List of Open Electives offered by various departments for III B.Tech

Applicable for 2019-20 Batch (R19)

Name of the department offering open elective	Open Elective-I (Third Year- Semester 1)	Open Elective-II (Third Year- Semester 2)
Computer Science and Engineering	19CS3161: Fundamentals of Python Programming	19CS3263: Core Concepts of IoT
	19CS3162: Machine Learning and Applications	19CS3264: Cyber Laws and Ethics
Information Technology	19IT3161 : Fundamentals of Operating Systems	19IT3263: Fundamentals of Java Programming
	19IT3162: Database Internals	19IT3264: Principles of Software Engineering
Electronics and Communications Engineering	19EC3161: Principles of Electronic and Communications	19EC3262:Microprocessors and Microcontrollers
Electrical and Electronics Engineering	19EE3161: Renewable Energy Sources	19EE3263: Electrical Energy Conservation and Auditing
	19EE3162: Nanotechnology	19EE3264: Reliability Engineering
Civil Engineering	19CE3161: Disaster Management	19CE3263: Remote Sensing & GIS
	19CE3162: Building Materials and Technologies	19CE3264: Environmental Pollution
Mechanical Engineering	19ME3161: Fundamentals of Mechanical Engineering	19ME3263: Fabrication Processes
	19ME3162: Fundamentals of Robotics	19CE3264: Quantitative Analysis for Business Decision

*Note: Students should take Open Electives from the List of Open Electives Offered by Other Departments/Branches Only.

19CS3161: FUNDAMENTALS OF PYTHON PROGRAMMING
(Open Elective - I)

B.Tech. III Year I Sem.

L	T	P	C
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Prerequisites:

- Should have basic knowledge of Computer usage.

Course Objectives

- To learn History and importance of Python and its basics.
- To learn about various Data Types in Python.
- To learn the usage of Conditional statements and various operators in Python
- To learn Creating Functions in python.
- To learn usage of String Functions and Exception Handling in Python

Course Outcomes

- By end of this course Students should be able to learn Python syntax and semantics.
- Enable Students to demonstrate simple programs on Various Data Types in Python.
- By end of this course Students should be able to implement conditional statements and looping functions in Python.
- By end of this course Students should be able to Implement Functions in Python
- By end of this course Students should be able to Implement String Functions and Exception handling in Python

UNIT-I

Introduction to Python and computer programming:Python Basics, Python literals, Why Python, Flavors in Python, Python Operators, Python Literals, Python Variables, How to talk to computer, Simple input Output, Operators and Expressions.

UNIT-II

Data types in python: Text Type: str, Numeric Types: int, float, complex, Sequence Types: list, tuple, range, Mapping Type: dict, Set Types: set, frozen set, Boolean Type: bool, Binary Types: bytes, byte array, memory view, Mutable types, Immutable types.

UNIT-III

Making decisions in Python, Comparison operators and conditional statements and looping functions (If, If elif, For, While), Logical and Bit operators in python, Lists – collections of data, Sorting a simple list – the bubble sort algorithm.

UNIT-IV

Writing functions in Python – How functions communicate with their environment, Returning a result from a function, Scopes in Python, Creating functions, Tuples and dictionaries.

UNIT-V

Strings Functions in python: The nature of strings in Python, Characters and strings vs. computers, String methods, Strings in action.

Exceptions in Python: Errors – programmer's daily bread, The anatomy of exceptions, Some of the most useful exceptions in Python Programming

TEXT BOOKS:

1. **Core Python Programming- Wesley J. Chun Second Edition Pearson**– A student's Hand Book – NASCOMM
2. **Core python programming - Dr.R.Naageswara Rao Second EditionDream Tech**
3. Python **Programming- Vamsi Kurama Second Edition Pearson**
4. **Learning Python- Mark Lutz Second Edition Orielly**

REFERENCES:

1. https://www.python.org/about/gettingstarted
2. https://www.netacad.com/
3. https://lms.netacad.com/course/view.php?id=550748
4. https://www.tutorialspoint.com/python/

19CS3162: MACHINE LEARNING AND APPICATIONS
(Open Elective - I)

B.Tech. III Year I Sem. **L T P C**
3 0 0 3

Prerequisites:
Linear algebra, Programming knowledge, and differential calculus

Course Objectives:
1. To understand the key algorithms and theory of Machine learning
2. To Understand the various Regression models
3. To Understand the Artificial Neural Networks
4. To Evaluate and interpret the results of the Hidden Markov Models and Bayesian Estimation
5. To Design and implement machine learning solutions to clustering problems

Course Outcomes: At the end of the course the student will be able to:
1: Understand the key algorithms and theory of Machine learning
2: Understand the Regression models
3: Understand the Artificial Neural Networks
4: Evaluate and interpret the results of the Hidden Markov Models and Bayesian Estimation
5: Design and implement machine learning solutions to clustering problems

UNIT I: Introduction, Examples of Machine Learning Applications, Learning Associations, Classification, Regression, Unsupervised Learning, Reinforcement Learning, Learning a Class, Vapnik-Chervonenkis Dimension, Probably Approximately Correct Learning.

UNIT II: Linear Regression, Multivariate Regression, Linear Methods for Regression, Linear Regression Models and Least Squares, Subset Selection, Shrinkage Methods, Principal Component Regression, Partial Least squares, Linear Classification, Logistic Regression, and Linear Discriminant Analysis

UNIT III: Neural Networks Introduction, Early Models, Perceptron Learning, Back propagation, Initialization, Training & Validation, Parameter Estimation MLE, MAP, Bayesian Estimation

UNIT IV: Hidden Markov Models: Introduction, Discrete Markov Processes, Hidden Markov Models, Three Basic Problems of HMMs.
Bayesian Estimation: Bayesian Estimation of the Parameters of a Discrete Distribution, Bayesian Estimation of the Parameters of a Gaussian Distribution

UNIT V: Clustering: Introduction, Mixture Densities, k-Means Clustering Partitional Clustering, Hierarchical Clustering, Birch Algorithm, Density-based Clustering,
Learning Theory, Introduction to Reinforcement Learning, Machine Learning: Real-World Examples- Image recognition

TEXT BOOK:
1. The Elements of Statistical Learning, Trevor Hastie, Robert Tibshirani, Jerome H. Friedman Springer Series in Statistics, 2 edition, 2008.
2. Introduction to Machine Learning, Ethem Alpaydın, MIT Press 3 Edition,2014

REFERENCES:
1. Tom M. Mitchell, ―Machine Learning, McGraw-Hill Education, 2013.
2. Stephen Marsland, ―Machine Learning: An Algorithmic Perspective, CRC Press, 2009.

19CS3263: CORE CONCEPTS OF IoT
(Open Elective - II)

B.Tech. III Year II Sem.

L	T	P	C
3	-	-	3

Course Objectives

- Understand the concepts of Internet of Things and able to build IoT applications
- Learn the programming and use of Arduino and Raspberry Pi boards.
- Known about data handling and analytics in SDN.

Course Outcomes

- To Know basic protocols in sensor networks.
- To write Program and configure Arduino boards for various designs.
- To write Python programming and interfacing for Raspberry Pi.
- To Design IoT applications in different domains.
- To Understand SDN for IOT

UNIT – I

Introduction to Internet of Things: Characteristics of IoT, Physical design of IoT, Functional blocks of IoT, Sensing, Actuation, Basics of Networking, Communication Protocols, Sensor Networks.

UNIT - II

Machine-to-Machine Communications: Difference between IoT and M2M, Interoperability in IoT, Introduction to Arduino Programming, Integration of Sensors and Actuators with Arduino,

UNIT – III

Introduction to Python programming, Programming – Python program with Raspberry PI with focus of interfacing external gadgets, controlling output, reading input from pins.

UNIT - IV

Introduction to Raspberry Pi, Interfacing Raspberry Pi with basic peripherals Implementation of IoT with Raspberry Pi,

UNIT – V

Introduction to Software defined Network (SDN), SDN for IoT, Industrial IoT, Case Study: Agriculture, Healthcare, Activity Monitoring

TEXT BOOKS:

1. "The Internet 'of Things: Enabling Technologies, Platforms, and Use Cases", by Pethuru Raj and Anupama C. Raman (CRC Press)
2. “Make sensors”: Terokarvinen, kemo, karvinen and villey valtokari, 1st edition, maker media, 2014.
3. "Internet of Things: A Hands-on Approach", by Arshdeep Bahga and Vijay Madisetti

REFERENCES:

1. Vijay Madisetti, Arshdeep Bahga, “Internet of Things: A Hands-On Approach”
2. Waltenegus Dargie,Christian Poellabauer, "Fundamentals of Wireless Sensor Networks: Theory and Practice"
3. Beginning Sensor networks with Arduino and Raspberry Pi – Charles Bell, Apress, 2013

19CS3264: CYBER LAWS AND ETHICS
(Open Elective - II)

B.Tech. III Year II Sem.

