



BTECH (CSE)
Academic Year: 2021-2025
Syllabus

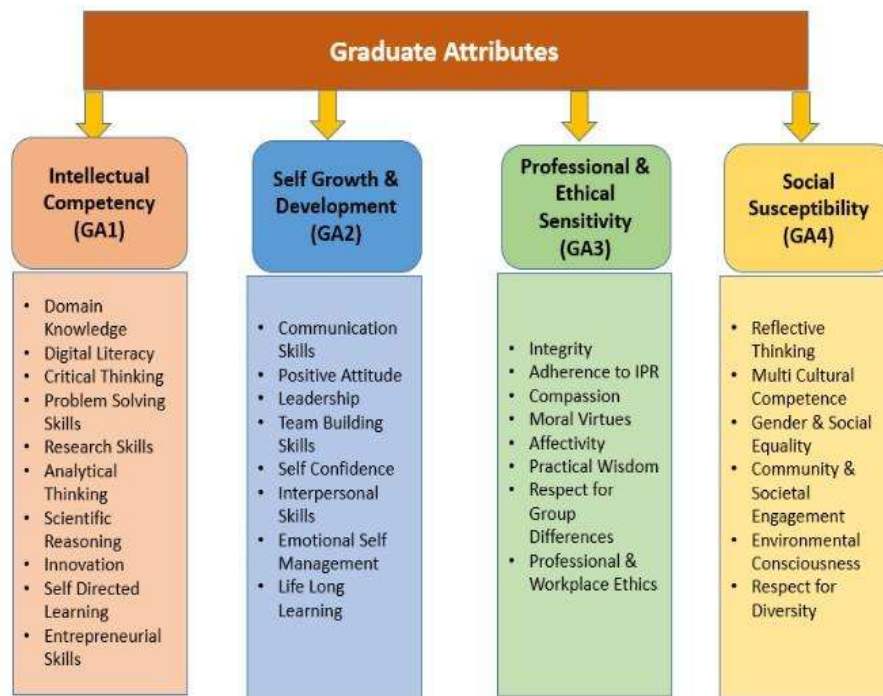
Vision of the University

The vision envisages augmenting the cause of education at all levels. As a catalyst for developing engaged and employable workforce, JRU envisions making a compelling transformation to the world through education, research and innovation that will make difference to the society and mankind.

Mission of the University

We endeavor to create the best possible learning environment for our students through dynamic research, rigorous training and efficient mentorship and are committed to the cause of making higher education accessible to all irrespective of caste, color or creed. To create an atmosphere of rigor and discipline through innovative education that helps students to understand all aspects of societal challenges and enable them to work in team to tackle multifarious problems that directly benefit society.

Graduate Attributes



Department Computer Science & Information Technology

Vision

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

Mission

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

B. TECH CSE PROGRAMME

Program Educational Objectives (PEOs)

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

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

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

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

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

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

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

Program Outcome (POs)

Engineering Graduates will be able to:

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

Program Specific Outcome (PSOs)

