Department of
INFORMATION TECHNOLGY

4 Years B.Tech Degree Programme

REGULATION & SYLLABUS 2017

Choice Based Credit System
Outcome Based Assessment

SEMESTER- VII & VIII

AUTONOMOUS
Accredited by NBA
Accredited by NAAC with 'A' Grade (3.28 out of 4.00 CGPA)

GANDHI INSTITUTE OF ENGINEERING AND TECHNOLOGY
Affiliated to UGC New Delhi &Biju Patnaik University of Technology, Odisha
GUNUPUR – 765022, Odisha, India

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEO1: To render best platform for adequate training and opportunities to work as teams on projects with effective communication skills and leadership qualities and understand professional ethics, social awareness and organizational context in which their engineering skills are utilized.

PEO2: To endow the students with sound knowledge in the field of mathematics, basic science and engineering fundamentals to solve and inculcate the ability to utilize their skills to prepare them for higher studies, research and analyze engineering problems.

PEO3: To extend an ability to analyze the need of the society by providing innovative solutions, leading to their personal cum professional growth as an entrepreneur.

PROGRAM SPECIFIC OUTCOMES (PSOs)

PSO 1: To provide students an understanding of the expectations of industry and practical competence with a broad range of programming language and open source platforms through value added courses.

PSO 2: The ability to analyze and develop computer programs in the areas related to artificial intelligence, big data analytics and cyber security for efficient design of computer-based systems of varying complexity.

PROGRAMME OUTCOMES (POs)

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

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

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

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

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

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

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

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

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

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

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

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

SEMESTER – VII

Sl.	Course Category	Course Code	Course Title	L	T	P	C	QP
THEORY								
1	PC	BCSPC7010	Computer Graphics	3			3	
2	PC	BITPC7020	Mobile Computing	3			3	
3	PE	BITPE7031	Advanced statistical techniques for analytics	3			3	
		BITPE7032	Advanced Database System					
		BITPE7033	Cloud Computing					
		BITPE7034	Cryptography and Network Security					
		BITPE7035	Software Testing					
		BITPE7036	Software Engineering Management					
4	PE	BITPE7041	Big data Using Hadoop	3			3	
		BITPE7042	Data Storage Technology & Networking					
		BITPE7043	Wireless Sensor					
		BITPE7044	Satellite Communication					
		BITPE7045	Object Oriented Analysis & Design					
		BITPE7046	Secure Software Engineering					
5	OE	B**OE705*	Open Elective - 3	3			3	
PRACTICAL								
1	PC	BCSPC7110	Computer Graphics Lab			2	1	
2	PE	BCSPE7120	MOOC subject*			2	2	
3	PC	BCSPC7130	Mini Project			6	3	
4	PC	BCSPC7140	Advanced lab – II			2	1	
5	PC	BCSPC7150	Summer Internship				1	
Total				**15**	**0**	**12**	**23**	

Course Code	Course Title	L	T	P	C	QP
BCSPC7010	**Computer Graphics**	**3**	**0**	**0**	**3**	**A**

Pre -Requisite:

Course Educational Objective

CEO1: Discuss various algorithms for scan conversion and filling of basic objects and their comparative analysis.

CEO2: Introduce the use of geometric transformations on graphics objects and their application in composite form.

CEO3: Impart frame extraction with different clipping algorithms and transformation to a graphics display device.

CEO4: Introduce projections and visible surface detection techniques for display of 3D scene on 2D screen and rendering of projected objects to naturalize the scene in 2D view.

Course Outcome: At the end of the course, the student will be capable of

CO1	To ***explain*** the structure of modern computer graphics systems and ***implement*** its primitives
CO2	To ***design, develop*** and ***model*** key algorithms for modeling and .
CO3	Apply Graphics in greater depth to more complex courses like Image Processing, Virtual, Augmented Reality, etc
CO4	To ***visualize*** surface detection and Virtual reality for a better visual effects.

UNIT:1 **(10 Hours)**

Overview of Graphics System: Video Display Units, Raster-Scan and Random Scan Systems, Graphics Input and Output Devices, monitor and work station.graphics Output Primitives:point and line Line, drawing Algorithms: DDA and Bresenham's , Circle drawing Algorithms: Midpoint Circle and Bresenham's filled area primitives.

UNIT:2 **(12 Hours)**

Two Dimensional Geometric Transformation: Translation, rotation, Scaling, Reflection, Shear, Matrix Representation, Composite Transformations, Transformation between coordinate systems. Window-to- View port Coordinate Transformation. Line Clipping (Cohen-Sutherland Algorithm) and Polygon Clipping (Sutherland Hodgeman Algorithm).

Three Dimensional Geometric and Modeling Transformations: Translation Rotation, Scaling, Reflections, shear, Composite Transformation. Projections: Parallel Projection and Perspective Projection.

UNIT:3 **(10 Hours)**

Object representation: Spline Representation, Bezier Curves and B-Spline Curves. Fractal Geometry: Fractal Classification and Fractal Dimension. Visible Surface Detection Methods: Back-face Detection, Depth Buffer, A- Buffer, Scan- line Algorithm and Painters Algorithm

UNIT:4 **(12 Hours)**

Light pattern and Illumination Models:Aliasing and Antialiasing, Half toning, Thresholding and Dithering, Basic Models, Displaying Light Intensities. Surface Rendering Methods: Polygon Rendering Methods: Gouraud Shading and Phong Shading.
Computer Animation: Types of Animation, Key frame Vs. Procedural Animation, methods of controlling Animation, Morphing. Virtual Reality: Types of Virtual reality systems, Input and Output Virtual Reality devices

Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert/MOOCS

Text Books

1. Computer Graphics with Virtual Reality System, Rajesh K.Maurya, WileyDreamtech.
2. Computer Graphics, D. Hearn and M.P. Baker (C Version), Pearson Education

Ref. Books

1. Computer Graphics Principle and Practice , J.D. Foley, A.Dam, S.K. Feiner, Addison,

Wesley
2. Procedural Elements of Computer Graphics- David Rogers (TMH)
3. Computer Graphics: Algorithms and Implementations – D.P Mukherjee & Debasish Jana (PHI)
4. Introduction to Computer Graphics & Multimedia – Anirban Mukhopadhyay

COMPUTER GRAPHICS LAB
(Sub. Code: BCSPC7110)

Course Educational Objective: At the end of the semester student will be able to
CEO1: ***Explain*** and implement different types of graphics drawing and scan conversion algorithms.
CEO2: ***Apply*** the concepts of 2D and 3D Geometrical Transformations
CEO3: ***Design*** clipping and viewing algorithms
CEO4: ***Model*** illumination model with surface elimination and shading

1. Implementation of DDA and Bressenham's line drawing algorithm
2. Implementation of Midpoint and Bressenham's circle drawing algorithm
3. Implementation of 2D transformation
4. Implementation of composite 2D transformation
5. Implementation of Cohen Sutherland 2D line Clipping Algorithm
6. Implementation of Sutherland Hodgeman polygon clipping algorithm
7. Implementation of 3D transformation
8. Implementation of 3D composite transformation
9. Implementation of B-spline and Bezier curve
10. Implementation of fractrals

Course Code	Course Title	L	T	P	C	QP
BITPC7020	**Mobile Computing**	3	0	0	3	A

Pre -Requisite:

Course Educational Objective

CEO1: To understand CDMA, GSM, Mobile IP, and Mobile OS.

CEO2: To understand various Mark-up Languages

CEO3: Student will able to differentiate between various wireless communication technologies.

CEO4: Mobile communication features will be appreciated

CEO5: Merits and demerits of various technologies will be understood by the student

Course Outcome: At the end of the course, the student will be capable of

CO1	Students will gain knowledge of GSM architecture.
CO2	Students will be able to understand mobility management.
CO3	Students will be able to understand working of wireless architectures and their applications.
CO4	Students will be able to understand recent trends and emerging technologies.

UNIT:1 **(12 Hours)**

Introduction to Personal Communications Services (PCS): PCS Architecture, mobility management, Networks signalling, Global System for Mobile Communication (GSM) and Short Service Messages (SMS): GSM Architecture, Entities, Call routing in GSM, PLMN Interface, GSM Addresses and Identities, Network Aspects in GSM, Mobility Management, GSM Frequency allocation. Introduction to SMS, SMS Architecture, General Packet Radio Services (GPRS): GPRS Architecture, GPRS Network Nodes, Mobile Data Communication; WLANs (Wireless LANs) IEEE 802.II standard, Mobile IP.

UNIT:2 **(14 Hours)**

Mobile Client: overview of Mobile handset, Mobile phones and their features, PDA, Design Constraints in applications for hand-held devices. Mobile IP: Introduction, discovery, Registration, Tunneling, Cellular IP, Mobile IP with IPv6Wireless Third Generation (3G) Mobile Services: Wideband Code Division Multiple Access (W-CDMA), and CDMA 2000 Global Mobile Satellite Systems; case studies of the IRIDIUM, ICO and GLOBALSTAR systems

UNIT:3 **(10 Hours)**

Wireless Enterprise Networks: Introduction to Virtual Networks, Blue tooth technology, Blue tooth Protocols. Server-side programming in Java, Pervasive web application architecture.
Mobile Operating Systems: WinCE, Palm OS, Symbian OS, Linux and Proprietary OS Client Development: The development process, Need analysis phase, Design phase, Implementation and Testing phase, Deployment phase, Development Tools, Device Emulators.