L	T	P	C
3	-	-	3

Course Objectives

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

Course Outcomes

- The students will able to identify Threats to security and need for access control
- The students will understand the need of Orange Book and Red Book
- The students will get exposure on Information security policies and procedures
- The students will learn the rights and responsibilities as an employee, team member and a global citizen
- The students will understand the importance of professional practice, Law and Ethics in their personal lives and professional careers.

UNIT- I

Introduction to Computer Security: Definition, Threats to security, Government requirements, Information Protection and Access Controls, Computer security efforts, Standards, Computer Security mandates and legislation, Privacy considerations, International security activity.

UNIT-II

Secure System Planning and administration: Introduction to the orange book, Security policy requirements, accountability, assurance and documentation requirements, Network Security, The Red book and Government network evaluations.

UNIT-III

Information security policies and procedures: Corporate policies- Tier 1, Tier 2 and Tier3 policies - process management-planning and preparation-developing policies-asset classification policy developing standards.

UNIT- IV

Information security: fundamentals-Employee responsibilities- information classification, Information handling-

Tools of information security- Information processing-secure program administration.

UNIT-V

Organizational and Human Security: Adoption of Information Security Management Standards, Human Factors in Security- Role of information security professionals.

TEXT BOOKS AND REFERENCES:

1. Debby Russell and Sr. G. T Gangemi, "Computer Security Basics (Paperback)", 2nd Edition, O' Reilly Media, 2006.
2. Thomas R. Peltier, "Information Security policies and procedures: A Practitioner's Reference", 2nd Edition Prentice Hall, 2004.
3. Kenneth J. Knapp, "Cyber Security and Global Information Assurance: Threat Analysis and Response Solutions", IGI Global, 2009.
4. Thomas R Peltier, Justin Peltier and John blackley," Information Security Fundamentals", 2nd Edition, Prentice Hall, 1996
5. Jonathan Rosenoer, "Cyber law: the Law of the Internet", Springer-verlag, 1997 6. James Graham, "Cyber Security Essentials" Averbach Publication T & F Group.

Course Code: 19IT3161

FUNDAMENTALS OF OPERATING SYSTEMS

OE-I(1)B.Tech III Year I Semester

L	T	P	C
3	-	-	**3**

Course Objectives:

- Provide an introduction to operating system concepts (i.e, Operating System services, OS Structure)
- Introduces the way an *operating system* can make the computer more productive by the effective **management of processes** (i.e., threads,scheduling, Synchronization)
- To understand the basic **memory management** of operating system.
- To elucidate **deadlocks**, present a number of various techniques for preventing or avoiding or recovering from deadlocks in a computer system
- Introduce the issues to be considered in the design and development of operating system with high **protection** and ease of access.

Course Outcomes:

- Will be able to explain services & structure of operating systems and demonstrate the knowledge of the components of computer and their respective roles in computing .
- Illustrate various methods of process scheduling, synchronization.
- Ability to resolve user problems related to memory management with standard operating system techniques.
- Gain practical knowledge on how to implement file system and directory Structures.
- Will be able to apply security mechanisms and techniques to handle deadlocks.

UNIT - I

Overview-Introduction: Operating system objectives, User view, System view, Operating system definition, Computer System Organization, Computer System Architecture, OS Structure, OS Operations, Process Management, Memory Management, Storage Management, Protection and Security, Computing Environments. Operating System services, User and OS Interface, System Calls, Types of System Calls, System Programs, Operating System Design and Implementation, OS Structure.

UNIT - II

Process and CPU Scheduling: Process concepts-The Process, Process State, Process Control Block, Threads, Inter process communication, Process Scheduling-Scheduling Queues, Schedulers, Context Switch, Operations on Processes, System calls-fork(), exec(),wait(),exit().

Process Scheduling: Basic concepts, Scheduling Criteria, Scheduling algorithms, Linux scheduling and Windows scheduling.

Process Synchronization: Background, The Critical Section Problem, Peterson's solution, Synchronization Hardware, Semaphores, Classic Problems of Synchronization.

UNIT - III

Memory Management: Background, Swapping, Contiguous Memory Allocation, Segmentation, Paging, Structure of Page Table.

Virtual Memory Management: Background, Demand Paging, Copy-on-Write, Page Replacement, Page Replacement Algorithms, Allocation of Frames, Thrashing, Virtual memory in Windows.

UNIT - IV

Storage Management-File System: Concept of a File, System calls for file operations- open (), read(), write(), close(), seek(), unlink(), Access methods, Directory, File System Mounting, File Sharing, Protection.

File System Implementation: File System Structure, File System Implementation, Directory Implementation, Allocation methods.

Mass Storage Structure: Overview of Mass Storage Structure, Disk Structure, Disk Scheduling, Disk Management, Swap space Management.

UNIT - V

Deadlocks: System Model, Deadlock Characterization, Methods for Handling Deadlocks, Deadlock

Prevention, Deadlock Avoidance, Deadlock Detection, and Recovery from Deadlock.

Protection: System Protection, Goals of Protection, Principles of Protection, Domain of Protection, Access Matrix, Implementation of Access Matrix, Access Control, Revocation of Access Rights.

TEXT BOOKS

[1]. Operating System Principles- Abraham Silber chatz, Peter B.Galvin, Greg Gagne 7th Edition.

[2]. John Wiley Advanced programming in the UNIX environment, W.R. Stevens, Pearson education.

REFERENCE BOOKS

[1]. Operating Systems–Internals and Design Principles Stallings, Fifth Edition–005, Pearson Education/PHI

[2]. Operating System A Design Approach- Crowley,TMH.

[3]. Modern Operating Systems, Andrew S.Tanenbaum 2nd edition,Pearson/PHI.

Course Code: 19IT3162

DATABASE INTERNALS

OE-I(2) B.Tech III Year I Semester

L	T	P	C
3	-	-	**3**

Course Objectives:

- To understand the basic database concepts, applications, data models, schemas and instances.
- To demonstrate the use of constraints and relational algebra operations and construct queries using SQL.
- To become familiar in the normalization techniques to organize data in databases.
- To demonstrate the basic concepts of transaction processing and concurrency control.
- To familiarize the concepts of database storage structures and the access techniques

Course Outcomes:

- Demonstrate the basic elements of a relational database management system.
- Ability to design entity relationship model and convert entity relationship diagrams.
- Formulate SQL queries on the data and Apply normalization for the development of application software.
- Analyze database transactions and analyze the methods to control them by applying ACID properties.
- Analyze the query processing the optimization methods

UNIT – I

Introduction: Introduction and applications of DBMS, Purpose of database, Data Independence, Database System architecture-Levels,Mappings,Database,users and DBA DATABASE DESIGN-Database Design Process, ER Diagrams-Entities, Attributes, Relationships, Constraints, keys, extended ER features, Generalization, Specialization, Aggregation, Conceptual design with the E-R model.

UNIT - II

The Relational Model: Introduction to the relational model, Integrity constraints over relations, Enforcing integrity constraints, Querying relational data, Logical database design: E-R to relational, Introduction to views, Destroying/altering tables and views.

Relational Algebra and Calculus: Preliminaries, relational algebra operators, relational calculus - Tuple and domain relational calculus, expressive power of algebra and calculus.

SQL: Basics of SQL, DDL,DML,DCL, structure – creation, alteration, defining constraints – Primary key, foreign key, unique, not null, check, IN operator, Functions - aggregate functions, Built-in functions – numeric, date, string functions, set operations, sub-queries, correlated sub- queries, Use of group by, having, order by, join and its types, Exist, Any, All , view and its types.
Transaction control commands – Commit, Rollback, save point, Triggers.

UNIT – III

Schema Refinement and Normal Forms: Introduction to schema refinement, functional dependencies, reasoning about FDs. Normal forms - 1NF, 2NF, 3NF, BCNF, properties of decompositions, normalization, schema refinement in database design, other kinds of dependencies ,overview of 4NF, 5NF, DKNF.

UNIT - IV

Transaction Management: Transaction concept, transaction state, implementation of atomicity and durability, concurrent executions, Serializability, recoverability, implementation of isolation, transaction definition in SQL, testing for Serializability.
Concurrency Control and Recovery System: Concurrency control, lock based protocols, time- stamp based protocols, validation based protocols.
Recovery system - failure classification, storage structure, recovery and atomicity, log based recovery, shadow paging.

UNIT – V

Query Processing and Optimization: Overview, measures of query cost, selection operation, and evaluation of expressions, transformation of relational expressions, evaluation plans, and materialized views.

