



**SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE
(AUTONOMOUS)**

(Affiliated to JNTUK, Kakinada), (Recognized by AICTE, New Delhi)
Accredited by NAAC with 'A' Grade, All UG Programmes are Accredited by NBA
CHINNA AMIRAM (P.O):: BHIMAVARAM :: W.G.Dt., A.P., INDIA :: PIN: 534 204

**LIST OF OPEN ELECTIVES
OFFERED BY VARIOUS DEPARTMENTS TO THE OTHER DEPARTMENTS
IN
III YEAR II SEMESTER**

Offered by	Course Code	Course Name	Offered to
CIVIL ENGINEERING	B19CEOE01	Disaster Management	CSE,ECE,EEE, IT &ME
	B19CEOE02	Remote Sensing &GIS	
COMPUTER SCIENCE & ENGINEERING	B19CSOE01	Data Structures	CE,ECE,EEE, &ME
	B19CSOE02	Java Programming	
	B19CSOE03	Web Technologies	
ELECTRONICS & COMMUNICATION ENGINEERING	B19ECOEO1	Basic Electronics	CE,CSE,EEE, IT &ME
	B19ECOEO2	Signals & Systems	
ELECTRICAL & ELECTRONICS ENGINEERING	B19EEOE01	Introduction To Electrical Systems	CE,CSE,ECE, IT &ME
	B19EEOE02	Electrical Estimation and Costing	
INFORMATION TECHNOLOGY	B19ITOE01	Data Structures & Algorithms	CE,ECE,EEE, &ME
	B19ITOE02	Database Design & Development	
	B19ITOE03	Java Programming	
MECHNAICAL ENGINEERING	B19MEOE01	Operations Research	CE,CSE,ECE, EEE & IT
	B19MEOE02	Operations Management	
	B19MEOE03	Total Quality Management	
ENGINEERING MATHEMATICS & HUMANITIES	B19BSOE01	Computational Statistics With R	ALL BRANCHES
	B19BSOE02	Fuzzy sets and Fuzzy Logic	

Code	Category	L	T	P	C	I.M	E.M	Exam
B19CEOE01	OE	3	--	--	3	25	75	3 Hrs.
DISASTER MANAGEMENT								
(offered by-CE)								
(offered to-CSE, ECE, EEE, IT & ME)								
Course Objectives:								
1	To provide an exposure to disasters, their significance and types.							
2	To familiarize with impacts of disaster key skills							
3	To impart the knowledge on different approaches of Disaster risk reduction.							
Course Outcomes:								
S.No	Outcome							Knowledge Level
1	Differentiate the types of disasters, causes and their impact on environment and society							K2
2	Analyze relationship between development and disasters							K2
3	Explain the process of risk management.							K2
4	Assess vulnerability and various methods of risk reduction measures as well As mitigation.							K2
SYLLABUS								
UNIT-I (10Hrs)	Concepts and definitions: disaster, disaster Management, hazard, vulnerability, Risk, capacity, mitigation. Types of Disasters, five priorities for action, relationship between disaster and human development, Disaster Management cycle, Disasters classification; Natural disasters –floods, Drought, earthquake, cyclone, Landslide. Manmade disasters – industrial pollution, nuclear radiation, chemical spills, bio terrorism, transportation accidents. Hazard and vulnerability profile of India.							
UNIT-II (10 Hrs)	Disaster Impacts: Introduction, Life and livestock loss, Habitation, agricultural and livelihood loss, Additional health hazards, Contamination of drinking water sources, impact on Children, Environmental loss. Impacts of climate change, greenhouse gases.							
UNIT-III (10 Hrs)	Disaster management cycle- its phases, prevention, mitigation, preparedness, relief & recovery; structural and non-structural measures, basic strategies and practices of disaster risk reduction, global policies and practices, risk management framework, vulnerability and capacity assessment..							
UNIT-IV (10 Hrs)	Education and Community Preparedness: Education in disaster risk reduction-Essentials of school disaster education-Community capacity and disaster resilience-Community based disaster recovery -Community based disaster management and social capital-Designing resilience building community capacity for action.							

UNIT-V (10 Hrs)	Role of Technology in Disaster Management: Disaster management for infra structures, mitigation program for earthquakes – flowchart, geospatial information in agriculture drought assessment-multimedia technology in disaster risk management and training-transformable indigenous knowledge in disaster reduction.
Text Books:	
1	Disaster Management – Global Challenges and Local Solutions’ by Rajib shah & R R Krishnamurthy (2009), Universities press.
2	‘Disaster Science & Management’ by Tushar Bhattacharya, Tata McGraw Hill Education Pvt. Ltd., New Delhi.
3	‘Disaster Management – Future Challenges and Opportunities’ by Jagbir Singh (2007), I K International Publishing House Pvt. Ltd.
Reference Books:	
1	‘Disaster Management’ edited by H K Gupta (2003), Universities press.

Code	Category	L	T	P	C	I.M	E.M	Exam
B19CEOE02	OE	3	--	--	3	25	75	3 Hrs.

REMOTE SENSING AND GEOGRAPHIC INFORMATION SYSTEMS

(offered by-CE)

(offered to-CSE, ECE, EEE, IT & ME)

Course Objectives:

1	Introduce the basic principles of Remote Sensing and GIS techniques
2	Teach various types of satellite sensors and platforms
3	Impart concepts of visual and digital image analyses
4	Understand the principles of spatial analysis
5	Appreciate application of RS and GIS in Civil engineering

Course Outcomes:

S.No	Outcome	Knowledge Level
1	Be familiar with ground, air and satellite based sensor platforms.	K2
2	Interpret the aerial photographs and satellite imageries	K3
3	Create and input spatial data for GIS application	K3
4	Apply RS and GIS concepts in Civil engineering like Agriculture, Water Resources, Transportation Urban planning etc.	K3

SYLLABUS

UNIT-I (10Hrs)	Introduction to Remote Sensing: Introduction, Basic components of remote sensing, electromagnetic radiation & electromagnetic spectrum and its interaction with atmosphere, energy interaction with the earth surfaces, Sensors: types and characteristics, passive sensor, active sensor, Platforms: airborne remote sensing & space borne remote sensing.
UNIT-II (10 Hrs)	Image Analysis: Introduction, elements of visual interpretations, Digital Image Processing - Image preprocessing, Image rectification, Image enhancement, Image classification: Supervised classification, Unsupervised classification.
UNIT- III (10 Hrs)	Geographic Information System (GIS): Introduction, key components, application areas of GIS, Spatial data models: Raster data models, Vector data models, Raster versus Vector, Data input methods, Map projections.
UNIT- IV (10 Hrs)	RS & GIS Applications - General: Land Cover and Land Use, Agriculture, Forestry, Geology, Geomorphology, Urban applications.
UNIT-V (10 Hrs)	RS and GIS applications in Civil Engineering: Flood zoning and mapping, Groundwater prospects and Potential Recharge Zones, Watershed Management. Environmental Impact Assessment.

Text Books:

1	Remote and GIS by Basudeb Bhatta
2	Remote Sensing and its Applications by LRA Narayana
3	Basics of Remote Sensing and GIS by Dr. S. Kumar
4	Remote Sensing and Geographical Information Systems by M. Anji Reddy

Reference Books:

1	Concepts & Techniques of GIS by C.P.Lo Albert
2	Principles of Geographical Information Systems by Peter A Burrough and Rachel A. Mc. Donnel
3	Fundamentals of Remote Sensing by George Joseph

