0	0	2	1	25	25	50	-
09	MC	HUT152	Constitution of India	2	0	0	0	-	-	-	-
10	MC	PEP151	Yoga/Sports	0	0	2	0	-	-	-	-
TOTAL				**13**	**02**	**10**	**17**				
				25 Hrs.							

SEMESTER –II											
Sr. No.	Category	Course Code	Course Name	Hours/week			Credits	Maximum Marks			ESE Duration (Hrs)
				L	T	P		Continuous Evaluation	End Sem Exam	Total	
01	ESC	ITT153	Object Oriented Programming	3	1	0	4	40	60	100	03
02	ESC	ITP153	Object Oriented Programming Lab	0	0	2	1	25	25	50	-
03	PCC	ITT154	Data Structures	2	1	0	3	40	60	100	03
04	PCC	ITP154	Data Structures Lab	0	0	2	1	25	25	50	-
05	ESC	ITP155	IT Workshop Lab -I	0	0	4	2	25	25	50	-
06	BSC	CHT154	Chemistry	2	0	0	2	40	60	100	03
07	BSC	CHP154	Chemistry Lab	0	0	2	1	25	25	50	-
08	BSC	MAT154	Mathematics-II	3	1	0	4	40	60	100	03
09	HSSM	HUT151	English	2	0	0	2	40	60	100	03
10	HSSM	HUP151	English Lab	0	0	2	1	25	25	50	-
11	ESC	IDT151	Creativity, Innovation & Design Thinking	1	0	0	1				
TOTAL				**13**	**03**	**12**	**22**				
				28 Hrs.							

SEMESTER -III											
Sr. No.	Category	Course Code	Course Name	Hours/week			Credits	Maximum Marks			ESE Duration (Hrs)
				L	T	P		Continuous Evaluation	End Sem Exam	Total	
01	PCC	ITT261	Computer Organization and Architecture	3	0	0	3	40	60	100	03
02	PCC	ITT262	Advanced Data Structures	2	1	0	3	40	60	100	03
03	PCC	ITP262	Advanced Data Structures Lab	0	0	2	1	25	25	50	-
04	PCC	ITT263	IT Infrastructure Services	2	0	0	2	40	60	100	03
05	PCC	ITP263	IT Infrastructure Services Lab	0	0	2	1	25	25	50	-
06	ESC	ITT264	Cyber Laws and Ethics	2	0	0	2	40	60	100	03
07	PCC	ITT265	Computer Graphics	2	1	0	3	40	60	100	03
08	PCC	ITP265	Computer Graphics Lab	0	0	2	1	25	25	50	-
09	BSC	MAT252	Linear Algebra & Statistics	3	0	0	3	40	60	100	03
10	HSSM	HUT254	Technical Communication	3	0	0	3	40	60	100	03
11	MC	CHT251	Environmental Science	2	0	0	0	-	-	-	-
TOTAL				**19**	**02**	**08**	**22**				
				29 Hrs.							

SEMESTER – IV											
Sr. No.	Category	Course Code	Course Name	Hours/week			Credits	Maximum Marks			ESE Duration (Hrs)
				L	T	P		Continuous Evaluation	End Sem Exam	Total	
01	PCC	ITT266	Formal Languages and Automata Theory	2	1	0	3	40	60	100	03
02	PCC	ITT267	Software Engineering	3	0	0	3	40	60	100	03
03	PCC	ITP267	Software Engineering Lab	0	0	2	1	25	25	50	-
04	PCC	ITT268	Design and Analysis of Algorithms	3	0	0	3	40	60	100	03
05	PCC	ITP268	Design and Analysis of Algorithms Lab	0	0	2	1	25	25	50	-
06	PCC	ITT269	Database Management System	3	0	0	3	40	60	100	03
07	PCC	ITP269	Database Management System Lab	0	0	2	1	25	25	50	-
08	OEC	ITT299	Open Elective – I	3	0	0	3	40	60	100	03
09	BSC	MAT281	Discrete Mathematics	3	0	0	3	40	60	100	03
10	MC	HUT252	Indian Traditional Knowledge	2	0	0	0	-	-	-	-
TOTAL				**19**	**01**	**06**	**21**				
				26 Hrs.							

Open Elective – I	
Course Code	**Course Name**
ITT299-05	Web Development

SEMESTER – V											
Sr. No.	**Category**	**Course Code**	**Course Name**	**Hours/week**			**Credits**	**Maximum Marks**			**ESE Duration (Hrs)**
				L	**T**	**P**		**Continuous Evaluation**	**End Sem Exam**	**Total**	
01	PCC	ITT371	Compiler Design	3	1	0	4	40	60	100	03
02	PCC	ITT372	Operating Systems	3	0	0	3	40	60	100	03
03	PCC	ITP372	Operating Systems Lab	0	0	2	1	25	25	50	-
04	PCC	ITT373	Computer Networks	3	0	0	3	40	60	100	03
05	PCC	ITP373	Computer Networks Lab	0	0	2	1	25	25	50	-
06	PCC	ITT374	Introduction to Machine Learning	2	1	0	3	40	60	100	03
07	PCC	ITP374	Introduction to Machine Learning Lab	0	0	2	1	25	25	50	-
08	OEC	ITT398	Open Elective– II	3	0	0	3	40	60	100	03
09	PROJC	ITP375	Project -I	0	0	4	2	50	50	100	
10	HSSM	HUT354	Managerial Economics	2	0	0	2	40	60	100	03
TOTAL				**16**	**02**	**10**	**23**				
				28 Hrs.							

Open Elective – II	
Course Code	**Course Name**
ITT398-05	Mobile Apps Development

SEMESTER -VI											
Sr. No.	Category	Course Code	Course Name	Hours/week			Credits	Maximum Marks			ESE Duration
				L	T	P		Continuous Evaluation	End Sem Exam	Total	
01	PCC	ITT376	Cryptography and Network Security	3	0	0	3	40	60	100	03
02	PCC	ITT377	Artificial Intelligence	2	1	0	3	40	60	100	03
03	PCC	ITP377	Artificial Intelligence Lab	0	0	2	1	25	25	50	-
04	PCC	ITT378	Cloud Computing	2	1	0	3	40	60	100	03
05	PCC	ITP378	Cloud Computing Lab	0	0	2	1	25	25	50	-
06	PEC	ITT379	Elective-I	3	0	0	3	40	60	100	03
07	OEC	ITT399	Open Elective– III	3	0	0	3	40	60	100	03
08	PCC	ITP380	IT Workshop Lab-II	0	0	4	2	25	25	50	-
09	HSSM	HUT358	Organizational Behavior	2	0	0	2	40	60	100	03
10	PROJC	ITP381	Project-II	0	0	6	3	75	75	150	-
TOTAL				**15**	**02**	**14**	**24**				
				31 Hrs.							

Elective-I	
Course Code	**Course Name**
ITT379-01	Customer Relationship Management
ITT379-02	Product and Project Management

Open Elective – III	
Course Code	**Course Name**
ITT399-05	Open-Source Technologies

SEMESTER – VII											
Sr. No.	Category	Course Code	Course Name	Hours/week			Credits	Maximum Marks			ESE Duration (Hrs)
				L	T	P		Continuous Evaluation	End Sem Exam	Total	
01	PCC	ITT481	Software Architecture	3	0	0	3	40	60	100	03
02	PEC	ITT482	Elective-II	3	1	0	4	40	60	100	03
03	PEC	ITP482	Elective-II Lab	0	0	2	1	25	25	50	-
04	PEC	ITT483	Elective-III	3	1	0	4	40	60	100	03
05	PEC	ITP483	Elective-III Lab	0	0	2	1	25	25	50	-
06	OEC	ITT498	Open Elective-IV	3	0	0	3	40	60	100	03
07	PROJC	ITP484	Industry Internship Evaluation*	0	0	2	1	-	-	-	-
08	PROJC	ITP485	Project-III	0	0	6	3	75	75	150	-
TOTAL				**12**	**02**	**12**	**20**				
				29 Hrs.							

***6-8 weeks Internship must be completed before reaching VII Semester**

Elective-II		Elective-III	
Course Code	**Course Name**	**Course Code**	**Course Name**
ITT482-01	Frontend Technologies	ITT483-01	Backend Technologies and DevOps
ITT482-02	Internet of Things (IoT)	ITT483-02	Mobile Application Development

Open Elective – IV	
Code	**Course Name**
ITT498-05	Introduction to Cybersecurity

SEMESTER – VIII											
Sr. No.	Category	Course Code	Course Name	Hours/week			Credits	Maximum Marks			ESE Duration (Hrs)
				L	T	P		Continuous Evaluation	End Sem Exam	Total	
01	PEC	IDT457/ ITT486	Elective-IV	3	0	0	3	40	60	100	03
02	PEC	ITT487	Elective-V	2	1	0	3	40	60	100	03
03	PEC	ITP487	Elective-V Lab	0	0	2	1	25	25	50	-
04	PEC	ITT488	Elective-VI	2	1	0	3	40	60	100	03
05	PEC	ITP488	Elective-VI Lab	0	0	2	1	25	25	50	-
			TOTAL	**07**	**02**	**04**					
				13 Hrs.			**11**				

OR

Sr. No.	Category	Course Code	Course Name	Hours/week	Credits	Maximum Marks			ESE Duration (Hrs.)
						Continuous Evaluation	End Sem Exam	Total	
01	PR	ITP460	Full Semester Internship		11	100	100	400	-

Elective-IV		Elective-V	
Course Code	**Course Name**	**Course Code**	**Course Name**
IDT457	Bioinformatics	ITT487-01	Image Processing
ITT486	Nature Inspired AI	ITT487-02	Data Warehouse and Mining

Elective-VI	
Code	**Course Name**
ITT488-01	Information Retrieval
ITT488-02	Digital Forensics

Scheme of Teaching & Examination of HONORS Specialization In Information Technology

Sr. No.	Semester	Course Code	Course Name	Hours/week			Credits	Maximum Marks			ESE Duration (Hrs.)
				L	T	P		Continuous Evaluation	End Sem Exam	Total	
01	III	ITTH301	Introduction to Web3 Programming	3	-	-	3	40	60	100	03 Hrs.
02	IV	ITTH401	Development of Progressive Web Application	3	-	-	3	40	60	100	03 Hrs.
03	V	ITTH501	Cloud Native Apps Development	4	-	-	4	100	-	100	-
04	VI	ITTH601	Introduction to DevOps	4	-	-	4	100	-	100	-
05	VII	ITPH701	Project	-	-	08	4	50	50	100	-
			Total	**14**	**-**	**08**	**18**			**500**	

*** Note: In case any of the above motioned courses are offered by the parent department, another course will be offered in lieu of that course.**

The Scheme of Teaching & Examination of MINORS Specialization In Information Technology

Sr. No.	Semester	Course Code	Course Name	Hours/week			Credits	Maximum Marks			ESE Duration (Hrs.)
				L	T	P		Continuous Evaluation	End Sem Exam	Total	
01	III	ITTM301	Web Designing	2	1	-	3	40	60	100	03 Hrs.
02	IV	ITTM401	Advanced Java Programming	2	1	-	3	40	60	100	03 Hrs.
03	V	ITTM501	Data Warehousing and Business Intelligence	3	1	-	4	40	60	100	03 Hrs.
04	VI	ITTM601	Introduction to Emerging Technologies	3	1	-	4	40	60	100	03 Hrs.
05	VII	ITTM701	Project			08	4	50	50	100	
				08	**08**	**08**	**18**			**500**	

***Note: In case any of the above motioned courses are offered by the parent department, another course will be offered in lieu of that course.**

Syllabus for B. Tech. I Semester
Department of Information Technology

Course Code	PHP159				
Category	Basic Science Course				
Course Title	Introduction to Quantum Computing Lab				
Scheme& Credits	L	T	P	Credits	Semester I
	0	0	2	1	

Course Outcomes:
The physics laboratory will consist of experiments and programming exercises illustrating the principles of physics relevant to the study of computer science and engineering. During the training in the Physics Lab, the students will be able,

1. To develop skills for experimental verification of physics laws using mathematical models and simulation.
2. To analyze the results using the mathematical tools
3. To learn the computational techniques
4. To interpret the mathematical and computational outcomes from the simulations.

The laboratory will consist of general physics experiments and computational physics practicals.

General Physics

1. Measuring scales and error estimation
2. Verification of Ohm's law and linear least square fitting method
3. Verification of Newton's law of cooling
4. Simple harmonic motion
5. Measurement, analysis and fitting of non-linear IV characteristics of PN junction diode

Computational Physics

1. Linear least square fit method for data analysis
2. Solving 1D Schrodinger Wave Equation for a free and a bound particle and for barrier tunnelling.
3. Superposition of two wavefunctions for 1D and 2D Potential.
3. Plotting of Plank's function and verification of Stefan's law
4. Finding inverse, norm and inner products, rank of a matrix, Tensors
5. Introduction to quantum computing packages (GitHub repository)
6. Implementation of Deutsch-Josza algorithm using Cirq library

Reference Books

1. Lab manual prepared by Physics Department, RCOEM, Nagpur

Syllabus for B. Tech. I Semester
Department of Information Technology

Course Code	MAT153				
Category	Basic Science Course				
Course Title	Mathematics-I				
Scheme& Credits	L	T	P	Credits	Semester I
	3	0	0	3	

Course Objective

The objective of this course is to familiarize the prospective engineers with techniques in ordinary differential equation, statistics, probability and Matrices. It aims to equip the students to deal with advanced level of mathematics and applications that would be essential for their disciplines.

Course Outcomes

On successful completion of the course, the students will learn:

1. The effective mathematical tools for the solutions of ordinary differential equations that modelphysical processes.
2. The essential tool of matrices in a comprehensive manner.
3. The ideas of probability and various discrete and continuous probability distributions and the basic ideas of statistics including measures of central tendency, correlation and regression.

Module 1: First order ordinary differential equations(7 hours)

Exact,linearandBernoulli'sequations,Euler'sequations,Equationsnotoffirstdegree:equationssolvablef or p, equations solvable for y, equations solvable for x and Clairaut's type.

Module 2: Ordinary differential equations of higher orders (8 hours)

Second order linear differential equations with constant and variable coefficients, method of variation of parameters, Cauchy-Euler equation.

Module 3: Basic Statistics: (7 hours)

Curve fitting by the method of least squares- fitting of straight lines, second degree parabolas and more general curves, correlation and regression– Rank correlation, Multiple regression and correlation.

Module 4: Basic Probability: (8 hours)

Probability spaces, conditional probability, independence; Discrete random variables, Binomial distribution, Poisson distribution, Normal distribution. Relation between binomial, Poisson and Normal distributions.

Module 5: Matrices (10 hours)

Algebra of matrices, Inverse and rank of a matrix, rank-nullity theorem; System of linear equations; Symmetric, skew-symmetric and orthogonal matrices; Eigenvalues and eigenvectors; Diagonalization of matrices; Cayley- Hamilton Theorem, Orthogonal transformation and quadratic to canonical forms.

Textbooks/References

1. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley& Sons, 2006.
2. W. E. Boyce and R. C. Di Prima, Elementary Differential Equations and Boundary Value Problems, 9th Edition, Wiley India, 2009.
3. S. L. Ross, Differential Equations, 3rd Ed., Wiley India, 1984.
4. E. A. Coddington, An Introduction to Ordinary Differential Equations, Prentice Hall India, 1995.
5. E. L. Ince, Ordinary Differential Equations, Dover Publications, 1958.
6. B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2000.
7. Theory& Problems of probability and statistics: 2nd ed :J. R. Spiegal, Schaumseries
8. A text book of Applied Mathematics Volume I & II, by P. N. Wartikar and J. N. Wartikar, Pune Vidhyarthi Griha Prakashan, Pune-411030 (India).
9. S. Ross, AFirst Course in Probability, 6th Ed., Pearson Education India, 2002.

Syllabus for B. Tech. I Semester
Department of Information Technology

Course Code	MAP153				
Category	Basic Science Course				
Course Title	Mathematics-I Lab				
Scheme& Credits	L	T	P	Credits	Semester I
	0	0	2	1	

Course Outcomes

The Computational Mathematics Lab course will consist of experiments demonstrating the principles of mathematics relevant to the study of science and engineering. Students will show that they have learnt laboratory skills that will enable them to properly acquire and analyze the data in the lab and draw valid conclusions. At the end of the Course the students will learn to:

1. Develop skills to impart practical knowledge in real-time.
2. Understand principle, concept, working and application of areas in mathematics and compare the results obtained with theoretical calculations.
3. Understand basics of mathematics, and report the results obtained through proper programming.

The

Lab turns will be utilized for performing the experiments based on the following list:

1. Calculus
2. Ordinary Differential Equations
3. Statistics
4. Linear Algebra

Suggested References

1. Computational Mathematics Lab Manual written by the Teaching Faculty of Mathematics Department, RCOEM.

A minimum of 8 experiments to be performed based on the above list.

Syllabus for B. Tech. I Semester
Department of Information Technology

Course Code	ITT151				
Category	Engineering Science Course				
Course Title	Fundamentals of Programming				
Scheme& Credits	L	T	P	Credits	Semester I
	3	0	0	3	

Course Outcomes

On successful completion of the course student will be able to:

1. Design logic for simple problem statements.
2. Code problem statements involving decision-making and loops
3. Use functions for modular programming
4. Apply the concept of arrays in coding
5. Apply the concept of structures in coding
6. Perform file operations

Unit I: Introduction to components of a computer system (disks, memory, processor, where a program is stored and executed, operating system, compilers, etc.). Algorithm and Flowchart for problem-solving with Sequential Logic Structure. Steps to solve logical and numerical problems. Representation of Algorithm, Flowchart / Pseudo code with examples.

