JHARKHAND
Rai University
UGC RECOGNISED UNIVERSITY
ACCREDITED BY NAAC

B.TECH (CSE)

Academic Year: 2021-2025

Syllabus

Vision

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

Mission

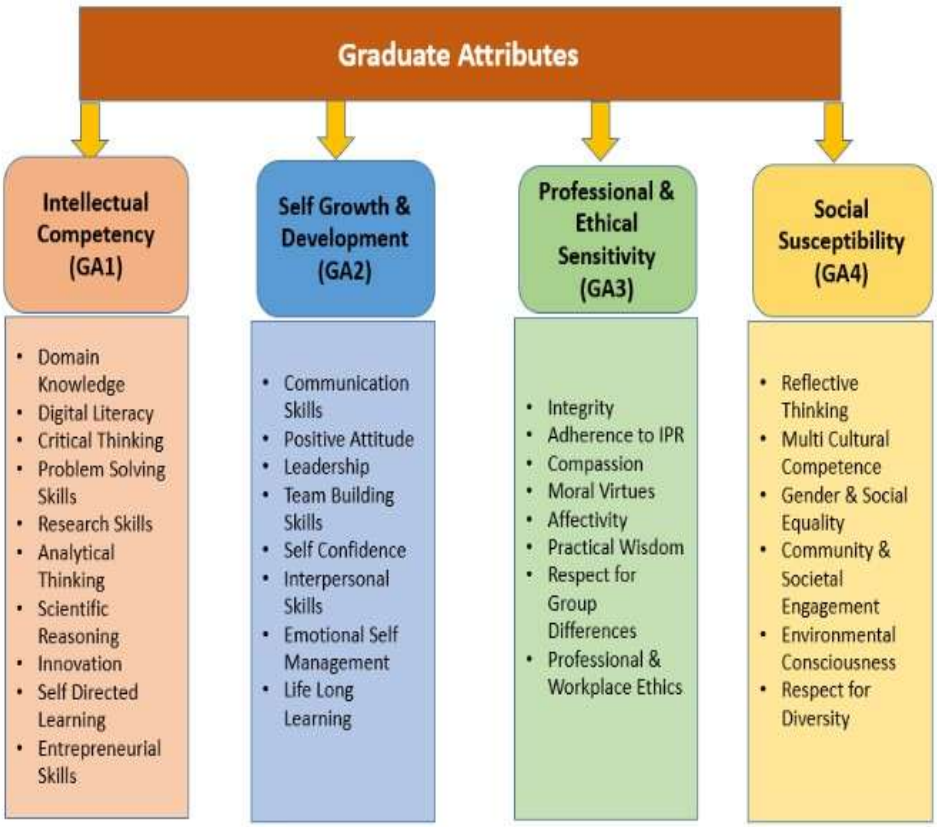
- We endeavor to provide the best possible learning environment to enhance innovations, research capabilities, problem solving skills, leadership qualities, team spirit and ethical responsibilities.
- To nurture the talent of the students to be successful, ethical and effective problem solvers who will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

Graduate Attributes

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

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

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



Program Educational Objectives (PEOs)

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

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

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

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

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

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

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

Program Outcome (POs)

Engineering Graduates will be able to:

1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcome (PSOs)

The students shall have the

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

Mapping between PEO and PSO

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

Mapping of PEO and PO

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

Course Scheme

COURSE SCHEME

BATCH 2021-2025

BTECH IN COMPUTER SCIENCE AND ENGINEERING

CHOICE BASED CREDIT SYSTEM

SEMESTER I

S. No	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**	****EnvironmentalScience**	3	0	0	20	10	30	70	100	0

PRACTICAL /SESSIONAL												
1	Basic ScienceCourse	BSC103P	Chemistry I Lab	0	0	2			30	20	50	1
2	Engineering Science Course	ESC103P	Programming for Problem SolvingLab	0	0	2			30	20	50	1
3	Engineering ScienceCourse	ESC104P	Workshop PracticeLab	0	0	2			30	20	50	1
									TOTAL		**650**	**15**