UNIT:4 **(12 Hours)**

Mobile Device Operating System, Commercial mobile operating systems, Software development kit, iOS, Android, Windows phones, M-Commerce, Mobile transaction system, related security issues, 4G technology, fundamental concepts of mobile cloud computing and different application instances.
Application Protocol (WAP): The Mobile Internet standard, WAP Gateway and Protocols, Wireless Local Loop (WLL):Introduction to WLL Architecture, wireless mark-up Languages (WML): HDML, WML, HTML, cHTML, XHTML, VoiceXML,Mobile Internet Applications: Thin client: Architecture, the client, Middleware, messaging Servers, Processing a Wireless request, introduction to J2ME

Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert/MOOCS

Text Books

1. P.K. Patra, S.K. Dash: Mobile Computing, Scitech Publications.
2. Rajkamal: Mobile Computing, Oxford University Press.
3. Ashok Talukder, Roopa Yavagal, Hasan Ahmed (2010), Mobile Computing, Technology,Applications and Service Creation, 2nd Edition, Tata McGraw Hill,

Course Code	Course Title	L	T	P	C	QP
BITPE7031	**Advanced Statistical Techniques for Analytics**	**3**	**0**	**0**	**3**	**A**

Pre -Requisite:

Course Educational Objective

CEO1: To introduce more advanced statistical methods that are used in data analysis and social research.

CEO2: Teach students statistical theories and inference techniques with focuses on statistical theories, probability distributions, bivariate and multivariate analysis.

Course Outcome: At the end of the course, the student will be capable of

CO1	Demonstrate competency on a variety of well-known distributions and the calculations involved.
CO2	Understand the theories of statistical inferences and apply the appropriate models in different settings to solve real-life problems
CO3	Perform statistical inferences involving two or more populations using statistical software
CO4	Design and perform simple and multiple regression analysis using statistical software

UNIT:1 **(12 Hours)**

INTRODUCTION : Analyses, Methods, Techniques, Discussion Items on Statistical Methods ,Discussion Items on Statistical Techniques , Statistical Methods and Analyses Revisited , Concepts of Probability , Laplacian Probability , Relative Frequency, Hypothetical Limiting Relative Frequency, Epistemic Probability , Transition to Approaches to Statistical Analysis

APPROACHES BASED ON RANDOMIZATION ,Populations, Attributes and Responses, Finite, Physically Existing Populations ,Sampling : The Sampling Frame , Population Statistics as Parameters,Simple Random Sampling, Estimation For Simple Random Samples,The Basic Estimators, Properties of the Estimators, Unequal Probability Samples,Obtaining Samples Through the Use of Restricted Randomization,Inclusion Probabilities and Linear Estimators The Overall Generalization , Interval Estimation

UNIT:2 **(12 Hours)**

THE EXPERIMENTAL APPROACH : Scientific Abstraction and Experiments ,The Nested Syllogism of Experimentation , Randomized Treatment Assignment , Quantifying Differences Among ,Permutation Tests , Toward Inductive Inference , Randomization Tests , Experiments Lacking Random ,Experiments With Constructed Units , Random Selection of

STATISTICAL MODELING : Statistical Abstraction : Random Variables , Probability Distributions, Statistical Abstraction.

UNIT:3 **(12 Hours)**

FAMILIES OF DISTRIBUTIONS : Exponential Families and Properties of ,Parameterizations, Exponential Dispersion Families ,Exponential Families for Samples ,Location-Scale Families and Properties

MODEL SPECIFICATION : Objectives of Analysis , Additive Error ,Constant Variance ,Linear and Nonlinear Models,Models with Known and Unknown Variance Parameters , Models Based on Response Distributions ,Multiple Random Components ,Stochastic ,

ESTIMATION AND INFERENCE : Estimators Based on Sample , Least Squares Estimation , Basic , Modified Likelihood , False Likelihood Functions

UNIT:4 **(02 Hours)**

MODEL ASSESSMENT: Analysis of Residuals, A General Notational Framework, Types of ,Plotting Residuals, Tests With Residuals , Cross Validation : concepts, types , Discrepancy Measures.

BAYESIAN ANALYSIS: Bayesian Paradigms, Strict Bayesian Analysis ,Bayesian Analysis of, Sequential Bayes, Prior Distributions, Exchangeability, Conjugate Priors, Non informative

BASIC ESTIMATION AND INFERENCE: Point Estimation, Interval Estimation, Model, Predictive Inference Simulation of Posterior Distributions, Fundamental Methods and

Principles of Simulation , The Gibbs Sampler , Metropolis Hastings.
Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert/MOOCS
Text Books 1 Advanced Statistical Methods Mark S. Kaiser Department of Statistics, Iowa State University, Fall 2005

Course Code	Course Title	L	T	P	C	QP
BITPE7032	**Advanced Database System**	**3**	**0**	**0**	**3**	**A**

Pre -Requisite:

Course Educational Objective

CEO1: Learn new ways to query

CEO2: Learn new techniques to model data.

CEO3: Become familiar with the expanding role of database technology.

Course Outcome: At the end of the course, the student will be capable of

CO1	***Apply*** and ***customize*** state-of-the-art implementation techniques for single-node database management systems following modern coding practices.
CO2	***Identify*** trade-offs among database systems techniques and contrast alternatives for both on-line transaction processing and on-line analytical workloads.
CO3	***Develop*** and justify design decisions in the context of a high-performance database system.
CO4	***Implement*** and ***evaluate*** complex, scalable database systems, with emphasis on providing experimental evidence for design decisions.

UNIT:1 **(10 Hours)**

Review of Relational Data Model. Reporting and Analytical,databases: Data Warehousing, OLAP, SQL Analytical Functions.,Case Studies (Postgres, Oracle).

UNIT:2 **(12 Hours)**

Parallel & Distributed Databases and Introduction to NoSQL:Concepts, Parallel and Distributed databases and issues;.Emergence of NoSQL databases, Characteristics of NoSQL,Categories of NoSQL systems, CAP Theorem.

UNIT:3 **(14 Hours)**

NoSQL Databases: Document databases with example,(MongoDB, CouchDB); Column Oriented databases with example(Cassandra); Key-Values Stores with example (Riak, Voldemort,etc.); Graph databases with example (Neo4J).

UNIT:4 **(10 Hours)**

Introduction to Big Data: What is Big Data, Hadoop, HDFS and Spark.

Specialty Databases: In-Memory databases for RDBMS (VoltDB),and Key-Value Store (Redis). Specialty databases – Spatial, Temporal, Deductive.

Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert/MOOCS

Ref. Books:

1. "Database System Concepts", Silberschatz, Korth and Sudarshan,6th Edition, McGraw Hill,2013.
2. "Database Management Systems", Raghu Ramakrishnan, 3rd Edition, McGraw- Hill, 2014.
3. "Fundamentals of Database Systems", Elmasri & Navathe, 7th Edition, Pearson Education, 2015.
4. "NoSQL Distilled", Pramod J. Sadalage and Martin Fowler, Addison Wesley, 2012.
5. "Seven Databases in Seven Weeks: A Guide to Modern Databases and the NoSQL Movement", Eric Redmond & Jim R. Wilson, O'Reilly, 2012.

Course Code	Course Title	L	T	P	C	QP
BITPE7033	**Cloud Computing**	**3**	**0**	**0**	**3**	**A**

Pre -Requisite:

Course Educational Objective

CEO1: Understand the rationale behind the cloud computing revolution

CEO2: Introduce various models of cloud computing

CEO3: Understand how to design applications on cloud and the role of security

CEO4: Understand and design distributed systems for scalability

Course Outcome: At the end of the course, the student will be able to

CO1	Understand the technical and business rationale behind cloud computing
CO2	Outline the model of cloud computing to use for solving a particular problem
CO3	Design and Build applications for the cloud and understand the security implications
CO4	Understand and Apply the fundamentals of distributed systems design to cloud computing

UNIT:1 **(12 Hours)**

Cloud Computing: Introduction, Types of cloud: private, public and hybrid cloud, . Hardware and Infrastructure: IaaS, PaaS, SaaS. public vs private clouds, Benefits and challenges of cloud computing, Virtualization: Types of Virtualization, Implementation Levels, Virtualization Structures, Tools and Mechanisms, Virtualization of CPU, Memory, I/O Devices ,Virtual Clusters and Resource management–Virtualization for Data-center Automation. role of virtualization in enabling the cloud,

UNIT:2 **(14 Hours)**

Cloud infrastructure: Architectural Design of Compute and Storage Clouds, Layered Cloud Architecture Development, Design Challenges, Inter Cloud Resource Management, Resource Provisioning and Platform Deployment, Global Exchange of Cloud Resources. Cloud Applications: Technologies and the processes required when deploying web services; Deploying a web service from inside and outside a cloud architecture, advantages and disadvantages Benefits and challenges to Cloud architecture, Application availability, performance, security and disaster recovery; next generation Cloud Applications.

UNIT:3 **(12 Hours)**

Cloud service management: Reliability, availability and security of services deployed from the cloud. Performance and scalability of services, tools and technologies used to manage cloud services deployment; Cloud Economics: Cloud Computing infrastructures available for implementing cloud based services. Economics of choosing a Cloud platform for an organization, based on application requirements, economic constraints and business needs (e.g Amazon, Microsoft and Google, Salesforce.com, Ubuntu and Redhat)

UNIT:4 **(10 Hours)**

Cloud security: Security Overview , Cloud Security Challenges and Risks, Software-as-a-Service Security ,Security Governance ,Risk Management ,Security Monitoring ,Security Architecture Design ,Data Security ,Application Security, Virtual Machine Security ,Identity Management and Access Control ,Autonomic Security. Cloud based service, applications and development platform

Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert/MOOCS

Text Books:

1. Cloud Computing : A Practical Approach by Anthony T. Velte Toby J. Velte, Robert Elsenpeter, 2010 by The McGraw-Hill
2. Gautam Shroff, “Enterprise Cloud Computing Technology Architecture Applications”, Cambridge University Press; 1 edition, [ISBN: 978-0521137355],2010
3. Rajkumar Buyya, Christian Vecchiola, S.Tamarai Selvi, ‘Mastering Cloud Computing”, TMGH,2013.