Overview of Storage and Indexing: Tree structured indexing- intuition for tree indexes, indexed sequential access method (ISAM), B+ Trees - a dynamic tree structure-definition.

TEXT BOOKS

[1] Data base Management Systems, Raghurama Krishnan, Johannes Gehrke, TATA McGrawHill, 3rd Edition .

[2] Database System Concepts, Abraham Silberschatz, Henry F. Korth, S. Sudarshan (2005), VI edition, McGraw-Hill, New Delhi, India.

REFERENCE BOOKS

[1] Fundamentals of Database Systems, Elmasri, Navathe, 7th Edition, Pearson Education, 2016.

[2] Introduction to Database Systems, C.J.Date Pearson Education.

[3] Data base Systems design, Implementation, and Management, Peter Rob & Carlos Coronel 7th Edition.

Course Code: 19IT3263

FUNDAMENTALS OF JAVA PROGRAMMING

L	T	P	C
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OE-II(1)B.Tech. III Year II Semester

Prerequisites:

- Fundamental knowledge of object-oriented concepts, terminology, and syntax, and the steps required to create basic Java programs.
- This course requires are familiar with programming language such as C/C++ and data structures, algorithms.

Course Objectives:

- To understand object oriented programming concepts, and apply them in solving problems.
- To introduce the implementation of packages and interfaces.
- To introduce the concepts of exception handling and multi-threading.
- To use the collection framework classes in to real time scenarios.
- To introduce the design of Graphical User Interface using applets and swing controls.

Course Outcomes:

- Able to solve real world problems using OOP techniques.
- Able to understand the use of inheritance, abstract classes, interfaces.
- Able to solve problems using java I/O streams and handling of Exceptions.
- Able to use Collection Framework and develop multi-threaded applications.
- Able to develop applets for web applications.

UNIT- I

Java Basics: Brief introduction to Oops concepts. Introduction to Java ,JVM Architecture, Java Buzz words, Java Tokens- Comments, Identifiers, Keywords, Separators, Data types, enumerated types, Variables, constants, Type Conversion, Operators, Control Statements, Wrapper Classes, Structure of java with simple standalone program, arrays, console input and output, formatting output, constructors, methods – static and instance, parameter passing, access control modifiers, this reference, overloading methods and constructors, recursion, garbage collection, Inner classes, exploring String and String Buffer class.

UNIT- II

Inheritance: Inheritance hierarchies, super and sub classes, super keyword, preventing inheritance: final classes and methods, the Object class and its methods.

Polymorphism: Dynamic binding, static binding, method overriding, abstract classes and methods.

Interfaces: Interfaces vs. Abstract classes, defining an interface, Multiple Inheritance through interface, extending interface.

Packages: Defining, Creating and Accessing a Package, Understanding CLASSPATH, importing packages.

UNIT- III

I/O STREAM: Introduction, Byte-oriented streams, Character-oriented streams, File streams, Random-access file, Serialization.

Exception handling -- Dealing with errors, benefits of exception handling, classification of exceptions-exception hierarchy, checked exceptions and unchecked exceptions, usage of try, catches, throw, throws and finally, built in exceptions and user defined exceptions.

UNIT- IV

Multithreading: Differences between processes and threads, thread life cycle, creating threads, thread priorities, synchronizing, inter-thread communication, thread group.

Collection framework in java: Introduction, Util Package interfaces, List, Set, Map, Retrieving elements from collections, Collection interfaces: Set, Map, List, Queue.

Implementation classes : ArrayList, Stack, StringTokenizer, more utilitiy classes.

UNIT-V

AWT: Introduction to AWT, Components, Event, Event-Delegation-Model, Listeners, Layout management and types – border, Grid and flow Individual components: Label, Button, Checkbox, Radio Button, Choice, List, Menu, Text Field, Text Area, Adapter classes.

Applets: Inheritance hierarchy for applets, differences between applets and applications, life cycle of an Applet, passing parameters to applets.

Swings: Introduction to Swing, Swing vs. AWT, Hierarchy for Swing components.

TEXT BOOKS:

[1]. Java,The complete reference,7th edition, Herbert Schildt,TMH.

[2]. Understanding OOP with java, updated edition, T.Budd, Pearson education.

REFERENCE BOOKS:

[1]. JAVA Fundamentals- A comprehensive introduction, Herbert Schildt and Dale Skrien, TMH.

[2]. Java for Programmers, P.J.Deitel and H.M.Deitel, Pearson education.

[3]. JAVA: How to program P.J.Deitel and H.M.Deitel, PHI.

[4]. Thinking in java, Bruce Eckel, Pearson Education.

[5]. Object Oriented Programming through java, P.Radha Krishna, Universities Press.

[6]. Programming in java, S.Malhotra and S.Choudhary, Oxford Univ. Press.

Course Code: 19IT3264

PRINCIPLES OF SOFTWARE ENGINEERING

L	T	P	C
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OE-II (2) B.Tech III Year II Semester

Prerequisites:

- Computer Programming
- Database Management Systems

Course Objectives:

- Apply basic principles and techniques of software development in actual problem domain
- Understand theories, methods, and technologies applied for professional software development.
- Gain knowledge on the emerging software engineering trends
- To gather knowledge on various software testing, maintenance methods
- To teach software metrics and software risks

Course Outcomes:

- To familiarize basic software engineering methods and practices, software process models such as waterfall and evolutionary models.
- To differentiate the system models according to software requirements.
- To categorize the software design and coding techniques through different software architectural styles and implementation issues such as modularity and coding standards.
- To evaluate the software testing principles, verification and validation, different software testing approaches and able to explain Software Metrics and Software Reliability.
- To assess various software risks, risk refinement, risks strategies, RMMM Plan.

UNIT - I: Introduction to Software Engineering:

Introduction: The evolving role of software, Changing Nature of Software, legacy software, Software myths.

A Generic view of process: Software engineering- A layered technology, a process framework, The Capability Maturity Model Integration (CMMI), Process patterns, process assessment, personal and team process models, COCOMO Model.

Process models: The waterfall model, Incremental process models, Evolutionary process models, specialized process models, The Unified process**.**

UNIT - II: Software Requirements:

Software Requirements: Functional and non-functional requirements, User requirements, System requirements, Interface specification, the software requirements document.

Requirements engineering process: Feasibility study, Requirements elicitation and analysis, Requirements validation, Requirements management, Software requirements documents.

System models: Context Models, Behavioral models, Data models, Object models, structured methods.

UNIT - III: Object-Oriented Analysis & Design:

Design Engineering: Design process and design quality, design concepts, the design model.

Creating an architectural design: software architecture, data design, architectural styles and patterns, architectural design, conceptual model of UML, basic structural modeling, class diagrams, sequence diagrams, collaboration diagrams, use case diagrams, component diagrams. Performing User Interface design.

UNIT - IV: Implementation and Testing Strategies:

Structured coding Techniques and guidelines. A strategic approach to software testing, Test strategies for conventional software, Regression Testing, Unit Testing, Black-Box and White-Box Testing, Validation Testing, System Testing, The art of Debugging.

UNIT - V: Metrics for Process and Products

Product metrics: Software quality, metrics for analysis model, metrics for design model, metrics for source code, metrics for testing, metrics for maintenance.

Risk management: Reactive Vs proactive risk strategies, software risks, risk identification, risk projection, risk refinement, RMMM, RMMM plan.

TEXT BOOKS:

[1] "Software Engineering: A Practitioner's Approach", Roger S. Pressman, McGraw Hill, 6/e, 2005Text Book 1

[2] "Fundamentals of Software Engineering", Rajib Mall, PHI, 3rd Edition, 2009

[3] "Object-Oriented Modeling and Design with UML, Michael R Blaha, James R Rambaugh, Pearson, LPE

REFERENCE BOOKS:

[1] "Software Engineering", Ian Sommerville, Addison-Wesley, 9th Edition, 2010, ISBN- 13: 978-0137035151.

[2] Richard Fairley, "Software Engineering Concepts", Tata McGraw Hill.

[3] Fundamentals of object oriented design using UML Meiler page-Jones: Pearson Education.

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PRINCIPLES OF ELECTRONICS AND COMMUNICATION
(OPENELECTIVE-I)

B.Tech. III Year I Sem.

Course Code : 19EC3161 **L T P C**

3 0 0 3

Pre - Requisites

1. Acquires knowledge on basics of communication systems .
2. Acquires knowledge on basics of modulation techniques.
3. Acquires knowledge on basics of switching networks.
4. Acquires knowledge on basics of satellite communication systems.
5. Acquires knowledge on basics of cellular mobile communication systems

Course Code:

Course Objectives:

1. Able to understand the basic concepts of modulation in communications and evaluation of itsparameters.
2. Able to understand different modulation schemes in analog and digital communications.
3. Able to have the basic knowledge about telecommunication systems, Internet and incommunication networking.
4. Able to understand the basic concepts and techniques with satellite communications and opticalcommunications.
5. Able to understand the concepts behind cellular and mobile communications and able to applythese concepts in wireless networking.