Unit II: Introduction to C language: Keywords, Constant, Variable, Data types, Operators, Types of Statements, Decision Control Statement-if, if-else, nested if-else statement, switch case, Loops and Writing and evaluation of conditionals and consequent branching, Pre-processor Directives.

Unit III:
Concept of functions, User defined and Library Functions, parameter passing and returning type, Recursion, Storage classes. Pointers and Function Arguments, Pointer Arithmetics, and Pointer operators.

Unit IV:
Arrays: 1-D, 2-D, Character arrays and Strings. Searching, Basic Sorting Algorithms (Bubble, Insertion and Selection), Pointers to the array, Command line arguments.

Unit V: Structures, Simple structures, Array of Structures, Use of Pointers in referencing structures, the notion of linked list (no implementation), malloc and calloc functions of C.

Unit VI: File handling Streams in C, Types of Files, File Input/ Output Operations: Modes of file opening, Reading and writing the file, Closing the files, using fflush ().

Text Books

1. Programming in ANSI C: E. Balguruswami McGraw Hill
2. Programming in C: B. Gottfried, Second Edition, Schaum Outline Series, Tata Mc-Graw Hill Publishers, 1996
3. The C Programming Language: B. W. Kernighan and D. M. Ritchie, Second Edition, Pearson, June 2015

Reference Books

1. Mastering C: K. R. Venugopal and S. R. Prasad, Tata McGraw Hill
2. Let Us C: Yashwant Kanetkar, BPB Publication

Syllabus for B. Tech. I Semester
Department of Information Technology

Course Code	ITP151				
Category	Engineering Science Course				
Course Title	Fundamentals of Programming Lab				
Scheme& Credits	L	T	P	Credits	Semester I
	0	0	2	1	

Minimum 10 Practicals based on Course Outcomes

Course Outcomes

On successful completion of the course student will be able to:

1. Write programs involving decision-making and loops
2. Write programs using arrays
3. Apply the concept of pointers in real-life programming
4. Use structures to code complex problems
5. Perform operations on files.

Syllabus for B.Tech. Semester I
Department of Information Technology

Course Code	ITT152				
Category	Engineering Science Course				
Course Title	Digital Circuits				
Scheme& Credits	L	T	P	Credits	Semester I
	2	1	0	3	

Course outcomes

Upon completion of the course, students will be able to

1. Minimize Boolean expressions using various techniques.
2. Design combinational circuits using Multiplexers, De-multiplexer, Encoders, Decoders
3. Use Flip Flop as a basic sequential circuit element.
4. Design different memory circuits using PLA and PAL
5. Design Shift registers and Moore –Mealy circuits
6. Design Counters

Unit I : Number Systems, Logic and Boolean algebra, Logic Gates & Truth Tables, DE Morgan's law, Digital Logic Family, Karnaugh maps, Quine McCluskey minimization technique.

Unit II: Code Converters, Multiplexers, Demultiplexers, Encoders, Decoders, Adder, Subtractors. Minimization of combinational circuits.

Unit III: Flip-flops and latches: D, T, S/R, J/K & J/K Master Slave flip-flops, Excitation table, Conversion of one type of F/F to another.

Unit IV: Introduction to Memory, ROM, RAM, Array of RAM ICs, Read only PLA, PAL Memory.

Unit V: Registers, Sequential circuit Analysis-Input equations, state table, analysis, and design, Moore & Mealy Circuits.

Unit VI: Counters, asynchronous and synchronous design using state and excitation tables.

Text Books:

1. Modern Digital Electronic: R. P. Jain, 4 edition by Tata McGraw Hill

2. Digital Logic Design: M. Mano, 2 edition. Pearson

Reference Books:

1. Fundamental of Digital Electronics: A. Anand Kumar. PHI

Syllabus for B.Tech. Semester I
Department of Information Technology

Course Code	ITP152				
Category	Engineering Science Course				
Course Title	Digital Circuits Lab				
Scheme& Credits	L	T	P	Credits	Semester I
	0	0	2	1	

Minimum 10 Practical's based on the course

Course Outcomes

Upon completion of the course, students will be able to

1. Design combinational circuits
2. Design sequential circuits.
3. Design basic memory elements
4. Design Counters

Syllabus for B. Tech. I Semester
Department of Information Technology

Course Code	HUT152				
Category	Mandatory Course				
Course Title	Constitution of India				
Scheme& Credits	L	T	P	Credits	Semester I
	2	0	0	0	

Course outcome

1. Students will understand the role of constitution in democratic India
2. Students will be responsible students by knowing their fundamental rights and duties
3. Students will develop better understanding of democratic functions of the government of India
4. Students will form better understanding of system of governance for effective participation

Course content

1. Meaning of the constitution law and constitutionalism
2. Historical perspective of the Constitution of India
3. Salient features and characteristics of the Constitution of India
4. Scheme of the Fundamental Rights
5. The scheme of the Fundamental Duties and its legal status
6. The Directive Principles of State Policy– Its importance and implementation
7. Federal structure and distribution of legislative and financial powers between the Union and the States.
8. Parliamentary Form of Government in India – The constitution powers and status of the President of India.
9. Union Executive: structure, functions
10. Judiciary: Structure, role with special reference to PIL, writ petitions, strengthening of democracy & social justice
11. Amendment of the Constitutional Powers and Procedure
12. Emergency Provisions: National Emergency, President Rule, Financial Emergency
13. Local Self Government – Constitutional Scheme in India
14. Provisions of civil services: Characteristics, functions, merits and demerits
15. Democratic principles in industry

Book

Durga Das Basu "An Introduction to Constitution of India" 22nd Edition, Lexis Nexis

Syllabus for B. Tech. Semester I
Department of Physical Education

Course Code	PEP151				
Category	Mandatory Course				
Course Title	Yoga / Sports				
Scheme& Credits	L	T	P	Credits	Semester I
	0	0	2	0	

Course outcome

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

1. Understand fundamental skills and basic rules of games offered by the Physical Education Department of RCOEM.
2. Obtained health-related physical fitness.
3. Develop body-mind coordination through games and yoga.
4. Changed sedentary life styles towards active living.

Brief Objectives of Sports/Yoga Practical Classes

It has long been proven that a healthy body leads to a healthy mind. With a strong belief in this, PhysicalEducation Department at RCOEM will conduct Sports/Yoga Classes with the objective of maintaining health, fitness and wellness of students as well as create awareness about need for good health and physical fitness. Theobjective would also be to make the all-round development with team spirit, social values as well as to identifyand develop leadership qualities in students through various sports activities. Sports activities would also be conducted with the objective to provide better interaction and recreation to the students which is an importantneutralizer for stress. Additionally, the objective would be to evaluate the health-related fitness of students so asto recommend and conduct specific Yoga and Sports activities. The emphasis is on participation, with healthy competition.

Program Outline

Sports:

1. Introduction to sports, offered by the department.
2. Health and safety issues related to sports; knowledge, recognition and ability to deal with injuries andillness associated with sports.
3. Practicing the fundamental skills and bringing awareness of basic rules and regulations.
4. Conduction of small recreational games and activities.

Yoga: Includes various sitting, standing and lying Asanas, Surya namaskars and Pranayamas.

Physical Efficiency Tests: This includes 6 health related physical fitness tests.

Components	**Name of Tests**
Speed	50 mts Dash
Agility	Shuttle run
Cardiovascular Endurance	8 mins Run/Walk
Test Flexibility	Sit and Reach Test
Abdominal Strength (M)/Shoulder strength (F)	Bent Knee Sit-ups (M)/Modified Pull-ups (F)
Yogic exercises	Surya namaskars

Syllabus for B.Tech. Semester II
Department of Information Technology

Course Code	ITT153				
Category	Engineering Science Course				
Course Title	Object Oriented Programming				
Scheme& Credits	L	T	P	Credits	Semester II
	3	1	0	4	

Course outcomes

Upon completion of the course, students will be able to

1. Differentiate between Procedural language and Object-Oriented language
2. Use basic features of object-oriented language to solve real life problems
3. Apply advanced features (overloading, polymorphism) of object-oriented language to solve real life problems
4. Apply exception handling mechanism
5. Implement various file operations through different stream classes.
6. Demonstrate the significance of Multithreaded Programming, Networking, Applet, and Servlet in Real-life applications.

Unit I

Introduction to Object Oriented Programming: Features of object-oriented programming languages like data encapsulation, inheritance, polymorphism, and late binding

Unit II

Basic Concept of OOP: Concept of a class, Access control of members of a class, instantiating a class, static and non-static members, overloading a method, Constructors, Garbage Collection, finalize() Method.

Unit III

Building the classes: Deriving a class from another class, access control of members under derivation, different ways of class derivation, overriding of a method, run time polymorphism, Use of super keyword and final keyword in inheritance, run time polymorphism. Abstract classes and methods, interface, implementation of interface, creating packages, importing packages,

Unit IV

Exceptions, types of exception, use of try-catch block, handling multiple exceptions, using finally, throw and throws clause, user-defined exceptions, Generics, the generic class with two type parameter, bounded generics, Collection classes: Arrays, Vectors, Array list, Linked list, Hash set, Queues, Trees.

Unit V

Introduction to streams, byte streams, character streams, linked lists, stacks, queues, trees, graphs, hash table, Set, Tree Set, File handling in Java, Serialization.

Unit VI

Multithreading: Java Thread models, creating thread using runnable interface and extending Thread, thread priorities, Thread Synchronization, Inter-thread communications. Networking, Applet and Servlet.

Text Books

The Complete Reference: Java 2: Herbert Schildt

1. A programmer's Guide to Java SCJP Certification: A Comprehensive Primer: *Khalid A. Mughal and Rolf W. Rasmussen,* Third Edition.
2. Java Fundamentals: A Comprehensive Introduction: *Herbert Schildt and Dale Skrien*; Tata McGraw-Hill Education Private Ltd., 2013.
3. ArnoldKen,GoslingJ,"TheJavaProgrammingLanguage"5edition,MGH,AddisonWesley
4. MattWeisfeld,"The Object-Oriented Thought Process", Pearson

Reference Books

1. CoxBrad,"Object–OrientedProgramming:AnEvolutionaryApproach",Addison–Wesley
2. Design Patterns By ErichGamma, Pearson Education
3. Core JAVA Volume-II Advanced Features: *Cay S. Horstmann and Gary Cornell;* Eighth Edition; Prentice Hall, Sun Microsystems Press, 2008.
4. Java Programming: A Practical Approach: *C Xavier;* Tata McGraw- Hill Education Private Ltd., 2011

Syllabus for B.Tech. Semester II
Department of Information Technology

Course Code	ITP153				
Category	Engineering Science Course				
Course Title	Object Oriented Programming Lab				
Scheme& Credits	L	T	P	Credits	Semester II
	0	0	2	1	

Minimum 10 Practical based on Course Outcomes

Course Outcomes

Upon completion of the course, students will be able to

1. Write simple programs in java language for the given problem statement.
2. Write advanced programs in java language to solve real life problems.
3. Design optimized and reusable codes for applications.
4. Implement data structures using object-oriented concepts.
5. Implement Multithreading and Networking mechanisms to solve real life problems.

Syllabus for B.Tech. Semester II
Department of Information Technology

Course Code	ITT154				
Category	Program Core Course				
Course Title	Data Structures				
Scheme& Credits	L	T	P	Credits	Semester II
	2	1	0	3	

Course Outcomes

Upon completion of the course, students will be able to

1. Analyze algorithms based on their complexities
2. Implement real world problems using Arrays
3. Implement real world problems using Link List
4. Analyze various searching and sorting algorithms
5. Use Trees as a data structure
6. Apply the graph structure for traversals and shortest path problems

Unit I

Introduction to Algorithms: Concept of data types, algorithms, and their features. Analysis of Algorithms, Asymptotic notations, Features of a structured program, Recursion, and Introduction to algorithm design techniques.

Unit II

Arrays: Introduction, Memory Representation, Introduction to Stacks & Queues. Application of array in implementation of structures like stacks, queues, De-queues, and Priority queues. Concept and representation of Sparse matrices and basic operations on them.

Unit III

Linked List: Purpose and representation in memory. Implementation of Single and doubly linked lists and basic operations on them. Applications of linked list: Polynomial operations, Equivalence relation, Generalized lists, Memory Management.

Unit IV

Sorting: Internal and external sorting, Bubble sort, Exchange sort, Insertion sort, Selection sort, Radix sort Merge sort, Quick sort, and Heap sort.
Searching: Sequential, Binary, Indexed search, Hashing techniques, and Collision-handling mechanisms.

Unit V

Trees: Definition and terminologies. Memory representation of binary trees. Tree traversal techniques, Threaded binary trees, Binary search trees, and Heap trees.

Unit VI

Graphs: Definition and terminologies. Implementation in memory. Graph traversal technique, Minimum CostSpanning Trees computation, and Shortest Path algorithm.

Text Books

1. Fundamentals of Data Structures in C: E. Horowitz, S. Sahani and Anderson- Freed, UniversityPress, 2nd Edition.
2. Data Structures and Program Design in C: Robert Kruse, G. L. Tondo and B. Leung, PHI
3. An Introduction to Data Structures with Applications: J. P. Tremblay & P. G. Sorenson, 2 Edition, MGH.

Reference Books

1. Data Structures: P. S. Deshpande, O. G. Kakde 1st Edition, Wiley Dream Tech.
2. Data Structures Using C / C++: Tanenbaum, 3rd Edition, Pearson.

Syllabus for B.Tech. Semester II
Department of Information Technology

Course Code	ITP154				
Category	Program Core Course				
Course Title	Data Structure Lab				
Scheme& Credits	L	T	P	Credits	Semester II
	0	0	2	1	

Minimum 10 Practical based on the course ITT153

Course outcomes

Upon completion of the course, students will be able to

1. Analyze the time and space complexities of a given algorithm
2. Use linear data structures for solving real world problems
3. Implement various sorting and searching algorithms
4. Use non-linear data structures for solving real world problems

Syllabus for B.Tech. Semester II
Department of Information Technology

Course Code	ITP155				
Category	Engineering Science Course				
Course Title	IT Workshop Lab-I				
Scheme& Credits	L	T	P	Credits	Semester II
	0	0	2	1	

Course Outcomes

Upon completion of the course, students will be able to

1. Use basic functions of MS Excel.
2. Use macros in MS Excel.
3. Design static web pages using basic HTML tags.
4. Apply CSS in HTML pages.
5. Use popular IDEs for program development.

MS Excel, Macros

HTML:

HTML Basics: Intro to HTML Syntax, The HTML, head, title, & body tags, Headings, paragraphs, & lists, The strong & em tags, The doctype, The lang attribute, The meta tag & the Unicode character set

Links: Absolute & Relative URLs, Using the width, height, & alt attributes, Using horizontal rules

CSS: Intro to Cascading Style Sheets (CSS), The style tag, Tag selectors, The font size, font-family, color, & line-height properties, Hexadecimal color code

Study of popular IDEs: NetBeans IDE, Ellipse IDE

Text Book

1. Linux Pocket guide- Daniel J. Barrett, O'Reilly Media
2. Linux: The Complete Reference, Sixth Edition- Richard Petersen, McGraw Hill Education

Reference Books

1. Linux Administration : A Beginner's Guide – Wale Soyinka , McGraw Hill Publication
2. Linux Command Line and Shell Scripting Bible- Richard Blum, Wiley

Syllabus for B.Tech. Semester II
Department of Information Technology

Course Code	CHT154				
Category	Basic Science Course				
Course Title	Chemistry				
Scheme& Credits	L	T	P	Credits	Semester II
	2	0	0	2	

Course Outcomes:
After the successful completion of the course, students shall be able to

- Predict the properties and interactions of chemical substances by understanding their composition at the atomic and molecular level.
- Discuss unique properties of nano-materials to solve challenges in our life and applications in computational world.
- Discuss how spectroscopic methods are used for qualitative and quantitative analysis.
- Analyze the utilization of green computing technology for environmental issues

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Syllabus:

Module 1: Atomic and Molecular Structure [6 hours]

Equations for atomic and molecular orbitals. Energy level diagrams of diatomic. HOMO, LUMO, Crystal field theory and the energy level diagrams for transition metal ions and their optical and magnetic properties. Band Theory

Module 2: Nanomaterials for Advanced Computing: [6 hours]

Basics of Nanochemistry, classification, synthesis and Industrial applications, quantum dots for quantum computers, Doping of nanocrystals, Nanowires, Nanofibers, Nanotechnological advancements for computing.

Module 3: Characterization Techniques and computational tools: [6 hrs]

Fundamentals of spectroscopy, Electronic Spectroscopy, Nuclear Magnetic Resonance Spectroscopy. Basics of Nuclear magnetic resonance quantum computer

Synthesis of drugs, basic soft-wares for bio-chemical assessment of drugs.

Module 4: Green Computing and Chemistry [6 hrs]

Metal extraction from E-wastes: Constraints and opportunities, Chemical exposure (Lead, Mercury, Cadmium, Chromium etc.) and contamination, Principles of Green Chemistry and Green Computing, Role of Green Computing in Environment and Research, Green devices and Green data Server.

Suggested Text Books:

1. Shikha Agrawal , Engineering Chemistry : Fundamentals and Applications, Cambridge University Press.

2. Dr. Rajshree Khare, A Textbook of Engineering Chemistry(AICTE), S.K. Kataria & Sons.

3. S. S. Dara, A Textbook of Engineering Chemistry, S. Chand Publications.

4. A. K. Das and M. Das, An introduction to nanomaterials and nanoscience, CBS Publishers and Distributors

5. M Afshar Alam, Sapna Jain, Hena Parveen, Green Computing Approach Towards Sustainable Development, Wiley Interscience Publications

Suggested Reference Books:

1. C. J. Cramer, Essentials of Computational Chemistry: Theories and Models, Second Edition, Wiley Interscience Publications.