SEMESTER III

S. No	CATEGORY	CODE	COURSE TITLE	Periods			Evaluation Scheme				Subject Total	Credit
				L	T	P	Assignment	TA	Total	ESE		
1	Basic Science Course	BSC201	MathematicsIII(Probability & Statistics)	2	0	0	20	10	30	70	100	2
2	Basic ScienceCourse	BSC202	Biological Science for Engineers	3	0	0	20	10	30	70	100	3
3	Engineering Science Course	ESC201	Analog Electronics Circuit	3	0	0	20	10	30	70	100	3
4	Professional CoreCourse	3PCCCS201	Data Structure AndAlgorithms	3	0	0	20	10	30	70	100	3
5	Professional Core Course	3PCCCS202	Computer Organization &Architecture	3	0	0	20	10	30	70	100	3
6	Humanities and 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	DatabaseManagement Systems	3	0	0	20	10	30	70	100	3
2	Professional Core Course	3PCCCS302	Formal Language & Automata Theory	3	0	0	20	10	30	70	100	3
3	Professional Core Course	3PCCCS304	IT Workshop (Sci Lab/MATLAB)	2	0	0	20	10	30	70	100	2
4	Professional Core Course	3PCCCS305	Operating Systems	3	0	0	20	10	30	70	100	3
5	Track Elective		Track Elective - 1	3	0	2	20	10	30	70	100	4
6	**Mandatory Course**	**MC301**	****Constitution of India**	**2**	**0**	**0**	**20**	**10**	**30**	**70**	**100**	**0**
PRACTICAL /SESSIONAL												
1	Professional Core Course	3PCCCS301P	Database Management Systems Lab	0	0	4			30	20	50	2
3	Professional Core Course	3PCCCS304P	IT Workshop (Sci Lab/MATLAB)	0	0	2			30	20	50	1
4	Professional CoreCourse	3PCCCS305P	Operating Systems Lab	0	0	4			30	20	50	2
									TOTAL		**750**	**20**

SEMESTER VI

S.No.	CATEGORY	CODE	COURSE TITLE	Periods			Evaluation Scheme				SubjectTotal	Credit
				L	T	P	Assignment	TA	Total	ESE		
1	Professional CoreCourse	3PCCCS306	Compiler Design	3	0	0	20	10	30	70	100	3
2	Professional CoreCourse	3PCCCS307	Computer Networks	3	0	0	20	10	30	70	100	3
3	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 ElectiveCourse		Open Elective I / MOOCs I	3	0	0	20	10	30	70	100	3
PRACTICAL /SESSIONAL												
1	Professional CoreCourse	3PCCCS306P	Compiler DesignLab	0	0	4			30	20	50	2
2	Professional CoreCourse	3PCCCS307P	Computer NetworksLab	0	0	4			30	20	50	2
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
SEM VIII	3TECCS414	Software Security	4	0	0	4
	3TECCS415	Software Testing	4	0	0	4
	3TECCS416	Software Maintenance	4	0	0	4
	3TECCS417	Software Engineering Management	4	0	0	4
	CODE	**Specialisation in CYBER SECURITY**	**L**	**T**	**P**	**C**
SEM V	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

Detailed Assessment Scheme

Assessment Scheme					
CIA- Continuous Internal Assessment (50 Marks)					
Assessment Parameters	**Assessment Tools**	**Marks**	**Percentage (%)**	**Bloom's Taxonomy Category**	**Bloom's Taxonomy Level LOT/HOT**
Assignment 1	Assignment consisting of minimum 5 Questions	10	20	Remember, Understand, Apply	LOT
Assignment 2	Assignment consisting of minimum 2 Questions	10	20	Analyze, Evaluate, Create	HOT
Teacher Assessment/ Class Participation					
Teacher Assessment 1	Quiz, Case Studies, Presentations, Group Discussion, Lab work, Project or any other activity	10	20	Remember, Understand, Apply	LOT
Teacher Assessment 2	Quiz, Case Studies, Presentations, Group Discussion, Lab work, Project or any other activity	10	20	Analyse, Evaluate, Create	HOT
Class Participation	Brainstorming, Discussion, Attendance, Extempore or any other activity	10	20		