The students shall have the

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

Mapping between PEO and PSO

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

Mapping of PEO and PO

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

Course Component of BTECH program having 120 Credits

COURSE SCHEME

COURSE SCHEME												
BATCH 2021-2025												
BTECH IN COMPUTER SCIENCE AND ENGINEERING												
CHOICE BASED CREDIT SYSTEM												
SEMESTER I												
S. No	CATEGORY	CODE	COURSE TITLE	Periods			Evaluation Scheme				Subject Total	Credit
				L	T	P	Assignment	TA	Total	ESE		
1	Basic ScienceCourse	BSC101	Physics I	3	1	0	20	10	30	70	100	4
2	Basic ScienceCourse	BSC102	Mathematics I	3	1	0	20	10	30	70	100	4
3	Engineering ScienceCourse	ESC101	Basic ElectricalEngineering	3	1	0	20	10	30	70	100	4
4	Engineering Science Course	ESC102	Engineering Graphics & Design	1	0	0	20	10	30	70	100	1
5	Humanities andSocial Sciences	HSMC101	English	2	0	2	20	10	30	70	100	3
PRACTICAL /SESSIONAL												
1	Basic Science Course	BSC101P	Physics I Lab	0	0	2			30	20	50	1
2	Engineering Science Course	ESC101P	Basic Electrical Engineering Lab	0	0	2			30	20	50	1
3	Engineering Science Course	ESC102P	EngineeringGraphics & Design Lab	0	0	2			30	20	50	1
									TOTAL		650	19
SEMESTER II												
S. No .	CATEGORY	CODE	COURSE TITLE	Periods			Evaluation Scheme				Subject Total	Credit
				L	T	P	Assignment	TA	Total	ESE		
1	Basic ScienceCourse	BSC103	Chemistry I	3	1	0	20	10	30	70	100	4
2	Basic ScienceCourse	BSC104	Mathematics II	3	1	0	20	10	30	70	100	4
3	Engineering ScienceCourse	ESC103	Programming forProblem Solving	3	0	0	20	10	30	70	100	3
4	Engineering ScienceCourse	ESC104	Workshop Practice	1	0	0	20	10	30	70	100	1
5	Mandatory Course	MC101	**EnvironmentalScienc e	3	0	0	20	10	30	70	100	0
PRACTICAL /SESSIONAL												
1	Basic ScienceCourse	BSC103P	Chemistry I Lab	0	0	2			30	20	50	1
2	Engineering Science Course	ESC103P	Programming for Problem SolvingLab	0	0	2			30	20	50	1
3	Engineering ScienceCourse	ESC104P	Workshop PracticeLab	0	0	2			30	20	50	1
									TOTAL		650	15

SEMESTER III

S. No	CATEGORY	CODE	COURSE TITLE	Periods			Evaluation Scheme				Subject Total	Credit
				L	T	P	Assignment	TA	Total	ESE		
1	Basic Science Course	BSC201	MathematicsIII(Probability & Statistics)	2	0	0	20	10	30	70	100	2
2	Basic ScienceCourse	BSC202	Biological Science for Engineers	3	0	0	20	10	30	70	100	3
3	Engineering Science Course	ESC201	Analog Electronics Circuit	3	0	0	20	10	30	70	100	3
4	Professional CoreCourse	3PCCCS201	Data Structure AndAlgorithms	3	0	0	20	10	30	70	100	3
5	Professional Core Course	3PCCCS202	Computer Organization &Architecture	3	0	0	20	10	30	70	100	3
6	Humanities and SocialScience	HSMC201	Effective Technical Communication	3	0	0	20	10	30	70	100	3
7	Mandatory Course	UMCBTCSE 102	Community Engagement and Social Responsibility	1	0	2	40	10	50	50	100	2
PRACTICAL /SESSIONAL												
1	Engineering Science Course	ESC201P	Analog Electronics Circuit Lab	0	0	4			30	20	50	2
2	Professional core Course	3PCCCS201P	Data Structure And Algorithms Lab	0	0	4			30	20	50	2
3	Professional core Course	3PCCCS202P	ComputerOrganization & Architecture Lab	0	0	4			30	20	50	2
									TOTAL		750	25

SEMESTER IV

S.No.	CATEGORY	CODE	COURSE TITLE	Periods			Evaluation Scheme				Subject Total	Credit
				L	T	P	Assignment	TA	Total	ESE		
1	Engineering ScienceCourse	ESC202	Digital Electronics	3	0	0	20	10	30	70	100	3
2	Professional CoreCourse	3PCCCS203	Object Oriented Programming with JAVA	3	0	0	20	10	30	70	100	3
3	Professional CoreCourse	3PCCCS204	Discrete Mathematics	3	1	0	20	10	30	70	100	4
4	Professional CoreCourse	3PCCCS205	Design & Analysis of Algorithms	3	0	0	20	10	30	70	100	3
5	Humanities and SocialScience	HSMC202	Professional Practice, Laws and Ethics	3	0	0	20	10	30	70	100	3
6	Humanities andSocialSciences	HSMC203	Entrepreneurship	3	0	0	20	10	30	70	100	3
7	Mandatory Course	MC201	**DisasterManagement	2	0	0	20	10	30	70	100	0
PRACTICAL /SESSIONAL												
1	Engineering ScienceCourse	ESC202P	Digital Electronics Lab	0	0	4			30	20	50	2
2	Professional Core Course	3PCCCS205P	Design & Analysis of Algorithms Lab	0	0	4			30	20	50	2
3	Professional Core Course	3PCCCS203P	Object Oriented Programming with JAVA	0	0	4			30	20	50	2
									TOTAL		850	25