2. Hans-Eckhardt Schaefer, Nanoscience: The Science of the Small in Physics, Engineering, Chemistry, Biology and Medicine, Springer-Verlag Berlin Heidelberg.

Syllabus for B.Tech. Semester II
Department of Information Technology

Course Code	CHP154				
Category	Basic Science Course				
Course Title	Chemistry Lab				
Scheme& Credits	L	T	P	Credits	Semester II
	0	0	2	1	

Course Outcomes:

The Chemistry laboratory course will consist of experiments illustrating the principles of chemistry relevant to the study of science and engineering.

The students will learn to:

1. Apply the fundamental principles of measurement and skills in preparation and handling of hazardous chemicals and interpret the statistical data related to measurements.
2. Estimate the rate constants of reactions and order of the reaction and/or to validate adsorption isotherms.
3. Use of various computational tools for analysis of different spectral properties and bio-activities.

List of Experiments: [Any six from the list]

[1] Preparation of different Solutions: Molar solution, Normal solution and percent solution and Determination of concentration.
[2] Demonstration of Handling of hazardous chemicals, MSDS (material safety data sheet), waste minimization strategies and chemical waste disposal.
[3] Basic statistical analysis of results of neutralization of acid against the base and preparing acceptable graphs using software.
[4] Prediction of infrared/NMR spectral and analytical data of organic molecules using Computational Software.
[5]. Spectroscopic/Colorimetric determine of wavelength of maximum absorption of chemical/biological compound in solution and determination of concentration using Lambert-Beer's Law.
[6] To study chemical kinetics of peroxydisulphate and iodide ions reactions and to find out order of the reaction and analysis of experimental data using Computational Software.
[7] Molecular docking of drugs using open computational software.
[8] Determination of rate of the reaction at room temperature and analysis of experimental data using Computational Software
[9] Use of open access software for the interpretation of various parameters of materials including drugs

Suggested Books/Reference Books:

1. S. S. Dara, A Textbook on Experiments and Calculations in Engineering Chemistry, S. Chand Publications.
2. J. B. Yadav, Advanced Practical Physical Chemistry, Krishna's Prakashan Media (P) Limited.

3. A. J. Elias, Collection of Interesting General Chemistry Experiments, Universities Press Publications.
4. V. K. Ahluwalia, S. Dhingra and A. Gulati, College Practical Chemistry, Universities Press Publications.
5. Ashutosh Kar , Advanced Practical Medicinal Chemistry, New Age International Publisher.

Suggested Reference Books:

1. David Young, Computational Chemistry: A Practical Guide for Applying Techniques to Real World Problems, Wiley Interscience Publications

Syllabus for B.Tech. Semester II
Department of Information Technology

Course Code	MAT154				
Category	Basic Science Course				
Course Title	Mathematics-II				
Scheme& Credits	L	T	P	Credits	Semester II
	3	1	0	4	

Course Objective

The objective of this course is to familiarize the prospective engineers with techniques in Calculus and multivariate analysis. It aims to equip the students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling more advanced level ofmathematics and applications that they would find useful in their disciplines.

Course Outcomes

On successful completion of the course, the students will learn:

1. The fallouts of Mean Valve Theorems that is fundamental to application of analysis to Engineering problems, to deal with functions of several variables that are essential in most branches of engineering.
2. Basics of improper integrals, Beta and Gamma functions, Curve tool of power series and Fourier series forlearning advanced Engineering Mathematics.
3. Multivariable Integral Calculus and Vector Calculus and their applications to Engineering problems.

Syllabus

Module 1: Calculus: (7 hours)

Rolle's theorem, Mean value theorems, Taylor's and Maclaurin series expansions; Indeterminate forms and L'Hospital's rule; radius of curvature (Cartesian form), evolutes and involutes

Module 2:Multivariable Calculus (Differentiation) (8 hours)

Limit, continuity and partial derivatives, Eulers Theorem, chain rule , total derivative, Jacobians, Maxima, minima and saddle points; Method of Lagrange multipliers.

Module 3 Calculus: (6 hours)

Evaluation of definite and improper integrals; Beta and Gamma functions and their properties; Tracingof curves(Cartesian form)

Module 4:Sequences and series: (7 hours)

Convergence of sequence and series, tests for convergence, power series, Fourier series: Half range sine and cosine series, Parseval's theorem.

Module 5: Multivariable Calculus (Integration) (7 hours)

Multiple Integration: double and triple integrals (Cartesian and polar), change of order of integration in double integrals, Change of variables (Cartesian to polar), Applications: areas and volumes by(double integration) Center of mass and Gravity (constant and variable densities).

Module 6 : Vector Calculus(7 hours)

Vector Differentiation, Directional derivatives, total derivative , Gradient, curl and divergence. Vector integration, Theorems of Green, Gauss and Stokes.

Topics for self-learning

Maxima and minima for function of one variable, Geometrical interpretation of Partial Differentiation (Tangent plane and Normal line) , Applications of definite integrals to evaluate perimeter, area,surface areas and volumes of revolutions.

Textbooks/References:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
3. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.
4. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2000.
5. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.
6. A text book of Applied Mathematics Volume I & II, by P. N. Wartikar and J. N. Wartikar, Pune Vidhyarthi Griha Prakashan, Pune-411030 (India).

Syllabus for B. Tech. Semester II
Department of Information Technology

Course Code	HUT151				
Category	Humanities Social Science and Management				
Course Title	English				
Scheme& Credits	L	T	P	Credits	Semester II
	2	0	0	2	

Course Objectives

The main objective of the subject is to enhance the employability skills of engineering students as wellas communication skills at workplace. The sub-objectives are:

1. To develop vocabulary of students.
2. To orient students in basic writing skills.
3. To orient students in functional grammar.
4. To orient students in the process of effective writing.
5. To provide practice and improve students' oral communication skills.

Course Outcomes

1. Students will have good word power.
2. Students will acquire basic writing skills.
3. Students will understand functional grammar and its usage.
4. Students will organize and express their thoughts effectively through written communication.
5. Students will learn oral communications kills in order to handle themselves effectively in an interview and group discussion

SYLLABUS

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 Redundancies
3.6 Cliches

4. Nature and Style of sensible Writing

4.1 Describing
4.2 Defining
4.3 Classifying
4.4 Providing examples or evidence

5. Writing Practices

5.1 Comprehension
5.2 Precis Writing
5.3 Essay Writing
5.4 Letter Writing
5.5 Email Writing

6. Oral Communication

(This unit involves interactive practice sessions in Language Lab)

- Listening Comprehension
- Pronunciation, Intonation, Stress and Rhythm
- Common Everyday Situations: Conversations and Dialogues
- Communication at Workplace
- Interviews
- Formal Presentations

Books

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

Syllabus for B. Tech. Semester II
Department of Information Technology

Course Code	HUP151				
Category	Humanities Social Science and Management				
Course Title	English Lab				
Scheme& Credits	L	T	P	Credits	Semester II
	0	0	2	1	

Course objective

1. To enhance competency of communication in English among learners.

Course outcomes

1. Students learn presentation and public speaking skills
2. Students learn to practice effective strategies for Personal Interview and Group Discussions
3. Students learn and effectively apply language skills– listening, speaking, reading and writing

List of Practical (2 hours each for each batch) based on unit 6 (oral communication).

1. Common Everyday Situations: Conversations and Dialogues
2. Pronunciation, Intonation, Stress, and Rhythm
3. Formal Presentations: Orientation
4. Formal Presentations: Practice Session
5. Interviews: Orientation
6. Interviews: Practice Session
7. Communication at Workplace: Group Discussion- Orientation
8. Communication at Workplace: Practice Session

Syllabus for B. Tech. Semester II
Department of Information Technology

Course Code	IDT151				
Category	Engineering Science Course				
Course Title	Creativity, Innovation & Design Thinking				
Scheme& Credits	L	T	P	Credits	Semester II
	1	0	0	1	

Course Outcomes

C1: Be familiar with processes and methods of creative problem solving

C2: Enhance their creative and innovative thinking skills

C3: Practice thinking creatively and innovative design and development

Detailed Topics

Unit 1. Introduction: Making a case for creativity, Creative thinking as a skill, Valuing diversity in thinking: Thinking preferences, Creativity styles, Creativity in problem solving.

Unit 2. Pattern Breaking : Thinking differently , Lateral thinking, Mind stimulation: games, brain-twisters and puzzles, Idea-collection processes, Brainstorming/Brainwriting, The SCAMPER methods, Metaphoric thinking, Outrageous thinking, Mapping thoughts, Other(new approaches)

Unit 3. Using Math and Science, Systematic logical thinking, Using math concepts, Eight-Dimensional(8D) Approach to Ideation: Uniqueness, Dimensionality, Directionality, Consolidation, Segmentation, Modification, Similarity, Experimentation

Unit4. Systematic Inventive Thinking: Systematic inventive thinking: The TRIZ methodology, Decision and Evaluation: Focused thinking framework, six thinking hats, Ethical considerations

Unit 5. Design for Innovation : Introduction to design for interaction, nine lessons for innovation, difference in creativity and innovation, Building blocks for innovation

Unit 6.Intellectual Property: Introduction to intellectual property: Patents, Copyrights©, Trademarks®, Trade Secret, Unfair Competition.

Reference Books and Text Book

1. Creative Problem Solving for Managers- Tony Proctor- Rout ledge Taylor &Francis Group
2. 101 Activities for Teaching creativity and Problem Solving- By Arthur B Vangundy- Pfeiffer
3. H. S. Fogler and S.E. Le Blanc, Strategies for Creative Problem Solving, Prentice Hall
4. E. Lumsdaine and M. Lumsdaine, Creative Problem Solving, McGraw Hill,
5. J. Goldenberg and D. Mazursky, Creativity in product innovation. Cambridge University Press, 2002.

Course Assignments for internal continuous assessment of 20 Marks (NO T1 and T2)

- Brainteasers (aka Puzzle Busters, to be solved individually)
- Cartoon captions (small teams)
- TRIZ, asystematic ideation method, reading(individual)
- Book readings and discussions (small teams)
- Small teams presentations on innovation: (1) innovative individual, (2) innovative company, (3) innovative movie / game, (4) sustainable innovation, (5) innovation in business, (6) innovation in art, (7) innovation in architecture,(8) innovative nation, (9) innovation in science, and(10) innovation in engineering.

Large groups hands-on projects

- Eight-dimensional(8D) ideation method examples
- Large teams videos

Syllabus for B. Tech. III Semester

Department of Information Technology

Course Code	ITT261				
Category	Program Core Course				
Course Title	Computer Organization and Architecture				
Scheme& Credits	L	T	P	Credits	Semester
	3	0	0	3	III

Course Outcomes

Upon completion of the course, student will be able to

1. Justify the need of various computer hardware units.
2. Design circuits for performing integer and floating-point arithmetic.
3. Design memory systems.
4. Exhibit knowledge of different bus structures and control unit.
5. Justify the need for different I/O handling techniques.
6. Apply concept of pipelining to enhance system performance.

Unit I

Data Representation and Arithmetic: Number representation, Addition of positive numbers, Logic design of fast adders, Addition & subtraction, Arithmetic & branching conditions, Multiplication of positive numbers, Signed operand multiplication, Fast multiplication, Integer division, Floating point numbers & operations, IEEE standard.

Unit II

Basic Structure of Computer Hardware & Software:

CPU, Memory, Input-Output Subsystems, Control unit. Instruction set architecture of a CPU, Registers, Instruction execution cycle, addressing modes, instruction set.

Unit III

Memory System Design: Semiconductor RAM memories, Memory system considerations, Semiconductor ROM memories, Multiple-module memories and interleaving, Cache memories, mapping functions, replacement algorithms.

Unit IV

Processing Unit: Fundamental concepts, bus architecture, execution of complete instruction, hardwired control, micro programmed control, microinstruction format, microinstruction sequencing.

Unit V

I/O Interfacing: Input-output organization, I/O mapped I/O and memory mapped I/O, Direct Memory Access, interrupts and interrupts handling mechanisms, device identification, vectored interrupts, interrupt nesting, I/O interfaces, synchronous vs. asynchronous data transfer, I/O channels, USB

Unit VI

Pipelining: Basic concepts, delayed branch, branch prediction, data dependency, multiple execution units, performance considerations, basic concepts in parallel processing and classification of parallel architectures.

Text Books

1. Computer Organization: Carl Hamacher, Z Vranesic, S Zaky , McGraw Hill
2. Computer Organization and Design: D. A. Patterson and J. L. Hennessy, Morgan Kaufmann

Reference Books

1. Computer Architecture and Organization: J. P. Hayes, McGraw Hill.

Syllabus for B.Tech. Semester III
Department of Information Technology

Course Code	ITT262				
Category	Program Core Course				
Course Title	Advanced Data Structures				
Scheme& Credits	L	T	P	Credits	Semester
	2	1	0	3	III

Course Outcomes

Upon completion of the course, students will be able to

1. Demonstrate the concepts of complexity and sorting techniques
2. Use Binary trees and multi-way trees for solving problems
3. Apply algorithms for solving problems using graphs
4. Apply various Text processing techniques
5. Exhibit knowledge of skip lists

Unit I

Performance of algorithms: Revision of Space and Time complexity analysis with examples, Revision of Asymptotic notations. External Sorting algorithms, sorting in linear time algorithms: Counting sort, Radix sort, Bucket sort

Unit II

Trees: Binary search tree (BST): Insertion and deletion of nodes in BSTs, AVL tree, Rotations, LL, RR, RL, LR rotations, Rotations for bigger trees, Insertion and Deletion operations with example.

Unit III
Trees: Comparison between AVL tree and RB tree, Red-Black Trees: Insertion and deletions, B trees and operations.

Unit IV Graphs: Revision of graphs, their types, The Floyd-Warshall algorithm, The Bellman-Ford algorithm, Johnson's algorithm for sparse graphs

Unit V
Text Processing: String Operations, Brute-Force Pattern Matching, The Boyer-Moore Algorithm, The Knuth-Morris-Pratt Algorithm, Standard Tries, Compressed Tries, Suffix Tries, The Huffman Coding Algorithm.

Unit VI
Skip Lists: Search and Update Operations on Skip Lists, Probabilistic Analysis of Skip Lists, Deterministic Skip Lists

Text Books

1. T. H. Cormen, C. E. Leiserson, R. L. Rivest and C. Stein, Introduction to Algorithms, MIT Press.
2. A V Aho, J. D Ullman and J. E Hopcroft, Data Structures and Algorithms, Addison Wesley.
3. E. Horowitz, S. Sahni and S. Rajasekeran, Fundamentals of Computer Algorithms, University Press

Reference Books

1. E. Horowitz, S. Sahni and S. Anderson-Freed, Fundamental of data Structure in C, W.H. Freen Co.
2. Data Structures & Program Design in C: Robert Kruse, G. L. Tondo and B. Leung PHI-EEE.
3. Aaron M. Tenenbaum, Y. Langsam, Moshe J. Augenstein, Data Structures Using C.

Syllabus for B.Tech. Semester III
Department of Information Technology

Course Code	ITP262				
Category	Program Core Course				
Course Title	Advanced Data Structures Lab				
Scheme& Credits	L	T	P	Credits	Semester
	0	0	2	1	III

Minimum 10 Practical based on the course ITP262

Course outcomes

Upon completion of the course, students will be able to

1. Find the complexity of algorithms
2. Use Binary trees and multi-ways trees for problem solving
3. Use graphs for problem solving
4. Apply various Text processing techniques.
5. Apply skip list for problem solving.

Syllabus for B.Tech. Semester III
Department of Information Technology

Course Code	ITT263				
Category	Program Core Course				
Course Title	IT Infrastructure Services				
Scheme& Credits	L	T	P	Credits	Semester
	2	0	0	2	III

Course Outcomes

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

1. Justify the need for file system
2. Manage the users and groups on the system
3. Configure GRUB loader services
4. Apply the concept of Package and storage management
5. Write shell scripts
6. Configure important services on the Linux server

Unit I

Introducing Linux: History, Linux distribution, Linux basics: Linux vs Microsoft Windows, Linux Basic commands, Linux file system, File handling commands, file permissions.

Unit II

Users and Groups: Working with Users and Groups.

Startup and Services: Linux booting process, Services, and Processes, GRUB boot loader, Managing services.

Unit III

Package Management: Introduction to Package Management, Package Management commands.
Storage management: Storage basics, Fdisk command Logical volume management.

Unit IV

Shell script and shell programming

Unit V

Infrastructure services: Configuration of NTP, DNS, and Mail Servers.

Unit VI

Web services: Apache web Server, File, and print sharing: File sharing with Samba and NFS, Managing documents, Print servers.

Backup and Recovery: Disaster recovery planning, Backup process, and configuring backup process using backup and recovery tools.

Text Books:

1. Linux Administration: A Beginner's Guide, Seventh Edition, by Wale Soyinka, McGraw Hill Publication.
2. Pro Linux System Administration: James Turnbull, Peter Lieverdink, and Dennis Matotek, Apress Publication

Reference Books:

1. Linux - The Complete Reference, TMH Publication

Syllabus for B.Tech. Semester III
Department of Information Technology

Course Code	ITP263				
Category	Program Core Course				
Course Title	IT Infrastructure Services Lab				
Scheme& Credits	L	T	P	Credits	Semester
	0	0	2	1	III

Minimum 10 Practical based on the course ITT153

Course outcomes

Upon completion of the course, students will be able to

1. Install different Linux distributions
2. Create users and groups on the Linux server
3. Apply process management commands
4. Use package and storage management tools.
5. Write shell scripts.
6. Install and configure services on Linux server.