Code	Category	L	T	P	C	I.M	E.M	Exam
B19CSOE01	OE	3	0	0	3	25	75	3 Hrs
DATA STRUCTURES								
(offered by-CSE)								
(offered to-CE, ECE, EEE & ME)								
Course Objectives:								
1.	Be familiar with basic techniques of algorithm analysis							
2.	Master the implementation of data structures like stacks, queues, linked lists, binary trees, graphs.							
3.	Be familiar with basic techniques for algorithm development like recursion.							
4.	Be familiar with several sub-quadratic sorting algorithms including quick sort, merge sort and heap sort.							
5.	Master analyzing problems and writing program solutions to problems using the above techniques.							
Course Outcomes:								
At the end of the course Students will be able								
1.	Demonstrate the concept of recursion, the way arrays, records, linked structures, stacks, queues, trees, and graphs are represented in memory							K4
2.	Implement stacks, linked lists, queues and trees and apply them to solve different Computer Science problems and Engineering problems.							K3
3.	Compare alternative implementations of data structures with respect to performance.							
4.	Apply the principal algorithms for sorting and searching to the given data and analyze the computational efficiency.							K4
5.	Make use of Graphs to solve real life applications.							K3
SYLLABUS								
UNIT-I (10 Hrs)	<p>Basic Concepts: Arrays, Structures: System Life Cycle, Algorithm Specification, Data Abstraction, Performance Analysis, Space Complexity, Time Complexity, Asymptotic Notation, Comparing Time Complexities. Array as an Abstract Data Type, Polynomial Abstract Data Type, Structures and Unions, Internal Implementation of Structures, Self-Referential Structures</p> <p>Simple Searching and Sorting Techniques: Introduction to Searching, Sequential Search, Binary Search, Interpolation Search, Selection Sort, Bubble Sort, Insertion Sort, Shell Sort, Introduction to Merge Sort</p> <p>Introduction to Recursion: Towers of Hanoi, Quick Sort, Merge Sort, Complexity Analysis of Basic Sorting and Searching techniques</p>							
UNIT-II (10 Hrs)	<p>Stacks, Queues Stack Abstract Data Type, Queue Abstract Data Type, Stacks and Queues using arrays, Introduction to Evaluation of Expressions, Evaluating Postfix Expressions, Infix to Postfix and Prefix conversion, Circular Queues using arrays. Pointers, Dynamically Allocated Storage using pointers, Dynamically Linked Stacks and Queues</p>							
UNIT-III (10 Hrs)	<p>Linked Lists: Singly Linked Lists: Representation in memory, Algorithms of several operations: Traversing, Searching, Insertion into, Deletion from linked list, Radix Sort,</p>							

	<p>Circular Linked Lists: Representation in memory, Algorithms of several operations: Traversing, Searching, Insertion into, Deletion from Circular Linked Lists,</p> <p>Doubly Linked Lists: Representation in memory, Algorithms of several operations: Traversing, Searching, Insertion into, Deletion from Doubly Linked Lists,</p> <p>Polynomials: Representing Polynomials as Singly Linked Lists, Adding Polynomials, Erasing Polynomials</p>
UNIT-IV (08 Hrs)	<p>Trees: Representation of Trees, Binary Trees Abstract Data Type, Properties of Binary Trees, Binary Tree Representations, Binary Tree Traversals, Additional Binary Tree Operations, Threaded Binary Trees, Heap Abstract Data Type, Insertion into a max heap, Deletion from a max heap, Heap Sort, Introduction to Binary Search Trees, Searching a Binary Search Tree, Inserting an Element into a Binary Search Tree, Deleting an Element from a Binary Search Tree, Height of a Binary Search Tree.</p>
UNIT-V (12 Hrs)	<p>Graphs: Graph Abstract Data Type, Definitions, Graph Representations, Elementary Graph Operations, Depth First Search, Breadth First Search, Connected Components, Spanning Trees, Minimum Cost Spanning Trees, Prim's and Kruskal's Algorithms, Shortest Paths and Transitive Closure, Single Source All Destination - Dijkstra's Algorithm</p>
Text Books:	
1.	Fundamentals of Data Structures in C, 2nd edition, Horowitz, Sahani and Anderson-Freed, Universities Press, 2008.
Reference Books:	
1.	Data Structures using C by Aaron M. Tenenbaum
2.	Data Structures with C by Seymour lipschutz
3.	Data Structures using C by R. KrishnaMoorthy G. IndiraniKumaravel

Code	Category	L	T	P	C	I.M	E.M	Exam
B19CSOE02	OE	3	0	0	3	25	75	3 Hrs
JAVA PROGRAMMING								
(offered by-CSE)								
(offered to-CE, ECE, EEE & ME)								
Course Objectives:								
1.	To identify Java language components and how they work together in applications							
2.	To learn the fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries.							
3.	To learn how to extend Java classes with inheritance and dynamic binding and how to use exception handling in Java applications							
4.	To understand how to design applications with threads in Java							
5.	To understand how to use Java APIs for program development							
Course Outcomes:								
At the end of the course Students will be able								
1.	Able to realize the concept of Object Oriented Programming & Java Programming Constructs							K1
2.	Able to describe the basic concepts of Java such as operators, classes, objects, inheritance, packages, Enumeration and various keywords							K2
3.	Apply the concept of exception handling and Input/ Output operations							K2
4.	Able to design the applications of Java & Java applet							K2
5.	Able to Analyze & Design the concept of Event Handling and Abstract Window Toolkit							K1
SYLLABUS								
UNIT-I (10 Hrs)	<p>Program Structure in Java: Introduction, Writing Simple Java Programs, Elements or Tokens in Java Programs, Java Statements, Command Line Arguments, User Input to Programs, Escape Sequences Comments, Programming Style.</p> <p>Data Types, Variables, and Operators : Introduction, Data Types in Java, Declaration of Variables, Data Types, Type Casting, Scope of Variable Identifier, Literal Constants, Symbolic Constants, Formatted Output with printf() Method, Static Variables and Methods, Attribute Final, Introduction to Operators, Precedence and Associativity of Operators, Assignment Operator (=), Basic Arithmetic Operators, Increment (++) and Decrement (- -) Operators, Ternary Operator, Relational Operators, Boolean Logical Operators, Bitwise Logical Operators. Control Statements: Introduction, if Expression, Nested if Expressions, if-else Expressions, Ternary Operator?:, Switch Statement, Iteration Statements, while Expression, do-while Loop, for Loop, Nested for Loop, For-Each for Loop, Break Statement, Continue Statement.</p>							
UNIT-II (10 Hrs)	<p>Classes and Objects: Introduction, Class Declaration and Modifiers, Class Members, Declaration of Class Objects, Assigning One Object to Another, Access Control for Class Members, Accessing Private Members of Class, Constructor Methods for Class, Overloaded Constructor Methods, Nested Classes, Final Class and Methods, Passing Arguments by Value and by Reference, Keyword this.</p>							

	<p>Methods: Introduction, Defining Methods, Overloaded Methods, Overloaded Constructor Methods, Class Objects as Parameters in Methods, Access Control, Recursive Methods, Nesting of Methods, Overriding Methods, Attributes Final and Static.</p>
<p>UNIT-III (10 Hrs)</p>	<p>Arrays: Introduction, Declaration and Initialization of Arrays, Storage of Array in Computer Memory, Accessing Elements of Arrays, Operations on Array Elements, Assigning Array to Another Array, Dynamic Change of Array Size, Sorting of Arrays, Search for Values in Arrays, Class Arrays, Two-dimensional Arrays, Arrays of Varying Lengths, Three-dimensional Arrays, Arrays as Vectors.</p> <p>Inheritance: Introduction, Process of Inheritance, Types of Inheritances, Universal Super Class Object Class, Inhibiting Inheritance of Class Using Final, Access Control and Inheritance, Multilevel Inheritance, Application of Keyword Super, Constructor Method and Inheritance, Method Overriding, Dynamic Method Dispatch, Abstract Classes, Interfaces and Inheritance. Interfaces: Introduction, Declaration of Interface, Implementation of Interface, Multiple Interfaces, Nested Interfaces, Inheritance of Interfaces, Default Methods in Interfaces, Static Methods in Interface, Functional Interfaces, Annotations.</p>
<p>UNIT-IV (10 Hrs)</p>	<p>Packages and Java Library: Introduction, Defining Package, Importing Packages and Classes into Programs, Path and Class Path, Access Control, Packages in Java SE, Java.lang Package and its Classes, Class Object, Enumeration, class Math, Wrapper Classes, Auto-boxing and Autounboxing, Java util Classes and Interfaces, Formatter Class, Random Class, Time Package, Class Instant (java.time.Instant), Formatting for Date/Time in Java, Temporal Adjusters Class, Temporal Adjusters Class.</p> <p>Exception Handling: Introduction, Hierarchy of Standard Exception Classes, Keywords throws and throw, try, catch, and finally Blocks, Multiple Catch Clauses, Class Throwable, Unchecked Exceptions, Checked Exceptions, try-with-resources, Catching Subclass Exception, Custom Exceptions, Nested try and catch Blocks, Rethrowing Exception, Throws Clause.</p>
<p>UNIT-V (10 Hrs)</p>	<p>String Handling in Java: Introduction, Interface Char Sequence, Class String, Methods for Extracting Characters from Strings, Methods for Comparison of Strings, Methods for Modifying Strings, Methods for Searching Strings, Data Conversion and Miscellaneous Methods, Class String Buffer, Class String Builder.</p> <p>Multithreaded Programming: Introduction, Need for Multiple Threads Multithreaded Programming for Multi-core Processor, Thread Class, Main Thread- Creation of New Threads, Thread States, Thread Priority-Synchronization, Deadlock and Race Situations, Inter-thread Communication - Suspending, Resuming, and Stopping of Threads.</p> <p>Java Database Connectivity: Introduction, JDBC Architecture, Installing MySQL and MySQL Connector/J, JDBC Environment Setup, Establishing JDBC Database Connections, ResultSet Interface, Creating JDBC Application, JDBC Batch Processing, JDBC Transaction Management</p>
Text Books:	
1.	JAVA one step ahead, Anitha Seth, B.L.Juneja, Oxford.
2.	The complete Reference Java, 8th edition, Herbert Schildt, TMH.