Course Outcomes:

1. understands the different parametric measurable in communication systems
2. Understands the basic concepts of different modulation techniques.
3. Understands the basic concepts of switching networks.
4. Understands the basic concepts of satellite and optical communications
5. Understands the basic concepts of cellular mobile communications and wireless technologies.

UNIT – I

Introduction: Need for Modulation, Frequency translation, Electromagnetic spectrum, Gain, Attenuation anddecibels.

UNIT – II

Simple description on Modulation: Analog Modulation-AM, FM, Pulse Modulation-PAM, PWM, PCM, Digital Modulation Techniques-ASK, FSK, PSK, QPSK modulation and demodulation schemes.

UNIT – III

Telecommunication Systems: Telephones Telephone system, Paging systems, InternetTelephony.

Networking and Local Area Networks: Network fundamentals, LAN hardware, Ethernet LANs, Token RingLAN.

UNIT IV

Satellite Communication: Satellite Orbits, satellite communication systems, satellite subsystems, Ground Stations Satellite Applications, Global Positioning systems. Optical Communication: Optical Principles, Optical Communication Systems, Fiber –Optic Cables, Optical Transmitters & Receivers, Wavelength Division Multiplexing.

UNIT V

Cellular and Mobile Communications: Cellular telephone systems, AMPS, GSM, CDMA,and WCDMA.

Wireless Technologies: Wireless LAN, PANs and Bluetooth, Zig Bee and Mesh Wirelessnetworks, Wimax and MANs, Infrared wireless, RFID communication, UWB.

Text Books

1. Principles of Electronic Communication Systems, Louis E. Frenzel, 3e, McGraw Hillpublications, 2008
2. Electronic Communications systems, Kennedy, Davis 4e, MC GRAW HILLEDUCATION, 1999
3. Theodore Rapp port, Wireless Communications - Principles and practice, PrenticeHall, 2002.

REFERENCES:

1. Roger L. Freeman, Fundamentals of Telecommunications, 2e, Wiley publications
2. Introduction to data communications and networking, Wayne Tomasi, PearsonEducation, 2005

MICROPROCESSORS AND MICROCONTROLLERS
(OPENELECTIVE-II)

B.Tech. III Year II Sem.

Course Code: 19EC3262 **L T P C**

3 0 0 3

Course Objectives:

- To familiarize the architecture of microprocessors and microcontrollers
- To provide the knowledge about interfacing techniques of bus &memory.
- To develop programming skills using 8051 based systems
- To understand the concepts of ARM architecture
- To study the basic concepts of Advanced ARM processors

Course Outcomes: Upon completing this course, the student will be able to

- Understands the internal architecture, organization and assembly language programming of8086processors.
- Understands the internal architecture, organization and assembly language programming of8051/controllers
- Understands the interfacing techniques to 8051 based systems.
- Understands the internal architecture of ARM processors and
- To outline basic concepts of advanced ARM processors.

UNIT -I:

8086 Architecture: 8086 Architecture-Functional diagram, Register Organization, Memory Segmentation, Programming Model, Memory addresses, Physical Memory Organization, Architectureof 8086, Signal descriptions of 8086, interrupts of 8086.

Instruction Set and Assembly Language Programming of 8086: Instruction formats, Addressing modes, Instruction Set, Assembler Directives, Macros, and Simple Programs involving Logical, Branch and Call Instructions, Sorting, String Manipulations.

UNIT -II:

Introduction to Microcontrollers: Overview of 8051 Microcontroller, Architecture, I/O Ports, Memory Organization, Addressing Modes and Instruction set of 8051.

8051 Real Time Control: Programming Timer Interrupts, Programming External Hardware Interrupts, Programming the Serial Communication Interrupts, Programming 8051 Timers and Counters

UNIT –III:

I/O And Memory Interface: LCD, Keyboard, External Memory RAM, ROM Interface, ADC, DACInterface to 8051.

Serial Communication and Bus Interface: Serial Communication Standards, Serial Data Transfer Scheme, On board Communication Interfaces-I2C Bus, SPI Bus, UART; External Communication Interfaces-RS232,USB.

UNIT –IV:

ARM Architecture: ARM Processor fundamentals, ARM Architecture – Register, CPSR, Pipeline, exceptions and interrupts interrupt vector table, ARM instruction set – Data processing, Branch instructions, load store instructions, Software interrupt instructions, Program status register instructions, loading constants, Conditional execution, Introduction to Thumb instructions.

UNIT – V:

Advanced ARM Processors: Introduction to CORTEX Processor and its architecture, OMAP Processor and its Architecture.

TEXT BOOKS:

1.Advanced Microprocessors and Peripherals – A. K. Ray and K. M. Bhurchandani, TMH,2nd Edition2006.

2.ARM System Developers guide, Andrew N SLOSS, Dominic SYMES, Chris WRIGHT,Elsevier, 2012

REFERENCE BOOKS:

1. The 8051 Microcontroller, Kenneth. J. Ayala, Cengage Learning, 3rd Ed,2004.
2. Microprocessors and Interfacing, D. V. Hall, TMGH, 2nd Edition2006.
3. The 8051 Microcontrollers, Architecture and Programming and Applications -K. Uma Rao,AndhePallavi, Pearson, 2009

19EE3161	III Year I Sem	Renewable Energy Sources	3L:0T:0P	3 Credits

Prerequisites: Power Systems-I

Course Objectives

- To Explain the concepts of Non-renewable and renewable energy systems
- To outline utilization of renewable energy sources for both domestic and industrial applications
- To Analyse the environmental and cost economics of renewable energy sources in comparison with fossil fuels.
- To study the characteristics of photo voltaic cells

Course Outcomes: At the end of this course, students will demonstrate the ability to

- Understand the energy scenario and the consequent growth of the power generation from renewable energy sources.
- Differentiate between fixed and variable speed wind turbines
- Analyse the basic physics of wind and solar power generation.
- Understand the power electronic interfaces for wind and solar generation.
- Analyse the issues related to the grid-integration of solar and wind energy systems.

UNIT I: INTRODUCTION TO RENEWABLE ENERGY SOURCES:

Introduction to Wind energy, solar energy, geo thermal energy, bio-mass, Ocean Energy, MHD Generation -Indian and Global statistics.

UNIT II: WIND GENERATOR TOPOLOGIES:

Review of modern wind turbine technologies, Fixed and Variable speed wind turbines, Induction Generators, Doubly-Fed Induction Generators and their characteristics, Permanent-Magnet Synchronous Generators, Power electronics converters.

UNIT III: THE SOLAR RESOURCE

Introduction, solar radiation spectra, solar geometry, Earth Sun angles, observer Sun angles, solar day length, Estimation of solar energy availability. Technologies, Parabolic trough, central receivers, parabolic dish, Fresnel, solar pond, elementary analysis.

UNIT IV: SOLAR PHOTOVOLTAIC

Technologies-Amorphous, Mon crystalline, polycrystalline; V-I characteristics of a PV cell, PV module, array, Power Electronic Converters for Solar Systems, Maximum Power Point Tracking (MPPT) algorithms. Converter Control.

UNIT V: NETWORK INTEGRATION ISSUES:

Over view of grid code technical requirements. Fault ride-through for wind farms - real and reactive power regulation, voltage and frequency operating limits, solar PV and wind farm behaviour during grid disturbances. Power quality issues. Power system interconnection experiences in the world.

TEXT BOOKS:

1. T. Ackermann, “Wind Power in Power Systems”, John Wiley and Sons Ltd., 2005.
2. G. M. Masters, “Renewable and Efficient Electric Power Systems**”,** John Wiley and Sons, 2004.

REFERENCES:

1. G. D. Rai, “Non-Conventional Energy Sources”, Khanna Publishers
2. S. P. Sukhatme, “Solar Energy: Principles of Thermal Collection and Storage”, McGraw Hill, 1984.
3. H. Siegfried and R. Waddington, “Grid integration of wind energy conversion systems” John Wileyand Sons Ltd., 2006.
4. G. N. Tiwari and M. K. Ghosal, “Renewable Energy Applications”, Narosa Publications, 2004.
5. J. A. Duffie and W. A. Beckman, “Solar Engineering of Thermal Processes”, John Wiley& Sons, 1991.

19EE3162	III Year I Sem	Nanotechnology	3L:0T:0P	3 Credits

Course Objectives:

Nano Technology is one of the core subjects of multidisciplinary nature. This has extensive applications in the field of energy, electronics, Biomedical Engg. Etc. Built to specifications by manufacturing matter on the atomic scale, the Nano products would exhibit an order of magnitude improvement in strength, toughness, and efficiency. The objective here is imparting the basic knowledge in Nano Science and Technology.