Course Code	Course Title	L	T	P	C	QP
BITPE7034	**Cryptography and Network Security**	**3**	**0**	**0**	**3**	**A**

Pre -Requisite:

Course Educational Objective

CEO1: Provide an overall view of what Computer & Network Security is all about and generate interest in this field to beable to take this as a further specialization area or a career path.

CEO2: Introduce of Perimeter Security (Firewall, IDS, IPSEC, VPN), Authentication and Access management, Cryptography, Malware, Secure Programming, Applications Security, Security and Privacy Policy.

Course Outcome: At the end of the course, the student will be capable of

CO1	Understand about Cryptography and Network Security.
CO2	Design and implement various encryption/decryption algorithms.
CO3	Relate different algorithms to real time application.
CO4	Understand and classify different protocols related to web security.

UNIT:1 **(10 Hours)**

INTRODUCTION & NUMBER THEORY: Services, Mechanisms and attacks-the OSI security architecture-Network security model-Classical Encryption techniques (Symmetric cipher model, substitution techniques, transposition techniques, steganography).FINITE FIELDS AND NUMBER THEORY: Groups, Rings, Fields-Modular arithmetic-Euclid‟s algorithm-Finite fields- Polynomial Arithmetic –Prime numbers-Fermat‟s and Euler‟s theorem-Testing for primality-The Chinese remainder theorem- Discrete logarithms.

UNIT:2 **(14 Hours)**

BLOCK CIPHERS & PUBLIC KEY CRYPTOGRAPHY: Data Encryption Standard-Block cipher principles-block cipher modes of operation-Advanced Encryption Standard (AES)-Triple DES-Blowfish-RC5 algorithm. Public key cryptography: Principles of public key cryptosystems-The RSA algorithm-Key management - Diffie Hellman Key exchange-Elliptic curve arithmetic-Elliptic curve cryptography.

HASH FUNCTIONS AND DIGITAL SIGNATURES: Authentication requirement–Authentication function – MAC – Hash function – Security of hash function and MAC –MD5-SHA-HMAC–CMAC-Digital signature and authentication protocols–DSS–EIGamal–Schnorr.

UNIT:3 **(12 Hours)**

SECURITY PRACTICE & SYSTEM SECURITY: Authentication applications – Kerberos – X.509 Authentication services - Internet Firewalls for Trusted System: Roles of Firewalls – Firewall related terminology- Types of Firewalls - Firewall designs - SET for E-Commerce Transactions. Intruder – Intrusion detection system – Virus and related threats – Countermeasures – Firewalls design principles – Trusted systems – Practical implementation of cryptography and security.

UNIT:4 **(10 Hours)**

E-MAIL, IP & WEB SECURITY: E-mail Security: Security Services for E-mail-attacks possible through E-mail - establishing keys privacy-authentication of the source-Message Integrity-Non-repudiation-Pretty Good Privacy-S/MIME. IPSecurity: Overview of IPSec - IP and IPv6-Authentication Header-Encapsulation Security Payload (ESP)-Internet Key Exchange (Phases of IKE, ISAKMP/IKE Encoding). Web Security: SSL/TLS Basic Protocol-computing the keys- client authentication-PKI as deployed by SSLAttacks fixed in v3-Exportability-Encoding-Secure Electronic Transaction (SET).

Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert/MOOCS

Text Books

1. “Cryptography and Network Security: Principles and Practice” by William Stallings
2. Cryptography and Network Security” by Behrouz A. Forouzan, Debdeep Mukhopadhya

Course Code	Course Title	L	T	P	C	QP
BITPE7035	**Software Testing**	**3**	**0**	**0**	**3**	**A**

Pre -Requisite:

Course Educational Objective

CEO1: Introduce the concepts of Software Quality and types of testing

CEO2: Familiarize the students with different levels of testing

CEO3: Understand the challenges in test management, test automation

CEO4: Gain hands on knowledge of tools, JUnit/ JMeter/ Selenium/ Bugzilla

Course Outcome: At the end of the course, the student will be capable of

CO1	Apply the concepts of Quality Engineering
CO2	Apply proper testing technique at different phases of development
CO3	Identify difficulties and complexities in Software Quality
CO4	Plan, employ and measure proper Quality approaches applied

UNIT:1 **(10 Hours)**

Basics of software testing and examples: Basic definitions of software testing, Test cases, Insights from a Venn diagram, Identifying test cases, Error and fault taxonomies, Levels of testing. Examples: Generalized pseudocode , The triangle problem, The NextDate function, commission problem, The Simple Automatic Teller Machine (SATM) problem.

UNIT:2 **(10 Hours)**

Decision table-based testing: Decision tables, Test cases for the triangle problem, Test cases for the NextDate function, Test cases for the commission problem, Guidelines and observations. **Data Flow testing:** Definition of Use testing, Slice-based testing, Guidelines and observations. **Levels of testing:** Traditional view of testing levels, Alternative life-cycle models, The SATM system, separating integration and system testing. **Integration Testing:** A closer look at the SATM system, Decomposition-based, call graph-based, Path-based integrations, Case study.

UNIT:3 **(14 Hours)**

System testing: Basic concepts of Threads, requirement specification, Finding threads, Structural strategies and functional strategies for thread testing, SATM test threads, guidelines for System testing, Atomic System Functions(ASF) testing examples. **Interaction Testing:** Context of interaction, A taxonomy of interactions, Interaction, composition, and Determinism, Client/Server Testing,. **Issues in object-oriented testing:** Units for object-oriented testing, Implications of composition and encapsulation, inheritance and polymorphism, Levels of object-oriented testing, GUI testing, dataflow testing for object-oriented software, Examples. **Class Testing:** Methods as units, Classes as units.

Exploratory testing: The context-driven school, Exploring exploratory testing with familiar examples, Exploratory and context-driven testing observations. **Model-based testing:** Testing based on models, appropriate models, Use case-based testing, Commercial tool support for model-based testing

UNIT:4 **(12 Hours)**

Object-oriented integration testing: UML support for integration testing, MM-paths for object-oriented software, A framework for object-oriented dataflow and integration testing. **GUI testing:** The currency conversion program, Unit testing, Integration Testing and System testing for the currency conversion program. **Object-Oriented System Testing:** Currency converter UML description, UML-based system testing, Statechart-based system testing. **Test-Driven Development:** Test-Driven code cycles, automated test execution, Java and JUnit examples, Pros, cons, and open questions of TDD, Retrospective on MDD versus TDD.

Teaching Methods: Chalk& Board/ PPT/Video Lectures

Text Books 1. Paul C. Jorgensen, (2013), *Software Testing, A Craftsman's Approach*ll, 3rd Edition, Auerbach Publications,

Ref. Books

1. Aditya P Mathur, (2008), *Foundations of Software Testing*, Pearson,

2. Mauro Pezze, Michal Young, (2008), *Software Testing and Analysis – Process, Principles and Techniques*, John Wiley & Sons,

Course Code	Course Title	L	T	P	C	QP
BITPE7041	**Big Data Using Hadoop**	**3**	**0**	**0**	**3**	**A**

Pre -Requisite:

Course Educational Objective

CEO1: To learn advanced cutting edge and state-of-the-art knowledge and implementation in big data.

CEO2: To read and understand research publications in the technical area of big data, beyond that of the traditional textbook level.

CEO3: To conduct independent project and to equip for scholarly research in big data.

CEO4: To explore the next generation of big data tools and applications, and other advanced topics if time permits.

Course Outcome: At the end of the course, the student will be capable of

CO1	Understand the principles and design of alternative storage technologies for Big data.
CO2	Understand and Apply different algorithms for processing Big Data using open source Hadoop, HDFS, MapReduce, Hive, Pig, Mahout, etc.
CO3	Understand and classify different computational issues and infrastructure for Big Data
CO4	Understand the impact of big data for business decisions and strategy.

UNIT:1 **(14 Hours)**

INTRODUCTION TO BIG DATA :Introduction – distributed file system – Big Data and its importance, Four Vs, Drivers for Big data, Big data analytics, Big data applications. Algorithms using map reduce, Matrix-Vector Multiplication by Map Reduce

INTRODUCTION HADOOP :Big Data – Apache Hadoop & Hadoop EcoSystem – Moving Data in and out of Hadoop – Understanding inputs and outputs of MapReduce - Data Serialization.

UNIT:2 **(12 Hours)**

HADOOP ARCHITECTURE :Hadoop Architecture, Hadoop Storage: HDFS, Common Hadoop Shell commands , Anatomy of File Write and Read., NameNode, Secondary NameNode, and DataNode, Hadoop MapReduce paradigm, Map and Reduce tasks, Job, Task trackers - Cluster Setup – SSH & Hadoop Configuration – HDFS Administering –Monitoring & Maintenance.

UNIT:3 **(8 Hours)**

HADOOP ECOSYSTEM AND YARN: Hadoop ecosystem components - Schedulers - Fair and Capacity, Hadoop 2.0 New FeaturesNameNode High Availability, HDFS Federation, MRv2, YARN, Running MRv1 in YARN.