Reference Books:	
1.	Introduction to java programming, 7th edition by Y Daniel Liang, Pearson
2.	Murach's Java Programming, Joel Murach
3.	Theory of Automata, Languages and Computation, Rajendra Kumar, McGraw Hill, 2014
e-Resources:	
1.	https://nptel.ac.in/courses/106/105/106105191/
2.	https://www.w3schools.com/java/java_data_types.asp

Code	Category	L	T	P	C	I.M	E.M	Exam
B19CSOE03	OE	3	0	0	3	25	75	3 Hrs
WEB TECHNOLOGIES								
(offered by-CSE)								
(offered to-CE, ECE, EEE & ME)								
Course Objectives:								
1.	Translate user requirements into the overall architecture and implementation of new systems and Manage Project and coordinate with the Client							
2.	Write backend code in PHP language and Writing optimized front end code HTML and JavaScript							
3.	Understand, create and debug database related queries and Create test code to validate the applications against client requirement							
4.	Monitor the performance of web applications & infrastructure and Troubleshooting web application with a fast and accurate a resolution							
Course Outcomes: At the end of the course Students will be able								
1.	Illustrate the basic concepts of HTML and CSS & apply those concepts to design static web pages							K2
2.	Identify and understand various concepts related to dynamic web pages and validate them using JavaScript							K2
3.	Outline the concepts of Extensible markup language & AJAX							K3
4.	Develop web Applications using Scripting Languages & Frameworks							K4
5.	Create and deploy secure, usable database driven web applications using PHP							K4
SYLLABUS								
UNIT-I (10 Hrs)	HTML: Basic Syntax, Core Elements, Links and Addressing, Images, Iframe Images, Text, Hyper Text Links, Colors and Background, Lists, Tables and Layouts, Frames, Forms GET and POST methods.							
UNIT-II (10 Hrs)	Dynamic HTML. CSS: Cascading style sheets, Levels of Style Sheets, Style Specification Formats, and Selector Forms. JavaScript: Introduction to JavaScript, Objects, Primitives Operations and Expressions, Control Statements, Arrays, Functions, Pattern Matching using Regular Expressions.							
UNIT-III (08 Hrs)	Working with XML: Document type Definition (DTD), XML schemas, Document object model, Parsers- DOM and SAX. AJAX A New Approach: Introduction to AJAX, Basics of AJAX, XML Http Request Object, Integrating PHP and AJAX.							
UNIT-IV (10 Hrs)	PHP Programming: Introduction to PHP, Creating PHP script, Running PHP script. Working with variables and constants: Using variables, Using constants, Data types, Operators. Controlling program flow: Conditional statements, Control statements, Arrays, functions.							
UNIT-V (10 Hrs)	MYSQL: Installation, Accessing MYSQL using PHP, Form Handling, Cookies, Session Tracking, Tables, inserting data into Tables, Selecting Data from a Table, Updating Table, Deleting data from Table, Webpage creation.							

Text Books:	
1.	Programming the World Wide Web, 7 th Edition Robert W Sebesta, Pearson, 2013.
2.	WebTechnologies, 1 st Edition 7 th impression, Uttam K Roy, Oxford, 2012.
3.	Pro Mean Stack Development, 1 st Edition, ELad Elrom, A press O'Reilly, 2016.
4.	Java Script & jQuery the missing manual, 2 nd Edition, David sawyer mcfarland, O'Reilly, 2011.
5.	Web Hosting for Dummies, 1 st Edition, Peter Pollock, John Wiley & Sons, 2013.
6.	RESTful web services, 1 st Edition, Leonard Richardson, Ruby, O'Reilly, 2007.
Reference Books:	
1.	Ruby on Rails Up and Running, Lightning fast Web development, 1 st Edition, Bruce Tate, Curt Hibbs, Oreilly, 2006.
2.	Programming Perl, 4 th Edition, Tom Christiansen, Jonathan Orwant, O'Reilly, 2012.
3.	Web Technologies, HTML, JavaScript, PHP, Java, JSP, XML and AJAX, Black book, 1 st Edition, Dream Tech, 2009.
4.	An Introduction to Web Design, Programming, 1 st Edition, Paul S Wang, Sanda S Katila, Cengage Learning, 2003.

Code	Category	L	T	P	C	I.M	E.M	Exam
B19ECOEO1	OE	3	-	-	3	25	75	3Hrs.
BASIC ELECTRONICS								
(offered by-ECE)								
(offered to-CE, CSE, EEE , IT & ME)								
Course Pre Requisite(s)								
Engineering Physics and Electronics Engineering.								
Course Objectives:								
1	Principles of semiconductor devices, basic construction, operation & applications of P-N and other special diodes.							
2	Construction and performance of half wave and full wave rectifiers with parametric evaluation.							
3	Fundamental operating characteristics and biasing of BJT along with its h-parameter model.							
4	Basic operation of JFET in n-channel and p-channel along with the biasing mechanism.							
Course Outcomes: After completion of the course, the student will be able to								
S.No	Outcome							Knowledge Level
1	Interpret the operation of P-N junction and various diodes along with the rectifier circuits.							K2
2	Illustrate the characteristics of BJT in CE, CB configurations along with biasing.							K3
3	Interpret the Biasing and Amplifier characteristics of a transistor.							K2
4	Explain the Operation, characteristics and biasing of JFET.							K2
SYLLABUS								
UNIT-I (8 Hrs)	Fundamentals of P-N junction Diode and Special diodes : Open circuited PN junction, breakdown mechanism, Diode current equation(no derivation) V-I characteristics and applications of PN junction diode, Zener diode, LED.							
UNIT-II (8 Hrs)	Rectifier circuits: Half wave and Full wave rectifiers, PIV, DC voltage and current, ripple factor, efficiency, capacitive filter(without mathematical analysis).							
UNIT-III (8 Hrs)	Fundamentals of Transistors : Bipolar Junction Transistor (BJT) construction & Basic operation, Active, Cut-off, Saturation modes of operation, CB, CE configurations, Input and Output characteristics, Early effect, Transistor as an Amplifier and a Switch, Comparison of three configurations.							
UNIT-IV (8 Hrs)	Transistor biasing: Types of biasing: Self and fixed bias, Significance of Stability factor(without problems). Introduction to h-parameters, Transistor hybrid model. Transistor amplifiers: Circuit Diagram and working principle of CE and CC amplifier configurations(without h-parameter analysis).							