SEMESTER V

S. No	CATEGORY	CODE	COURSE TITLE	Periods			Evaluation Scheme				Subject Total	Credit
				L	T	P	Assignment	TA	Total	ESE		
1	Professional Core Course	3PCCCS301	Database Management Systems	3	0	0	20	10	30	70	100	3
2	Professional Core Course	3PCCCS302	Formal Language & Automata Theory	3	0	0	20	10	30	70	100	3
3	Professional Core Course	3PCCCS304	IT Workshop (Sci Lab/MATLAB)	2	0	0	20	10	30	70	100	2
4	Professional Core Course	3PCCCS305	Operating Systems	3	0	0	20	10	30	70	100	3
5	Track Elective		Track Elective - 1	3	0	2	20	10	30	70	100	4
6	Mandatory Course	MC301	**Constitution of India	2	0	0	20	10	30	70	100	0
PRACTICAL /SESSIONAL												
1	Professional Core Course	3PCCCS301P	Database Management Systems Lab	0	0	4			30	20	50	2
3	Professional Core Course	3PCCCS304P	IT Workshop (Sci Lab/MATLAB)	0	0	2			30	20	50	1
4	Professional Core Course	3PCCCS305P	Operating Systems Lab	0	0	4			30	20	50	2
									TOTAL		750	20

SEMESTER VI

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

SEMESTER VII

S. No	CATEGORY	CODE	COURSE TITLE	Periods			Evaluation Scheme				SubjectTotal	Credit
				L	T	P	Assignment	TA	Total	ESE		
1	Track Elective		Track Elective V	3	0	0	20	10	30	70	100	3
2	Track Elective		Track Elective VI	3	0	2	20	10	30	70	100	4
3	Track Elective		Track Elective VII	3	0	0	20	10	30	70	100	3
4	Open ElectiveCourse		Open Elective II / MOOCs II	3	0	0	20	10	30	70	100	3

PRACTICAL /SESSIONAL

2	Project	3PROJCS401	Project-II	0	0	8			100	100	200	4
									TOTAL		600	17

SEMESTER VIII

S.No.	CATEGORY	CODE	COURSE TITLE	Periods			Evaluation Scheme				SubjectTotal	Credit
				L	T	P	Assignment	TA	Total	ESE		
1	Track Elective		Track Elective VIII	4	0	0	20	10	30	70	100	4
2	Open ElectiveCourse		Open Elective-III / MOOCs III	3	0	0	20	10	30	70	100	3
4	Humanities and Social Sciences	HSMC402	**Human Values& Ethics	3	0	0	20	10	30	70	100	3

PRACTICAL /SESSIONAL

1	Project	3PROJCS402	Project-III	0	0	16			100	100	200	8
									TOTAL		500	18

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

Track Elective

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

SEM VIII	3TECCS416	Software Maintenance	4	0	0	4
	3TECCS417	Software Engineering Management	4	0	0	4
	CODE	Specialisation in CYBER SECURITY	L	T	P	C
SEM V	3TECCS301	Introduction to Python Programming	3	0	2	4
	3TECCS302	Fundamentals of Software Engineering	3	0	2	4
	3TECCS305	Malware Analysis	4	0	0	4
	3TECCS306	Network Security	4	0	0	4
SEM VI	3TECCS311	Relational Database Management System	3	0	2	4
	3TECCS312	Machine Learning	3	0	0	3
	3TECCS313	Web Technology	3	0	2	4
	3TECCS317	Cryptography Fundamentals	3	0	0	3
	3TECCS318	Data Mining	3	0	0	3
	3TECCS316	Soft Computing	3	0	0	3
SEM VII	3TECCS401	Internet -of- Things	3	0	0	3
	3TECCS402	Artificial Intelligence	3	0	2	4
	3TECCS407	Cyber Security	3	0	2	4
	3TECCS408	Biometrics	3	0	0	3
	3TECCS405	Cloud Computing	3	0	0	3
	3TECCS409	Cyber Forensics and Investigations	3	0	0	3
SEM VIII	3TECCS418	Web Security	4	0	0	4
	3TECCS419	Android Security	4	0	0	4
	3TECCS411	Deep Learning	4	0	0	4
	3TECCS420	High Speed Networks	4	0	0	4