Syllabus for B.Tech. Semester III
Department of Information Technology

Course Code	ITT264				
Category	Engineering Science Course				
Course Title	Cyber Laws and Ethics				
Scheme& Credits	L	T	P	Credits	Semester
	2	0	0	2	III

Course Outcomes

Upon completion of the course, students will be able to

1. Correlate between national and international cyber laws
2. Analyze various cyber crimes
3. Apply forensic techniques for solving cyber crimes
4. Apply various security measures for prevention of cyber crimes
5. Apply ethical and moral behaviors while using Information Technology

Unit I

Introduction to Cyber laws: Cyber laws in India, International cyber laws.

Unit II

Cyber-crimes: classification, cyber-crimes against individual, cyber-crimes against property, cyber-crimes against nation.

Unit III

Introduction to cyber forensics: classification, digital evidence, forensic tools.

Unit IV

Intellectual property rights and related rights in Information Technology: Patent protection, copyright, database protection

Unit V

Electronic Privacy: Privacy and data protection, Access to electronic information.

Unit VI

Ethics in IT: Ethics for IT workers and users, Ethics of IT organizations

Text Books

1. Cyber Forensics: Dejey, Murugan, Oxford University Press
2. Computer Law: Chris Reed, Oxford University Press

Reference Books

1. Ethics in Information Technology: George W. Reynolds, Cengage
2. Cyber Laws and IT Protection: Harish Chander, PHI

Syllabus for B.Tech. Semester III
Department of Information Technology

Course Code	ITT265				
Category	Program Core Course				
Course Title	Computer Graphics				
Scheme& Credits	L	T	P	Credits	Semester
	2	1	0	3	III

Course Outcomes

Upon completion of the course, students will be able to

1. Exhibit knowledge of Graphics hardware
2. Implement basic Graphics Primitives using standard algorithms
3. Apply Two-Dimensional and Three-Dimensional transformations
4. Apply Clipping and Solid Area Scan Conversion Techniques on basic objects.
5. Exhibit knowledge of Curves and Surface Detection and their applications
6. Create a simple animation sequence through programming

Unit I

Introduction Computer Graphics: Introduction to Image and Objects, Image Representation, Basic Graphics Pipeline, Bitmap and Vector-Based Graphics, Applications of Computer Graphics, Display Devices, Input Technology, Coordinate System Overview.

Scan-Conversion of Graphic Primitives: Scan-Conversion of a Lines (Digital Differential Analyzer Algorithm), Bresenham's Line- Drawing Algorithm, Scan-Conversion of Circle and Ellipse (Bresenham's Method of Circle Drawing, Midpoint Circle Algorithm), Drawing Ellipses and Other Conics.

Unit II

Two-Dimensional Transformations: Introduction, Transformation Matrix, Types of Transformations in Two-Dimensional Graphics: Identity Transformation, Scaling, Reflection, Shear Transformations, Rotation, Translation, Rotation about an Arbitrary Point, Combined Transformation, Homogeneous Coordinates, 2D Transformations using Homogeneous Coordinates.

Unit III

Three-Dimensional Transformations: Homogeneous Coordinates, Three-Dimensional Scaling, Translation, Rotation, Shear Transformations, Reflection, World Coordinates and Viewing Coordinates, Projections: Parallel and Perspective Projections.

Unit IV

Viewing and Clipping: Introduction to viewing and viewing Transformation in Two Dimensions, Two-Dimensional Clipping, Line Clipping, Introduction to a Polygon Clipping, Viewing and Clipping in Three Dimensions, Three-Dimensional Viewing Transformations.
Solid Area Scan-Conversion: Inside - Outside Test, Winding Number Method and Coherence Property, Polygon Filling, Seed Fill Algorithm, Scan-Lino Algorithm, Priority Algorithm, Scan Conversion of Character, Aliasing, Anti-Aliasing, Halftoning, Thresholding and Dithering.

Unit V

Curves and surfaces: Spline representations, Bezier curves and surfaces, B-spline curves and surfaces. Visible surface detection methods: Back-face detection, depth buffer, A-buffer, Z-buffer, Scan-Line Illumination models and Surface rendering.

Unit VI

Introduction to Animation: Key-Frame Animation, Construction of an Animation Sequence, Motion Control Methods, Procedural Animation, Key-Frame Animation vs. Procedural Animation, Introduction to Morphing, Three-Dimensional Morphing.

Text Books

1. Procedural elements of Computer Graphics, David F. Rogers, TataMcGraw-Hill.
2. Computer Graphics, Donald Hearn and M. Pauline Baker, PrenticeHall of India.
3. Computer Graphics, Steven Harrington, McGraw-Hill.

Reference Books

1. Computer Graphics Principles and Practice, J.D. Foley, A VanDam, S. K. Feiner and R. L. Phillips, Addison Wesley.
2. Mathematical Elements of Computer Graphics, David F. Rogers, J.Alan Adams, Tata McGraw-Hill.
3. Computer Graphics with OpenGL, Hearn and Baker, Pearson.

Syllabus for B.Tech. Semester III
Department of Information Technology

Course Code	ITP265				
Category	Program Core Course				
Course Title	Computer Graphics Lab				
Scheme& Credits	L	T	P	Credits	Semester
	0	0	2	1	III

Minimum 10 Practical based on the course ITT265

Course outcomes

Upon completion of the course, students will be able to

1. Write programs for the implementation of Graphics Primitives
2. Apply 2-D and 3-D Transformations on the given objects
3. Perform Viewing Transformations on the given object
4. Apply Line Clipping Algorithms against a given window in 2-D
5. Apply Solid Area Scan Conversion algorithms on the given polygon
6. Develop simple Animation Sequences using suitable Graphics library

Syllabus for B.Tech. Semester III
Department of Information Technology

Course Code	**MAT252**				
Category	Basic Science Course				
Course Title	Linear Algebra & Statistics				
Scheme& Credits	L	T	P	Credits	Semester
	3	0	0	3	III

Course Outcomes

On successful completion of the course, the students will learn:

1. Computational techniques and algebraic skills essential for the study of systems of linear equations, matrix algebra, vector spaces, eigen values and eigen vectors, orthogonality anddiagonalization.
2. Visualization, spatial reasoning, as well as geometric properties and strategies to model, solve problems and view solutions, especially in and, as well as conceptually extend these results to higher dimensions.
3. To prepare the background of students to pursue statistical theory or methodology and analyze data in any stream of computer science and information technology.

Module 1 (10-Lectures) :

Vector Space; Sub spaces; Linear Dependence/Independence; Basis; Dimension; Linear transformation; Range Space and Rank; Null Space and Nullity; Rank nullity theorem, Matrix Representation of a linear transformation; Linear Operators on Rn and their representation as square matrices; Invertible linear operators; Inverse of a non-singular matrix.

Module 2 (8-Lectures):

Eigen values and eigenvectors of a linear operator; Inner Product Spaces, Norm; Ortho normal Sets, Gram Schmidt orthogonalisation process; projections, positive definite matrices, and Singular Value Decomposition.

Module 3 (13-Lectures):

Review of Discrete and continuous random variable, joint probability function, Introduction to stochastic process, random walk, stationary and auto regressive process, transition probability Matrix,Discrete time Markov chain, Continuous time Markov chain.

Module 4 (6-lectures) :

Hypothesis testing for sampling distributions of means, proportions, sum and differences of means and proportions for large and small samples.

Text Books

1. Hoffman and Kunze : Linear Algebra, Prentice Hall of India, New Delhi

2. Gilbert Strang : Linear Algebra And Its Applications (Paperback) , Nelson Engineering (2007)
3. M R. Spiegal : Theory and Problems of probability and statistics :,2nd ed :, Schaum series

Reference Books

1. Seymour Lipschutz et al: Linear Algebra, 3rded:Schaum series.
2. V. Krishnamoorthy et al : An introduction to linear algebra , Affiliated East West Press, New Delhi
3. P. G. Bhattacharya, S. K. Jain and S.R. Nagpaul : First course in Linear Algebra, Wiley Eastern Ltd.,New Delhi
4. K. B. Datta : Matrix and Linear Algebra, Prentice Hall of India, New Delhi
5. W. Feller, An Introduction to Probability Theory and its Applications, Vol. 1, 3rd Ed., Wiley, 1968.
6. S. Ross, A First Course in Probability, 6th Ed., Pearson Education India, 2002.

Syllabus for B.Tech. Semester III
Department of Information Technology

Course Code	HUT254				
Category	Basic Science Course				
Course Title	Technical Communication				
Scheme& Credits	L	T	P	Credits	Semester
	3	0	0	3	III

Course Outcomes

1. Students will understand the process and types of communication.
2. Students will understand the objectives of technical communication and role of audience in effective communication.
3. Students will learn basic grammar rules, develop technical writing skills and produce effective work placedocuments.
4. Students will understand the process of research writing and develop skills to write documents for higher studies.
5. Students will develop skills to enhance visual appeal of documents.
6. Students will understand strategies for effective oral communication for professional needs.

Unit 1 Technical communication

Definition, Barriers of Communication, Objectives of technical communication, Producing the product, Audience recognition and involvement.

Unit 2. Technical Writing

Process of Technical Writing, Types of Technical Writing Letters: Job application, Job Description and Resume, Sales, enquiry, complaint, order, follow-up letters, Organizational announcement, Minutes of the Meetings. Reports: Trip, Progress, Incident, Investigative, Feasibility/Recommendation reports

Unit 3. Grammar and Editing

Functional Grammar: Punctuations, Mechanics, Active/ Passive, Transformation of sentences

Unit 4.Orientation in Research

Writing proposals, SOP, writing articles for journals and conferences, abstract and executive summary, thesis writing

Unit 5. Preparation of Documents

Visual appeal: Document design, graphics, tables, poster presentations User manuals, Brochures, Fliers

Unit 6.Effective Oral Communication

Non- Verbal Communication, Public speaking, Presentations, Group Discussion and Interviews

Text Books

1. Gerson and Gerson, “Technical Communication: Process and Product”, 2018, Pearson
2. Meenakshi Raman and Sangeeta Sharma, “Technical Communication: Principles and Practice”, 2015,Oxford University Press

Reference Books

1. S. Kumar and Pushplata, “Communication Skills”, 2016, Oxford University Press
2. C. Muralikrishna and Sunita Mishra, “Communication Skills for Engineers”, 2016, Pearson
3. Andrea Rutherfoord, “Basic Communication Skills for Technology”, 2012,Pearson
4. Barun K Mitra, “Effective Technical Communication: A Guide for Scientists and Engineers”, 2006, Oxford

Syllabus for B.Tech. Semester III
Department of Information Technology

Course Code	CHT251				
Category	Basic Science Course				
Course Title	Environmental Science				
Scheme& Credits	L	T	P	Credits	Semester
	2	0	0	(0) Audit Course	III

Course Outcomes

On successful completion of the course, the students:

1. Will get sufficient knowledge regarding different types of environmental pollutions, their causes, detrimental effects on environment and effective control measures.
2. Will realize the need to change an individual's outlook, so as to perceive our environmentalissues correctly, using practical approach based on observations and self-learning.
3. Will become conversant with recent waste management techniques such as E-wastes, its recycling and management.
4. Will gain knowledge about the modes for sustainable development, importance of green energy and processes.
5. Will be able to identify and analyze environmental problems as well as risks associated withthese problems and greener efforts to be adopted, to protect the environment from gettingpolluted.

Principle of contaminant behavior and recent trends in environmental pollution control I- Air pollution and its control techniques: (4lectures)

Contaminant behavior in the environment, Air pollution due to SOx, NOx, photochemical smog,Indoor air pollution

Natural pathways for degradation: Carbon cycle, Sulphur cycle, Nitrogen cycle, Oxygen cycle.

Factors responsible for altering the composition of atmosphere (deforestation, burning of fossil fuels, industrial and vehicular emissions, CFCs).

Techniques to control Air pollution, ambient air quality and continuous air quality monitoring, Control measures at source, Kyoto Protocol, Carbon Credits.

1. Noise pollution and its control techniques: (2 lectures)

Introduction to noise pollution and its causes Noise pollution control: Recent advances in noise pollution control and benefits.

2. Soil pollution and its control techniques: (5 lectures)

Soil pollution: Soil around us, Soil water characteristics, soil pollution.

Solid waste management: Composting, vermi culture, landfills, hazardous waste treatment, bio

remediation technologies, conventional techniques (land farming, constructed wetlands), and phyto remediation.

Degradation of xenobiotic in environment: Petroleum hydrocarbons, pesticides, heavy metals

3. Water pollution and its control techniques: (8 lectures)

Major sources of water pollution: Eutrophication, acid mine drains, pesticides and fertilizers, dyeing and tanning, marine pollution, microplastics

Techniques to control water pollution: Conventional waste water treatment-types of sewage, sewerage system, alternative systems, primary, secondary and tertiary processes including aerobic and anaerobic techniques, safe disposal. Treatment schemes for waste water from dairy, textile, power plants, pharmaceutical industries, and agro based industries such as rice mills

4. E-wastes (2 lectures)

Introduction, types of e-wastes, environmental impact, e-waste recycling, e-waste management rules.

5. Environmental Sustainability: Role of Green technology (5 lectures)

Concept of green technologies, categories, goals and significance, sustainability

Green energy, green chemistry, challenges to green technology, advantage and disadvantages ofgreen processes, Eco mark certification- its importance and implementation

6. Different government initiatives(2lectures)

National ambient air quality standard 2009, Swacch bharat abhiyan, National afforestation program and Act- 2016, National river conservation plan, Formation of National Green Tribunal

Books Suggested

1. Benny Joseph, Environmental Studies, Mc Graw Hill Education (India) Private Limited
2. B. K. Sharma, Environmental Chemistry, Goel Publishing House, Meerut
3. PAarne Vesilind, J. Jeffrey Peirce and Ruth F. Weiner, Environmental Pollution and Control, Butterworth - Heinemann
4. D. D. Mishra, S. S. Dara, A Textbook of Environmental Chemistry and Pollution Control, S. Chand & Company Ltd. Sultan Chand & Company.
5. Shree Nath Singh, Microbial Degradation of Xenobiotics, Springer-Verlag Berlin Heidelberg
6. P. T. Anastas & J. C. Warner, Green Chemistry: Theory& practice, Oxford University Press
7. P. Thangavel & Sridevi, Environmental Sustainability: Role of Green technologies, Springer publications.

HONOR COURSE

Course Code	ITTH301				
Category	HONOR COURSE				
Course Title	Introduction to Web3 Programming				
Scheme& Credits	L	T	P	Credits	Semester III
	3	0	0	3	

Course Outcomes

At the end of the course students will be able to

1. Apply concepts of Blockchain in different use cases
2. Use Solidity for writing simple smart contracts
3. Deploy smart Contracts
4. Create Decentralized applications
5. Explore emerging trends in Web3 programming

Unit 1: Introduction to Web3 and Blockchain Basics

Overview of Web 3.0: Evolution from Web 2.0 to Web 3.0, Understanding the concept of Blockchain, Key differences between centralized and decentralized networks, Introduction to Ethereum: History and significance, Understanding Smart Contracts: Use cases and importance, Cryptography in Blockchain: Public-private key pairs, signing transactions

Unit 2: Ethereum Ecosystem and Solidity Programming

Deep dive into Ethereum: Ethereum accounts, Gas, Transactions and Blocks, Introduction to Solidity: Understanding its syntax and semantics, Smart Contract Development: Writing, compiling, and deploying Solidity smart contracts, Tools for Solidity development: Remix IDE, Truffle Suite

Unit 3: Web3 Development and Interaction with Smart Contracts

Setting up Web3.js: Introduction and setting up the environment, Web3.js APIs: Understanding the different functionalities and their usage, Interacting with Ethereum Blockchain using Web3.js: Creating, compiling and deploying smart contracts, Event and Error Handling in Web3.js

Unit 4: Building Decentralized Applications (DApps)

Introduction to DApps: Understanding their structure and design principles, Creating a DApp: Frontend development to interact with smart contracts, Connecting DApps with Ethereum Wallets: Usage of MetaMask and WalletConnect, DApp testing and debugging: Tools and techniques

Unit 5: Advanced Topics and Emerging Trends

Introduction to IPFS: Understanding decentralized storage, Decentralized Finance (DeFi): Overview and its impact on traditional finance, Exploring other blockchain platforms: Binance Smart Chain, Polkadot, etc., Security in Web3: Best practices and common pitfalls, Future Trends in Web3: Layer 2 solutions, Web3 in IoT and AI.

Refence Books:

1. Elrom, E. (2019). The Blockchain developer: A practical guide for designing, implementing, publishing, testing, and securing distributed Blockchain-based projects. Apress.
2. Solorio, K., Kanna, R., & Hoover, D. H. (2019). Hands-on Smart Contract Development with Solidity and Ethereum: From Fundamentals to Deployment. O'Reilly Media**.**

Syllabus for B. Tech. III Semester
Department of Information Technology
MINOR COURSE

Course Code	ITTM301				
Category	MINOR COURSE				
Course Title	Web Designing				
Scheme& Credits	L	T	P	Credits	Semester III
	2	1	0	3	

Course Outcomes

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

1. Understand the basic Internetworking concept and technologies
2. Create web pages using HTML.
3. Plan, design and publish websites.
4. Write PHP scripts to handle HTML forms
5. Create PHP programs that use various PHP library functions, and that can work with files.

Unit I

Introduction, Network hardware, LAN, MAN, WAN, Network topologies: Bus, Star and Ring. Basictools of Internet accesses: Email, FTP, WWW etc, Internet Protocol- HTTP, FTP, SNMP, Emailprotocols – SMTP, POP3, IMAP, MIME

HTML Programming: Tags, Special Characters, Heading, Paragraph, creation of List.

Unit II

Tables in HTML: Creation of tables, Including Images in Web Pages: Image Tag, Image mapping, Frames in HTML, creation of Forms, Introduction to Cascading style sheet (CSS).

Unit III

Introducing PHP and MySQL: History, Features, and architecture. Learning PHP: Using variables, Statements, and Operators. Using conditional statements.