UNIT-V (8 Hrs)	Field effect transistors (FET's) : Junction Field Effect Transistor (JFET) Operation, n-channel JFET, p-channel JFET, Pinch-off Voltage, Volt-Ampere characteristics, FET biasing, Advantages of FET over BJT, Applications of FET.
Text Books:	
1.	Integrated Electronics: Analog and Digital circuits and systems by Jacob Millman and Christos C.Halkias, Tata MCGraw Hill edition.
2.	Electronic devices and circuits by S.Salivahanan and N.Sureshkumar, Tata MCGraw Hill edition.
Reference Books:	
1.	Electronic Devices and Circuits Theory by Robert L. Boylestad & Louis Nashelsky, PHI edition
2.	Electronic Devices and Circuits by SanjeevGuptha, DhanapatRai publications.
e-Resources:	
1.	https://books.google.co.in/books?id=Qta8v9hJBMAC&printsec=copyright#v=onepage&q&f=false
2.	https://books.google.co.in/books?id=z5nL2x7Z5X4C&printsec=frontcover&source=gbs_ge_summary_r&hl=en#v=onepage&q&f=false

Code	Category	L	T	P	C	I.M	E.M	Exam
B19EC0E02	OE	3	--	--	3	25	75	3 Hrs.

SIGNALS AND SYSTEMS

(offered by-ECE)

(offered to-CE, CSE, EEE , IT & ME)

Course Objectives:

1.	To introduce the fundamental concepts and techniques associated with the understanding of signals and systems.
2.	To familiarize with techniques suitable for analyzing continuous-time LTI systems using transforms.
3.	To familiarize with development of the mathematical skills to solve problems involving convolution and sampling.

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

S.No	Outcome	KL
1.	Outline the basic concepts of signals and systems.	K2
2.	Analyze the spectral characteristics of Continuous Time aperiodic signals using Fourier analysis.	K4
3.	Apply Laplace- transforms for analyzing Continuous -time signals and systems.	K3
4.	Apply Z- transforms for analyzing discrete-time signals and systems.	K3
5.	Outline the process of sampling and the effects of under sampling.	K2

SYLLABUS

UNIT-I (8 Hrs)	Introduction to Continuous –Time and Discrete –Time Signals : Continuous–Time & Discrete–Time signals, Signal Energy and Power, Periodic Signals, Even & odd Signals, Continuous-Time complex Exponential and Sinusoidal Signals, Discrete–Time complex Exponential and Sinusoidal Signals and their Periodicity, The Continuous–Time and Discrete–Time Unit Impulse and Unit step Functions.
UNIT-II (8 Hrs)	Introduction to Continuous –Time and Discrete –Time Systems: Continuous–Time and Discrete–Time Systems, Operations on signals, Interconnections of Systems, Basic System Properties, Continuous–Time and Discrete Time LTI Systems: The Graphical interpretation of Convolution Integral and The Convolution Sum, Causal LTI Systems Described by Differential and Difference Equations, Singularity Functions.
UNIT-III (8 Hrs)	Continuous time Fourier Transform: Introduction, Representation of Aperiodic signals, Continuous time Fourier Transform, Properties of the continuous time Fourier Transform, Systems characterized by linear constant coefficient differential equations.
UNIT-IV (8 Hrs)	Laplace Transform: Introduction, The Laplace Transform, Region of convergence for Laplace Transforms, The Inverse Laplace Transform, Properties of Laplace Transforms, The initial and Final value theorems.

UNIT-V (10 Hrs)	Sampling Theorem and Z-Transform: Introduction to Sampling Theorem, Statement of Sampling Theorem for Low pass signals (Theorem Proof for Low Pass signals only), Discussion on Oversampling, Critical sampling and Under sampling (aliasing), The Z-Transform, The Inverse Z-Transform, Properties of Z-Transform, Initial and Final Value theorems, Some common Z-transform pairs.
Text Books:	
1.	Signals Systems and Communication-B. P. Lathi, BS Publication.
2.	Signals and Systems- Alan V. Oppenheim, Alan S. Willsky and Ian T. Young, PHI, 2ndEdn.
Reference Books:	
1.	Signals and Systems – P.RamakrishnaRao, TMH.
2.	Signals and Systems- A.AnandaKumar,PHI.
e-Resources:	
1.	https://ocw.mit.edu/resources/res-6-007-signals-and-systems-spring-2011/video-lectures/
2.	https://swayam.gov.in/nd1_noc20_ee06/preview

Code	Category	L	T	P	C	I.M	E.M	Exam
B19EE0E01	OE	3	--	--	3	25	75	3 Hrs.
INTRODUCTION TO ELECTRICAL SYSTEMS								
(offered by-EEE)								
(offered to-CE, CSE, ECE , IT & ME)								
Course Objectives:								
1.	To study the various aspects of electricity generation and power generation scenario in India							
2.	To study the various aspects of transmission and distribution of electrical energy and Indian Power grid scenario							
3.	To study the utilization of electricity in various applications.							
4.	To study the power conversion and energy storage of electricity							
5.	To study the electrical hazards, electrical safety measures and equipment protection devices							
Course Outcomes: The student should be able to								
S.No	Students will be able to	KL						
1.	Apply basic knowledge to understand principles of power generation and its scenario in India.	3						
2.	Identity different components of transmission and distribution substations and understand the Indian Power grid scenario.	3						
3.	Apply energy conversion principles to understand operation of electrical utility components	3						
4.	Apply basic knowledge to understand operation of rectifier, Inverter, batteries and uninterrupted power supply	3						
5.	Understand and apply the Electrical safety measures while handling electrical equipment.	3						
SYLLABUS								
UNIT-I (10 Hrs)	ELECTRICITY GENERATION History of Electricity generation, Basic electrical quantities-Voltage, Current, Power and energy, DC and AC power supplies, frequency and rms value of sinusoidal voltage, Electric generator - principle of operation, Major sources of electricity generation: schematics of conventional power plants (Thermal and Hydro), Non-conventional sources (solar and wind)-principles and advantages, Power generation scenario in India.							
UNIT-II (10 Hrs)	TRANSMISSION AND DISTRIBUTION OF ELECTRICITY Transmission of Electrical Energy: Layout of power system, Overhead lines and cables, Power transmission at high voltage, Transformer - Working principle, Construction, Distribution of electrical energy - schematics diagrams of radial and ring main distribution, Substations - substation layout, substation equipment and their purpose. Overview of Indian power grid.							

UNIT-III (10 Hrs)	ELECTRICAL ENERGY CONSUMPTION Conversion to mechanical energy -Classification of Electrical motors and their applications, DC motor - Working principle, Torque equation, AC motor - Working principle of 3-phase Induction motor, slip, .Illumination - laws of illumination, Fluorescent lamp, LED lamp, Electrical energy consumption in India
UNIT-IV (10 Hrs)	POWER CONVERTERS AND STORAGE Need of power conversion, Rectifier- Single phase full wave diode rectifier with C-filter, rectifier applications, Inverter- Single phase full bridge inverter operation, Inverter Applications, Electricity storage- Batteries, types of batteries , Lead acid battery, Li ion batteries, Ratings and basic parameters of batteries, battery pack, Domestic Uninterrupted power supply(UPS) system.
UNIT-V (10 Hrs)	ELECTRICAL SAFETY AND EQUIPMENT PROTECTION. Hazards in electrical systems, Different types of hazards, Electric Shock, Electrical safety measures, Earthing, Different methods of earthing. Domestic Protective Devices - Fuses and their ratings, Miniature Circuit Breaker (MCB), Earth Leakage Circuit Breaker(ELCB), Power ratings of different domestic loads - Fans, Lights, Air conditioners, Refrigerators, etc.
Text Books:	
1.	Basic Electrical Engineering- S. K. Sahdev, Pearson Publications, ISBN 978-93-325-4216-7
2.	Dr P.S. Bimbhra, Power Electronics - 4th Edition, Kanna Publisher
Reference Books:	
1.	Iqbal Husain, “Electric and Hybrid Vehicles Design Fundamentals”, CRC Press, Taylor & Francis Group, 2011
2.	Generation Distribution and Utilization of Electrical Energy by C.L Wadhwa.3rd Edition