	CODE	Specialisation in ARTIFICIAL INTELLIGENC	L	T	P	C
SEM V	3TECCS301	Introduction to Python Programming	3	0	2	4
	3TECCS302	Fundamentals of Software Engineering	3	0	2	4
	3TECCS307	Pattern Recognition	4	0	0	4
	3TECCS308	Intelligent systems	4	0	0	4
SEM VI	3TECCS311	Relational Database Management System	3	0	2	4
	3TECCS312	Machine Learning	3	0	0	3
	3TECCS313	Web Technology	3	0	2	4
	3TECCS319	Statistics for Artificial Intelligence	3	0	0	3
	3TECCS318	Data Mining	3	0	0	3
	3TECCS320	Knowledge Representation	3	0	0	3
SEM VII	3TECCS401	Internet -of- Things	3	0	0	3
	3TECCS402	Artificial Intelligence	3	0	2	4
	3TECCS410	Supervised Machine Learning	3	0	0	3
	3TECCS411	Deep Learning	3	0	0	3
	3TECCS412	Natural Language Processing	3	0	0	3
	3TECCS406	AI for games	3	0	2	4
SEM VIII	3TECCS421	Computer Vision	4	0	0	4
	3TECCS422	UnSupervised Machine Learning	4	0	0	4
	3TECCS423	Introduction to Robotics	4	0	0	4
	3TECCS424	AI/ML Analyst	4	0	0	4
	CODE	Specialisation in WEB AND MOBILE APPLICATION	L	T	P	C
SEM V	3TECCS301	Introduction to Python Programming	3	0	2	4
	3TECCS302	Fundamentals of Software Engineering	3	0	2	4
	3TECCS309	Multimedia	3	0	2	4

	3TECCS310	Internet and Website Management	3	0	2	4
SEM VI	3TECCS311	Relational Database Management System	3	0	2	4
	3TECCS312	Machine Learning	3	0	0	3
	3TECCS313	Web Technology	3	0	2	4
	3TECCS314	Object Oriented Modelling and Design	3	0	0	3
	3TECCS321	Computer Graphics	2	0	2	3
	3TECCS322	Introduction to PHP	2	0	2	3
SEM VII	3TECCS401	Internet -of- Things	3	0	0	3
	3TECCS402	Artificial Intelligence	3	0	2	4
	3TECCS413	Introduction to Android Studio	2	0	2	3
	3TECCS411	Deep Learning	3	0	0	3
	3TECCS405	Cloud Computing	3	0	0	3
	3TECCS406	AI for games	3	0	2	4
SEM VIII	3TECCS425	Computer Vision	4	0	0	4
	3TECCS419	Android Security	4	0	0	4
	3TECCS418	Web Security	4	0	0	4
	3TECCS417	Software Engineering Management	4	0	0	4

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

Open Elective can be opted by MOOCs

The students of B.Tech CSE can opt for any of the courses offered by the other Department