Unit IV

Understanding and using different loops- for, while, do while. Understanding and using Arrays: Using Arrays to Group Related Values.

Unit V

User defined function: Defining and Invoking Functions, Using arguments and return values, Defining global and local variables, Importing function definitions.

String and regular expression: Determining length, Comparing strings Manipulating string case,Padding and striping a string. Counting characters and words.

Unit VI

Using Files, Sessions, cookies: Reading and Writing Files, Managing sessions and Using session variables, Storing data in Cookies.

Text Books

1. The Complete Reference HTML &XHTML :Thomas Powell, 3rd Edition, TMH.
2. PHP and MySQL : Vikram Vaswani, McGraw Hill

Reference Books

1. PHP 5 / MySQL Programming for the Absolute Beginner: Andy Harris, 1st Edition Thomson Publication
2. Web Design: A Beginners Guide: Wendy Willard, 2nd Edition, MGH.
3. www.php.net

Syllabus for B.Tech. Semester IV
Department of Information Technology

Course Code	ITT266				
Category	Program Core Course				
Course Title	Formal Language Automata Theory				
Scheme& Credits	L	T	P	Credits	Semester
	2	1	0	3	IV

Course Outcomes

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

1. Design Finite automata for real-life problems
2. Construct the grammar for various models
3. Use the pushdown automaton model for the given language.
4. Make use of the Turing machine concept to solve the problems.
5. Demonstrate an understanding of complexity classes, unsolved problems ,and recursive function theory.

Unit I

Introduction: Strings, Alphabet, Language, Operations, Finite state machine, Definitions, Finite automation model (FA), Acceptance of strings and languages, Non-deterministic finite automation, Deterministic finite automation, Equivalence between NFA & DFA, Conversion of NFA into DFA, Minimization of FSM, Equivalence between two FSM's, Two Way finite automata, Myhill-Nerode Minimization theorem, Moore and Mealy machines.

Unit II

Regular Expressions: Regular sets, Regular expressions (RE), Identity rules, Manipulation of regular expressions, Equivalence between RE and FA, Pumping lemma, Closure properties of regular sets, Regular grammars (RG), Right linear and Left linear grammars, Equivalence between regular linear grammar and FA, Interconversion between RE and RG.

Unit III

Grammars: Context-free grammar, Derivation trees, Chomsky normal form, Greibach normal form, Push down Automata, Definition, Model, Acceptance of CFL, Equivalence of CFL & PDA, Interconversion, Enumeration of properties of CFL.

Unit IV

Push down automata (PDA): Non determinism, acceptance by two methods and their equivalencebetween PDA and CFG, closure and decision properties of CFLs.

Unit V

Turing machine: variants, recursively enumerable set; recursive sets TM as a computer function,

decidability and solvability, Halting Problem, Post correspondence Problems (PCP) and unsolvability of ambiguity problem of CFGs, Church's hypothesis.

Unit VI

Computable Functions: Partial, Total, Constant Functions, Primitive Recursive Functions, Bounded Normalization, Regular function, Recursive Functions.

Text Books

1. An Introduction to Formal Languages and Automata: Peter Linz, Narosa Pub.
2. Theory of Computer Science: K. L. P. Mishra and N. Chandrasekaran, PHI.
3. Theory of Computation: Michael Sipser, Cengage Learning.

Reference Books

1. Introduction to Languages and the Theory of Automata: John C. Martin, McGraw Hill
2. Introduction to Automata Theory, Languages and Computation: J. E. Hopcroft, Rajeev Motwani, Pearson Education

Syllabus for B.Tech. Semester IV
Department of Information Technology

Course Code	ITT267				
Category	Program Core Course				
Course Title	Software Engineering				
Scheme& Credits	L	T	P	Credits	Semester
	3	0	0	3	IV

Course Outcomes

Upon completion of the course, students would be able to

1. Apply different software development process models for projects.
2. Analyze the various estimation and risk techniques for software project development
3. Apply UML modelling to design diagrams for the project
4. Analyze Quality Assurance parameters and respective methodologies
5. Exhibit the knowledge of Software design fundamentals for software building
6. Apply the various testing methods for software development

Unit I

Introduction to Software Engineering, Software Myths, Software Engineering a Layered Technology, Software Process Framework, Software Process Models, The Waterfall Model, Incremental Process Models, Evolutionary Process Models, Specialized Process Models, The Unified Process Model, Agile Development: Agility, XP (Extreme Programming), Other Agile process models.

Unit II

Risk management - Risk strategies, Software risks, Risk identification, Risk refinement, RMMM Software project estimation and planning, Decomposition techniques, LOC and FP estimation, Effect estimation, Identification, Projection, Assessment, Management and monitoring, Software re-engineering, Requirement analysis, Tasks, Analyst, Software prototyping

Unit III

UML diagrams for designing: Use case Diagram, Sequence diagram, Activity diagram, Data Flow Diagram, ER Diagram, Class Diagram and their usage. Case studies.

Unit IV

Quality Management - Quality Concepts, Software Quality Assurance, Software Reviews, Formal Technical Review, Statistical Software Quality Assurance, Software Reliability, Change Management - Software Configuration Management, SCM Repository, SCM Process

Unit V

Software design fundamentals- process, fundamentals, Effective modular Design, User interface design, Dash boards, Human factors, Human computer interface design, guidelines, standards.

Unit VI

Software quality assurance, Software quality factors, Quality metrics, Halstead's S/W science, Software testing - techniques, fundamentals, White box testing, Black box testing, Validation testing, System testing, Debugging software maintenance maintainability, Maintenance tasks.

Text Books

1. Software Engineering: Roger S. Pressman, 7th Edition, TMH.
2. Software Engineering, Principles and Practices: Rajesh Narang, MGH.

Reference Books

1. Software Engineering: Kassem A. Saleh, India Edition, Cengage Learning.
2. Software Engineering: Schach, Special Indian Edition, TMH.

Syllabus for B.Tech. Semester IV
Department of Information Technology

Course Code	ITP267				
Category	Program Core Course				
Course Title	Software Engineering lab				
Scheme& Credits	L	T	P	Credits	Semester
	0	0	2	1	IV

Minimum 8 Practical based on the course ITP267

Course Outcomes

Upon completion of the course, students would be able to

1. Apply different software development processes for project development
2. Apply different estimation methods for the project development
3. Design different UML Diagrams using tools
4. Apply different testing strategies

Group activity: Mini Project Designing and Prototype building and Testing.

Syllabus for B.Tech. Semester IV
Department of Information Technology

Course Code	ITT268				
Category	Program Core Course				
Course Title	Design and Analysis of Algorithms				
Scheme& Credits	L	T	P	Credits	Semester
	3	0	0	3	IV

Course Outcomes

Upon completion of the course, students will be able to

1. Justify the fundamental needs of algorithms and the reason for their analysis
2. Analyse the time and space complexity of various algorithms
3. Exhibit the knowledge of standard algorithm design techniques
4. Apply different algorithm design techniques for problem-solving
5. Design efficient algorithms for various computing problems
6. Know the limitations on the time complexity of algorithms for problem-solving

Unit I

Mathematical foundations, Summation of arithmetic and geometric series, Asymptotic notations for analysis of algorithms, Recurrence relations, Amortized analysis and application. Review of Basic Tree and Graph Traversals and Search Techniques.

Unit II

Divide and Conquer: Basic strategy. Case studies of Binary Search, Quick sort, Merge sort and Matrix operations. Other applications.
Greedy Method: Basic strategy, Case studies of Job Sequencing problem, Minimum Cost Spanning Trees and Single Source Shortest path.

Unit III

Dynamic Programming: Basic strategy. Concept of Multistage Graphs. Case studies of Al Pairs Shortest Path Algorithm, Optimal Binary Search Trees, Traveling Salesman Problem, Longest Common Subsequence Problem and its variations. Other applications.

Unit IV

Backtracking: Basic strategy. Case studies of n-Queen's problem, Graph Coloring Problem, Hamiltonian Cycles. Other applications.

Unit V

Branch and Bound: basic strategy. Implementations of some of the above problems using Branch and Bound Technique. Other applications.

Unit VI

Non-deterministic algorithms, NP-hard and NP-complete problems, Decision and Optimization problems, Graph based problems on NP Principle. Introduction to Approximation algorithms.

Text Books

1. Introduction to Algorithms: Thomas H. Cormen et.al, MIT Press.
2. Fundamentals of Computer Algorithms: Horowitz, Sahani, Rajsekharam, Computer Science Press.
3. Fundamentals of Algorithms: Brassard, Bratley, Prentice Hall, India.

Reference Books

4. The Design and Analysis of Algorithms: Dexter C. Kozen, Springer.
5. Foundations of Algorithms: Dr. S. R. Sathe, Penram Publications.

Syllabus for B.Tech. Semester IV
Department of Information Technology

Course Code	ITP268				
Category	Program Core Course				
Course Title	Design and Analysis of Algorithms Lab				
Scheme & Credits	L	T	P	Credits	Semester
	0	0	2	1	IV

Minimum 10 Practical based on the course ITT265

Course outcomes

Upon completion of the course, students will be able to

1. Analyze the functional requirements of algorithms for solving the problems
2. Demonstrate knowledge of Time and Space Complexities.
3. Derive the Time Complexity of given Algorithms
4. Demonstrate knowledge of different programming paradigms
5. Apply the different programming paradigms to solve problems

Syllabus for B.Tech. Semester IV
Department of Information Technology

Course Code	ITT269				
Category	Program Core Course				
Course Title	Database Management System				
Scheme& Credits	L	T	P	Credits	Semester
	3	0	0	3	IV

Course Outcomes

Upon completion of the course, students will be able to

1. Exhibit the knowledge of Data models and DBMS architectures
2. Design optimal database
3. Apply query processing
4. Demonstrate knowledge of various concurrency and recovery techniques
5. Exhibit the knowledge of Advanced Databases
6. Implement database system for various applications

Unit I

Introduction to database systems: Overview, File systems Vs DBMS, Various data models, Levels of abstraction, Structures of DBMS, Relational model, Relations and Integrity constraints, Relational algebra, Tuple and Domain Calculus, SQL.

Unit II

Database design: Overview of database design, ER model, Features of ER model, Conceptual design using ER model, Scheme refinement and normal forms, Scheme refinement, Use of decompositions, Functional dependencies, Multi-valued dependencies

Unit III

Query optimization and evaluation: Introduction to query processing, Selection operation, Projection operation, Join operation, Set operation and Aggregate operation, Relational query optimization, Translating SQL queries, estimating the cost, Relational algebra equivalence.

Unit IV

Concurrency control and recovery: Concepts of transaction, Transactions and schedules, Lock based concurrency control, Lock management, specialized locking techniques, Concurrency control without locking, Crash recovery, Introduction to crash recovery, Log recovery, Checkpointing.

Unit V

NoSQL Databases: Introduction, Differences from Relational Databases, Basic Schema and data types, Types of NoSQL Databases, Concepts of replication, distribution, sharding, and resilience, Use of NoSQL in Industry.

Object-Based Databases: Overview, Complex Data Types, Structures Types and Inheritance in SQL Table Inheritance, Array and Multiset Types in SQL, Object-Identity and Reference Types in SQL, implementing O-R features, Object-Relational Mapping, Object-Oriented versus Object-Relational Databases.

Unit VI

Data Storage for Modern High-Performance Business Applications: Implementing a Relational Database, implementing a Key/Value Store, implementing a Document Database, Column-Family Database, and Graph Database.

Text Books

1. Database Systems Concepts: Silberschatz, Korth, Sudarshan, McGraw-Hill
2. Advanced Database systems (Morgan Kaufmann)

Reference Books

1. Fundamentals of Database Systems: R. Elmasri, S.B. Navathe, Pearson Education
2. Seven databases in seven weeks: a guide to modern databases and the NoSQL movement. Perkins, L., Redmond, E., & Wilson, J. (2018). Pragmatic Bookshelf.

Syllabus for B.Tech. Semester IV
Department of Information Technology

Course Code	ITP269				
Category	Program Core Course				
Course Title	Database Management System Lab				
Scheme& Credits	L	T	P	Credits	Semester
	0	0	2	1	IV

Minimum 10 Practical based on the course ITP269

Course Outcomes

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

1. Apply DDL, DML and DCL commands.
2. Write queries using SQL.
3. Apply various functions and clauses in SQL.
4. Implement the concept of PL/SQL
5. Implement the database using NOSQL.

Syllabus for B.Tech. Semester IV
Department of Information Technology

Course Code	MAT281				
Category	Basic Science Course				
Course Title	Discrete Mathematics				
Scheme& Credits	L	T	P	Credits	Semester
	3	0	0	3	IV

Course Outcomes

Upon completion of the course, students will be able to

1. Construct mathematical arguments using logical connectives and quantifiers.
2. Perform operations on discrete structures such as sets, functions and relations
3. Demonstrate understanding of various algebraic structures.
4. Apply the concept of lattices and Boolean algebra to switching circuits.
5. Model different problems in computer science using graphs.

Unit I

Relation and Function: Basic concepts of Set theory, Power set, some operations on Sets, Venn diagram, some basic set identities, Cartesian products. Properties of binary relation in a set, Relation matrix and the graph of the relation, Partition and covering of a set. Equivalence relations, Compatibility relations, Compositions of binary relations. Definition and composition of functions, inverse functions and characteristic function of a set.

Unit II

Mathematical Logic: Statement and notations, connectives, Negation, conjunction, disjunction, conditional & biconditional, statement formulas & truth tables. Tautologies, equivalence of formulas, Duality law, Tautological implications. Normal Forms -Principal disjunctive and principal conjunctive normal forms. Theory of inference for statement calculus. Theory of inference for predicate calculus.

Unit III

Algebraic Structures: Semigroups, monoids -(definition and examples), Group definitions and examples, Cyclic group, permutation groups, subgroups and homomorphism, co sets and Lagrange'stheorem and Normal subgroup.

Unit IV

Rings and field: Ring (definition and examples), sub-rings, Ring homomorphism, ideals and Quotient rings, polynomial rings. Finite field, Galois field, Integral domain.

Unit V

Lattice theory and Boolean Algebra: Lattices as partially ordered set, Definitions and examples, some properties of Lattices, Lattices as algebraic system, sub lattices, direct product, homomorphism, some special Lattices. Boolean Algebra: Definitions and examples, Application of Boolean Algebra to switching circuits.

Unit VI

Graph Theory: Properties, types of graphs, Operations of graphs, Subgraphs and Isomorphic graphs, Paths, cycles and connectivity, Eulerian and Hamiltonian graphs, shortest path problems, graph coloring, vertex coloring, edge coloring, graph covering, network flows.

Text Books

1. Combinatorial Mathematics: C. L. Liu& D. P. Mohapatra, 4th edition, Tata McGraw Hill.
2. Discrete Mathematics and Its Applications, Kenneth Rosen, 7th Edition, Tata McGraw Hill.
3. Discrete Mathematical Structures with Applications to Computer Science: J. P. Tremblay and R.Manohar, Tata McGraw-hill.

Reference Books

1. Discrete Mathematics: Babu Ram, Pearson Publication.
2. Discrete Mathematics: Kolman, Busby & Ross, Pearson Publication

Syllabus for B.Tech. Semester IV
Department of Information Technology

Course Code	HUT252				
Category	Basic Science Course				
Course Title	Indian Traditional Knowledge				
Scheme& Credits	L	T	P	Credits	Semester
	2	0	0	0 (Audit Course)	IV

Course Outcomes

Students will have increased ability to understand the importance and application of:

1. Indian Knowledge system and its scientific approach
2. Indian philosophical tradition
3. Indian artistic tradition.
4. Traditional knowledge and protection of nature
5. The legality and its importance for the protection of Indian traditional knowledge

Syllabus

1. Basic Structure of Indian Traditional Knowledge : Vedas, Upavedas, Vedang, Upadang, scientific approach
2. Ecology and Indian Traditional Knowledge : Meaning, role, case studies
3. Intellectual Property Rights and Indian traditional Knowledge : Meaning, role in protection of Indian traditional knowledge, cases studies
4. Indian Philosophical traditions : Nyay, Sankaya, Yog, Mimansa, Jainism, Buddhism, Sikhism, and other approaches
5. Indian Artistic Traditions : Chitrakala, Murtikala, Vastukala, Sangeet, Sthpatya, Nrityaevam Sahitya, case studies

Reference Material

1. R R Gaur, Rajeev Sangal, G P Bagaria, Human Values and Professional Ethics (Excel Books, New Delhi, 2010)
2. V. Sivaramakrishanan (ed.), Cultural Heritage of India – Course material, Bharatiya Vidya Bhavan, Mumbai, 5th Edition, 2014
3. Swami Jitatman and, Modern Physics and Vedant, Bharatiya Vidya Bhavan
4. Swami Jitatman and, Holistic Science and Vedant, Bharatiya Vidya Bhavan
5. S.C. Chatterjee and D. M. Datta, An introduction to Indian Philosophy, University of Calcutta, 1984
6. Pramod Chandra, Indian Arts, Howard University Press, 1984
7. Krishna Chaitanya, Arts of India, Abhinav Publications,1987

Syllabus for B.Tech. Semester IV
Department of Information Technology

Course Code	ITT299-05				
Category	Open Elective Course				
Course Title	Open Elective-I : Web Development				
Scheme& Credits	L	T	P	Credits	Semester
	3	0	0	3	IV

Course Outcomes

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

1. Understand the basic Internetworking concept and technologies
2. Create web pages using HTML.
3. Plan, design and publish websites.
4. Write PHP scripts to handle HTML forms
5. Create PHP programs that use various PHP library functions, and that can work with files.