Code	Category	L	T	P	C	I.M	E.M	Exam
B19EE0E02	OE	3	--	--	3	25	75	3 Hrs.
ELECTRICAL ESTIMATION AND COSTING								
(offered by-EEE)								
(offered to-CE, CSE, ECE , IT & ME)								
Course Objectives: students will learn								
1.	The electrical symbols and simple electrical circuits.							
2.	The design of electrical installations.							
3.	The design of electrical installation for different types of buildings and small industries.							
4.	The basic components of electrical substations.							
5.	The design of overhead and underground Transmission and Distribution lines.							
Course Outcomes: students will be able to								
1.	Identify the various electrical apparatus and their interconnections.							KL3
2.	Select suitable electrical supply system and design earthing systems of various electric loads.							KL4
3.	Estimate the cost for installation of wiring for different types of buildings and small industries.							KL3
4.	Identify the components of electrical substations.							KL3
5.	Design overhead and underground Transmission and Distribution lines.							KL4
SYLLABUS								
UNIT-I (8-- Hrs)	Electrical Symbols and Simple Electrical Circuits: Need of electrical symbols, list of symbols, Electrical Diagrams, Methods of representation for wiring diagrams, introduction to simple light and fan circuits, system of connection of appliances and accessories, simple examples on light and fan circuits.							
UNIT-II (12-- Hrs)	Design Considerations of Electrical Installations: Electric supply system, Three-phase four wire distribution system, protection of electric installation against overload, short circuit and earth fault, Earthing, neutral and earth wire, types of loads, systems of wiring, Service connections, Service Mains, Sub-Circuits, Location of Outlets, Location of Control Switches, Location of Main Board and Distribution board, Guide lines for Installation of Fittings, Load Assessment, estimating and costing of electrical installations							
UNIT-III (12-- Hrs)	Electrical Installation for Different Types of Buildings and Small Industries: Electrical installations for residential buildings, estimating and costing of material, simple examples on electrical installation for residential buildings, electrical installations for commercial buildings, Electrical installations for small industries.							
UNIT-IV (8-- Hrs)	Substations : Introduction, types of substations, outdoor substations-pole mounted type, indoor substations-floor mounted type, simple examples on quantity estimation.							

UNIT-V (10-- Hrs)	Overhead and Underground Transmission and Distribution Lines: Introduction, Supports for transmission lines, Distribution lines — Materials used, Underground cables, Mechanical Design of overhead lines, Design of underground cables, Estimation and cost for 1000 Meter 400/230 Volt overhead transmission line with street lightning.
Text Books:	
1.	Electrical Design and Estimation Costing - K. B. Raina and S.K.Bhattacharya – New Age International Publishers.
Reference Books:	
1.	Electrical wiring estimating and costing – S.L.Uppal and G.C.Garg – Khanna publishers, sixth edition, 1987.
2.	A course in electrical installation estimating and costing – J.B.Gupta –Kataria SK & Sons.

Subject Code	Category	L	T	P	C	I.M	E.M	Exam
B19IT0E01	OE	3	--	--	3	25	75	3 Hrs.
DATA STRUCTURES & ALGORITHMS								
(offered by-IT)								
(offered to-CE, ECE, EEE & ME)								
Course Objectives:								
1.	Introduce the fundamental concept of data structures and abstract data types							
2.	Emphasize the importance of data structures in developing and implementing efficient algorithms							
3.	Describe how arrays, records, linked structures, stacks, queues, trees, and graphs are represented in memory and used by algorithms							
4.								
Course Outcomes: By the end of the course, the student should have the ability to:								
S.No	Outcome							Knowledge Level
1.	Illustrate different techniques for searching and sorting for given data.							K3
2.	Identify different parameters to analyze the performance of algorithms and implement linear data structures.							K3
3.	Design algorithms to perform operations with Non-Linear data structures.							K4
SYLLABUS								
UNIT-I (10 Hrs)	Data Structures - Definition, Classification of Data Structures, Operations on Data Structures, Abstract Data Type (ADT), Preliminaries of algorithms. Time and Space complexity, Asymptotic Notations Searching - Linear search, Binary search, Interpolation Search, Fibonacci search. Sorting - Insertion sort, Selection sort, Exchange (Bubble sort, quick sort), distribution (radix sort), merging (Merge sort) algorithms.							
UNIT-II (10 Hrs)	Stacks: Introduction to Stacks, Array Representation of Stacks, Operations on Stacks, Applications-Reversing list, Factorial Calculation, Infix to Postfix Conversion, Evaluating Postfix Expressions. Queues: Introduction to Queues, Representation of Queues-using Arrays, Implementation of Queues-using Arrays, Application of Queues-Circular Queues, Dequeues, Priority Queues, Multiple Queues.							
UNIT-III (10 Hrs)	Linked Lists: Introduction, Single linked list, Representation of Linked list in memory, Operations on Single Linked list-Insertion, Deletion, Search and Traversal, Reversing Single Linked list, Applications on Single Linked list- Implementation of Stack and Queues, Polynomial Expression Representation, Addition and Multiplication, Sparse Matrix Representation using Linked List, Advantages and Disadvantages of Single Linked list, Double Linked list-Insertion, Deletion, Circular Linked list-Insertion, Deletion.							
UNIT-IV (8 Hrs)	Trees: Basic Terminology in Trees, Binary Trees-Properties, Representation of Binary Trees using Arrays and Linked lists. Binary Search Trees- Basic Concepts, BST Operations:							

	Insertion, Deletion, Tree Traversals, Applications-Expression Trees, Heap Sort, Balanced Binary Trees- AVL Trees, Insertion, Deletion and Rotations.
UNIT-V (12 Hrs)	Graphs: Basic Concepts, Representations of Graphs-Adjacency Matrix and using Linked list, Graph Traversals (BFT & DFT), Applications- Minimum Spanning Tree Using Prims &Kruskals Algorithm, Dijkstra’s shortest path, Transitive closure, Warshall’s Algorithm.
Text Books:	
1.	Data Structures Using C. 2nd Edition.ReemaThareja, Oxford.
2.	Data Structures and algorithm analysis in C, 2nded, Mark Allen Weiss.
Reference Books:	
1.	Fundamentals of Data Structures in C, 2nd Edition, Horowitz, Sahni, Universities Press.
2.	Data Structures: A PseudoCode Approach, 2/e, Richard F.Gilberg, Behrouz A. Forouzon, Cengage.
3.	Data Structures with C, Seymour Lipschutz TMH

Subject Code	Category	L	T	P	C	I.M	E.M	Exam
B19IT0E02	OE	3	--	--	3	25	75	3 Hrs.
DATABASE DESIGN & DEVELOPMENT								
(offered by-IT)								
(offered to-CE, ECE, EEE & ME)								
Course Objectives:								
1.	To introduce about database management systems.							
2.	To give a good formal foundation on the E-R and relational model of data.							
3.	To introduce the concepts of basic SQL as a universal Database language.							
4.	To demonstrate the principles behind systematic database design approaches by covering conceptual design, logical design through normalization.							
5.	To demonstrate the concepts of transaction management, concurrency control and recovery of a database system.							
Course Outcomes: By the end of the course, student will be able to:								
S. No	Outcome							Knowledge Level
1	Understand fundamental concepts and architectures of database systems.							K2
2	Develop database for an organization using E-R and Relational data models.							K3
3	Apply knowledge of SQL to Create, Manipulate and Query databases.							K4
4	Examine anomalies in database design and Apply Normalization concepts to refine the design.							K4
5	Understand concepts and issues related to transaction processing and their solutions.							K2
SYLLABUS								
UNIT-I (6 Hrs)	Introductory Concepts: Databases and Information Systems, An example usage context, Database System Concepts, Levels of abstraction, Data Independence, Schema and Instance, Data Models, Advantages of DBMS, Database Users, Structure of DBMS, 2-Tier and 3-Tier Application Architectures.							
UNIT-II (10 Hrs)	Semantic Database Design: High-Level Conceptual Modeling, ER Modeling Concepts, Attributes and Types of Attributes, Entity Sets, Unary and Higher-Order Relationships, Cardinality Constraints, Participation Constraints, Weak-Entity Sets, Subclasses and Inheritance, Specialization and Generalization, ER Diagrams. Relational Model: Relational Model Concepts, Relational Integrity Constraints, Referential Integrity, ER to Relational Mapping.							
UNIT-III (12 Hrs)	Structured Query Language: Data Definition and Data Manipulation in SQL, Simple Queries, and Nested Queries, Aggregate Functions, Group By and Having Clauses, Views and Joins. IBM DB2 Case Study: Architecture of DB2, Data Definition and Manipulation in DB2.							