UNIT:4 **(10 Hours)**

HIVE AND HIVEQL, HBASE: Hive Architecture and Installation, Comparison with Traditional Database, HiveQL - Querying Data - Sorting And Aggregating, Map Reduce Scripts, Joins & Subqueries, HBase conceptsAdvanced Usage, Schema Design, Advance Indexing - PIG, Zookeeper - how it helps in monitoring a cluster, HBase uses Zookeeper and how to Build Applications with Zookeeper.

Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert/MOOCS

Text Books

1. Boris lublinsky, Kevin t. Smith, Alexey Yakubovich, “Professional Hadoop Solutions”, Wiley,ISBN: 9788126551071, 2015.
2. Chris Eaton, Dirk deroos et al. , “Understanding Big data ”, McGraw Hill, 2012.
3. Tom White, “HADOOP: The definitive Guide”, O Reilly 2012. 6 IT2015 SRM(E&T)
4. Vignesh Prajapati, “Big Data Analytics with R and Haoop”, Packet Publishing 2013.

Course Code	Course Title	L	T	P	C	QP
BITPE7042	**Data Storage Technology and Networking**	**3**	**0**	**0**	**3**	**A**

Pre -Requisite:

Course Educational Objective

CEO1:learning concepts virtualization technologies

CEO2:Storage area network (SAN) and network attached storage (NAS)

CEO3:How to provide storage security

CEO4: Storage infrastructure management processes

Course Outcome: At the end of the course, the student will be capable of

CO1	Implement virtualization technologies
CO2	Provide security to data storage
CO3	Understand the concept behind cloud computing

UNIT:1 **(12 Hours)**

Data Storage Fundamentals, Introduction to enterprise IT infrastructure components, server-storage connectivity, virtualization technologies, storage devices such as magnetic disk drive and solid state drive, and the factors to consider for storage investment

UNIT:2 **(10 Hours)**

Enterprise Storage Solutions Introduction to storage system architecture, RAID, types of storage systems, storage area network, and network attached storage.

UNIT:3 **(10 Hours)**

Business Continuity and Storage Security Introduction to business continuity, data replication, data backup architecture and methods, and an overview of storage infrastructure security.

UNIT:4 **(12 Hours)**

Storage Infrastructure Management, Cloud Computing, and Trends in the Storage Industry Introduction to storage infrastructure management processes, cloud computing and cloud storage, and an overview of the technology trends in the storage industry.

Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert/MOOCS

Text Books

1. Introduction to Data Storage and Management Technologies, Pramod Prasad
2. The Complete Guide to Data Storage Technologies for Network-centric Computing 1st Edition by Franklyn E. Dailey

Course Code	Course Title	L	T	P	C	QP
BITPE7043	**Wireless Sensor**	**3**	**0**	**0**	**3**	**A**

Pre -Requisite:

Course Educational Objective

CEO1: Develop an understanding of advanced topics in wireless networking technology, including fundamental network design concepts/algorithms and existing network protocols.

CEO2: Acquire competence to analyze the design principles and communication protocols in wireless ad hoc & sensor networks

CEO3: Examine current problems and proposed solutions in wireless ad hoc & sensor networks and design and optimize communication protocols and algorithms in sensor networks.

Course Outcome: At the end of the course, the student will be capable of

CO1	Identify the major issues associated with Ad-hoc/sensor networks.
CO2	Identify various protocols as applicable to applications.
CO3	Analyze the design issues in wireless sensor networks
CO4	Develop ideas for pursuing student projects in wireless sensor networking domain

UNIT: I **[10Hours]**

OVERVIEW OF WIRELESS SENSOR NETWORKS

Challenges for Wireless Sensor Networks, Enabling Technologies For Wireless Sensor Networks.

UNIT: II **[12 Hours]**

ARCHITECTURES

Single-Node Architecture - Hardware Components, Energy Consumption of Sensor Nodes, Operating Systems and Execution Environments, Network Architecture - Sensor Network Scenarios, Optimization Goals and Figures of Merit, Gateway Concepts.

UNIT: III **[14 Hours]**

Physical Layer and Transceiver Design Considerations, MAC Protocols for Wireless Sensor Networks, Low Duty Cycle Protocols And Wakeup Concepts - S-MAC , The Mediation Device Protocol, Wakeup Radio Concepts, Address and Name Management, Assignment of MAC Addresses, Routing Protocols- Energy-Efficient Routing,Geographic Routing.

UNIT : IV **[12 Hours]**

INFRASTRUCTURE ESTABLISHMENT

Topology Control , Clustering, Time Synchronization, Localization and Positioning, Sensor Tasking and Control.

SENSOR NETWORK PLATFORMS AND TOOLS

Sensor Node Hardware – Berkeley Motes, Programming Challenges, Node-level software platforms, Node-level Simulators, State-centric programming.

Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert/MOOCS

Text Books:

1. Holger Karl & Andreas Willig, " Protocols And Architectures for Wireless Sensor Networks" , John Wiley, 2005.
2. Feng Zhao & Leonidas J. Guibas, “Wireless Sensor Networks- An Information Processing Approach", Elsevier, 2007.

Ref. Books :

1. Kazem Sohraby, Daniel Minoli, & Taieb Znati, “Wireless Sensor Networks Technology, Protocols, And Applications”, John Wiley, 2007.
2. Anna Hac, “Wireless Sensor Network Designs”, John Wiley, 2003.

Course Code	Course Title	L	T	P	C	QP
BITPE7044	**Satellite Communication**	**3**	**0**	**0**	**3**	**A**

Pre -Requisite:

Course Educational Objective

CEO1: To calculate the received carrier power at the input of earth station receiver or satellite transponder.

CEO2: To design domestic satellite system using small earth station.

Course Outcome: At the end of the course, the student will be capable of

CO1	Define And Describe the dynamics of the satellite.
CO2	Calculate orbital parameters, look angles and learn the operation of launching method.
CO3	Analyze the commands monitoring power systems and developments of antennas.
	Classify different multiple access techniques like TDMA, CDMA, FDMA, DAMA.
CO4	Design antennas of Uplink and down link Frequency of Satellite real time applications
	Judge the impacts of GPS, Navigation, and NGSO constellation design for tracking.

UNIT:1 **(10 Hours)**

Introduction: (i)A brief History of Satellite Communications, the Role and Application of Satellite Communication, Frequency allocations for Satellite Services, Indian satellite scenario and applications; (ii) Orbital mechanics: Kepler's laws, Orbital Mechanics, Satellite Look Angles determination, Slant range determination, Basics of eclipse and Doppler frequency,, Orbital perturbations, Orbital effects in communication systems performance, Radiation and van Allen belts, Launching and positioning, satellite drift and station keeping.

UNIT:2 **(12 Hours)**

Satellite link design: (i) Basic transmission theory, Noise figure, Sky and system noise temperatures, Design of up and down satellite links, EIRP, G/T, over all C/N, Threshold and Dynamic range, Design examples; (ii) Satellite subsystems: Attitude and orbit control, Telemetry, tracking, and command (TT&C), Power generation, storing and distribution, Communication payloads, Bent pipe and regenerative transponders, Satellite antennas and coverage contours, Reliability and space qualification; (iii) Earth station: Introduction, earth station subsystems. Different types of earth stations; (iv) Error Control for Digital Satellite Links: Channel capacity and error detection and correction coding techniques, Linear block codes, Convolution codes, Concepts of Viterbi decoding, Concepts of Turbo & LDPC coding, Implementation of error detection on satellite links;

UNIT:3 **(10 Hours)**

Multiple access: Space segment access methods, FDMA, TDMA, CDMA, SDMA, Estimation of number of users, Applications; Direct broadcast TV & Radio: Concepts of DTH/ DBS TV, System Design, Link analysis, Master Control Station and Uplink, Installation of DBS TV Antennas

UNIT:4 **(14 Hours)**

Satellite Navigation & Global Navigation Satellite System (GNSS): (i) History of Navigation, Radio and Satellite Navigation, Position Location Principles, Introduction to GPS, GALILEO and GLONOSS, GPS Receivers and Codes, GPS Navigation Message, Signal levels, Timing Accuracy, Receiver Operation, GPS C/A Code Accuracy, Differential GPS, overview of GAGAN, over view of GNSS - Regional Navigation Systems, Indian Regional Navigation system; (ii) VSAT Systems: Introduction, Network Architectures, Star and Mesh networks, Access Control Protocols, VSAT Earth Station configuration, Link analysis for a VSAT Star and Mesh Networks, Concepts of system design, Up link power control;

Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert/MOOCS

Ref. Books

1. Digital Communication with Satellite and Fiber Optic Application, HarlodKolimbins, PHI
2. Satellite Communication, Robert M. Gagliardi, CBS Publishers
3. Satellitte Communication Systems, Richharia. BSP BOOKS PVT LTD.
4. Satellitte Communication Engg., MichealKolawole, BSP BOOKS PVT LTD

Course Code	Course Title	L	T	P	C	QP
BITPE7045	**Object Oriented Analysis and Design**	**3**	**0**	**0**	**3**	**A**

Pre -Requisite:

Course Educational Objective

CEO1: Introduce the students to Object Oriented Analysis and Modeling using the Unified Modeling Language (UML)

CEO2: Familiarize them with the models used in UML, including static as well as dynamic \ (behavioural) models

CEO3: Make the students appreciate the importance of system architecture and system design in product development

Course Outcome: At the end of the course, the student will be capable of

CO1	Use UML to model a complex system by defining actors and use cases and constructing class models
CO2	Analyze the dynamics of a system using Activity, Sequence, State, and Process models
CO3	Depict the architecture of a software system by using component and deployment models, and design a database based on a class model
CO4	Use GRASP and SOLID principles in the design of software