Unit I

Introduction, Network hardware, LAN, MAN, WAN, Network topologies: Bus, Star and Ring. Basictools of Internet accesses: Email, FTP, WWW etc, Internet Protocol- HTTP, FTP, SNMP, Emailprotocols–SMTP, POP3, IMAP, MIME

HTML Programming: Tags, Special Characters, Heading, Paragraph, creation of List.

Unit II

Tables in HTML: Creation of tables, Including Images in Web Pages: Image Tag, Image mapping,Frames in HTML, creation of Forms, Introduction to Cascading style sheet (CSS).

Unit III

Introducing PHP and MySQL: History, Features, and architecture. Learning PHP: Using variables,Statements, and Operators. Using conditional statements.

Unit IV

Understanding and using different loops- for, while, do while. Understanding and using Arrays: UsingArrays to Group Related Values.

Unit V

User defined function: Defining and Invoking Functions, Using arguments and return values, Defining global and local variables, Importing function definitions.

String and regular expression: Determining length, Comparing strings Manipulating string case, Padding and striping a string. Counting characters and words.

Unit VI

Using Files, Sessions, cookies: Reading and Writing Files, Managing sessions and Using sessionvariables, Storing data in Cookies.

Text Books

3. The Complete Reference HTML &XHTML :Thomas Powell, 3rd Edition, TMH.

4. PHP and MySQL : Vikram Vaswani, McGraw Hill

Reference Books

4. PHP 5 / MySQL Programming for the Absolute Beginner: Andy Harris, 1st Edition ThomsonPublication

5. Web Design: A Beginners Guide: Wendy Willard, 2nd Edition, MGH.

6. www.php.net

Syllabus for B. Tech. IV Semester
Department of Information Technology
HONOR COURSE

Course Code	ITTH401				
Category	HONOR COURSE				
Course Title	Development of Progressive Web Applications				
Scheme& Credits	L	T	P	Credits	Semester IV
	3	0	0	3	

Course Outcomes

At the end of the course students will be able to

1. Understand progressive Web applications
2. Build responsive UI
3. Use web APIs
4. Optimize progressive Web applications
5. Test and deploy progressive Web applications

Unit 1: Introduction to PWAs: Understanding PWAs

Overview, significance, and difference from traditional web and mobile applications, Core Technologies: Overview of HTML5, CSS3, and JavaScript ES6, Building Blocks of PWAs: Introduction to Service Workers, Fetch API, Cache API, Promises, and Web App Manifest.

Unit 2: Building Responsive UI and Enhancing Offline Capabilities

Designing Responsive Layouts: Introduction to responsive design principles, media queries, and accessibility considerations. Offline First Approach: Understanding the offline-first concept, working with Service Workers for offline functionality. Advanced Service Worker Management: Lifecycle, fetch and cache management.

Unit 3: Native-Like Functionality

Introduction to Web APIs: Overview of Notification API, Background Sync API, and Web Payment API. Working with IndexedDB: Introduction to IndexedDB for client-side data storage, operations on IndexedDB. Implementing Push Notifications: Working with the Notification and Push APIs.

Unit 4: PWA Optimization Techniques

PWA Performance Optimization: Understanding the PRPL Pattern, code splitting and tree shaking techniques. Application Shell Architecture: Introduction and implementation of the App Shell Model. SEO & PWA: Best practices for making PWAs SEO friendly.

Unit 5: Testing and Deployment

Testing PWAs: Using tools like Lighthouse, Chrome DevTools for testing performance and PWA features. PWA Deployment: Overview of various deployment options and considerations for deploying PWAs. Future of PWAs: Upcoming features, trends and benefits of PWAs in the near future.

Refence Books:

1. Rojas, C. (2019). Building Progressive Web Applications with Vue. js: Reliable, Fast, and Engaging Apps with Vue. js. Apress.
2. Ater, T. (2017). Building progressive web apps: bringing the power of native to the browser. " O'Reilly Media, Inc.".

Syllabus for B. Tech. IV Semester
Department of Information Technology
MINOR COURSE

Course Code	ITTM401				
Category	MINOR COURSE				
Course Title	Advanced Java Programming				
Scheme& Credits	L	T	P	Credits	Semester IV
	2	1	0	3	

Course Outcomes:

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

1. Apply J2EE architecture for development of web applications.
2. Create dynamic web application using JDBC.
3. Create dynamic web pages using Servlets and JSP.
4. Use the Struts framework.
5. Map Java classes and object associations to relational database tables with Hibernate mapping files.
6. Use Spring framework.

Unit I:

J2EE: J2EE architecture, Enterprise application concepts, n-tier application concepts, J2EE platform, HTTP protocol, web application, Web containers and Application servers, Set up Tomcat Container on a machine, Web application project structure

Unit II:

JDBC: Creating a Database and Tables, Getting Information from Database, Obtaining Result Set Information, Connecting a Java program to a Database, Prepared Statements and Statement Classes in Java, Inserting, Updating & Deleting Table data

Unit III:

Servlet: What is a Web Application, Java Servlets, What is a Servlet, Servlet Lifecycle, Servlet Context, Session management, Building the first servlet, Deploying the servlet, **JSP:** What is a JSP Page, Basic HTML Tags, JSP Tag Library, JSP Page Life cycle, Creating the first dynamic page using JSP MVC architecture, 3-tier architecture

Unit IV:

Struts: Introduction to MVC1, MVC2 Architecture, Overview of Struts Framework, Components of Model, View and Controller, Action Classes, Handling Application Requests, Generating Dynamic Views, Validating User Input, Validator Plug-in, Working with Tiles, Deployment Descriptors

Unit V:

Hibernate: Introduction to Hibernate, Object Related Mapping, Persistent Classes, Mapping Collections, Hibernate Query language, Caching and Transactions, Hibernate with web applications

Unit VI:

Spring: Introduction to Spring Framework, Spring Framework Architecture, Spring bean wiring, AOP with Spring, Transactions management, Spring with database

Text Book:

1. Database Programming with JDBC and Java 2e,
2. Head First Servlets and JSP, Kathy Sierra, Bryan Basham, Bert Bates, O'Reilly Media, Inc.
3. Spring in Action, Craig Walls, Manning Publication
4. Struts: The Complete Reference, James Holmes McGraw-Hill Education
5. Java Persistence with Hibernate, Gary Gregory, Christian Bauer, Manning Publication

Reference Book:

1. Spring Microservices in Action, John Cornell, Manning Publication
2. The Struts Framework: Practical Guide for Java Programmers, The Struts Framework: Practical Guide for Java Programmers, Sue Spielman, Morgan Kaufmann
3. Hibernate in Action, Christian Bauer and Gavin King, Manning Publication

Syllabus for B. Tech. V Semester

Department of Information Technology

Course Code	ITT371				
Category	Professional Core Course				
Course Title	Compiler Design				
Scheme& Credits	L	T	P	Credits	Semester
	3	1	0	4	V

Course Outcomes

On successful completion of the course, the student will be able to:

1. Exhibit the knowledge of Lexical Analyzer and use of Lex tool
2. Apply the concepts of different Parser Techniques and know their pros and cons.
3. Apply the knowledge of semantic rules to generate Intermediate code.
4. Demonstrate an understanding of performing code optimization.
5. Evaluate the performance of code generation techniques.
6. Exhibit the understanding of symbol table data structures and parallelism concept in compiler design.

Unit I: Introduction

Introduction to Compilers: Compilers and Translators, Phases of compilation and overview, cross compiler, Bootstrapping, Design of Lexical analyzer, study of Lex / Flex.

Unit II: Parsers

Syntax Analysis: Specification of syntax of programming languages using CFG, Top-down parser technique, design of LL (1) parser, bottom up parsing technique, LR parsing algorithm, Design of SLR, LALR, CLR parsers. Study of Yacc / Bison.

Unit III: Intermediate Code

Syntax directed translation: Study of syntax directed definitions & syntax directed translation schemes, implementation of SDTS, intermediate code notations: postfix, syntax tree, TAC. Using SDTS for translation of expression, controls structures, declarations, procedure calls, and Array reference.

Unit IV: Code Optimization

Code optimization: Analysis of code using basic blocks, Important code optimization techniques, loop optimization, control flow analysis, data flow analysis, Loop invariant computation, Induction variable removal, Elimination of Common sub expression.

Unit V: Code Generation

Code generation: Problems in code generation, Simple code generator, Register allocation and assignment, Code generation from DAG, Peephole optimization, Runtime Organization- Activation Records

Unit VI: Symbol Table and Parallelism

Symbol TableManagement, Automatic Parallelization- Optimizations for Cache Locality and Vectorization, Instruction Scheduling and Software Pipelining

Text Books

1. Compilers: Principles, Techniques and Tools: A. Aho, Ravi Sethi, Jeffrey Ullman, Second Edition, Addison-Wesley Publication.
2. Compilers: Principles, Techniques and Tools: A. Aho, Ravi Sethi, Jeffrey Ullman, Addison-Wesley Pub.

Reference Books

1. Compiler Design: O. G. Kaden, 4th Edition, University Science Press.
2. Principles of Compiler Design: V. Raghavan, MGH.

Syllabus for B. Tech. Semester V
Department of Information Technology

Course Code	ITT372				
Category	Professional Core Course (PCC)				
Course Title	Operating systems				
Scheme& Credits	L	T	P	Credits	Semester
	3	0	0	3	V

Course Outcomes:
On successful completion of the course, the student will be able to:

1. Describe the role of Operating Systems and their types.
2. Use the concept of a process, thread, and scheduling algorithms.
3. Demonstrate the concept of process synchronization in real-life problems.
4. Analyze the occurrence of deadlock and handle it.
5. Apply various memory management techniques to real-life problems.
6. Apply the concept of file system, disk scheduling, protection, and security.

Unit I:
Introduction, Services provided by OS, System programs and System Calls - brief discussions of the evolution of OS Multiprogramming systems, Time sharing, Real-time systems, Multiprocessor system - and distributed systems: a brief overview of issues.

Unit II:
Processes and 3 levels of scheduling, process control block and context switch, goals of scheduling and different scheduling algorithms, threads: user-level and kernel level.

Unit III:
Process cooperation and synchronization, mutual exclusion, the critical section problem, semaphores, classical inter - process communication problems.

Unit IV:
Deadlocks and strategies for handling them: Deadlock characterization, Deadlock prevention, Deadlock avoidance, Deadlock Detection and Recovery, Combined approach to deadlock handling.

Unit V:
Memory management techniques, contiguous and non-contiguous, paging and segmentation, translation look-aside buffers (TLB) and overheads, virtual memory and demand paging, page faults and instruction restart, problems of large address spaces, page tables and page replacement algorithms, miscellaneous issues.

Unit VI:
File systems, disk space management and space allocation strategies, directory structures, disk arm scheduling strategies.
Protection and security: protection and security issues, cryptographic techniques

Text Books:

1. Operating System Concepts: Silberchatz & Galvin, 6th Edition, Addison Wesley.
2. Operating Systems: Internals and Design Principles, William Stallings, 5th Edition, Pearson Education.

Reference Books:

1. Operating System by Concept & Design: Milan Milenkovic, 2nd Edition, MGH.
2. Operating System: Madnick & Donovan, 1st Edition, MGH.
3. Modern Operating Systems: Tanenbaum, 2nd Edition, PHI.

Syllabus for B.Tech. Semester V

Department of Information Technology

Course Code	ITP372				
Category	Professional Core Course				
Course Title	Operating systems Lab				
Scheme& Credits	L	T	P	Credits	Semester
	0	0	2	01	V

Course Outcomes

On successful completion of the course, the student will be able to:

1. Demonstrate the use of various System calls
2. Write programs for CPU scheduling.
3. Write programs using cooperating processes.
4. Write a program for deadlock avoidance.
5. Write programs for memory management.
6. Write virus programs and their countermeasures.

Description
Programs to demonstrate shell programming
Programs to Demonstrate various Systems Calls for File Handling and Process Management
Program to demonstrate the various CPU Scheduling algorithms
Program to demonstrate any Process Synchronization algorithm for cooperating processes
Program to demonstrate Deadlock Avoidance algorithm
Program to demonstrate Memory Management techniques
Program to create different types of Virus and provide countermeasures for the same

Syllabus for B. Tech. Semester V
Department of Information Technology

Course Code	ITT373				
Category	Professional Core Course				
Course Title	Computer Networks				
Scheme& Credits	L	T	P	Credits	Semester
	3	0	0	3	V

Course Outcomes:

On successful completion of the course, the student will be able to:

1. Exhibit the knowledge of layered architecture for networking.
2. Know the design issues at different layers in network architecture.
3. Analyze the protocols w.r.t their performance at different layers.
4. Apply the algorithms at different layers to solve problems.
5. Apply IP addressing for configuring the networks.
6. Exhibit knowledge of standard network services.

Unit I

Introduction: Network hardware, Network software, Protocol hierarchies, Design issues for layers. The ISO-OSI reference model, TCP/IP model.

Physical Layer: Issues, Transmission Impairments, Data Rate Limits, Performance. Bandwidth Utilization: Multiplexing, Transmission Media: Guided and Unguided.

Unit II

Data Link Layer - Design issues, Services, Error Detection and Correction, Data Link Control, Elementary Data Link Layer protocols.

The Medium Access Sub Layer: Multiple Access Protocols, IEEE standards: Ethernet (802.3), Wireless LAN (802.11).

Unit III

Network Layer: Design issues, Comparison of Virtual Circuit and Datagram subnets, Routing algorithms, Congestion control algorithms, Congestion control in Virtual Circuit subnets.

Unit IV

IPv4 Addressing, Datagram forwarding in IP4, Subnetting, CIDR Notation. Address Translation (ARP), Host Configuration (DHCP), Error Reporting (ICMP), Introduction to IPv6.

Unit V

Transport layer: Services, Addressing, Establishing and releasing a connection, Flow

control/buffering, Multiplexing and Crash recovery. Congestion control and Quality of Service. Introduction to UDP and TCP.

Unit VI

Application Layer: Name Service (DNS) application, Introduction to Electronic Mail System and World Wide Web.

Text Books

1. Computer Networks: Andrew Tanenbaum, 4th Edition, PHI.
2. Data Communication and Networking: Behrouz Forouzan, 4th Edition, TMH.
3. Computer Networks and Internet: Douglas Comer, 5th Edition, PHI.

Reference Books

1. Introduction to Data Communications and Networking: Wayne Tomasi, 1st Edition, Pearson Education.
2. Computer Networks: A systems approach: Larry. L. Peterson, Bruce. S. Davie, 3rd Edition, Morgan Kaufmann publishers.

Syllabus for B. Tech. Semester V
Department of Information Technology

Course Code	ITP373				
Category	Professional Core Course				
Course Title	Computer Networks Lab.				
Scheme& Credits	L	T	P	Credits	Semester
	0	0	2	1	V

Course Outcomes

On successful completion of the course, the student will be able to:

1. Demonstrate the functionality of various software and hardware components of networking.
2. Implement the layered functionalities at different layers.
3. Configure different devices like routers, and host machines for setting up a network.
4. Use different networking tools like Wire Shark and Network Visualizer.

Syllabus for B. Tech. V Semester
Department of Information Technology

Course Code	ITT374				
Category	Program Core Course (PCC)				
Course Title	Introduction to Machine Learning				
Scheme& Credits	L	T	P	Credits	Semester
	2	1	0	3	V

Course Outcomes

On successful completion of the course, the student will be able to:

1. Exhibit the Fundamental Concept and Importance of Machine Learning.
2. Analyze different models of learning.
3. Apply learning models to Real-World Challenges.
4. Apply various supervised learning methods to appropriate problems.
5. Create probabilistic and unsupervised learning models for handling unknown pattern.

Unit I:

Basics of Machine Learning, Supervised Learning, Unsupervised Learning, Cost Function, Regression, Linear Regression, Multiple linear regressions, Loss function, Least-squares fit, Statistical view on the regression, Gradient descent, Gradient Descent for Linear Regression, Modelling and evaluation.

Unit II:

Instance-Based Learning: k-Nearest neighbor algorithm, Decision Tree Learning, Case-based Reasoning, Multiclass classification, Multilabel classification, Logistic regression.

Unit III:

Artificial Neural Networks: Types of Learning, Introduction of Multilayer Networks and back-propagation, Activation functions, recurrent neural networks, Types of RNN, Vanishing and Exploding gradient problem, Applications of ANN and RNN.

Unit IV:

Ensemble and Probabilistic Learning: Ensemble Learning, Ensemble Learning techniques, Blending, Bagging, Random Forest Trees, Boosting, Adaboost, Stacking, Gradient Boosting. Probabilistic Models: Gaussian mixture models, The Expectation-Maximization (EM) Algorithm, Naive Bayes Algorithm

Unit V:

Ensemble Learning, Ensemble Learning techniques, Stacking, Blending, Bagging, Boosting, Adaboost, Gradient Boosting.

Unit VI:

Introduction and implementations: Clustering, Hierarchical Clustering, K-means Clustering, Reinforcement Learning: Introduction, Learning Task, Q Learning, Non deterministic Rewards and actions, Relationship to Dynamic Programming, Active reinforcement learning, Generalization in reinforcement learning.