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

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

Semester III

Program: B T E C H
Semester: Third
Course: Mathematics III (Probability & Statistics)
Course Code: BSC201

L	T	P	C
2	0	0	2

Course Objective:
The objectives of this course are:

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

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

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

Course Content:

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

Suggested Text/Reference Books

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

Program: BTECH

Semester: Third
Course: Biological Science for Engineers
Course Code: BSC202

L	T	P	C
3	0	0	3

Course Objective:

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

Course Outcome:

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

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

Course Content:

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

disorders in humans. Discuss the concept of complementation using human genetics.	
UNIT IV- Biomolecules	4
Purpose: To convey that all forms of life has the same building blocks and yet the manifestations are as diverse as one can imagine Molecules of life. In this context discuss monomeric units and polymeric structures. Discuss about sugars, starch and cellulose. Amino acids and proteins. Nucleotides and DNA/RNA.Two carbon units and lipids.	
UNIT V - Enzymes	4
Purpose: To convey that without catalysis life would not have existed on earth Enzymology: How to monitor enzyme catalyzed reactions. How does an enzyme catalyzereactions. Enzyme classification. Mechanism of enzyme action. Discuss at least two examples. Enzyme kinetics and kinetic parameters. Why should we know these parameters to understand biology? RNA catalysis.	
UNIT VI - Information Transfer	4
Purpose: The molecular basis of coding and decoding genetic information is universal Molecular basis of information transfer. DNA as a genetic material. Hierarchy of DNA structure- from single stranded to double helix to nucleosomes. Concept of genetic code. Universality and degeneracy of genetic code. Define gene in terms of complementation and recombination.	
UNIT VII - Macromolecular analysis	5
Purpose: How to analyses biological processes at the reductionist level Proteins- structure and function. Hierarch in protein structure. Primary secondary, tertiary and quaternary structure. Proteins as enzymes, transporters, receptors and structural elements.	
UNIT VIII - Metabolism	
Purpose: The fundamental principles of energy transactions are the same in physical and biological world. Thermodynamics as applied to biological systems. Exothermic and endothermic versus endergonic and exergoinc	5

reactions. Concept of K_{eq} and its relation to standard free energy. Spontaneity. ATP as an energy currency. This should include the breakdown of glucose to CO_2+ H_2O (Glycolysis and Krebs cycle) and synthesis of glucose from $CO_2$and H_2O (Photosynthesis). Energy yielding and energy consuming reactions. Concept of Energy charge	
UNIT IX- Microbiology	
Concept of single celled organisms. Concept of species and strains. Identification and classification of microorganisms. Microscopy. Ecological aspects of single celled organisms. Sterilization and media compositions. Growth kinetics. pose: How to analyses biological processes at the reductionist level Proteins- structure and function. Hierarch in protein structure. Primary secondary, tertiary and quaternary structure. Proteins as enzymes, transporters, receptors and structural elements.	

References:

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

Program: BTECH
Semester: Third
Course: Analog Electronic Circuits
Course Code: 3ECS201

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COURSE OBJECTIVES:

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

COURSE OUTCOMES

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

Course Content:

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

Nonlinear applications of op-amp Hysteretic Comparator, Zero Crossing Detector, Square-wave and triangular-wave generators. Precision rectifier, peak detector. Monoshot.	

Text/References:

A. S. Sedra and K. C. Smith, "Microelectronic Circuits", New York, Oxford University Press, 1998.

J. V. Wait, L. P. Huelsman and G. A. Korn, "Introduction to Operational Amplifier theory and applications", McGraw Hill U. S., 1992.

J. Millman and A. Grabel, "Microelectronics", McGraw Hill Education, 1988.

P. Horowitz and W. Hill, "The Art of Electronics", Cambridge University Press, 1989.

P.R. Gray, R.G. Meyer and S. Lewis, "Analysis and Design of Analog Integrated Circuits", John Wiley & Sons, 2001.