UNIT:1 **(10 Hours)**

INTRODUCTION: Complexity- Structure of complex of systems, Inherent complexity of software, attributes of a complex system, Evolution of object models – Foundations of Object model, Elements of Object model – Major elements: Abstraction, Encapsulation, Modularity and Hierarchy- Minor elements Typing, Concurrency, Persistence (5+2)

UNIT:2 **(14 Hours)**

CLASSES AND OBJECTS – Nature of an object- Relationships among objects – Nature of class – Relationship among classes – Interplay of Classes and objects- on building quality classes and objects Classification: Importance of Proper Classification- Identifying classes and objects –Key Abstractions and Mechanisms

METHODOLOGY AND MODELING: Object Oriented methodologies - Introduction, Survey of some Object oriented methodologies – Rumbaugh, Booch, Jacobson ,Patterns, Frameworks, Unified approach

UNIT:3 **(12 Hours)**

UNIFIED MODELING LANGUAGE: Introduction – Diagram Taxonomy, static and dynamic models

CLASS DIAGRAM: Notation- Object diagram, Class interface notation, Binary Association notation, Association Rule, Qualifier, Multiplicity, OR Association, Association Class, N-ary association, Aggregation and Composition, Generalization

USE CASE MODELING: Components of a use case diagram- Use case identification and description-construction

UNIT:4 **(10 Hours)**

UML DYNAMIC MODELING: UML Interaction DIAGRAMS: Sequence Diagrams, Collaboration Diagrams- UML State chart diagram, UML Activity diagram, Implementation diagrams: Component diagram, Deployment diagram

MODEL MANAGEMENT: Packages and Model Organization, UML Extensibility: Model constraints and comments, note, stereotype – UML metamodel CASE STUDIES: Object Oriented Analysis process, Object oriented Design process - Automatic Teller Machine

Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert/MOOCS

Text Books

1. Grady Booch, Robert A.Maksimchuk, Michael. W. Engle, Bobbi J. Young, JIM Conallen, Kelli A. Houston “Object Oriented Analysis and Design with Applications”, Pearson Education Inc., USA, 2010

2. Ali Bahrami, “Object Oriented System Development”, McGraw Hill International Edition, Singapore, 2008.

Ref. Books

1. Rumbaugh J, Blaha M, Premerlani W, Eddy F and Lorensen W, “Object Oriented Modeling and Design”, Prentice Hall of India/ Pearson Education, New Delhi, 2004.
2. Kendall Scott, martin Fowler, “UML Distiled : A brief guide to the standard Object modeling Language “, Addison Wesley, USA, 2009
3. Atul Kahate, “ Objetct Oriented Analysis and Design “, Tata McGraw-Hill , New Delhi 2007. 4. Sudha Sadasivam G., “ Object-Oriented Analysis and Design”, Macmillian India, New Delhi, 2009.

Course Code	Course Title	L	T	P	C	QP
BITPE7046	**SECURE SOFTWARE ENGINEERING**	**3**	**0**	**0**	**3**	**A**

Pre -Requisite:

Course Educational Objective

CEO1: Understand the phases in a software project.

CEO2: Understand fundamental concepts of requirements engineering and analysis modeling.

CEO3: Understand the major considerations for enterprise integration and deployment.

CEO4: Learn various testing and maintenance measures.

Course Outcome: At the end of the course, the student will be capable of

CO1	Interpreting the key activities for managing a software project and Compare different process models.
CO2	Analyze different types of software requirements and identify the suitable model for the new system.
CO3	Apply systematic procedure for software design.
CO4	Implement and test the software which will meet the software requirement specifications.

UNIT:1 **(10 Hours)**

Why Is Security a Software Issue? Introduction, The problem, Software assurance and software security, Threats to software security, Sources of software insecurity, The benefits of detecting software security defects early, Managing secure software development.

What Makes Software Secure? Defining properties of secure software, How to influence the security properties of software, How to assert and specify desired security properties.

UNIT:2 **(12 Hours)**

Requirements Engineering for Secure Software Introduction, Misuse and Abuse Cases, The SQUARE process model: SQUARE sample outputs, Requirements elicitation, Requirements Prioritization. Secure Software Architecture and Design Introduction, Software security practices for architecture and design: Architectural risk analysis.

Software security knowledge for architecture and design: Security principles, Security guidelines, and Attack patterns.

UNIT:3 **(12 Hours)**

Considerations for Secure Coding and Testing Introduction, Code analysis, Coding practices, Software security testing, Security testing considerations throughout the SDLC. Security and Complexity: System Assembly Challenges Introduction, Security failures, Functional and attacker perspectives for security analysis, System complexity drivers and security, Deep technical problem complexity.

UNIT:4 **(12 Hours)**

Governance, and Managing for More Secure Software Introduction, Governance and security, Adopting an enterprise software security framework, How much security is enough?, Security and project management, maturity of practice.

Security Metrics: Defining security metrics, Diagnosing problems and measuring technical security, Analysis techniques, Organize, aggregate, and analyze data to bring out key insights.

Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert/MOOCS

Text Books: 1. Software Security Engineering: A Guide for Project Managers, by Julia H. Allen, Sean Barnum, Robert J. Ellison, Gary McGraw, Nancy R. Mead, Addison-Wesley , 1st edition, 2008.

2. Security Metrics: Replacing Fear, Uncertainty, and Doubt , by Andrew Jaquith, AddisonWesley , 1st edition , 2007.

Ref. Books:

1. Integrating Security and Software Engineering: Advances and Future Vision, by Haralambos Mouratidis, Paolo Giorgini, IGI Global, 2006.

2. Software Security: Building Security In , by Gary McGraw , Addison-Wesley, 2006
3. The Art of Software Security Assessment: Identifying and Preventing Software Vulnerabilities, by Mark Dowd, John McDonald, Justin Schuh, Addison-Wesley, 1st edition, 2006
4. Building Secure Software: How to Avoid Security Problems the Right Way by John Viega,Gary McGraw, Addison-Wesley, 2001
5. Writing Secure Code, by M. Howard, D. LeBlanc, Microsoft Press, 2nd Edition, 2003.
6. Exploiting Software: How to break code, by G. Hoglund, G. McGraw, Addison Wesley, 2004.

Course Code	Course Title	L	T	P	C	QP
BAEOE7051	**Sensor Technology**	**3**	**0**	**0**	**3**	**A**

Pre -Requisite:

Course Educational Objective

CEO1:

Course Outcome: At the end of the course, the student will be capable of

CO1	Understanding Sensors and there interaction with environment.
CO2	Clear Idea of Physical Principles of Sensing
CO3	Practical implementation of interfacing sensors with micro-controllers
CO4	Analyze and understand various applications of sensors

UNIT:1 **(08 Hours)**

Sensors Fundamentals and Characteristics Sensors, Signals and Systems; Sensor Classification; Units of Measurements; Sensor Characteristics

UNIT:2 **(14 Hours)**

Physical Principles of Sensing Electric Charges, Fields, and Potentials; Capacitance; Magnetism; Induction; Resistance; Piezoelectric Effect; Hall Effect; Temperature and Thermal Properties of Material; Heat Transfer; Light; Dynamic Models of Sensor Elements Interface Electronic Circuits Input Characteristics of Interface Circuits, Amplifiers, Excitation Circuits, Analog to Digital Converters, Direct Digitization and Processing, Bridge Circuits, Data Transmission, Batteries for Low Power Sensors

UNIT:3 **(10 Hours)**

Sensors in Different Application Area Occupancy and Motion Detectors; Position, Displacement, and Level; Velocity and Acceleration; Force, Strain, and Tactile Sensors; Pressure Sensors, Temperature Sensors Sensor Materials and Technologies :Materials, Surface Processing, Nano-Technology.

UNIT:4 **(12 Hours)**

Applications of different sensors.

Chemical Sensors: Blood –Gas and Acid –base physiology Electrochemical sensors, Chemical Fibro sensors, Iron-Selective Field-Effect Transistor (ISFET), Immunologically Sensitive Field Effect Transistor (IMFET) , Integrated flow sensor and Blood Glucose sensors.

Optical Sensors: Fiber optic light propagation, Graded index fibers, Fiber optic communication driver circuits, Laser classifications, Driver circuits for solid –state laser diodes, Radiation sensors and Optical combinations

Biomedical Sensors: Sensors Terminology in human body, Introduction, Cell, Body Fluids

Musculoskeletal system, Bioelectric Amplifiers, Bioelectric Amplifiers for Multiple input Circuits, Differential Amplifiers, Physiological Pressure and other cardiovascular measurements and devices.

Aerospace Sensor: Laser Gyroscope and accelerometers. Sensors used in space and environmental applications.

Electrodes: –Electrodes for Biophysical sensing, Electrode model circuits, Microelectrodes,

ECG, EEG, electrodes ECG signals, waveforms, Standard lead system, Polarization Polarizable, Non polarizable electrodes and body surface recording electrodes. Ultrasonic Transducers for Measurement and therapy – radiation detectors – NIR spectroscopy .

Teaching Method(s): Chalk & Board/ PPT/ Internship/Industry Guest Lecture/ Demonstration.

Text Books :

1. Sensors Hand Book Sabaree Soloman - Sensors Hand Book, McGraw Hill,1998
2. Smith H.M. - Principles of Holography, John Wiley & Sons, New York, 1975
3. J.G. Webster Medical instrumentation Application and Design, Houghton Mifilin Co. 2004

Reference Book:

1. Carr and Brown - Introduction to Medical Equipment Technology, Addison Wesley. 1999
2. Culshaw B and Dakin J (Eds) Optical Fibre Sensors, Vol. 1 & 2 Artech House, Norwood. (1989)-
3. P. Garnell– Guided Weapon Control Systems – Pergamon Press. 1980
4. J. Fraden, Handbook of Modern Sensors:Physical, Designs, and Applications, AIP Press, Springer

5. D. Patranabis, Sensors and Transducers, PHI Publication, New Delhi
6. Mechatronics- Ganesh S. Hegde, Published by University Science Press (An imprint of Laxmi Publication Private Limited).