UNIT-IV (8 Hrs)	Database Design using Relational Model: Anomalies in Database Design, Concept of Functional Dependencies, Finding Keys in Relational Model, Normal Forms Based on Primary Keys up to 3 rd Normal Form, Boyce-Codd Normal Form, Multi-Valued Dependencies and Fourth Normal Form, Join Dependencies and Fifth Normal Form.
UNIT-V (12 Hrs)	<p>Transaction Processing: Concept of a Transaction, Necessary Properties of a Transactions (ACID properties), Transaction states, Serializability, Recoverable and Non-Recoverable Schedules, Cascading Rollbacks.</p> <p>Concurrency Control: Anomalies due to interleaved execution, Locking, Lock Compatibility Matrix, , Two-phase locking (2PL) Protocol, Conflict Serializability, View Serializability, Timestamp-Ordering Based Protocol, Multi Version Protocol, Deadlock Prevention Protocols, Wait-Die and Wound-Wait Schemes.</p> <p>Database Recovery: Recovery Concepts, Deferred Update Technique , Immediate Update Technique , ARIES Recovery Algorithm.</p>
Text Books:	
1.	Database Management System, 3/e RamezElmasri, Shamkant B. Navathe, PEA.
2.	Database Management Systems, 3/e, Raghurama Krishnan, Johannes Gehrke, TMH.
Reference Books:	
1.	Introduction to Database Systems, 8/e C J Date, PEA.
2.	Database System Concepts,5/e, Silberschatz, Korth, TMH
3.	Database Principles Fundamentals of Design Implementation and Management, Corlos Coronel, Steven Morris, Peter Robb, Cengage Learning.

Subject Code	Category	L	T	P	C	I.M	E.M	Exam
B19IT0E03	OE	3	--	--	3	25	75	3 Hrs.
JAVA PROGRAMMING								
(offered by-IT)								
(offered to-CE, ECE, EEE & ME)								
Course Objectives:								
1.	To identify Java language components and how they work together in applications							
2.	To learn the fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries.							
3.	To learn how to extend Java classes with inheritance and dynamic binding and how to use exception handling in Java applications							
4.	To understand how to design applications with threads in Java							
5.	To understand how to use Java APIs for program development							
Course Outcomes: By the end of the course, the student should have the ability to:								
S.No	Outcome							Knowledge Level
1.	Able to apply the concepts of Object-Oriented Programming & Java Programming Constructs							K3
2.	Able to understand the basic concepts of Java such as operators, classes, objects, and various keywords							K2
3.	Apply the concept of Inheritance, Interfaces and Overriding the methods							K3
4.	Able to Analyze the applications of Java using Multithreading, Exception handling							K3
5.	Able to Analyze & Design the concept of Event Handling and Abstract Window Toolkit							K4
SYLLABUS								
UNIT-I (10 Hrs)	<p>Program Structure in Java: Introduction, Writing Simple Java Programs, Elements or Tokens in Java Programs, Java Statements, Command Line Arguments, User Input to Programs, Escape Sequences Comments, Programming Style.</p> <p>Data Types, Variables, and Operators : Introduction, Data Types in Java, Declaration of Variables, Data Types, Type Casting, Scope of Variable Identifier, Literal Constants, Symbolic Constants, Formatted Output with printf() Method, Static Variables and Methods, Attribute Final, Introduction to Operators, Precedence and Associativity of Operators, Assignment Operator (=), Basic Arithmetic Operators, Increment (++) and Decrement (- -) Operators, Ternary Operator, Relational Operators, Boolean Logical Operators, Bitwise Logical Operators.</p> <p>Control Statements: Introduction, if Expression, Nested if Expressions, if-else Expressions, Ternary Operator? :, Switch Statement, Iteration Statements, while Expression, do-while Loop, for Loop, Nested for Loop, For-Each for Loop, Break Statement, Continue Statement.</p>							
UNIT-II (10 Hrs)	<p>Classes and Objects: Introduction, Class Declaration and Modifiers, Class Members, Declaration of Class Objects, Assigning One Object to Another, Access Control for Class Members, Accessing Private Members of Class, Constructor Methods for Class, Overloaded Constructor Methods, Nested Classes, Final Class and Methods, Passing Arguments by Value and by Reference, Keyword this.</p>							

	<p>Methods: Introduction, Defining Methods, Overloaded Methods, Overloaded Constructor Methods, Class Objects as Parameters in Methods, Access Control, Recursive Methods, Nesting of Methods, Attributes Final and Static.</p>
UNIT-III (10 Hrs)	<p>Arrays: Introduction, Declaration and Initialization of Arrays, Storage of Array in ComputerMemory, Accessing Elements of Arrays, Operations on Array Elements, Assigning Array toAnother Array, Dynamic Change of Array Size, Sorting of Arrays, Search for Values inArrays, Class Arrays, Two-dimensional Arrays, Arrays of Varying Lengths, ThreedimensionalArrays, Arrays as Vectors.</p> <p>Inheritance: Introduction, Process of Inheritance, Types of Inheritances, Universal Super Class-Object Class, Inhibiting Inheritance of Class Using Final, Access Control and Inheritance, Multilevel Inheritance, Application of Keyword Super, Constructor Method andInheritance, Method Overriding, Dynamic Method Dispatch, Abstract Classes, Interfaces andInheritance.</p> <p>Interfaces: Introduction, Declaration of Interface, Implementation of Interface, Multiple Interfaces, Nested Interfaces, Inheritance of Interfaces, Default Methods in Interfaces, Static Methods in Interface, Functional Interfaces, Annotations.</p>
UNIT-IV (8 Hrs)	<p>Packages and Java Library: Introduction, Defining Package, Importing Packages and Classesinto Programs, Access Control, Packages in Java SE:Java.lang Package, Java utilandTimePackages.</p> <p>Exception Handling: Introduction, Keywordthrows and throw, try, catch, and finally Blocks, Multiple Catch Clauses, Class Throwable, Custom Exceptions, Nested try and catch Blocks,ThrowsClause.</p> <p>String Handling in Java: Introduction, Class String handling Methods, Class String Buffer.</p> <p>Multithreaded Programming: Introduction, Thread Class, Main Thread- Creation of New Threads, Thread States, Runnable Interface, Thread Priority-Synchronization.</p>
UNIT-V (12 Hrs)	<p>GUI programming with Swing:Introduction, limitations of AWT, MVC Architecture, containers. Understanding Layout Managers: Flow, Border, Grid, Card, GridBag.</p> <p>Event Handling: The Delegation event model-Events, Event sources, Event Listeners, Event classes, Handling mouse and keyboard events, Adapter classes, Inner classes, Inner classes, Inner classes, Anonymous Inner classes. A Simple Swing Application.Exploring swing controls-JLabel, JText field, The Swing Buttons-JButton, JToggle Button, JCheck Box, JRadio Button, JTabbed Pane, JScroll Pane, JList ,JCombo Box, Swing Menus, Dialogs.</p> <p>Java Database Connectivity: Introduction, JDBC Architecture,Establishing JDBC Database Connections.</p>
Text Books:	
1.	JAVA one step ahead, Anitha Seth, B.L.Juneja, Oxford.
2.	The complete Reference Java, 8th edition, Herbert Schildt, TMH.
Reference Books:	
1.	Introduction to java programming, 7th edition by Y Daniel Liang, Pearson
2.	Murach's Java Programming, Joel Murach
e-Resources:	
1)	https://nptel.ac.in/courses/106/105/106105191/
2)	ps://www.w3schools.com/java/java_data_types.asp