SEMESTER IV

B.TECH IN COMPUTER SCIENCE AND ENGINEERING
SEMESTER IV

COURSE SCHEME

SEMESTER IV												
S.No.	CATEGORY	CODE	COURSE TITLE	Periods			Evaluation Scheme				Subject Total	Credit
				L	T	P	Assignment	TA	Total	ESE		
1	Engineering Science Course	ESC202	Digital Electronics	3	0	0	20	10	30	70	100	3
2	Professional Core Course	3PCCCS203	Object Oriented Programming with JAVA	3	0	0	20	10	30	70	100	3
3	Professional Core Course	3PCCCS204	Discrete Mathematics	3	1	0	20	10	30	70	100	4
4	Professional Core Course	3PCCCS205	Design & Analysis of Algorithms	3	0	0	20	10	30	70	100	3
5	Humanities and Social Sciences	HSMC202	Professional Practice, Laws and Ethics	3	0	0	20	10	30	70	100	3
6	Humanities and Social Sciences	HSMC203	Entrepreneurship	3	0	0	20	10	30	70	100	3
7	Mandatory Course	MC201	**Disaster Management	2	0	0	20	10	30	70	100	0
PRACTICAL /SESSIONAL												
1	Engineering Science Course	ESC202P	Digital Electronics Lab	0	0	4			30	20	50	2
2	Professional Core Course	3PCCCS205P	Design & Analysis of Algorithms Lab	0	0	4			30	20	50	2
3	Professional Core Course	3PCCCS203P	Object Oriented Programming with JAVA	0	0	4			30	20	50	2
									TOTAL		850	25



Program: BTECH
Semester: Fourth

Course: Digital Electronics
Course Code: ESC202

L	T	P	C
3	0	0	3

Course Objective:

The objective of this course is:

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

Course Outcome:

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

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

Course Content:

Topics	Hours
Module 1: Fundamentals of Digital Systems and logic families	
Digital signals, digital circuits, AND, OR, NOT, NAND, NOR and Exclusive-OR operations, Boolean algebra, examples of IC gates, number systems-binary, signed binary, octal hexadecimal number, binary arithmetic, one's and two's complements arithmetic, codes, error detecting and correcting codes, characteristics of digital ICs, digital logic families, TTL, Schottky TTL and CMOS logic, interfacing CMOS and TTL, Tri-state logic	07
Module II: Combinational Digital Circuits	
Standard representation for logic functions, K-map representation, simplification of logic functions using K-map, minimization of logical functions. Don't care conditions, Multiplexer, De-Multiplexer/Decoders, Adders, Subtractors, BCD arithmetic, carry look ahead adder, serial adder, ALU, elementary ALU design, popular MSI chips, digital comparator, parity checker/generator, code converters, priority encoders, decoders/drivers for display devices, Q-M method of function realization	07
Module III: Sequential circuits and systems	
A 1-bit memory, the circuit properties of Bistable latch, the clocked SR flip flop, J-K-T and D-types flip flops, applications of flip flops, shift registers, applications of shift registers, serial to parallel converter, parallel to serial converter, ring counter, sequence generator, ripple (Asynchronous) counters, synchronous counters, counters design using flip flops, special counter IC's, asynchronous sequential counters, applications of counters.	07
Module IV: A/D and D/A Converters	
Digital to analog converters: weighted resistor/converter, R-2R Ladder D/A converter, specifications for D/A converters, examples of D/A converter ICs, sample and hold circuit, analog to digital converters: quantization and encoding, parallel comparator A/D converter, successive approximation A/D converter, counting A/D converter, dual slope A/D converter, A/D converter using voltage to frequency and voltage to time conversion, specifications of A/D converters, example of A/D converter ICs	07
Module V: Semiconductor memories and Programmable logic devices	
Memory organization and operation, expanding memory size, classification and characteristics of memories, sequential memory, read only memory (ROM),	07

read and write memory(RAM), content addressable memory (CAM), charge de coupled device memory (CCD), commonly used memory chips, ROM as a PLD, Programmable logic array, Programmable array logic, complex Programmable logic devices (CPLDS), Field Programmable Gate Array (FPGA).

Suggested Reading:

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

Program: BTECH

Semester: Fourth

Course: Digital Electronics lab

Course Code: ESC202P

L	T	P	C
0	0	4	2

List of Experiment:

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

Program: BTECH

Semester: Fourth

Course: Object Oriented Programming with Java

Course Code: 3PCCCS203

L	T	P	C
3	0	0	3

Course Objective:

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

Course Outcome:

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

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

Course Content:

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

Suggested Readings:

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

Program: BTECH

Semester: Fourth

Course: Object Oriented Programming with Java Lab

Course Code: 3PCCCS203

L	T	P	C
0	0	4	2

List of Experiment:

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

Program: BTECH

Semester: Fourth

Course: Discrete mathematics

Course Code: 3PCCCS205

L	T	P	C
3	1	0	4

Course Objectives:

To expose the students to the following:

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

Course Outcomes

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

CO1: Know how to represent various statements using set, relations, functions, permutations and combinations, groups, graphs and trees

CO2: Use logical notations to formulate and reason about fundamental mathematical concepts such as sets, relations, functions and algebraic structures

CO3: Analyse the growth of functions and real world problems using various concepts like recurrence relations, graph coloring, etc.