Course Code	Course Title	L	T	P	C	QP
BAEOE7053	**ADVANCE AUTOMATION**	**3**	**0**	**0**	**3**	

Pre -Requisite:

Course Educational Objective

CEO1:

Course Outcome: At the end of the course, the student will be capable of

CO1	Understand the current voltage characteristics of semiconductor devices
CO2	Analyze dc circuits and relate ac models of semiconductor devices with their physical Operation,
CO3	Design and analyze of electronic circuits,
CO4	Evaluate frequency response

UNIT:1 **(09 Hours)**

Process Control: Introduction: Process Definition, Feedback Control, PID Control, Multivariable Control. (Chapter 1 of Text Book 1)

PID Controller Tuning: Introduction, Zeigler-Nichols Tuning Method (Based on Ultimate Gain and Period, and Process Reaction Curve), Digital PID Controllers. (Chapter 13 of Text Book 2)

UNIT:2 **(10 Hours)**

Special Control Structures: Cascade Control, Feedfroward Control, Feedfroward-Feedback Control Configuration, Ratio Control, Selective Control, Adaptive Control, Adaptive Control Configuration. (Chapter 10 and 11 of Text book 3)

Actuators: Introduction, Pneumatic Actuation, Hydraulic Actuation, Electric Actuation, Motor Actuators and Control Valves. (Chapter 8 of Text Book 1)

UNIT:3 **(09 Hours)**

Industrial Automation: Programmable Logic Controllers: Introduction, Principles of operation, Architecture, Programming (Programming Languages, Ladder Diagram, Boolean Mnemonics) (Chapter 5 of Text Book 1)

UNIT:4 **(10 Hours)**

Distributed Control: Distributed vs. Centralized, Advantages, Functional Requirements, System Architecture, Distributed Control Systems (DCS), Communication options in DCS.

Real-time Programming: Multi-tasking, Task Management, Inter-task Communication, Real-time Operating System. (Chapter 9 of Text Book 1)

Teaching Methods: Chalk& Board/ PPT/Video Lectures

Text Books:

1. Krishna Kant, “Computer-Based Industrial Control”, PHI, 2009.
2. M. Gopal, “Digital Control and State Variable Methods” Tata McGraw Hill, 2003.
3. Surekha Bhanot, Process Control: Principles and Applications, Oxford university Press, 2010

Ref. Books:

1.Smith Carlos and Corripio, “Principles and Practice of Automatic Process Control”, John Wiley & Sons, 2006.
2. Jon Stenerson, “Industrial Automation and Process Control”, Prentice Hall, 2003.
3. C. Johnson, “Process Control Instrumentation Technology”, PHI, New Delhi
4. D.R. Coughnowr, “Process System analysis and Control”, McGraw Hill.

SEMESTER - VIII

Sl.	Course Category	Course Code	Course Title	L	T	P	C	QP
THEORY								
1	PE	BCSPE8011	Information retrieval	3	-	-	3	
		BCSPE8012	Bioinformatics					
		BCSPE8013	Client server computing					
		BCSPE8014	Parallel computing					
		BCSPE8015	Software for embedded systems					
		BCSPE8016	Software maintenance management					
2	PE	BCSPE8021	Pattern Recognition	3	-	-	3	
		BCSPE8022	Human Computer Interface					
		BCSPE8023	Social networking					
		BCSPE8024	Cyber security					
		BCSPE8025	Software project management					
		BCSPE8026	Software usability Engineering					
3	OE	B**OE803*	Open Elective - 4	3	-	-	3	
PRACTICAL								
4	PC	BCSPC8110	Comprehensive VIVA	-	-	4	2	
5	PC	BCSPC8120	Seminar	-	-	4	2	
6	PC	BCSPC8130	Major project/ Industrial project /Startup training cum project	-	-	12	6	
Total				**9**	**0**	**20**	**19**	

Course Code	Course Title	L	T	P	C	QP
BITPE8011	**Information Retrieval**	**3**	**0**	**0**	**3**	**A**

Pre -Requisite:

Course Educational Objective

CEO1: To understand information retrieval process.

CEO2: To understand concepts of clustering and how it is related to Information retrieval.

CEO3: To deal Storage, Organization & Access to Information Items.

CEO4: To evaluate the performance of IR system.

Course Outcome: At the end of the course, the student will be capable of

CO1	Student should be able to understand the concept of Information retrieval.
CO2	Student should be able to deal with storage and retrieval process of text and multimedia data.
CO3	Student should be able to evaluate performance of any information retrieval system.
CO4	Student should be able to understand importance of recommender system.

UNIT:1 **(12 Hours)**

Introduction to information retrieval: Boolean retrieval, term vocabulary and postings list, index construction and optimization, vector-space model, computing scores, fuzzy string matching, content extraction, introduction to Apache Lucene

UNIT:2 **(10 Hours)**

Web search: Web search basics, economic model of web search, search user experience, web crawling and indices, link analysis, the PageRank algorithm, building a complete search system using Apache (Nutch, Solr, Lucene)

UNIT:3 **(10 Hours)**

Recommender systems: Introduction and taxonomy of recommender systems, collaborative filtering (user-user, item-item), and content based recommenders, evaluation of recommender systems, applications using Apache Mahout.

UNIT:4 **(14 Hours)**

Text Classification and Clustering: Naïve Bayes, Multinomial and Bernoulli models, feature selection, evaluation of classification models, Vector space classification – Rocchio, kNN, SVM classifiers, use of NLP, applications using Apache Mahout , Clustering in information retrieval, clustering algorithms (flat, probabilistic, hierarchical), applications using Apache Mahout

Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert/MOOCS

Text Books

1**. Text Classification and Clustering:** Naïve Bayes, Multinomial and Bernoulli models, feature selection, evaluation of classification models, Vector space classification – Rocchio, kNN, SVM classifiers, use of NLP, applications using Apache Mahout , Clustering in information retrieval, clustering algorithms (flat, probabilistic, hierarchical), applications using Apache Mahout

Course Code	Course Title	L	T	P	C	QP
BITPE8012	**Bioinformatics**	**3**	**0**	**0**	**3**	**A**

Pre -Requisite:

Course Educational Objective

CEO1: To introduce students with Synthesis of DNA and RNA, major databases and applications in Bioinformatics along with classification schema.

CEO2: Study of various data visualization and statistical techniques to discover new patterns in protein structure, through Clustering and Classification

CEO3: Study of various Data Mining and Pattern Matching techniques for knowledge discovery in Bioinformatics Databases through sequence alignment algorithms.

CEO4: Analysis of various simulation tools in Bioinformatics for similarity search and study of prediction algorithms.

Course Outcome: At the end of the course, the student will be capable of

CO1	Understand basic DNA and RNA structure, features and classification schema for databases, applications in Bioinformatics.
CO2	Use various statistical concepts and visualization tools to discover new patterns in Protein Structures and analyze randomness in data.
CO3	Explore the various Bioinformatics Databases for knowledge discovery given by Data Mining and Pattern Matching techniques through study of various sequence alignment algorithms.
CO4	Offer appropriate solutions for similarity search through similarity search and prediction algorithms. 5. Understand modeling and simulation in bioinformatics with the help of simulation and statistical protocols, basic drug discovery process.

UNIT:1 **(14 Hours)**

The Central Dogma ,The Killer Application, Parallel Universes, Watson's Definitio, Top Down Versus Bottom up, Information Flow, Convergence, Databases, Data Management, Data Life Cycle, Database Technology, Interfaces ,Implementation ,Networks , Geographical Scop, Communication Models ,Transmissions Technology,Protocols, Bandwidth ,Topology ,Hardware, Contents ,Security,Ownership,Implementation, Management

UNIT:2 **(10 Hours)**

The search process, Search Engine Technology, Searching and Information Theory ,Computational methods, Search Engines and Knowledge Management, Data Visualization ,sequence visualization, structure visualization, user Interface,Animation Versus simulation ,General Purpose Technologies.

UNIT:3 **(12 Hours)**

Statistical concepts , Microarrays ,Imperfect Data, Randomness, Variability,Approximation ,Interface Noise, Assumptions ,Sampling and Distributions,Hypothesis Testing, Quantifying Randomness ,Data Analysis ,Tool selection statistics of Alignment,Clustering and Classification ,Data Mining, Methods ,Selection and Sampling ,Preprocessing and Cleaning , Transformation and Reduction ,Data Mining Methods, Evaluation ,Visualization, Designing new queries, Pattern Recognition and Discovery ,Machine Learning ,Text Mining, Tools.

UNIT:4 **(12 Hours)**

Pair wise sequence alignment, Local versus global alignment,Multiple sequence alignment, Computational methods, Dot Matrix analysis ,Substitution matrices,Dynamic Programming ,Word methods, Bayesian methods, Multiple sequence alignment, Dynamic Programming ,Progressive strategies, Iterative strategies, Tools, Nucleotide Pattern Matching, Polypeptide pattern matching, Utilities ,Sequence Databases. Drug Discovery ,components, process, Perspectives ,Numeric considerations, Algorithms ,Hardware, Issues, Protein structure, Ab Initio Method, Heuristic methods, Systems Biolo, Tools, Collaboration and Communications, standards, Issues ,Security, Intellectual property.

Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert/MOOCS

Text Books:

1. Bryan Bergeron, "Bio Informatics Computing", Second Edition, Pearson Education,2003.

2. D.E. Krane and M. L. Raymer, Fundamental Concepts of Bioinformatics, Pearson

Education, 2003.
3. T. K. Attwood and D. J. Parry-Smith, Introduction to Bioinformatics, Pearson Education, 2003. 4. J. H. Zar, Biostatistical Analysis, 4/e, Pearson Education, 1999.

Course Code	Course Title	L	T	P	C	QP
BITPE8013	**Client Server Computing**	**3**	**0**	**0**	**3**	**A**

Pre -Requisite:

Course Educational Objective

CEO1: Gain Exposure on most common used servers.

CEO2: Understand the concept of client-server development and learn problem solving skills through design scenarios for network environment

CEO2: Develop a client –server based application.

Course Outcome: At the end of the course, the student will be capable of

CO1	Define the underlying concepts in client server development using common access databases
CO2	Devise popular servers with two tier scenarios
CO3	Design and Set up a client /server environment using LAN and WAN Scenarios.
CO4	Describe the concept of middleware, and communication protocols

UNIT:1 **(10 Hours)**

INTRODUCTION : Client Server Computing, Benefits, Evolution of client server computing, Client Server Applications, Components, Classes of Client Server Computing – Categories of Client Server Computing

UNIT:2 **(10 Hours)**

CLIENT/SERVER OPERATING SYSTEMS : Dispelling the myths, Obstacles upfront and hidden, open systems and standards, factors needed for success. Standards setting organizations

UNIT:3 **(14 Hours)**

THE CLIENT AND THE SERVER : Client Hardware and software, Client components, Client Operating Systems, GUI, X windows and Windowing, Database Access Application Logic, Client Software Products, Client Requirements,Server Hardware, Categories, Features classes of Server Machines, Server Environment, Network management environment, network Computing Environment, Network Operating Systems, Server requirements, Platform Independence, Transaction Processing, Connectivity. Server Data Management and Access Tools

UNIT:4 **(12 Hours)**

LIENT SERVER AND INTERNET: Client server and internet, Web client server, 3 tier client server web style, CGI , the server side of web, CGI and State, SQL database servers, Middleware and federated databases, data warehouses, EIS/DSS to data mining, GroupWare Server , what is GroupWare, components of GroupWare.

Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert/MOOCS

Text Books:

1. Dawana Travis Dewire, “Client Server Computing”, Tata Mc-Graw Hill Education Pvt. Ltd.,New Delhi, 2003
2. Robert Orfali, Dan Harkey & Jeri Edwards, “Essential Client/Server Survival Guide”,second edition, John Wiley & Sons, Singapore, 2003.

Ref. Books:

1. Eric J Johnson, “A complete guide to Client / Server Computing”, first edition, Prentice Hall,New Delhi, 2001.
2. Smith & Guengerich, “Client /Server Computing”, Prentice Hall, New Delhi, 2002
3. James E.Goldman, Phillip T.Rawles, Julie R.Mariga,“Client/Server Information Systems, A Business Oriented Approach”, John Wiley & Sons, Singapore, 2000.

Course Code	Course Title	L	T	P	C	QP
BITPE8014	**Parallel Computing**	**3**	**0**	**0**	**3**	**A**

Pre -Requisite:

Course Educational Objective

CEO1: Understand various models of parallel computations such as threads, OpenMP, MPI, clusters.

CEO2: Develop programs using parallel languages and appreciate parallel compilers using parallel architectures.

Course Outcome: At the end of the course, the student will be capable of

CO1	Design efficient parallel algorithms and applications.
CO2	Analyse the effectiveness of any parallel program.

UNIT:1 **(14 Hours)**

Computer Architecture and Systems: Memory Subsystem & Cache , Shared Memory Systems :Memory Consistency Models , Cache Coherence AND Distributed Memory Systems : Message Passing, Network Topologies , Synchronization , Primitives and Implementation: Locking, Barrier, Semaphore , Probs: Deadlock, Livelock, Starvation, Priority Inv., Race Cond,Architecture : Multicore , Manycore , GPU , Vector Machines , Multithreading.

UNIT:2 **(12 Hours)**

Data/Task Distribution: Load Balancing: Static and Dynamic Graph Partitioning: Algorithms ,Locality in Simulation : cyclic, blocked, block-cyclic data distribution,surface to volume minimization , Exascale challenges : Fault tolerance , Communication (memory hierarchy) , Power management

UNIT:3 **(12 Hours)**

Languages/Libraries : Data Parallel Languages: CUDA , Global Address Space Languages: UPC, Compiler-aided Parallelization: OpenMP , Message-Passing Library: MPI , Performance modeling of Networks: PRAM, Alpha/Beta Model , LogP/LogGP , Roofline Model

UNIT:4 **(10 Hours)**

Applications/Algorithms : Dense/Sparse Linear Algebra : Matrix Multiplication (Canon's algorithm, SUMMA, Vasily's study, Gaussian Elimination, LU , Sparse GE/LU, sparse matrix storage ,Autotuning , N-Body/Particle Simulations , Barnes Hut , FMM , Finite Difference Approximations to PDEs , Jacobi, SOR, conjugate gradients, Multigrid , FFT , Structured and Unstructured Grids , AMR , Graph Algorithms ,scans on GPU , pointer-jumping , list ranking , parallel prefix

Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert/MOOCS

Text Books

1. James Demmel, CS267 Applications of Parallel Computers Lectures, 2010,
2. John L. Hennessy and David A. Patterson, Computer Architecture~ A quantitative Approach (Fourth Edition), Morgan Kaufman Publishers, San Francisco, CA, 2007
3. David E. Culler, Jaswinder Pal Singh and Anoop Gupta, Parallel Computer Architecture - A Hardware/Software Approach, Morgan Kaufman Publishers, San Francisco, CA, 1999
4. Jack Dongarra et al., Sourcebook of Parallel Computing, Morgan Kaufman Publishers, San Francisco, CA, 2003

Course Code	Course Title	L	T	P	C	QP
BITPE8015	**Software for Embedded System**	**3**	**0**	**0**	**3**	**A**

Pre -Requisite:

Course Educational Objective

CEO1: To discuss about real-time and quality of service system principles.

CEO2: Develop knowledge and understanding of fundamental embedded systems design paradigms, architectures, possibilities and challenges, both with respect to software and hardware and wide competence from different areas of technology.

CEO3: To educate students to meet current and future industrial challenges and emerging embedded systems engineering trends.

Course Outcome: At the end of the course, the student will be capable of

CO1	Gain knowledge of architectural aspects, interfacing and programming details for microcontroller
CO2	Familiar with embedded system's hardware components and software tool chain.
CO3	Develop systems with RTOS features like inter process communication, process synchronization techniques, and process scheduling algorithms.
CO4	Design an embedded system, Debug and test it

UNIT:1 **(10 Hours)**

POGRAMMING EMBEDDED SYSTEMS: Embedded Progra, Role of Infinite loo, Compiling, Linking and locating ,downloading and debugging, Emulators and simulators processor ,External peripherals, Memory testing ,Flash Memory.

UNIT:2 **(14 Hours)**

OPERATING SYSTEM: Embedded operating system,Real time characteristics ,Selection process, Flashing the LED,serial ports, Zilog 85230 serial controlled code efficiency, Code size ,Reducing memory usage ,Impact of C++.

HARDWARE FUNDAMENTALS: Buses, DMA ,interrupts, Built-ins on the microprocessor, Conventions used on schematics, Microprocessor Architectures, Software Architectures, RTOS Architectures ,Selecting and Architecture.

UNIT:3 **(10 Hours)**

RTOS : Tasks and Task states, Semaphores, Shared data, Message queues, Mail boxes and pipes, Memory management ,Interrupt routines, Encapsulating semaphore and queues, Hard Real-time scheduling, Power saving.

UNIT:4 **(10 Hours)**

EMBEDDED SOFTWARE DEVELOPMENT TOOLS: Host and target machines, Linkers Locators for Embedded Softwar, Debugging techniques, Instruction set simulators Laboratory tools, Practical example ,Source code.

Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert/MOOCS

Text Books:

1. David E.Simon, "An Embedded Software Primer", Perason Education, 2003.
2. Michael Bass, "Programming Embedded Systems in C and C++", Oreilly, 2003.

Course Code	Course Title	L	T	P	C	QP
BITPE8021	**Pattern Recognition**	**3**	**0**	**0**	**3**	**A**

Pre -Requisite:

Course Educational Objective

CEO1: To study the Pattern Recognition techniques and its applications

CEO2: To learn the fundamentals of Pattern Recognition techniques

CEO3: To learn the various Statistical Pattern recognition techniques

CEO4: To learn the various Syntactical Pattern recognition techniques

Course Outcome: At the end of the course, the student will be capable of

CO1	Understand the major concepts and techniques in pattern recognition.
CO2	Identify classes of images.
CO3	Analyze classifying features in images or patterns
CO4	Design various classification algorithm & pattern recognition systems

UNIT:1 **(10 Hours)**

PATTERN RECOGNITION OVERVIEW: Pattern recognition, Classification and Description Patterns and feature Extraction with Examples—Training and Learning in PR systems Pattern recognition Approaches

UNIT:2 **(14 Hours)**

STATISTICAL PATTERN RECOGNITION: Introduction to statistical Pattern Recognition supervised Learning using Parametric and Non Parametric Approaches.

LINEAR DISCRIMINANT FUNCTIONS AND UNSUPERVISED LEARNING AND CLUSTERING: Introduction—Discrete and binary Classification problems—Techniques to directly Obtain linear Classifiers -- Formulation of Unsupervised Learning Problems—Clustering for unsupervised learning and classification.