Course Outcomes:

1. To understand the importance and applications of nanomaterials and nanostructures.(L2)
2. To familiarize about the various unique properties of nanostructures/nanomaterials including magnetic properties. (L3)
3. To provide knowledge about top-down and bottom-up approaches for the synthesis of nanomaterials. (L3)
4. To give an overview of contemporary microscopy and analysis tools to characterize different properties of nanomaterials (L3)
5. To discuss applications specific properties of nanomaterials. (L3)

UNIT - I

Introduction: History and Scope, Can Small Things Make a Big Difference? Classification of Nanostructure Materials, Fascinating Nanostructures, Applications of Nanomaterials, Nature: The Best of Nanotechnologist, Challenges, and Future Prospects.

UNIT - II

Unique Properties of Nanomaterials:

Microstructure and Defects in Nanocrystalline Materials: Dislocations, Twins, stacking faults and voids, Grain Boundaries, triple and disclinations.

Effect of Nano-dimensions on Materials Behavior: Elastic properties, Melting Point, Diffusivity, Grain growth characteristics, enhanced solid solubility.

Magnetic Properties: Soft magnetic nanocrystalline alloy, Permanent magnetic nanocrystalline materials, Giant Magnetic Resonance, Electrical Properties, Optical Properties, Thermal Properties, and Mechanical Properties.

UNIT- III

Synthesis Routes: Bottom up approaches: Physical Vapor Deposition, Inert Gas Condensation, Laser Ablation, Chemical Vapor Deposition, Molecular Beam Epitaxy, Solgel method, Self- Assembly.

Top down approaches: Mechanical alloying, Nano-lithography.

Consolidation of Nanopowders: Shock wave consolidation, hot iso-static pressing and cold-iso static pressing Spark plasma sintering.

UNIT - IV

Tools to Characterize nanomaterials: X-Ray Diffraction (XRD), Small Angle X-ray scattering (SAXS), Scanning Electron Microscopy (SEM), Transmission Electron Microscopy (TEM), Atomic Force Microscopy (AFM), Scanning Tunneling Microscope (STM), Field Ion Microscope (FEM), Three-dimensional Atom Probe (3DAP), Nano indentation.

UNIT - V

Applications of Nanomaterials: Nano-electronics, Micro and Nano-electromechanical systems (MEMS/NEMS), Nanosensors, Nan catalysts, Food and Agricultural Industry, Cosmetic and Consumer Goods, Structure and Engineering, Automotive Industry, Water- Treatment and the environment, Nano-medical applications, Textiles, Paints, Energy, Defense and Space Applications, Concerns and challenges of Nanotechnology.

TEXT BOOKS:

1. Text Book of Nano Science and Nano Technology – B.S. Murthy, P. Shankar, Baldev Raj, B.B. Rath and James Munday, University Press-IIM.
2. Introduction to Nanotechnology – Charles P. Poole, Jr., and Frank J. Owens, Wley India Edition, 2012.

REFERENCES:

1. Nano: The Essentials by T. Pradeep, Mc Graw- Hill Education.
2. Nanomaterials, Nanotechnologies and Design by Michael F. Ashby, Paulo J. Ferreira and Daniel L. Schodek.
3. Transport in Nano structures- David Ferry, Cambridge University press 2000
4. Nanofabrication towards biomedical application: Techniques, tools, Application and impact – Ed. Challa S., S. R. Kumar, J. H. Carola.
5. Carbon Nanotubes: Properties and Applications- Michael J. O'Connell.
6. Electron Transport in Mesoscopic systems - S. Dutta, Cambridge University press.

19EE3263	III EEE II Sem	Electrical Energy Conservation & Auditing	3L:0T:0P	3 credits

Course Objectives:

- To apply the knowledge of science, mathematics, and engineering principles for solving problems
- To identify, formulate and solve electrical engineering problems in the broad areas like electrical and mechanical installations, electrical machines, power systems
- To exhibit management principles and function as a member of a multidisciplinary team.

Course Outcomes:

At the end of this course students will demonstrate the ability to:

- Understand Energy scenario and Energy conservation
- Ability to apply the knowledge of science, mathematics, and engineering principles for solving problems.
- Ability to identify, formulate and solve electrical engineering problems in the broad areas like electrical and mechanical installations, electrical machines, power systems.
- Ability to exhibit management principles and function as a member of a multidisciplinary team.
- Ability to evaluate Energy efficiency in Electrical utilities and thermal systems

Unit I: Energy Scenario: Energy sources-Primary and Secondary, Commercial and Non-commercial, Energy scenario in India and Global scenario, Energy Security, Energy and GDP, Energy Intensity, Energy conservation and its importance, Energy Conservation Act 2001 and related policies, Role of Non-conventional and renewable energy.

Unit II: Energy Management and Integrated Resource Planning and Energy Audit

Definition and Objectives of Energy management, Energy management strategy, Key elements, Responsibilities and duties of Energy Manager, Energy efficiency Programs, Energy Monitoring System, Importance of SCADA, Analysis techniques, Cumulative sum of differences (CUSUM)

Definition, need of energy Audit, Types of Energy Audit, Maximizing system efficiency, Optimizing the input energy requirements, fuel and energy substitution, Energy Audit instruments and metering, thermography, SMART metering

Unit III: Financial Analysis and Management: Investment need, Financial analysis techniques, Calculation of Simple Pay-back period, return on investment, cash flows, risk and sensitivity analysis, Time value of money, Net Present value, Breakeven analysis, Cost optimization, Cost and Price of Energy services, Cost of Energy generated through Distributed Generation

Unit IV: Energy Efficiency in Electrical Utilities: Electrical billing, power factor management, distribution and transformer losses, losses due to unbalance and due to harmonics, Demand Side Management, Demand-Response, Role of tariff in DSM and in Energy management, TOU tariff, Power factor tariff, Integrated Resource Planning and Energy Management Energy conservation in Lighting systems, HVAC, Electric Motors, Pump and Pumping systems

Unit V: Energy Efficiency in Thermal Systems

Fuels and combustion, properties of Fuel Oil, coal and gas, storage and handling of fuels, principles of combustion, combustion of oil, coal, gas. Energy efficiency in Boilers, Steam systems, Furnaces, Insulation and Refractors.

Text Books:

- S. C. Tripathy, "Utilization of Electrical Energy", Tata Mc Graw Hill
- Success stories of Energy Conservation by BEE, New Delhi (www.bee-india.org)

19EE3264	III Year II Sem	Reliability Engineering	3L:0T:0P	3 Credits

Prerequisites: Mathematics-III (Laplace Transforms, Numerical Methods and Complex variables)

Course Objectives:

- To introduce the basic concepts of reliability, various models of reliability
- To analyze reliability of various systems
- To introduce techniques of frequency and duration for reliability evaluation of repairable systems

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

- To apply probability theory & Binomial distribution in Engineering applications
- model various systems applying reliability networks
- evaluate the reliability of simple and complex systems
- estimate the limiting state probabilities of repairable systems
- apply various mathematical models for evaluating reliability of irreparable systems

UNIT - I

Basic Probability Theory: Elements of probability, probability distributions, Random variables, Density and Distribution functions- Mathematical expected – variance and standard deviation

Binomial Distribution: Concepts, properties, engineering applications.

UNIT- II

Network Modeling and Evaluation of Simple Systems: Basic concepts- Evaluation of network Reliability / Unreliability - Series systems, Parallel systems - Series-Parallel systems- Partially redundant systems- Examples.

Network Modeling and Evaluation of Complex Systems: Conditional probability method- tie set, Cut-set approach- Event tree and reduced event tree methods Relationships between tie and cut-sets- Examples.

UNIT - III

Probability Distributions In Reliability Evaluation: Distribution concepts, Terminology of distributions, General reliability functions, Evaluation of the reliability functions, shape of reliability functions –Poisson distribution – normal distribution, exponential distribution, Weibull distribution.

Network Reliability Evaluation Using Probability Distributions: Reliability Evaluation of Series systems, Parallel systems – Partially redundant systems- determination of reliability measure- MTTF for series and parallel systems – Examples.

UNIT - IV

Discrete Markov Chains: Basic concepts- Stochastic transitional probability matrix- time dependent probability evaluation- Limiting State Probability evaluation- Absorbing states – Application.

Continuous Markov Processes: Modeling concepts- State space diagrams- Unreliability evaluation of single and two component repairable systems

UNIT – V

Frequency and Duration Techniques: Frequency and duration concepts, application to multi state problems, Frequency balance approach.

Approximate System Reliability Evaluation: Series systems – Parallel systems- Network reduction techniques- Cut set approach- Common mode failures modeling and evaluation techniques- Examples.