Code	Category	L	T	P	C	I.M	E.M	Exam
B19MEOE01	OE	3	--	--	3	25	75	3 Hrs.
OPERATIONS RESEARCH								
(offered by-ME)								
(offered to-CE, CSE, ECE, EEE & IT)								
Course Objectives:								
1.	To acquaint the students with basic Operation Research concepts, Formulation of LPP and its solution using various methods.							
2.	To build capabilities in the students to analyse the various transportation and assignment problems, job sequencing problems, inventory problems, Games theory and Queuing Models.							
3.	To familiarise the students with project management techniques i.e., PERT and CPM .							
Course Outcomes: Upon successful completion of the course, the students will be able to								
S.No	Outcome							Knowledge Level
1.	Describe the basic Operations Research models, formulate and solve Linear Programming problems for industrial and business applications							K4
2.	Build and Solve Transportation and Assignment problems using appropriate methods for different situations.							K4
3.	Determine the optimal solutions for various Job Sequencing and Inventory models for industrial applications.							K4
4.	Analyse and solve various Games theory and Queuing Models in real situations							K4
5.	Design and schedule various project management problems by CPM & PERT.							K4
SYLLABUS								
UNIT-I (10Hrs)	Introduction to OR: Definition of OR, Characteristics and phases of OR, Scope of OR, OR models, General methods for solving OR models, Roll of computers in OR. Linear Programming: Formulation, Graphical Solution, Simplex Method, Artificial Variable Technique-Big-M method, Duality.							
UNIT-II (10 Hrs)	Transportation Model: Balanced and Unbalanced transportation problems-Initial solution by North West Corner Rule, Lowest Cost Method and VAM, Optimality test by MODI method, Degeneracy in TP. Assignment Model: Hungarian algorithm, Balanced and Unbalanced Assignment Problems, Travelling Salesman Problems.							
UNIT-III (10 Hrs)	Job Sequencing: Introduction, Assumptions, Johnson's algorithm for N-Jobs 2-Machines Problems, N-Jobs 3-Machines Problems, N-Jobs M-Machines Problems, Graphical solution for 2-Jobs and M-Machines Problems. Inventory Models: Definition of Inventory, Costs associated with Inventory Problems, Classification of Models, EOQ Model with and without Shortages, Inventory Problems with Price Breakups.							
UNIT-IV (10 Hrs)	Game Theory: Introduction, Basic definitions, Two Person Zero Sum Games, Minimax criterion, Saddle point, Value of game, Solution of games with saddle point, Mixed Strategy Games-Arithmetic method, Dominance principle to reduce size of game, Graphical Method,							

	Algebraic solution to rectangular games. Queuing Theory: Structure of Queuing Models, Characteristics of Queuing process, Kendall's notation, Single channel systems-(M/M/1:∞/FIFO) model and (M/M/1:N/FIFO) model.
UNIT-V (10 Hrs)	Network Analysis: Introduction, Project scheduling by CPM and PERT, Network diagram representations, Rules to construct Network diagrams, Time estimates in network analysis- EST, EFT, LST, LFT, float/slack and critical path, Time estimates and Probability considerations in PERT, Crashing in PERT
Text Books:	
1.	Operations Research by S.D Sharma.
2.	Operations Research by V. K. Kapoor.
Reference Books:	
1.	Operations Research - Kanti Swaroop, P.K. Gupta, Man Mohan, Sulthan Chand&Sons Education.
2.	Operations Research - Hamdy A Taha – Pearson Education.
3.	Operations Research -Panneer Selvan Prentice Hall of India.
4.	Introduction to Operations Research, F.S. Hiller, G.J. Liberman, TMH.
Web links	
1.	https://nptel.ac.in/courses/112/106/112106134/
2.	https://nptel.ac.in/courses/110/106/110106062/

Code	Category	L	T	P	C	I.M	E.M	Exam
B19MEOE02	OE	3	--	--	3	25	75	3 Hrs.
OPERATIONS MANAGEMENT								
(offered by-ME)								
(offered to-CE, CSE, ECE, EEE & IT)								
Course Objectives:								
1.	To develop an understanding of how the operations, have strategic importance and can provide a competitive advantage in the workplace.							
2.	To understand the relationship between operations and other business functions							
3.	To understand techniques of location and facility planning; line balancing; job designing; and capacity planning in operations management.							
Course Outcomes: On completion of this course, the students will be able to								
S.No	Outcome							Knowledge Level
1.	Identify the elements of operations management and various transformation processes to enhance productivity and competitiveness							K3
2.	Analyze plant and process layout							K3
3.	Apply materials management principles and material requirement planning in operation environment.							K3
4.	Develop aggregate capacity plans and MPS in operation environments							K3
5.	Apply inventory control techniques and contemporary management techniques in operation environment.							K3
SYLLABUS								
UNIT-I (10 Hrs)	Forecasting: Introduction, types of forecasting and their uses, General principles of forecasting, Forecasting techniques: qualitative and quantitative methods of Forecasting. Production Systems: Types of production systems: job, batch, mass and flow type production.							
UNIT-II (8 Hrs)	Plant Location: Factors affecting the plant location, comparison of rural and urban sites. Plant Layout: Introduction, principles of plant layout, types of plant layouts							
UNIT-III (10 Hrs)	Materials Management: Introduction, functions of materials management, inventory, inventory management, types of inventories, Selective inventory control techniques: ABC analysis, VED analysis. Material Requirement Planning: Introduction, Inputs, outputs and MRP logic.							
UNIT-IV (10 Hrs)	Aggregate Planning: Introduction, aggregate planning strategies, aggregate planning methods mathematical planning models, heuristic and computer search models, problems. Scheduling: Introduction, difference with loading, scheduling policies, techniques, standard scheduling methods.							
UNIT-V (10 Hrs)	Inventory Control: Deterministic models, safety stock inventory control systems Contemporary management techniques: Introduction to MRP-II, JIT, ERP and Supply chain management							

Text Books:	
1.	Operations Management by Joseph. G.Monks, International (3rd) Edition
2.	Elements of Production Planning and Control by Samuel Eilon.
3.	Modern Production/ operation managements by Baffa & Rakesh Sarin
Reference Books:	
1.	Operations Management by S.N. Chary.
2.	Inventory Control Theory and Practice by Martin K. Starr and David W. Miller.
3.	Production And Operation Management by Martand Telsang
4.	Production Control A Quantitative Approach by John E. Biegel.
5.	Production Control by Moore.

Code	Category	L	T	P	C	I.M	E.M	Exam
B19MEOE03	OE	3	--	--	3	25	75	3 Hrs.
TOTAL QUALITY MANAGEMENT								
(offered by-ME)								
(offered to-CE, CSE, ECE, EEE & IT)								
Course Objectives:								
1.	To understand the concept of Quality							
2.	To understand the Implication of Quality on Business							
3.	To Implement Quality Implementation Programs							
4.	To have exposure to challenges in Quality Improvement Programs							
Course Outcomes: On completion of this course, the students will be able to:								
S.No	Outcome							Knowledge Level
1.	To realize the importance of significance of quality							K3
2.	Manage quality improvement teams							K3
3.	Identify requirements of quality improvement programs							K3
SYLLABUS								
UNIT-I (10 Hrs)	INTRODUCTION: The concept of TQM, Quality and Business performance, attitude and involvement of top management, communication, culture and management systems. Management of Process Quality: Definition of quality, Quality Control, a brief history, Product Inspection vs, Process Control, Statistical Quality Control, Control Charts and Acceptance Sampling.							
UNIT-II (10 Hrs)	CUSTOMER FOCUS AND SATISFACTION: The importance of customer satisfaction and loyalty- Crating satisfied customers, Understanding the customer needs, Process Vs. Customer, internal customer conflict, quality focus, Customer Satisfaction, role of Marketing and Sales, Buyer – Supplier relationships. Bench Marketing: Evolution of Bench Marketing, meaning of Bench marketing, benefits of bench marketing, the bench marketing process, pitfalls of bench marketing.							
UNIT-III (10 Hrs)	ORGANIZING FOR TQM: The systems approach, Organizing for quality implementation, making the transition from a traditional to a TQM organizing, Quality Circles. Productivity, Quality and Reengineering: The leverage of Productivity and Quality, Management systems Vs. Technology, Measuring Productivity, Improving Productivity Re-engineering.							
UNIT-IV (9 Hrs)	THE COST OF QUALITY: Definition of the Cost of Quality, Quality Costs, Measuring Quality Costs, use of Quality Cost Information, Accounting Systems and Quality Management.							
UNIT-V (9 Hrs)	ISO9000: Universal Standards of Quality: ISO around the world, The ISO9000 ANSI/ASQCQ-Series Standards, benefits of ISO9000 certification, the third party audit, Documentation ISO9000 and services, the cost of certification implementing the system.							