CO4: Model and solve real world problems using graphs and trees.

Course Content:

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

Suggested readings:

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

Program: BTECH

Semester: Fourth

Course: Design and Analysis of Algorithms

Course Code: 3PCCCS205

L	T	P	C
3	0	0	3

Course Objectives:

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

Course Outcome:

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

Course Content:

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

Text/Reference Books:

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

Program: BTECH

Semester: Fourth

Course: Design and Analysis of Algorithms Lab

Course Code: 3PCCCS205P

L	T	P	C
0	0	4	2

List of Experiment:

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

Program: BTECH

Semester: Fourth

Course: Professional Practice, Law & Ethics

Course Code: HSMC202

L	T	P	C
3	0	0	3

Course Objective:

- To make the students understand the types of roles they are expected to play in the society as practitioners of the civil engineering profession.
- To develop some ideas of the legal and practical aspects of their profession.

Course Outcome:

- To familiarise the students to what constitutes professional practice, introduction of various stakeholders and their respective roles; understanding the fundamental ethics governing the profession
- To give a good insight into contracts and contracts management in civil engineering, dispute resolution mechanisms; laws governing engagement of labour
- To give an understanding of Intellectual Property Rights, Patents.
- To make the students understand the types of roles they are expected to play in the society as practitioners of the civil engineering profession
- To develop good ideas of the legal and practical aspects of their profession

Course Content:

Topics	Hours
Module 1: Professional Practice & Professional Ethics	
<p>Professional Practice – Respective roles of various stakeholders: Government (constituting regulatory bodies and standardization organizations, prescribing norms to ensure safety of the citizens); Standardization Bodies (ex. BIS, IRC)(formulating standards of practice); professional bodies (ex. Institution of Engineers(India), Indian Roads Congress, IIA/ COA, ECI, Local Bodies/ Planning Authorities) (certifying professionals and offering platforms for interaction); Clients/ owners (role governed by contracts); Developers (role governed by regulations such as RERA); Consultants (role governed by bodies such as CEAI); Contractors (role governed by contracts and regulatory Acts and Standards); Manufacturers/ Vendors/ Service agencies (role governed by contracts and regulatory Acts and Standards)</p> <p>Professional Ethics – Definition of Ethics, Professional Ethics, Business Ethics, Corporate Ethics, Engineering Ethics, Personal Ethics; Code of Ethics as defined in the website of Institution of Engineers (India); Profession, Professionalism, Professional Responsibility, Professional Ethics; Conflict of Interest, Gift Vs Bribery, Environmental breaches, Negligence, Deficiencies in state-of-the-art; Vigil Mechanism, Whistleblowing, protected disclosures.</p>	08
Module 2: General Principles of Contracts Management	
<p>Indian Contract Act, 1972 and amendments covering General principles of contracting; Contract Formation & Law; Privacy of contract; Various types of contract and their features; Valid & Voidable Contracts; Prime and sub-contracts; Joint Ventures & Consortium; Complex contract terminology; Tenders, Request For Proposals, Bids & Proposals; Bid Evaluation; Contract Conditions & Specifications; Critical /“Red Flag” conditions; Contract award & Notice To Proceed; Variations & Changes in Contracts; Differing site conditions; Cost escalation; Delays, Suspensions & Terminations; Time extensions & Force Majeure; Delay Analysis; Liquidated damages & Penalties; Insurance & Taxation; Performance and Excusable Non-performance; Contract documentation; Contract Notices; Wrong practices in contracting (Bid shopping, Bid fixing, Cartels); Reverse auction; Case Studies; Build-Own-Operate & variations; Public-Private Partnerships; International Commercial Terms</p>	06
Module 3: Dispute Resolution Mechanisms	
<p>Arbitration – meaning, scope and types – distinction between laws of 1940 and 1996; UNCITRAL model law – Arbitration and expert determination; Extent of judicial intervention; International commercial arbitration; Arbitration agreements – essential and kinds, validity, reference and interim measures by court; Arbitration tribunal – appointment, challenge, jurisdiction of arbitral tribunal, powers, grounds of challenge, procedure and court assistance; Award including Form and content, Grounds for setting aside an award, Enforcement, Appeal and Revision; Enforcement of foreign awards – New York and Geneva Convention Awards; Distinction between conciliation, negotiation, mediation and arbitration, confidentiality, resort to judicial proceedings, costs; Dispute Resolution Boards; Lok Adalats</p>	07
Module 4: Labour & other Laws	04