TEXT BOOKS:

1. Roy Billinton and Ronald N Allan, Reliability Evaluation of Engineering Systems, Plenum Press.

2. E. Balagurusamy, Reliability Engineering by Tata McGraw-Hill Publishing Company Limited

REFERENCE BOOKS:

1. Reliability Engineering: Theory and Practice by Alessandro Birolini, Springer Publications.

2. An Introduction to Reliability and Maintainability Engineering by Charles Ebeling, TMH Publications.

3. Reliability Engineering by Elsayed A. Elsayed, Prentice Hall Publications.

19CE3161-OPEN ELECTIVE-I : DISASTER MANAGEMENT

Course Category	Open Elective	**Credits**	**3**
Course type:	**Theory**	**Lecture-Tutorial-practice**	**3-0-0**
Pre requisites:	Earth Science	**Continuous evaluation:** **Semester end evaluation:** **Total Marks:**	**30** **70** **100**

Course Objectives:

- To increase the knowledge and understanding basic concepts of Disasters and Hazards
- To impart the knowledge of types of Disasters and vulnerable profile of India
- To infer capacity building concepts and planning of disaster management.
- To interpret the strategies, policies and coping capacities in order to lessen the impact of hazards.
- To demonstrate the role of Government Agencies in disaster planning and policies

Course outcomes:
After learning the contents of this paper the student must be able to

- Understanding Disasters, man-made Hazards and Vulnerabilities
- Understanding disaster management mechanism
- Understanding capacity building concepts and planning of disaster managements
- Understanding coping strategies and alternative adjustment processes
- Understanding role of government agencies in disaster planning and policies

UNIT - I: Understanding Disaster

Concept of Disaster , Environmental Disasters and Environmental Stress- Different approaches- Concept of Risk - Levels of Disasters - Disaster Phenomena and Events (Global, national and regional)

Hazards and Vulnerabilities: Natural and man-made hazards; response time, frequency and forewarning levels of different hazards - Characteristics and damage potential or natural hazards; hazard assessment - Dimensions of vulnerability factors; vulnerability assessment - Vulnerability and disaster risk - Vulnerabilities to flood and earthquake hazards , epidemics and pandemics

UNIT - II: Disaster Management Mechanism

Concepts of risk management and crisis managements - Disaster Management Cycle - Response and Recovery - Development, Prevention, Mitigation and Preparedness - Planning for Relief

UNIT - III: Capacity Building

Capacity Building Concept - Structural and Nonstructural Measures Capacity Assessment; Strengthening Capacity for Reducing Risk - Counter-Disaster Resources and their utility in Disaster Management

UNIT - IV: Coping with Disaster

Coping Strategies; alternative adjustment processes - Changing Concepts of disaster management - Industrial Safety Plan; Safety norms and survival kits - Mass media and disaster management

UNIT - V: Planning for disaster management

Planning for disaster management: Strategies for disaster management planning - Steps for formulating a disaster risk reduction plan - Disaster management Act and Policy in India - Organizational structure for disaster management in India - Preparation of state and district disaster management plans, Legislative Support at the state and national levels.

TEXT BOOKS:

1. Manual on Disaster Management, National Disaster Management, Agency Govt of India.
2. Disaster Management by Mrinalini Pandey Wiley 2014.
3. Disaster Science and Management by T. Bhattacharya, McGraw Hill Education (India) Pvt Ltd Wiley 2015

REFERENCES:

1. Earth and Atmospheric Disasters Management, N. Pandharinath, CK Rajan, BS Publications 2009.
2. National Disaster Management Plan, Ministry of Home affairs, Government of India (http://www.ndma.gov.in/images/policyplan/dmplan/draftndmp.pdf)

19CE3162-OPEN ELECTIVE-I: BUILDING MATERIALS AND TECHNOLOGIES

Course category:	Open Elective	**Credits**	**3**
Course type:	**Theory**	**Lecture-Tutorial-practice**	**3-0-0**
Pre requisites:	**-**	**Continuous evaluation:** **Semester end evaluation:** **Total Marks:**	**30** **70** **100**

Course Objectives: The objectives of the course is to
- To understand various building materials
- To opherhend knowledge on foundation and masonry
- To study about lintels, arches, roofs and roofs
- To comphred knowledge on energy and environmental issues of building materials
- To learn about various building technology

Course Outcomes: After the completion of the course student should be able to
- **Define** the Basic terminology that is used in the industry
- **Categorize** different building materials, properties and their uses
- **Select** the different type's lintels and roofs and floors in industry construction
- **Understand** the Prevention of damage measures and good workmanship
- **Explain** different building techniques in industry construction

UNIT I

Building Materials: Stone: as building material, Requirements of good quality stones, dressing of stones, deterioration and prevention of stone work. **Bricks:** Classification, Manufacturing, Requirements of good bricks, Field and laboratory tests on bricks, compressive strength, water absorption, efflorescence, dimension and warpage; cement concrete blocks, stabilized mud blocks, sizes, requirements of good blocks; **Mortar:** Types and requirements; **Timber:** wood, structure, types and properties, seasoning, defects: alternate materials for timber.

UNIT II

Foundation: Investigation of soil, Safe bearing capacity of soil, Functions and requirements of good foundation, types of foundation.

Masonry: Definition and terms used in masonry, Brick masonry, characteristics and requirements of good brick masonry, bonds in brick work; Stone masonry: requirements of good stone masonry, classification, characteristics of different stone masonry, joints in stone masonry; Walls, types of walls, cavity walls.

UNIT-III

Lintels and Arches: Definition, function and classification of lintels, Balconies, Chejja and Canopy; Arches: Elements, types and stability of an arch.

Floors and Roofs: Floors: Requirements of good floor, components of ground floor, selection of floor material, laying of concrete, Mosaic, Marble, Granite, Tile flooring, cladding of tiles. Roof: requirements of good roof, elements of a pitched roof, Trussed roof, King post Truss, Queen post truss, Different roofing material, RCC roof.

UNIT IV

Introduction Energy in building materials, Environmental issues concerned to building materials,Global warming and construction industry,Environmental friendly and cost effective building

technologies,Requirements for building of different climatic regions,Traditional building methods and vernacular architecture.

UNIT V

Building Technologies: Wall construction,Types,Construction method ,Masonry mortars, Types, Preparation, Properties, Ferro cement and ferro concrete building components, Materials and specifications, Properties, Construction methods, Applications , roofing systems, Concepts, Filler slabs,Composite beam panel roofs, Masonry vaults and domes

TEXT BOOKS:

1. Building Materials and Construction – Arora & Bindra, Dhanpat Roy Publications.
2. Building Construction by B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain - Laxmi Publications (P) ltd., New Delhi.

REFERENCE BOOKS:

1. Building Materials by Duggal, New Age International.
2. Building Materials by P. C. Varghese, PHI.
3. Construction Technology – Vol – I & II by R. Chubby, Longman UK.
4. Alternate Building Materials and Technology, Jagadish, Venkatarama Reddy and others; New Age Publications.

19CE3263-OPEN ELECTIVE – II : REMOTE SENSING & GIS

Course category:	Professional Core	**Credits**	3
Course type:	**Theory**	**Lecture-Tutorial-practice**	3-0-0
Pre requisites :	--	**Continuous evaluation:** **Semester end evaluation:** **Total Marks:**	30 70 100

Course Objectives: This course will make the student to understand about the principles of GIS, Remote Sensing, Spatial Systems, and its applications to Engineering Problems.

Course Outcomes: At the end of the course, the student

- Ability to analyze aerial photographs.
- Ability to explain electromagnetic spectrum, basic concepts and process of remote sensing.
- Ability to analyze and understand the geographic coordinate system
- Ability to analyze and interpret data using vector data model.
- Ability to analyze and interpret data using raster data model

UNIT - I

Introduction to Photogrammetry: Principles& types of aerial photograph, geometry of vertical aerial photograph, Scale & Height measurement on single vertical aerial photograph, Height measurement based on relief displacement, Fundamentals of stereoscopy, Fiducial points, parallax measurement using fiducial line.

UNIT - II

Remote Sensing: Basic concept of remote sensing, Data and Information, Remote sensing data Collection, Remote sensing advantages & Limitations, Remote Sensing process. Electro-magnetic Spectrum, Energy interactions with atmosphere and with earth surface features (soil, water, vegetation), Indian Satellites and Sensors characteristics, Resolution, Map and Image and False color composite, introduction to digital data, elements of visual interpretation techniques.