Program: BTECH
Semester: Third
Course: Analog Electronic Circuits Lab
Course Code: 3ESC201P

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Course Objective:

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

List of Experiment (Analog Electronics Circuit)

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

Program: BTECH
Semester: Third
Course: Data Structure & Algorithms
Course Code: 3PCCCS201

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COURSE OBJECTIVE

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

COURSE OUTCOME

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

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

Course Content:

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

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

Suggested books:

"Fundamentals of Data Structures", Illustrated Edition by Ellis Horowitz, Sartaj Sahni, Computer Science Press.

Suggested reference books:

Algorithms, Data Structures, and Problem Solving with C++", Illustrated Edition by Mark Allen Weiss, Addison-Wesley Publishing Company
"How to Solve it by Computer", 2nd Impression by R.G. Dromey, Pearson Education.

Program: BTECH
Semester: Third
Course: Data Structure & Algorithms Lab
Course Code: 3PCCCS201P

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Program:

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

Program: BTECH
Semester: Third
Course: Computer Organization & Architecture
Course Code: 3PCCCS202

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Course Objective:

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

Course Outcome:

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

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

Course Content:

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

Suggested books:

"Computer Organization and Design: The Hardware/Software Interface", 5th Edition by David A. Patterson and John L. Hennessy, Elsevier.

"Computer Organization and Embedded Systems", 6th Edition by CarlHamacher, McGraw Hill Higher Education.

Suggested reference books:

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

Program: BTECH
Semester: Third
Course: Computer Organization & Architecture Lab
Course Code: 3PCCCS202P

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List of Experiments:

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

Program: BTECH
Semester: Third
Course: Effective Technical Communication
Course Code: HSMC201

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Course Objective:

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

Course Outcome:

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

Course Content:

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

Text/Reference Books:

1. David F. Beer and David McMurrey, Guide to writing as an Engineer, John Willey. New York, 2004
2. Diane Hacker, Pocket Style Manual, Bedford Publication, New York, 2003. (ISBN 0312406843)
3. Shiv Khera, You Can Win, Macmillan Books, New York, 2003.
4. Raman Sharma, Technical Communications, Oxford Publication, London, 2004.
5. Dale Jungk, Applied Writing for Technicians, McGraw Hill, New York, 2004. (ISBN: 07828357-4)
6. Sharma, R. and Mohan, K. Business Correspondence and Report Writing, TMH New Delhi 2002.
7. Xebec, Presentation Book, TMH New Delhi, 2000. (ISBN 0402213)

Program: BTECH
Semester: Third
Course: Community Engagement and Social Responsibility
Course Code: MC201

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

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

Course Content:

Topics	Hours
Unit 1: Appreciation of Rural Society	8
Rural life style, rural society, caste and gender relations, rural values with respect to community, nature and resources, elaboration of "soul of India lies in villages' (Gandhi), rural infrastructure.	
ASSIGNMENT: Prepare a map (physical, visual or digital) of the village you visited and write an essay about inter-family relations in that village.	
Unit II: Understanding rural economy & livelihood	
Agriculture, farming, landownership, water management, animal husbandry, non-farm livelihoods and artisans, rural entrepreneurs, rural markets.	
ASSIGNMENT: Describe your analysis of rural h o u s e h o l d economy, its challenges and possible pathways to address them.	
Unit III: Rural Institutions	8

Traditional rural organisations, Self-help Groups, Panchayati raj institutions (Gram Sabha, Gram Panchayat, Standing Committees), local civil society, local administration.	
ASSIGNMENT: How effectively are Panchayati raj institutions functioning in the village? What would you suggest to improve their effectiveness? Present a case study (written or audio- visual)	
Unit IV: Rural Development Programmes	8
History of rural development in India, current national programmes: Sarva Shiksha Abhiyan, Beti Bachao, Beti Padhao, Ayushman Bharat, Swatchh Bharat, PM Awaas Yojana, Skill India, Gram Panchayat Decentralized Planning, NRLM, MNREGA, etc	
ASSIGNMENT: Describe the benefits received and challenges faced in the delivery of one of these programmes in the rural community; give suggestions about improving Implementation of the programme for the rural poor.	

Suggested Readings:

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