Text Books

1. Mitchell Tom. Machine Learning. Tata McGraw Hill, 1997.
2. Richard O. Duda, Peter E. Hart, David G. Stork. Pattern classification, Second Edition, Wiley, New York, 2001.
3. Christopher Bishop, Pattern Recognition and Machine Learning (Information Science and Statistics), First Edition
4. Aurelien Geron, Hands-on Machine Learning with Scikit-Learn, Keras & Tensor Flow, Third Edition

Reference Books

1. Earl Gose, Richard Johansabaugh, Steve Jost, Pattern Recognition and Image Analysis. Prentice-Hall of India Pvt.Ltd.

Syllabus for B. Tech. V Semester
Department of Information Technology

Course Code	ITP374				
Category	Program Core Course (PCC)				
Course Title	Introduction to Machine Learning Lab.				
Scheme& Credits	L	T	P	Credits	Semester
	0	0	2	1	V

Course Outcomes

On successful completion of the course, student will be able to:

6. Apply Regression Model for evaluation.
7. Analyze the results of regression model evaluation metrics to interpret the accuracy, and precision.
8. Apply learning models to Real-World Challenges.
9. Implement machine learning algorithms on real-world datasets.
10. Assess the strengths and limitations of different machine learning algorithms

Description
Evaluate a regression model using the following metrics: 1. Mean Absolute Error 2. Mean Squared Error 3. R squared Error
Implement a Linear Regression Model on given datasets
Identify Overfitting and Under fitting on given datasets
Implement Logistic Regression on given datasets
Implement Decision tree
Implement SVM for both classification and regression tasks.
Implement the KNN algorithm for both classification and regression
Implement Gaussian Naïve Bayes learning on given datasets
Implement K-Means Clustering.
Open Ended Experiments

Syllabus for B. Tech. V Semester
Department of Information Technology

Course Code	ITT398-05				
Category	Open Elective Course				
Course Title	Mobile Apps Development				
Scheme & Credits	L	T	P	Credits	Semester
	3	0	0	3	V

Course Outcomes

On successful completion of the course, the student will be able to:

1. Analyze the different aspects of mobile app development.
2. Design and develop mobile apps using Android as a development platform with a key focus on user experience design, native data handling, and background tasks and notifications.
3. Apply the concepts of Intent, Fragment, ListView, Progress bar, Seek bar and Rating bar.
4. Apply the concepts of native hardware, location awareness, graphics, and multimedia in building real-world applications.
5. Apply techniques of software testing and review.
6. Perform testing signing, packaging, and distribution of mobile apps.

Unit I: Getting started with Mobility: Mobility landscape, Mobile platforms, Mobile apps development, Overview of Android platform, setting up the mobile app development environment along with an emulator, a case study on Mobile app development.

Unit II: Building blocks of mobiles apps: App user interface designing –mobile UI resources (Layout, UI elements, Draw-able, Menu), Activity-state and life cycle, interaction amongst activities. App functionality beyond user interface – Threads, Async task, Services – States and life cycle, Notification, Broadcast receivers, Telephony and SMS APIs.

Unit III: Working with View Groups, Building data with the AdapterView Class, Designing AutoTextCompleteView, Implementing Screen Orientation, Designing the views programmatically, Handling UI events, Creating Menus

Unit IV: Intents: Explicit Intents, Implicit intents, Fragments, Webview, ListView, Spinner, Alert Dialog, Rating Bar, Seek Bar, Progress Bar

Unit V: Sprucing up mobile apps: Graphics and animation – custom views, canvas, animation APIs, multimedia – audio/video playback and record, location awareness and native hardware access (sensors such as accelerometer and gyroscope), Native data handling: On device file I/O, shared preferences, Mobile databases such as SQLite, and enterprise data access (via Internet /Internet)

Unit VI: Testing of Mobile App: Different levels of testing, different types of testing, Static Testing types, Dynamic Testing types, Debugging mobile apps , Test automation of mobile apps, Taking apps to market, Versioning, signing and packaging mobile apps, distributing apps on mobile market place, Localization, Prework for publishing app

Text Books

1. Android Application Development all in one for Dummies - Barry Burd, 1st Edition, John Wiley and Sons.
2. Teach Yourself Android Application Development 24 Hours- Lauren Darcy, 1st Edition, Pearson.

Reference Books

1. Mobile Apps Development : Anubhav Pradhan , Anil V. Deshpande, 1st Edition, Wiley India
2. Foundations of Software Testing: Dorothy Graham, Erik van Veenendaal, Isabel Evans, Rex Black, 2nd Revised Edition, Cengage Learning.

Syllabus for B. Tech. V Semester
Department of Information Technology

Course Code	ITP375				
Category	PROJC				
Course Title	Project-I				
Scheme& Credits	L	T	P	Credits	Semester
	0	0	4	2	V

Course Outcomes

On successful completion of the course, the student will be able to:

1. Demonstrate a sound technical knowledge of the selected project topic.
2. Undertake requirement analysis for the problem statement.
3. Design engineering solutions for problems using a software development approach.
4. Communicate with engineers and the community at large in written and oral forms.
5. Demonstrate the knowledge, skills, and attitudes of a professional engineer.
6. Learn to work as a team for timely completion of project work.

Syllabus for B. Tech. V Semester
Department of Information Technology

Course Code	HUT354				
Category	HSSM				
Course Title	Managerial Economics				
Scheme& Credits	L	T	P	Credits	Semester
	2	0	2	2	V

Course Outcomes

1. Students will understand and apply the basic knowledge of Economics to take managerial decisions.
2. Students will understand various concepts of demand and supply.
3. Students will apply various theoretical concepts of Utility, Indifference curve and revealed preference to take decisions related to consumer behaviour.
4. Students will be able to carry analysis of process of production and cost.
5. Students will be able to evaluate various forces impacting price and output in different markets.
6. Understanding and recalling the concepts and issues of macroeconomics will enable the students to discharge their duties effectively as managers.

Unit I: Nature and scope of Managerial Economics

Introduction: Meaning of Managerial Economics, Managerial Economics and Economic Theory, Types of business decisions, Managerial decision process, Firm as an agent of production, business and social responsibility.

Unit II: Demand and Supply

Demand: Meaning of Demand, determinants of demand, types of demand, Law of demand, Movements and shifts of demand curve, Elasticity of demand, types of elasticity of demand, Measurement of elasticity of demand, application of elasticity of demand.

Supply: Concept of supply and its use in business, Distinction between Supply and Stock, Law ofsupply, Movements and shifts of supply curve, Elasticity of supply, types of elasticity of supply, factorsthat determine elasticity of supply, Measurement of elasticity of supply.

Unit III: Theory of Consumer Behaviour

Nature of Human wants, Marginal Utility Analysis, Indifference Curve Analysis, Revealed preference theory of demand.

Unit IV: Theory of Production and cost

Meaning of Production, factors of Production, Law of variable proportions, Economies and Diseconomies of scale.

Theory of Cost: Cost Analysis and Cost Concepts.

Unit V: Price and output Determination in Different Markets

Meaning of Market, types of market, Price and output determination under different market forms.

Unit VI: Macroeconomics for management

Concepts and issues: Consumer Price Index, Wholesale Price Index, BOP, Current and Capital account, GDP, GNP, PI, Inflation, Business cycles, Monetary policy

Text Books

1. Ahuja H.L., (2017) Managerial Economics, Analysis of managerial Decision making, S. Chandand company Limited, New Delhi, 9th ed.
2. Dwivedi D.N., (2015). Managerial Economics, Vikas publishing house Pvt. Ltd, Nodia, 8th ed.

Reference Books

1. Mankiw G., (2008) Principles of Economics (Kindle Edition) South Western Cengage Learning, Nodia 6th ed.
2. Salvatore, D., (2007) Managerial Economics. London: Oxford University Press, 6th ed.

Syllabus for B. Tech. V Semester
Department of Information Technology
HONOR COURSE

Course Code	ITTH5001-01				
Category	HONOR COURSE				
Course Title	Cloud-Native Apps Development				
Scheme& Credits	L	T	P	Credits	Semester
	4	0	0	4	V

Course Outcomes

At the end of the course students will be able to

Course Objectives:

1. Understand the principles and practices of cloud-native application development.
2. Develop proficiency in building scalable, resilient, and portable applications using Node.js.
3. Gain practical experience in deploying and managing cloud-native applications on cloud platforms.
4. Learn to leverage cloud services and infrastructure to optimize application performance and reliability.
5. Explore best practices for designing and architecting microservices-based applications.
6. Develop skills in automated testing, continuous integration, and continuous deployment (CI/CD) for cloud-native applications.

Syllabus:

Unit 1: Introduction to Cloud-Native Development

Overview of cloud computing and its benefits, Introduction to cloud-native architecture and design principles, Understanding microservices and containerization, Introduction to Node.js and its role in cloud-native development

Unit 2: Building Cloud-Native Applications with Node.js

Setting up development environment with Node.js and npm, Basics of asynchronous programming in Node.js, Designing RESTful APIs with Express.js, Integrating databases with Node.js applications (MongoDB, PostgreSQL), Implementing authentication and authorization using Passport.js

Unit 3: Containerization with Docker

Introduction to Docker and containerization concepts, Building Docker images for Node.js applications, Managing multi-container applications with Docker Compose, Best practices for container security and optimization, Deploying Docker containers to local and cloud environments

Unit 4: Serverless Computing

Introduction to serverless computing and its benefits, Developing serverless functions with AWS Lambda or Google Cloud Functions, Integrating serverless functions with Node.js applications, Serverless architectures and event-driven design patterns, Deploying serverless applications to cloud platforms

Unit 5: CI/CD for Cloud-Native Applications

Introduction to continuous integration and continuous deployment (CI/CD), Setting up CI/CD pipelines for Node.js applications with Jenkins or GitLab CI, Automating testing and code quality checks in CI/CD pipelines, Deploying applications to cloud platforms using CI/CD pipelines, Implementing blue-green deployments and canary releases

Unit 6: Cloud-Native Services and Best Practices

Overview of cloud-native services (AWS, Azure, Google Cloud), Leveraging managed services for databases, storage, and messaging, Implementing service mesh for microservices communication, Designing for scalability, resilience, and observability, Best practices for securing cloud-native applications

Refence Books:

3. Rojas, C. (2019). Building Progressive Web Applications with Vue. js: Reliable, Fast, and Engaging Apps with Vue. js. Apress, First Edition.

4. Ater, T. (2017). Building progressive web apps: bringing the power of native to the browser. " O'Reilly Media, Inc." First Edition.

Syllabus for B. Tech. V Semester
Department of Information Technology

Course Code	ITTM501				
Category	Minor Course				
Course Title	Data Warehousing and Business Intelligence				
Scheme& Credits	L	T	P	Credits	Semester I
	3	1	0	4	

Course Outcomes

On successful completion of the course, the student will be able to:

1. Understand the need for Data Warehouse and Business Intelligence
2. Understand the Architecture of a data warehouse and methods for data gathering and data pre-processing using OLAP tools.
3. Apply knowledge of different data mining models and techniques.
4. Differentiate between Transaction Processing and Analytical applications and describe the need for Business Intelligence.
5. Demonstrate understanding of technology and processes associated with Business Intelligence framework.

Syllabus

Unit I

Foundation: Introduction to DATA Warehousing. Client/Server Computing model & Data Warehousing. Parallel processors & Cluster Systems. Distributed DBMS implementations. Client/Server RDBMS Solutions. Data Warehousing: Data Warehousing Components. Building a Data Warehouse. Mapping the Data Warehousing to a Multiprocessor Architecture.

Unit II

DBMS Schemas for Decision Support. Data Extraction, Cleanup and Transformation Tools. Metadata. Business Analysis: Reporting & Query Tools & Applications. On line Analytical Processing (OLAP).

Unit III

BI Definitions & Concepts, Business Applications of BI, BI Framework, Role of Data Warehousing in BI, BI Infrastructure Components – BI Process, BI Technology, BI Roles & Responsibilities

Unit IV

Concepts of Data Integration Need and Advantages of Using Data Integration, Introduction to Common Data Integration Approaches, Introduction to ETL, Introduction to Data Quality, Data Profiling Concepts and Applications.

Unit V

Introduction to Data and Dimension Modeling, Multidimensional Data Model, ER Modeling Vs. Multi Dimensional Modeling, Concepts of Dimensions, Facts, Cubes, Attribute, Hierarchies, Star and Snowflake Schema, Introduction to Business Metrics and KPIS, Creating Cubes Using SSAS, Introduction to Enterprise Reporting, Concepts of Dashboards, Balanced Scorecards, and Overall Architecture.

Unit VI

Data Mining: Introduction to Data Mining, Mining Multimedia Databases, Mining Time Series and Sequence Data, Mining Text Database, Mining World Wide Web, Data Mining Applications, Additional themes on Data Mining, Social Impacts of Data Mining.

Text Books:

1. Data Warehousing, Data Mining & OLAP: Berson, 2nd Edition, TMH.
2. Data Mining: Concepts and Techniques : Jiawei Han and Micheline Kamber, 2nd edition Morgan Kaufmann Publishers, 2006.
3. Fundamentals of Business Analytics: R N Prasad, Seema Acharya, 1st Edition Wiley India.

Reference Books:

1. Data Warehousing System: Mallach, TMH.
2. Data Mining and Knowledge Discovery Technologies (Advances in Data Warehousing and Mining : David Taniar , IGI Publication
3. Business Intelligence: David Loshin, 2nd Edition, Morgan Kaufman publishers, Harcourt India pvt. Ltd.
4. Business intelligence for the enterprise: Mike Biere, First edition.

Syllabus for B.Tech. Semester VI
Department of Information Technology

Course Code	ITT376				
Category	Professional Core Course				
Course Title	Cryptography and Network Security				
Scheme& Credits	L	T	P	Credits	Semester
	3	0	0	3	VI

Course Outcomes

On successful completion of the course, the student will be able to:

1. Gain familiarity with different types of attacks and defences against them.
2. Apply knowledge of Mathematics required for cryptography.
3. Develop an understanding of conventional and modern ways of providing information security.
4. Understand and analyze various standard security protocols.
5. Get acquainted with the concept of Blockchain

Unit I

Types of Attacks and Software Vulnerabilities, Mathematics of Cryptography

Unit II

Classical Ciphers, Modern Block ciphers: DES, Triple DES, Blowfish, AES and modes of operation, Asymmetric key ciphers: RSA, Rabin, ElGamal

Unit III

Message Integrity and Authentication: Requirements of Hash functions and MAC, Algorithms: MD5,SHA-1, Whirlpool, HMAC. Digital Signatures: Algorithms: RSA, ElGamal, Schnorr, DSS, Attacks, variations and applications.

Unit IV

Key Management: Symmetric key distribution, Symmetric key agreement, Public key distribution.

Entity Authentication: Password based, Challenge Response protocols, Zero knowledge protocols, Biometrics.

Unit V

Security at Application layer: PGP, SET Security at Network layer: IPSec Security at Transport layer: SSL and TLS

Unit VI

System Security: Buffer overflow and malicious software, Intrusion detection system, Fire walls. Introduction to Block chain: Concepts, Private Vs Public Block chain, Various consensus mechanisms.

Text Books

1. Cryptography & Network Security: Behrouz A. Forouzan, Debdeep Mukhopadhyay, 3rdEditionMGH.
2. Cryptography & Networks Security Principles & Practice: William Stallings,5th Edition, PearsonEducation.

Reference Books

1. Network Security and Cryptography: Bernard Menezes, 1st Edition, Cengage Learning.
2. NPTEL videos on the course Block chain Architecture Design and Use cases.

Syllabus for B. Tech. VI Semester
Department of Information Technology

Course Code	ITT377				
Category	Professional Core Course				
Course Title	Artificial Intelligence				
Scheme& Credits	L	T	P	Credits	Semester
	2	1	0	3	VI

Course Outcomes

On successful completion of the course student will be able to:

1. Ability to formulate an efficient problem space for a problem expressed in natural language.
2. Apply basic principles of AI in solutions that require problem-solving, inference
3. Possess the ability to apply AI techniques to solve problems of game playing using local and adversial search algorithms
4. Demonstrate knowledge of reasoning, uncertainty, and knowledge representation for solving real-world problems
5. Analyze and illustrate how planning is used in problem-solving

Unit I: Introduction

Evolution of AI, State of Art -Different Types of Artificial Intelligence- Applications of AI-Subfields of AI-Intelligent Agents- Structure of Intelligent Agents Environments.

Unit II: Problem Solving based on Searching

Problem Solving by searching Methods-State Space search, Uninformed Search Methods – Uniform Cost Search, Breadth First Search- Depth First Search-Depth limited search, Iterative deepening depth-first, Informed Search Methods- Best First Search, A* Search.

Unit III: Local and Adversarial Search

Local Search algorithms – Hill-climbing search, Simulated annealing, Genetic Algorithm, Adversarial Search: Game Trees and Minimax Evaluation, Elementary two-player games: tic-tac-toe, Minimax with Alpha-Beta Pruning.

Unit IV: Logic and Reasoning

Propositional Logic-First Order Logic-Inference in First Order Logic- Unification, Forward Chaining, Backward Chaining, Resolution.

Unit V: Uncertain Knowledge and Reasoning

Quantifying Uncertainty- Bayes Rule -Bayesian Belief Network- Approximate Inference in Bayesian networks**.**

Unit VI: Planning

Planning as State-space search, Forward search, backward search, Planning graphs, Hierarchical Planning.