UNIT – III

Geographic Information Systems: Introduction to GIS; Components of a GIS; Geospatial Data: Spatial Data-Attribute data – Joining Spatial and Attribute data; GIS Operations: Spatial Data Input- Attribute data Management –Data display- Data Exploration- Data Analysis. COORDINATE SYSTEMS: Geographic Coordinate System: Approximation of the Earth, Datum; Map Projections: Types of Map Projections-Map projection parameters commonly used Map Projections - Projected coordinate Systems.

UNIT – IV

Vector Data Model: Representation of simple features- Topology and its importance; coverage and its data structure, Shape file; Data models for composite features Object Based Vector Data Model; Classes and their Relationship; The geobase data model; Geometric representation of Spatial Feature and data structure, Topology rules.

UNIT - V

Raster Data Model: Elements of the Raster data model, Types of Raster Data, Raster Data Structure, Data Conversion, Integration of Raster and Vector data.

Data Input: Metadata, Conversion of Existing data, creating new data; Remote Sensing data, Field data, Text data, Digitizing, Scanning, on screen digitizing, importance of source map, Data Editing

TEXT BOOKS:

1. Remote Sensing and GIS B. Bhatta by Oxford Publishers 2015.
2. Introduction to Geographic Information System – Kang-Tsung Chang, McGraw-Hill 2015

REFERENCES:

1. Concepts & Techniques of GIS by C. P. Lo Albert, K.W. Yonng, Prentice Hall (India) Publications.
2. Principals of Geo physical Information Systems – Peter A Burragh and Rachael A. Mc Donnell, Oxford Publishers 2004.
3. Basics of Remote sensing & GIS by S. Kumar, Laxmi Publications.
4. Remote Sensing and GIS Lillesand and Kiefer, John Willey 2008.
5. Text Book of Remote Sensing and Geographical Information Systems by M. Anji Reddy – 4th Edition B.S.Publications.

19CE3264-OPEN ELECTIVE-II: ENVIRONMENTAL POLLUTION

Course category:	Open Elective	**Credits**	3
Course type:	**Theory**	**Lecture-Tutorial-practice**	3-0-0
Pre requisites :	Environmental science	**Continuous evaluation:** **Semester end evaluation:** **Total Marks:**	30 70 100

Course Objectives:

- Understanding the importance of ecological balance for sustainable development.
- Understanding the impacts of developmental activities and mitigation measures.
- Understanding the various environmental issues

Course Outcomes: At the end of the course, the student

- Able to define the importance of ecological balance and bio diversity
- Able to suggest natural resources & Bio Diversity for sustainable life style
- Able to identify various environmental pollutants and their effects
- Able to suggest various management methods
- Able to identify various causes of environmental issues

UNIT - I

Multi disciplinary Nature of Environment : -Introduction , objectives, scope and importance , science of environment, Need of Public awareness , world environment Day , Environmental Protection

Chemistry of environmental pollutants Definition of pollution; pollutants; classification of pollutants; solubility of pollutants (hydrophilic and lipophilic pollutants), transfer of pollutants within different mediums, role of chelating agents in transferring pollutants, concept of biotransformation and bioaccumulation, concept of radioactivity, radioactive decay and half-life of pollutants

UNIT - II

Natural resources- Renewable and non-renewable Resources –Forest Resouces,Water resources, mineral resources, Food resources energy resources, energy resouces,land resources, ,Equitable use of resources for sustainable life style

Ecosystem and biodiversity - Natural and Artificial ecosystems –impacts of Human on Ecosystems ,biodiversity , Biological classification of India , threats of biodiversity endangered and endemic species of India ., value of biodiversity, India as a mega-diversity nation , Biodiversity at global , national and local level

UNIT – III

Environmental pollution and management – sources ,effects on environment and Humans , types of environmental pollution, Role of an individual in prevention of Pollution , sources of surface and ground water pollution , Eutrophication , effect of water contaminants on human health , marine pollution –souces, oil spills ,coral reefs and their demise , existing challenges and management

Management and Effects - Floods, earthquake ,cyclone ,landslides ,Tsunami

UNIT – IV

Social issues and the environment - unsustainable to sustainable Development –case studies, urban problems related to energy –Definition, Need , Barriers , promoting of energy conservation , water conservation and management – water conservation , Rain water Harvesting , Water shed management –case study , Population Explosion

Environmental protection laws in India – water,air,wildlife protection ,Indian forest , environment protection act , Issues involves in enforcement of environmental Legislation

UNIT - V

Environmental Issues : Definition , need and objectives of environmental protection. – issues and effects of environmental problems –Automobile pollution ,soil degradation ,Global warming, over population, Natural Resources Depletion , waste Disposal , leachate formation ,Loss of biodiversity , climate change , Ocean Acidification, Nitrogen cycle ,, acid rains,,over fishing ,Public Health issues,Urban sprawl.

TEXT BOOKS:

1. Environmental Science And Engineering by Dr.Suresh K.Dhameja S.K,Kataria Sons , third Edition :2006-2007
2. Text book of Environmental Studies by Erach Bhaurach , University Grants commission , University Press

REFERENCES :

1. Text bo ok of Environmental Science –Dr.Anji Reddy 2007, BS Publications
2. Introduction to Environmental Science by Y.Anjaneyulu BS Publications
3. Environmental science :toward a Sustainable Future by Richard T.Wright.2008 PHL Learning Privated Ltd.New Delhi

(19ME3161)FUNDAMENTALS OF MECHANICAL ENGINEERING
(OPEN ELECTIVE - I)

B.Tech. III Year I Sem. **LT P C**

3 0 0 3

Pre-Requisites: None

Course Objectives:

- Understanding of basic principles of Mechanical Engineering is required in various field of engineering.

Course Outcomes:

By the end of this course, Students should be able to

- Under stand the Fundamentals of mechanical systems
- Under stand the Fundamentals of Properties of Gas, Steam & Steam Turbines
- Choose Suitable IC Engines for Different applications and Classify the Heat Engines
- Choose Suitable Pumps and Compressors , Refrigeration & Air conditioning Systems for Different Applications .
- Classify Power Transmission Systems and Select Suitable Power trasmission Systems and Materials for different applications .

UNIT - I

Introduction: Prime movers and its types, Concept of Force, Pressure, Energy, Work, Power, System, Heat, Temperature, Specific heat capacity, Change of state, Path, Process, Cycle, Internal energy, Enthalpy, Statements of Zeroth Law and First law.

Energy: Introduction and applications of Energy sources like Fossil fuels, Nuclear fuels, Hydel, Solar, wind, and bio-fuels, Environmental issues like Global warming and Ozone depletion.

UNIT - II

Properties of gases: Gas laws, Boyle's law, Charle's law, Combined gas law, Gas constant, Relation between Cp and Cv, Various non-flow processes like constant volume process, constant pressure process, Isothermal process, Adiabatic process, Poly-tropic process

Properties of Steam: Steam formation, Types of Steam, Enthalpy, Specific volume, Internal energy and dryness fraction of steam, use of Steam tables, steam calorimeters.

Steam Boilers: Introduction, Classification, Cochran, Lancashire and Babcock and Wilcox boiler, functioning of different mountings and accessories.

UNIT - III

Heat Engines: Heat Engine cycle and Heat Engine, working substances, Classification of heat engines, Description and thermal efficiency of Carnot; Rankine; Otto cycle and Diesel cycles.

Internal Combustion Engines: Introduction, Classification, Engine details, four- stroke/ two-stroke cycle Petrol/Diesel engines, Indicated power, Brake Power, Efficiencies.

UNIT - IV

Pumps: Types and operation of Reciprocating, Rotary and Centrifugal pumps, Priming

Air Compressors: Types and operation of Reciprocating and Rotary air compressors, significance of Multistage.

Refrigeration & Air Conditioning: Refrigerant, Vapor compression refrigeration system, vapor absorption refrigeration system, Domestic Refrigerator, Window and split air conditioners.

UNIT - V

Couplings, Clutches and Brakes: Construction and applications of Couplings (Box; Flange; Pin type flexible; Universal and Oldham), Clutches (Disc and Centrifugal), and Brakes (Block; Shoe; Band and Disc).

Transmission of Motion and Power: Shaft and axle, Belt drive, Chain drive, Friction drive, Gear drive.

Engineering Materials: Types and applications of Ferrous & Nonferrous metals, Timber, Abrasive material, silica, ceramics, glass, graphite, diamond, plastic and polymer.

TEXT BOOKS:

1. Basic Mechanical Engineering / Pravin Kumar/ Pearson.
2. Introduction to Engineering Materials / B.K. Agrawal/ Mc Graw Hill.

REFERENCES:

1. Fundamental of Mechanical Engineering/ G.S. Sawhney/PHI.
2. Thermal Science and Engineering / Dr. D.S. Kumar/ Kataria.