Text Books:	
1.	Total Quality Management by Joel E.Ross/Taylor and Franscis Limited
2.	2. Total Quality Management by P.N.Mukherjee/PHI
Reference Books:	
1.	Beyond TQM by Robert L.Flood
2.	Statistical Quality Control by E.L. Grant / McGraw Hill.
3.	Total Quality Management by A Practical Approach/H. Lal
4.	Quality Management by Kanishka Bedi/Oxford University Press/2011
5.	Total Engineering Quality Management by Sunil Sharma/Macmillan

Subject Code	Category	L	T	P	C	I.M	E.M	Exam
B19BSOE01	OE	3	--	--	3	25	75	3 Hrs.
COMPUTATIONAL STATISTICS with R								
(offered by-EM&H)								
(offered to-ALL BRANCHES)								
Course Objectives: Students are expected to								
1	Have an idea of discrete and continuous random variables and fundamentals of R.							
2	Learn the concept of Estimation and R commands for computing probability distributions							
3	Learn sampling distribution, Standard error and sampling distribution of means and variances							
4	Identify R functions for constructing confidence intervals of a few sampling distributions							
5	Know how to design and conduct experiments by ANOVA and forecast the data by various models in time series. Also learn R commands for the same.							
6	Learn how to test the hypothesis for non-parametric data.							
Course Outcomes: At the end of the course students will be able to								
S. No	OUT COME							Knowledge Level
1	Identify discrete and continuous random variables and data structures in R							K2
2	Estimate the parameters using point and interval estimation and Execute R functions for probability distributions.							K3
3	Explain sampling distribution and construct sampling distribution for means & variances							K3
4	Use R functions for constructing confidence intervals for sampling distributions							K3
5	Apply ANOVA techniques and forecasting methods to the given time series data.							K3
6	Make use of testing of hypothesis and its applications to non-parametric data.							K3
SYLLABUS								
UNIT-I (12 Hrs.)	Random Variables and Introduction to R Random Variables- Discrete, Continuous random variables-Expectation, Variance, Moment Generating Function Introduction to R software – Vectors – Matrices – Arrays – Lists – Data frames – Basic arithmetic operations in R – Importing and exporting files in R.							
UNIT-II (10 Hrs.)	Estimation and R commands for computing probability distributions Estimation: Point estimation, criteria for good estimates - Methods of estimation - maximum likelihood estimation, interval estimation R commands for computing probability distributions-Binomial, Poisson, and Normal distributions.							
UNIT-III (12 Hrs.)	Sampling Theory Types of sampling- Random sampling. Sampling from finite and infinite populations. Parameter, statistic, sampling distribution and standard error (sampling with replacement							

	and sampling without replacement), Sampling distribution of sample mean (σ known) and variance. Sampling distribution of differences and sums. Construction of confidence intervals for sampling distributions (t, F and Chi-square distributions) using R.
UNIT-IV (14 Hrs.)	ANOVA and Basics of Time Series Analysis: Introduction, Analysis of Variance one-way classification, Analysis of Variance two-way classification. Time Series Analysis: Introduction, Utility, and components of Time series. Estimation and Forecasting of Trend by using Graphic method, Method of semi averages, method of moving averages and method of least squares. Calculation of ANOVA and forecasting of trend by using R commands.
UNIT-V (12 Hrs.)	Test of hypothesis: Concept & formulation of hypothesis Type I and Type II errors, Neyman Pearson lemma (without proof), Procedures of testing of hypothesis. Non-parametric Inference: Comparison with parametric inference, Use of order statistics. Sign test, Wilcoxon signed rank test, Mann-Whitney test, Run test, Kolmogorov-Smirnov test. Spearman and Kendall's test. R Programming for Nonparametric tests.
TEXT BOOKS:	
1.	G. Jay Kerns, Introduction to Probability and Statistics Using R, First Edition ISBN: 978-0-557-24979-4. (Free e-book from R software website)
2.	Fundamentals of Mathematical Statistics by S. C. Gupta and V.K. Kapoor, Sultan Chand & Sons Publishers.
3	Introduction to Time Series Analysis and Forecasting, Douglas C. Montgomery, Cheryl L. Jennings, Murat Kulahci, Wiley Publications, 2011A.
4	The Art of R Programming, Norman Matloff, No starch Press.
REFERENCE BOOKS:	
1.	Higher Engineering Mathematics, Dr. B. S. Grewal, 43 rd Edition, Khanna Publishers.
2	Fundamentals of Statistics, S C Gupta, 7 th Edition, Himalaya publishing house
3.	Probability and statistics for Engineers, Miller and Freund, 7 th edition, Prentice-Hall India.
4.	Probability and statistics for Engineers and Scientists by Ronald E. Walpole, Raymond H. Myers, Sharon L. Myers and Keying Ye, Eighth edition, Pearson Education.
5.	Higher engineering mathematics, B V Ramana, MC Graw Hill Education publications.
6.	R Cookbook, Paul Teetor, Oreilly.
7.	R in Action, Rob Kabacoff, Manning
WEB REFERENCE	
1	http://www.swayam.gov.in
2	https://www.tutorialspoint.com/r/
3	http://www.stat.umn.edu/geyer/old/5101/rlook.html
4	http://www.r-tutor.com/elementary-statistics
5	https://onlinecourses.nptel.ac.in/noc16_ma03/preview

Code	Category	L	T	P	C	I.M	E.M	Exam
B19BSOE02	OE	3	--	--	3	25	75	3 Hrs.
FUZZY SETS AND FUZZY LOGIC								
(offered by-EM&H)								
(offered to-ALL BRANCHES)								
Course Objectives: Students are expected to learn								
1	Crisp sets, Fuzzy sets and Fuzzy Union, Fuzzy Intersection of Fuzzy sets							
2	Lamda cut for fuzzy relations, Fuzzy tolerance and equivalence relations							
3	Fuzzification for features of membership							
4	Defuzzification to scalars by Centroid method, centre of sums method, mean and maxima method.							
5	Fuzzy logic, Crisp connectives, Fuzzy logic connectivity							
6	Applications of Fuzzy systems like washing machine, air conditioner controller							
Course Outcomes: After completion of the course, the student will be able to								
S.No	Outcome							Knowledge Level
1	Describe Crispsets, Fuzzy sets and operations of Fuzzy sets							K3
2	Describe different types of Fuzzy relations							K3
3	Describe Fuzzification for features of membership							K3
4	Perform Defuzzification to scalars by Centroid method, centre of sums method and mean and maxima method.							K3
5	Describe Fuzzylogic, Crisp connectives, Fuzzy logical connectivity							K3
6	Apply Fuzzylogic to systems like washing machine, air conditioner controller.							K3
SYLLABUS								
UNIT-I (12Hrs)	Crisp Sets Vs Fuzzy Sets: Crisp sets an overview, Concept of fuzziness, the notion of Fuzzy sets, basic concepts of fuzzy sets. Operations of Fuzzy Sets: Fuzzy set operations –fuzzy complement, fuzzy union, fuzzy intersection, combinations of operations.							
UNIT-II (12Hrs)	Fuzzy Relations: Fuzzy Cartesian product, Fuzzy relations, operations on fuzzy relations, properties of fuzzy relations, Lamda cut for fuzzy relations and composition, Fuzzy tolerance, and equivalence relations.							
UNIT-III (12Hrs)	Fuzzification and Defuzzification: Features of membership function, fuzzification, defuzzification to crispset, Defuzzification to scalars (centroid method, centre of sums method, mean of maxima method).							
UNIT-IV (12Hrs)	FuzzyLogic: Introduction to fuzzy logic, Crisp connectives vs Fuzzy logical connectives, Approximate reasoning.							

UNIT-V (12Hrs)	Applications of Fuzzy Systems: Fuzzy Control System, Control System Design Problem, Simple Fuzzy Logic Controller, general applications of fuzzy logic (washing machine, air conditioner controller).
Text Books:	
1.	Timothy J. Ross., Fuzzy Logic with Engineering Applications - Second Edition, Wiley Publications, 2007, New Delhi.
2.	S. Rajasekaran, G.A. Vijayalakshmi Pai, Neural Networks, Fuzzy Logic, and Genetic Algorithms – Synthesis and Applications – Prentice-Hall of India Private Limited, 2008, New Delhi.
Reference Books:	
1.	H.J. Zimmerman, Fuzzy Set Theory and its Applications, 4th Edition, Springer, 2006, New Delhi.
2.	S. Nanda and N.R. Das “Fuzzy Mathematical Concepts”, Narosa Publishing House, New Delhi.