Text Books

1. Artificial Intelligence: A Modern Approach, Stuart Russell and Peter Norvig, 3rd Edition Prentice-Hall.
2. Introduction to Artificial Intelligence & Expert System: D. Patterson, 1st Edition, PHI

Reference Books

1. Fundamentals of Artificial Intelligence, K. R. Chowdhury, Springer, 2020.

Syllabus for B. Tech. VI Semester
Department of Information Technology

Course Code	ITP377				
Category	Professional Core Course				
Course Title	Artificial Intelligence Lab.				
Scheme& Credits	L	T	P	Credits	Semester
	0	0	2	1	VI

Course Outcomes

On successful completion of the course, the student will be able to:

1. Apply problem-solving search algorithms for real-time problems
2. Simulate a given problem scenario and analyze its performance
3. Apply AI techniques to solve problems using a programming tool.
4. Develop programming solutions for Bayesian Networks

Title
Write a program to implement Water Jug Problem Idea: Consider 3 water jug, 8L 5L and 3L. Jugs can't be filled from the tap, 8L jug is full. Distribute the equal water 4L in two jugs) **OR** Missionaries and Cannibals is a problem in which 3 missionaries and 3 cannibals want to cross from the left bank of a river to the right bank of the river. There is a boat on the left bank, but it only carries at most two people at a time (and can never cross with zero people). If cannibals ever outnumber missionaries on either bank, the cannibals will eat the missionaries.
Write a program to find goal node using a) DFS / BFS b) UCS Note: Apply this algorithm on any state space
Write a program to implement A* search on given Map
Write a program to implement Minimax algorithm on random graph (Assume suitable values at leaf/ terminal node
Study one problem each on Uninformed search, Informed Search and CSP using Simpleai library of python https://simpleai.readthedocs.io/en/latest/
Implement the concept of Knowledge Representation

Implement the concept of Bayesian Networks
Design an simple ChatBot

Syllabus for B. Tech. VI Semester
Department of Information Technology

Course Code	ITT378				
Category	Program Core Course (PCC)				
Course Title	Cloud Computing				
Scheme& Credits	L	T	P	Credits	Semester
	2	1	0	3	VI

Course Outcomes

On successful completion of the course, the student will be able to:

1. Exhibit the understanding of virtualization technologies.
2. Apply the existing virtualization technologies to solve real-world problems.
3. Analyze architecture, services, and challenges in Cloud computing.
4. Know the services of the AWS platform and their usage.
5. Know services on the Microsoft Azure platform and their usage.

Unit I

Introduction: Traditional server concept: pros and cons. Need of Virtualized Technology, Benefits of Virtualization. Hypervisors, Types of Hypervisors, Full Virtualization, Para Virtualization, Hardware Assisted Virtualization, Types of virtualizations: Various forms of virtualization: Desktop, Application, Server, Hardware, Storage, Memory and I/O virtualization. Virtualization at different levels. Virtualization Vs Containerization, Concept of Containers, Container Orchestration.

Unit II

Virtualization Technologies: Software Virtualization, Hardware Virtualization, Application Virtualization, Storage Virtualization, OS Virtualization. Accomplishing Virtualization. High availability of Data Centers, Planned and unplanned maintenance activities in a datacenter. Migration: Migration consideration, Things to do before migration of servers- Discovery, Assessment and Migration. Concepts of Networking: CIDR Blocks, Subnet Mask, Designing a network.

Unit III

Cloud Computing Fundamental: Cloud deployment models, Cloud service models. Benefits and challenges of cloud computing. Regions, Availability zones, Edge locations. Fundamentals of pricing: Total cost of ownership (TCO) and monthly calculator.

Unit IV

Amazon Web services (AWS): AWS core services: Storage: Simple Storage service (S3), Elastic Block Store (EBS), Elastic File Store (EFS), Content Delivery Network (CDN), Cloudfront, Snowball, Snowmobile, Route53.

Unit V

Introduction to Microsoft Azure, Subscription, Resource Group, Resource Deployment Models, Different methods of creating resources: Azure portal, Cloud shell, ARM templates, Virtual Networking in cloud.

Unit VI

Compute Services in AWS and Azure: Elastic Compute Cloud (EC2) in AWS and VMs in Azure, Virtual Machine creation in Windows and Linux platform, Remote Desktop Protocol (RDP), Secure Shell (SSH) protocol, Security Groups, Load balancer, Auto scaling.

Text Books:

1. Distributed and Cloud Computing : Kai Hwang, Geoffrey C. Fox, Jack J. Dongarra, 1st Edition Elsevier
2. Cloud Computing Basics: A Non-Technical Introduction, Anders Lisdorf, Apress Publication.
3. Cloud Computing Bible : Barrie sosinsky, Wiley- India Edition
4. Cloud Computing : A Practical approach for learning and Implementation, A. Srinivasan, J. Suresh, 1stEdition, Pearson Publication

Reference Books:

1. The Complete Cornerstone Guide to Virtualization Best Practices: Ivanka Menken, Paperback, 2ndEdition, Emereo Pty Ltd.
2. Cloud Computing Explained: Implementation Handbook for Enterprise, 2013 Edition, Recursive Press Publication.
3. Enterprise Cloud Computing : Technology, Architecture, Applications, Gautam Shroff, 1st Edition, Cambridge University Press
4. Cloud Computing : Dr. Kumar Saurabh, 2nd Edition, Wiley- India Edition

Syllabus for B.Tech. VI Semester
Department of Information Technology

Course Code	ITP378				
Category	Program Core Course (PCC)				
Course Title	Cloud Computing Lab				
Scheme& Credits	L	T	P	Credits	Semester
	0	0	2	1	VI

Course Outcomes

On successful completion of the course, the student will be able to:

1. Identify and use the appropriate cloud service for a given application.
2. Demonstrate the use of Virtualization technology.
3. Demonstrate the need for high availability in the Cloud environment.
4. Design and Create a Virtual Network in the Cloud
5. Deploy Storage and application services on the Cloud platform.

Description
Configure Virtual Machines in Cloud
Configure High Availability of servers in Cloud
Configure Storage in Cloud
Configure Load Balancing and Auto Scaling for servers in Cloud
Design and Configure Network in Cloud
Establish Communication among Cloud Networks.

Syllabus for B. Tech. VI Semester
Department of Information Technology

Course Code	ITT379-01				
Category	Program Elective Course (PEC)				
Course Title	Customer Relationship Management				
Scheme& Credits	L	T	P	Credits	Semester
	3	0	0	3	VI

Course Outcomes

On successful completion of the course, the student will be able to:

1. Gain a comprehensive understanding of the Salesforce platform, its features, and capabilities.
2. Learn how to administer Salesforce orgs effectively, including user management, security settings, customization options, and data management.
3. Acquire skills in Salesforce development, such as building custom applications, creating custom objects, fields, and workflows, and writing Apex code.
4. Understand how to configure Salesforce to meet business requirements, including setting up objects, fields, page layouts, and validation rules.
5. Learn how to automate business processes using Salesforce tools like Process Builder, Workflow Rules, and Flow.

Unit I: Introduction to CRM, Identity Confirmation: CRM functionalities, Products of SF, Login to SF page, Sales Architecture, Accounts, Contacts, Lead, Cases

Unit II: Customization: Create Custom Profiles and Users, Custom Objects & Custom Fields & Custom Tabs, Customizing Relationships, Formula fields and Rollup summary fields, Define Dependent Picklists, Customize page Layouts, Records Types, Customize Standards related lists, Learn About Record Types & Business Processes, Use Field Level Security

Unit III: Security and Access: Set Organization-Wide Defaults, Role Hierarchy, Public Groups, Queues, Permission Sets Sharing Rules, Workflow: Define Workflow, Set up workflow rules, Setup workflow tasks & Email Alerts & Field Updates, Time dependant workflows.

Unit IV: Introduction to Apex: Data Types (Primitive Data Types, sObject Types), Writing Anonymous Blocks with Apex Datatypes, Use DML Statements, Sample Programs using the above concepts, Retrieving records from database: sObject Relationships, SOQL, SOSL, Apex Sharing, Sample programs using the above concepts

Unit V: Collections: Types of Collections, Creating an Apex Class, Calling a Class Method, Alternative Apex Class Creation, Trigger Events, Trigger Syntax, Trigger Context Variables, Context Variable Considerations, Bulk Triggers, Sample Programs using above concepts(using maps and sets in the Bulk Triggers), Order of Execution, Governor Limits

Unit VI: Development overview (Understanding Testing in Apex), Annotations, Testing Examples, Sample programs using the above concept, Batch Apex and Debugging Apex: By using Changes Sets, By using Force.com IDE tool, By using Force.com Migration tool kit.

Text Book:

1. Salesforce for Beginners -Sharif Shaalan, 2nd Edition, Packt Publishing
2. Learning Salesforce Development with Apex, Paul Battisson, BPB Publication

Reference Book:

1. Salesforce CRM – The Definitive Admin Handbook – Paul Goodey, Packt Publishing, 4th Edition

Syllabus for B. Tech. VI Semester
Department of Information Technology

Course Code	ITT379-02				
Category	Program Elective Course (PEC)				
Course Title	Product and Project Management				
Scheme& Credits	L	T	P	Credits	Semester
	3	0	0	3	VI

Course Outcomes

On successful completion of the course, the student will be able to:

1. Exhibit the role and responsibilities of a product and project manager in different organizations
2. Learn techniques for market research, customer discovery, competitive analysis, effective communication, team collaboration, and stakeholder engagement
3. Develop skills in product and project strategy formulation, including segmentation, targeting, and positioning, project planning, scheduling, budgeting, and resource management
4. Learn essential product and project management terminology, concepts, and methodologies
5. Apply product and project management tools and software for planning and tracking

Syllabus:

Unit I:
Introduction to Product Management

Unit II:
Introduction to Project Management

Unit III:
Market Research, Competitor Analysis, Red Ocean & Blue Ocean, SWOT Analysis, Segment, Target, Position, Pricing Strategy

Unit IV:
User Persona & Experience, Interview your Users, Persona Builder, Wireframes

Unit V:
Project Life Cycle : Project Initiation, Execution and Closure, Project Monitoring and Risk Management

Unit VI:
Case Study for Product and Project Management, Practical Case Study x 3, Mobile App, SaaS App, Consumer Goods & Services, Investors Deck, Product Deck, Project Tracker

Textbooks:

1. Inspired: How to Create Products Customers Love , by Marty Cagan
2. A Guide to the Project Management Body of Knowledge (PMBOK Guide)"

Syllabus for B.Tech. Semester VI
Department of Information Technology

Course Code	ITT399-05				
Category	Open Elective Course				
Course Title	Open-Source Technologies				
Scheme& Credits	L	T	P	Credits	Semester
	3	0	0	3	VI

Course Outcomes

Upon completion of course, students would be able to

1. Understand Linux Architecture, different Linux installation and Linux commands.
2. Effectively use Linux Environment using shell, file system, scripts, filters and program development tools
3. Perform user, group management, package management through commands
4. Perform storage management and failure recovery through commands.
5. Automate tasks and write simple programs using shell scripts.

Unit - I

History of Linux OS, Architecture of Linux OS, Linux Distributions, Installation of Linux OS, Introduction to terminal, Basic commands, File system, File handling commands, process and process management commands, VI editor.

Unit - II

Users and Group management- Creation, Updating, Deletion of user and group, Commands – password, Shadow, user add, user mod, user del, group add, group mod, group del.

Unit - III

Package Management - Introduction to package manager, function of package manager, Package management commands – rpm, yum.

Unit - IV

Storage management- Types of storages, creating partitions using f disk command, Logical volume management (LVM), Creating file system, mounting file system.

Unit - V

Shell and Shell script.

Unit VI

OpenShift and open-source tools.

Text Book

1. Unix and Shell Programming – B. M. Harwani, OXFORD University Press.

Reference Books

1. Linux Administration: A Beginner's Guide – Wale Soyinka, 8th Edition, McGraw Hill Publication
2. Unix Concepts and Applications – Sumitabha Das, 4th Edition, McGraw Hill Publication

Syllabus for B. Tech. VI Semester
Department of Information Technology

Course Code	ITP380				
Category	Program Core Course (PCC)				
Course Title	IT Workshop Lab-II				
Scheme & Credits	L	T	P	Credits	Semester VI
	0	0	4	2	

Course Outcomes

On successful completion of the course student will be able to:

1. Design logic for responsive and creative websites using Bootstrap.
2. Dive into the concept of ETL (Extract, Transform, Load) which is crucial for preparing data for visualization (Use BI tools)
3. Programming challenges in Python.
4. Apply the concept of various machine learning libraries in python.
5. Utilizing the most recent AI technologies.

The utilization of diverse tools:

Description
Program to demonstrate the use of visual studio code IDE.
Program to create a responsive website using HTML, CSS & BOOTSTRAP.
Prepare Data for BI Visualization in PowerBI.
Introduction to DAX programming.
Program to create apps using API's in Python.
Introduction to Python IDE Jupyter Notebook.
Demonstrate use of Adobe Firefly, DALLE-3, SlidesAI.
Demonstrate use of OpenAI API.

Syllabus for B. Tech. V Semester
Department of Information Technology

Course Code	ITP381				
Category	PROJC				
Course Title	Project-II				
Scheme& Credits	L	T	P	Credits	Semester
	0	0	6	3	VI

Course Outcomes

Upon completion of the course, students would be able to

1. Demonstrate a sound technical knowledge of their selected project topic.
2. Undertake problem identification, formulation and solution.
3. Design engineering solutions to complex problems utilizing a systems approach.
4. Communicate with engineers and the community at large in written and oral forms.
5. Demonstrate the knowledge, skills and attitudes of a professional engineer.
6. Learn to work as a team for timely completion of project work.

Syllabus for B. Tech. VI Semester
Department of Information Technology
HONOR COURSE

Course Code	ITTH6001-01				
Category	Honor Course				
Course Title	Introduction to DevOps				
Scheme& Credits	L	T	P	Credits	Semester
	4	0	0	4	VI

Course Outcomes

At the end of the course students will be able to

Course Objectives:

1. Understand the principles and concepts of DevOps.
2. Gain familiarity with key DevOps practices and methodologies.
3. Learn to implement automation and collaboration techniques in software development and IT operations.
4. Develop skills in using popular DevOps tools and technologies.
5. Explore best practices for building, testing, deploying, and monitoring software applications.
6. Understand the cultural aspects and organizational implications of adopting DevOps practices.

Unit 1: Introduction to DevOps

Definition and evolution of DevOps, Key principles and goals of DevOps

- Benefits and challenges of adopting DevOps practices
- Cultural and organizational aspects of DevOps adoption

Unit 2: Continuous Integration (CI)

- Introduction to continuous integration (CI) concepts
- Setting up CI pipelines with Jenkins or GitLab CI
- Automating builds, tests, and code quality checks
- Best practices for CI, including version control and automated testing

Unit 3: Continuous Deployment and Delivery (CD)

- Introduction to continuous deployment and delivery (CD)
- Implementing CD pipelines with tools like Jenkins, GitLab CI, or CircleCI
- Automating deployment processes and release management
- Implementing blue-green deployments and canary releases

Unit 4: Infrastructure as Code (IaC)

- Introduction to infrastructure as code (IaC) concepts
- Managing infrastructure with tools like Terraform or AWS CloudFormation
- Automating provisioning, configuration, and management of infrastructure
- Benefits of IaC for scalability, repeatability, and reliability

Unit 5: Configuration Management

- Introduction to configuration management concepts
- Managing configuration with tools like Ansible, Puppet, or Chef
- Automating configuration tasks, such as software installation and updates
- Ensuring consistency and compliance across infrastructure environments

Unit 6: Monitoring and Logging

- Importance of monitoring and logging in DevOps practices
- Implementing monitoring solutions with tools like Prometheus or Grafana
- Collecting and analyzing metrics to identify performance bottlenecks
- Implementing centralized logging and log aggregation for troubleshooting

Refence Books:

1. Rojas, C. (2019). Building Progressive Web Applications with Vue. js: Reliable, Fast, and Engaging Apps with Vue. js. Apress.
2. Ater, T. (2017). Building progressive web apps: bringing the power of native to the browser. " O'Reilly Media, Inc.".

Syllabus for B. Tech. VI Semester
Department of Information Technology

Course Code	ITTM601				
Category	Minor				
Course Title	Introduction to Emerging Technologies				
Scheme& Credits	L	T	P	Credits	Semester VI
	3	1	0	4	VI

Course Outcomes

On successful completion of the course student will be able to:

1. Describe the concepts and benefits of Internet of Things.
2. Differentiate between different Cloud Computing Models.
3. Analyze the services in Cloud Computing.
4. Understand the concepts of SDLC and DevOps.
5. Apply the concepts of DevOps in real world applications

Unit I

Introduction to Internet of Things: IoT basics, Connected devices evolution, Introduction to communication mechanisms in IoT, Challenges with IoT, Applications of IoT, Introduction to Sensor Interfacing.

Unit II

Cloud Computing Fundamental: Concept of Virtualization, Cloud Computing definition, Service Models in Cloud: IaaS, PaaS, SaaS. Deployment Models in Cloud: Private, Public, Community and Hybrid cloud. Benefits and challenges of Cloud Computing.

Unit III

Cloud Platform: Introduction to Amazon Web Services (AWS), Core Services offered by AWS for Compute, Storage and Networks.

Unit IV

Cloud Platform: Services offered by AWS for Security and Monitoring: Identity and Access Management (IAM), Network Security Groups (NSGs), CloudWatch, CloudTrail etc., Services offered by AWS for IoT application deployment.

Unit V

Software Development Life Cycle (SDLC): Introduction to SDLC, SDLC Models: Waterfall Model, Agile Model etc.

Unit VI

Introduction to DevOps: Introduction to DevOps, DevOps Tools, CICD Pipeline, DevOps on Cloud.

Text Books:

1. Learning Internet of Things By: Peter Waher Publisher: Packt Publishing.
2. Cloud Computing: A Practical approach for learning and implementation, A. Srinivasan, J. Suresh, 1st Edition, Pearson Publication.
3. AWS Documentation.
4. Introduction to DevOps, Kallori Vikram; 1st edition.
5. Software Engineering: A Practitioner Approach, Roger S. Pressman, 7th Edition, McGraw Hill

Reference Books:

1. The Internet of Things: Key Applications and Protocol By: Olivier Hersent; David Boswarthick
2. Omar Elloumi, Publisher: John Wiley & Sons. M2M Communications: A Systems Approach By: David Boswarthick; Omar Elloumi; Olivier Hersent, John Wiley & Sons
3. Cloud Computing Explained: Implementation Handbook for Enterprise, 2013 Edition, Recursive Press Publication.
4. Enterprise Cloud Computing: Technology, Architecture, Applications, Gautam Shroff, 1st Edition, Cambridge University Press
5. Cloud Computing: Dr. Kumar Saurabh, 2nd Edition, Wiley- India Edition