(19ME3162)FUNDAMENTALS OF ROBOTICS
(OPEN ELECTIVE – I)

B.Tech. III Year I Sem. **L T P C**
3 0 0 3

Pre-requisites: None

Course Objectives:

- The goal of the course is to familiarize the students with the concepts and techniques in robotic engineering, manipulator kinematics, dynamics and control, chose, and incorporate robotic technology in engineering systems.
- Make the students acquainted with the theoretical aspects of Robotics.
- Enable the students to acquire practical experience in the field of Robotics through design projects and case studies.
- Make the students to understand the importance of robots in various fields of engineering.
- Expose the students to various robots and their operational details.

Course outcomes:

- The goal of the course is to familiarize the students with the concepts and techniques in robotic engineering, manipulator kinematics, dynamics and control, chose, and incorporate robotic technology in engineering systems.
- Make the students acquainted with the theoretical aspects of Robotics.
- Enable the students to acquire practical experience in the field of Robotics through design projects and case studies.
- Make the students to understand the importance of robots in various fields of engineering.
- Expose the students to various robots and their operational details.

UNIT - I

Robotics-Introduction-classification with respect to geometrical configuration (Anatomy), Controlled system & chain type: Serial manipulator & Parallel Manipulator. Components of Industrial robotics-precession of movement-resolution, accuracy & repeatability-Dynamic characteristics- speed of motion, load carrying capacity & speed of response-Sensors-Internal sensors: Position sensors,& Velocity sensors, External sensors: Proximity sensors, Tactile Sensors, & Force or Torque sensors.

UNIT - II

Grippers - Mechanical Gripper-Grasping force-Engelberger-g-factors-mechanisms for actuation, Magnetic gripper , vaccume cup gripper-considerations in gripper selection & design . Industrial robots specifications. Selection based on the Application .

UNIT - III

Kinematics-Manipulators Kinematics, Rotation Matrix, Homogenous Transformation Matrix, D-H transformation matrix, D-H method of assignment of frames. Direct and Inverse Kinematics for industrial robots. Differential Kinematics for planar serial robots

UNIT - IV

Trajectory planning: Joint space scheme- Cubic polynomial fit-Obstacle avoidance in operation space-cubic polynomial fit with via point, bleding scheme. Introduction Cartesian space scheme. Control- Interaction control, Rigid Body mechanics, Control architecture- position, path velocity, and force control systems, computed torque control, adaptive control, and Servo system for robot control.

UNIT - V

Programming of Robots and Vision System-Lead through programming methods- Teach pendent- overview of various textual programming languages like VAL etc. Machine (robot) vision:

TEXT BOOKS:

1. Industrial Robotics / Groover M P /Mc Graw Hill.
2. Introduction to Robotics / John J. Craig/ Pearson.

REFERENCES:

1. Theory of Applied Robotics /Jazar/Springer.
2. Robotics / Ghosal / Oxford.

(19ME3263)FABRICATION PROCESSES
(OPEN ELECTIVE –II)

B.Tech. III Year II Sem. **L T P C**
3 0 0 3

Prerequisites: Nil

Course Objectives: Understand the philosophies of various Manufacturing process.

Course Outcomes:

1. Understand the steps in casting and different applications of casting process.
2. Understand the welding process and Select suitable welding techniques for different applications
3. Classify the Hot working and Cold Working process and Explain the different Hot working and Cold Working Processes
4. Understand Extrsion process and Select suitable extrusion process for manufacturing of different components.
5. Understand Forgeing process and Select suitable Forgeing process for different applications

UNIT – I

Casting: Steps involved in making a casting – Advantage of casting and its applications; Patterns - Pattern making, Types, Materials used for patterns, pattern allowances and their construction; Properties of moulding sands. Methods of Melting - Crucible melting and cupola operation – Defects in castings; Casting processes – Types – Sand moulding, Centrifugal casting, die- casting, Investment
casting, shell moulding; Principles of Gating – Requirements – Types of gates, Design of gating systems – Riser – Function, types of Riser and Riser design.

UNIT – II

Welding: Classification – Types of welds and welded joints; Gas welding - Types, oxy-fuel gas cutting. Arc welding, forge welding, submerged arc welding, Resistance welding, Thermit welding.
Inert Gas Welding - TIG Welding, MIG welding, explosive welding, Laser Welding; Soldering and Brazing; Heat affected zone in welding. Welding defects – causes and remedies; destructive and non- destructive testing of welds.

UNIT – III

Hot working, cold working, strain hardening, recovery, recrystallisation, and grain growth. Stamping, forming, and other cold working processes. Blanking and piercing – Bending and forming – Drawing and its types – wire drawing and Tube drawing – coining – Hot and cold spinning. Types of presses and press tools. Forces and power requirement in the above operations.

UNIT – IV

Extrusion of Metals: Basic extrusion process and its characteristics. Hot extrusion and cold extrusion - Forward extrusion and backward extrusion – Impact extrusion – Extruding equipment – Tube extrusion and pipe making, Hydrostatic extrusion. Forces in extrusion

UNIT – V

Forging Processes: Forging operations and principles – Tools – Forging methods – Smith forging, Drop Forging – Roll forging – Forging hammers : Rotary forging – forging defects – cold forging, swaging, Forces in forging operations.

TEXT BOOKS:

1. Manufacturing Technology / P.N. Rao / Mc Graw Hill.
2. Manufacturing Engineering and Technology/Kalpakjin S/ Pearson.

REFERENCES:

1. Metal Casting / T.V Ramana Rao / New Age.
2. Métal Fabrication Technology/ Mukherjee/PHI.

(19ME3264): QUANTITATIVE ANALYSIS FOR BUSINESS DECISIONS
(OPEN ELECTIVE –II)

B.Tech. III Year II Sem. **L T P C**
3 0 0 3

Course Objectives:

- Understand the problem, identifying decision variables, objective and constraints.
- Formulation of Optimization Problem by constructing Objective Function and Constraint functions.
- Learn to select appropriate Optimization Technique for the formulated Optimization Problem.
- Understood the procedure involved in the selected Optimization Technique.
- Solve the Optimization Model with the selected Optimization Technique.

Course Outcomes: At the end of the course, student will be :

1. Formulate and Solve Linear Programming Models
2. Apply Transportation and Assignmodels for finding the optimum solutions
3. Formulate the suitable Replacement models for finding the Optimum Replacement period
4. Apply the Game theory concepts for finding the optimum busssines decisions
5. Understand Queuing systems and formulate the suitable quieting system and simulation model for finding the optimum solutions.

UNIT – I:

Introduction and Linear Programming: Nature and Scope of O.R.–Analyzing and Defining the Problem, Developing A Model, Types of models, Typical Applications of Operations Research; Linear programming: Graphical Method, Simplex Method; Solution methodology of Simplex algorithm, Artificial variables; Duality Principle, Definition of the Dual Problem, Primal - Dual Relationships.

UNIT – II:

Transportation and Assignment Models: Definition and Application of the Transportation Model, Solution of the Transportation Problem, the Assignment Model, & Variants of assignment problems. Traveling Salesman Problem.

UNIT – III:

Replacement Model: Replacement of Capital Cost items when money's worth is **not** considered, Replacement of Capital Cost items when money's worth is considered, Group replacement of low-cost items.

UNIT – IV:

Game Theory and Decision Analysis: Introduction – Two Person Zero-Sum Games, Pure Strategies, Games with Saddle Point, Mixed strategies, Rules of Dominance, Solution Methods of Games without Saddle point – Algebraic, arithmetic methods. Decision Analysis: Introduction to Decision Theory, Steps In the Decision Making, the Different environments In Which Decisions Are Made, Criteria For Decision Making Under Risk and Uncertainty, The Expected Value Criterion With Continuously Distributed Random Variables, Decision Trees, Graphic Displays of the Decision Making Process.

UNIT – V:

Queuing Theory and Simulation: Basic Elements of the Queuing Model, Poisson Arrivals and Exponential Service times; Different Queing models with FCFS Queue disciplne: Single service station and infinite population, Single service station and finite population, Multi service station models with infinite population. **Simulation**: Nature and Scope, Applications, Types of simulation, Role of Random Numbers, Inventory Example, Queuing Examples, Simulation Languages.

TEXTBOOKS:

1. Operations Research: Theory and Applications/ J. K. Sharma: / Macmillan, 2008.
2. Operations Research/ Er. Prem Kumar Gupta & Dr. D. S. Hira / S. Chana, 2016.

REFERENCES:

1. Introduction To Operations Research; Hillier/Lieberman/ TMH, 2008.
2. Render: Quantitative Analysis for Management, Pearson, 2009.
3. Quantitative Analysis for Business Decisions / Sridharabhat/ HPH, 2009.
4. Operations Research / R. Panneerselvam/ PHI, 2008.
5. Operations Research: An Introduction / Hamdy, A. Taha/ PHI, 2007.