Role of Labour in Civil Engineering; Methods of engaging labour- on rolls, labour sub-contract, piece rate work; Industrial Disputes Act, 1947; Collective bargaining; Industrial Employment (Standing Orders) Act, 1946; Workmen's Compensation Act, 1923; Building & Other Construction Workers (regulation of employment and conditions of service) Act (1996) and Rules (1998); RERA Act 2017, NBC 2017	
Module 5: Intellectual Property Management	
Meaning of intellectual property, main forms of IP, Copyright, Trademarks, Patents and Designs, Secrets; Law relating to Copyright in India including Historical evolution of Copy Rights Act, 1957, Meaning of copyright – computer programs, Ownership of copyrights and assignment, Criteria of infringement, Piracy in Internet – Remedies and procedures in India; Law relating to Patents under Patents Act, 1970 including Concept and historical perspective of patents law in India, Patentable inventions with special reference to biotechnology products, Patent protection for computer programs, Process of obtaining patent – application, examination, opposition and sealing of patents, Patent cooperation treaty and grounds for opposition, Rights and obligations of patentee, Duration of patents – law and policy considerations, Infringement and related remedies	05

Text/Reference Books:

- B.S. Patil, Legal Aspects of Building and Engineering Contracts, 1974.
- The National Building Code, BIS, 2017
- RERA Act, 2017
- Meena Rao (2006), Fundamental concepts in Law of Contract, 3rd Edn. Professional Offset
- Neelima Chandiramani (2000), The Law of Contract: An Outline, 2nd Edn. Avinash Publications Mumbai
- Avtarsingh (2002), Law of Contract, Eastern Book Co.
- Dutt (1994), Indian Contract Act, Eastern Law House
- Anson W.R. (1979), Law of Contract, Oxford University Press
- Kwatra G.K. (2005), The Arbitration & Conciliation of Law in India with case law on UNCITRAL Model Law on Arbitration, Indian Council of Arbitration
- Wadhera (2004), Intellectual Property Rights, Universal Law Publishing Co.

Program: BTECH

Semester: Fourth

Course: Entrepreneurship

Course Code: HSMC203

L	T	P	C
3	0	0	3

Course Objective:

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

Course Outcome:

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

CO 1: Understand the Concept of project, characteristics of projects, Identify the type of project and Project's life cycle, as well as steps for Successful Project Implementation.

CO 2: Analyse the project from technical, financial, market- demand and economic feasibility and analyse the difference between the CBA and SCBA. Create and formulate linear programming and integer programming model, project network and estimation of time and critical path in PERT and CPM model.

CO 3: Evaluate capital budgeting system of an organization through discounted and non-discounted techniques like NPV, IRR, Profitability index, ARR and Payback period.

CO 4: Understand entrepreneurship Development and role of institution like SIDO, MDI, EDI, AISSIB, NIESBUD etc. Also the students will analyze all the factors for success and failure of a new business.

Course Content:

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

Suggested Reading:

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

Program: BTECH

Semester: Fourth

Course: Disaster Management**

Course Code: MC201

L	T	P	C
2	0	0	0

Course Objective:

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

Course Outcome:

CO1: Understanding foundations of hazards, disasters and associated natural/social phenomena.

CO 2: Familiarity with disaster management theory (cycle, phases)

CO 3: Knowledge about existing global frameworks and existing agreements (e.g. Sendai)

CO 4: Methods of community involvement as an essential part of successful DRR.

Course Content:

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

Suggested Reading:

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