UNIT:3 **(10 Hours)**

SYNTACTIC PATTERN RECOGNITION: Overview of Syntactic Pattern Recognition—Syntactic recognition via parsing and other grammars–Graphical Approaches to syntactic pattern recognition—Learning via grammatical inference.

UNIT:4 **(10 Hours)**

NEURAL PATTERN RECOGNITION: Introduction to Neural networks—Feed forward Networks and training by Back Propagation—Content Addressable Memory Approaches and Unsupervised Learning in Neural PR.

Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert/MOOCS

Text Books

1. Robert Schalkoff, “Pattern Recognition: Statistical Structural and Neural Approaches”, John wiley & sons , Inc,1992.
2. Earl Gose, Richard johnsonbaugh, Steve Jost, “Pattern Recognition and Image Analysis”, Prentice Hall of India,.Pvt Ltd, New Delhi, 1996.
3. Duda R.O., P.E.Hart & D.G Stork, “ Pattern Classification”, 2nd Edition, J.Wiley Inc2001
4. Duda R.O.& Hart P.E., “Pattern Classification and Scene Analysis”, J.wiley Inc, 1973.
5. Bishop C.M., “Neural Networks for Pattern Recognition”, Oxford University Press, 1995.

Course Code	Course Title	L	T	P	C	QP
BITPE8022	**Human Computer Interface**	**3**	**0**	**0**	**3**	**A**

Pre -Requisite:

Course Educational Objective

CEO1: To stress the importance of a good interface design.

CEO2: To understand the importance of human psychology in designing good interfaces

CEO3: To motivate students to apply HMI in their day – to – day activities.

CEO4: To bring out the creativity in each student – build innovative applications that are user friendly.

CEO5: To encourage students to indulge into research in Machine Interface Design.

Course Outcome: At the end of the course, the student will be capable of

CO1	Learner will be able to…
CO2	To design user centric interfaces.
CO3	To design innovative and user friendly interfaces.
CO4	To apply HMI in their day-to-day activities.

UNIT:1 **(10 Hours)**

Introduction: Introduction to Human Machine Interface, Hardware, software and operating environment to use HMI in various fields. The psychopathology of everyday things – complexity of modern devices; human-centered design; fundamental principles of interaction; Psychology of everyday actions- how people do things; the seven stages of action and three levels of processing; human error.

UNIT:2 **(14 Hours)**

Goal directed design; Implementation models and mental models; Beginners, experts and intermediates – designing for different experience levels; Understanding users; Modeling users – personas and goals. **GUI** : benefits of a good UI; popularity of graphics; concept of direct manipulation; advantages and disadvantages; characteristics of GUI; characteristics of Web UI; General design principles.

UNIT:3 **(12 Hours)**

perception, Gesalt principles, visual structure, reading is unnatural, color, vision, memory, six behavioral patterns, recognition and recall, learning, factors affecting learning, time**. Interaction styles** menus; windows; device based controls, screen based controls;

UNIT:4 **(10 Hours)**

Communication: text messages; feedback and guidance; graphics, icons and images; colours

Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert/MOOCS

Text Books:

1. Alan Dix, J. E. Finlay, G. D. Abowd, R. Beale “Human Computer Interaction”, Prentice Hall.
2. Wilbert O. Galitz, “The Essential Guide to User Interface Design”, Wiley publication.
3. Alan Cooper, Robert Reimann, David Cronin, “About Face3: Essentials of Interaction design”, Wiley publication.
4. Jeff Johnson, “Designing with the mind in mind”, Morgan Kaufmann Publication.
5. Donald A. Normann, “Design of everyday things”, Basic Books; Reprint edition 2002.

Ref. Books

1. Donald A. Norman, “The design of everyday things”, Basic books.
2. Rogers Sharp Preece, “Interaction Design:Beyond Human Computer Interaction”, Wiley.
3. Guy A. Boy “The Handbook of Human Machine Interaction”, Ashgate publishing Ltd.

Course Code	Course Title	L	T	P	C	QP
BITPE8023	**Social Networking**	**3**	**0**	**0**	**3**	**A**

Pre -Requisite:

Course Educational Objective

CEO1: Provide students background on concept of various types and kinds of Social Networks, their structural properties and related measures

CEO2: Train students to observe and measure unique aspects of network formation and growth of social networks

CEO3: Enable students to understand social phenomena such as diffusion and cascades.

CEO4: Expose students to Strategic Networks, the incentive model for connection formation

CEO5: Expose students to Game theory and Games on Networks , concepts related to strategies and optimality

Course Outcome: At the end of the course, the student will be capable of

CO1	Model a given scenario/problem as a network, evaluate the type and kind of such a network and measure structural properties of that network.
CO2	Apply algorithms to detect communities and decipher phenomena peculiar to social networks such as small worlds and power laws
CO3	Model a social process such as spread of information and diseases using diffusion model.
CO4	Model and analyze strategic networks and measure networkproperties.

UNIT:1 **(10 Hours)**

Background and Fundamentals of network analysis: Introduction to Networks and Examples, Ego-centric Networks, Exchange Networks, Graph-Theory, Directions and Weights, Adjacency Matrices, homophily, Tie-strengths and structural holes**.** Representing and Measuring Networks: Degree distribution, diameters, path-lengths, centrality, closures, clustering

UNIT:2 **(10 Hours)**

Models of Network formation: Random Networks, Small World,Growing Random Networks, Growth Models, Distribution of expected degrees, Preferential attachment, Fat tails, Power Laws, Fat Tails, Scale-free networks, Affiliation Networks, Cliques and Cores, Cohesion, Communities and Community Detection Algorithms

UNIT:3 **(12 Hours)**

Implications of Network Structure: Diffusion through Networks:-The Bass Model, Diffusion in Random networks, Giant Components, Models to study disease and information spreads, Cascades and Contagions , Assortativity, Percolation and Robustness of Networks, Effects of communities and centralities on diffusion

UNIT:4 **(14 Hours)**

Strategic Networks and Games on Networks : Economic Game Theoretic Models of Network Formation, Connections Model, Pair-wise Stability, Efficient and Pareto-efficient networks, Externalities and Coauthor Models, Pair-wise Nash Stability, Complements and Substitutes.

Introduction to Games, Reasoning about behavior in a Game, Prisoner's Dilemma, Best response and Dominant Strategies, Nash Equilibrium, Multiple equilibriums:Co-ordination Games, Hawk-Dove Game, Mixed Strategies, Pareto Optimality and Social Optimality**.**

Teaching Methods: Chalk& Board/ PPT/Video Lectures

Ref. Books:

1."Introduction to Social Network Methods", Robert A. Hanneman, University of California Riverside, 2005.

2."Social and Economic Networks", Mathew O Jackson, Princeton University Press, 2008.

3**.**"Networks, Crowds, and Markets: Reasoning About a Highly Connected World", D. Easley and J. Kleinberg, Cambridge University Press, 2010.

Course Code	Course Title	L	T	P	C	QP
BITPE8024	**Cyber Security**	**3**	**0**	**0**	**3**	**A**

Pre -Requisite:

Course Educational Objective

CEO1: Understand the essentials of information security.

CEO2: Learn the algorithms for implementing security

CEO3 To provide an understanding of principal concepts, major issues, technologies, and basic approaches in information security

Course Outcome: At the end of the course, the student will be capable of

CO1	Students shall be able to understand what are the common threats faced today
CO2	What is the foundational theory behind information security
CO3	What are the basic principles and techniques when designing a secure system
CO4	How today's attacks and defenses work in practice

UNIT:1 **(14 Hours)**

Introduction to security- Cyber Intrusions and Security: Cyberbullies, Online Reputation Attacks, Reputation Management, Protecting from Cyberbullies, Phishing, Recognizing Phishing trip, Protection from Phisher's hook up, Online Shopping Basics, Hijackers, Ensuring Safe Shopping, Security Tokens, Cookies, Making cookies work for you, tips for staying Safe and Social, Meeting People Online, Liars, Creeps, Cyberstalkers, Protecting yourself from creeps, Internet Monitoring CIA triad-Case studies- security attacks-issues related to social networking – Guidelines

UNIT:2 **(12 Hours)**

METHODS TO SECUREYOURSELF IN THE CYBER WORLD AND SECURE TRANSACTIONS: Why and What of Reversible and Irreversible Cryptographic mechanisms? -Applications of Digital Signature - Good password practices,What is E-commerce?–Online banking security- Online shopping fraud-Guidelines and Recommendations

UNIT:3 **(10 Hours)**

EVERYDAY SECURITY :Connecting your laptop, mobile devices, PDAs to Internet-Managing your browser-Facebook Security-E-mail security , Safe guarding from Viruses, Antiviruses

UNIT:4 **(10 Hours)**

CYBER SECURITY LAWS AND COMPETENT AUTHORITIES: Indian IT Act, 2008 - What is Cyber Forensics? – Functions of cybercrime cell ,Responding to a cyber attack

Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert/MOOCS

Text Books:

1. "Information Security Awareness Handbook, ISEA, Department of Electronics and Information Technology", Government of India, 2010
2. Cyber Security by Godbole, Wiley India

Course Code	Course Title	L	T	P	C	QP
BITPE8025	**Software Project Management**	**3**	**0**	**0**	**3**	**A**

Pre -Requisite:

Course Educational Objective

CEO1: To outline the need for Software Project Management

CEO2: To highlight different techniques for software cost estimation and activity planning.

CEO3: At the end of the course the students will be able to practice Project Management principles while developing software.

Course Outcome: At the end of the course, the student will be capable of

CO1	Develop increased awareness in project planning, scheduling, tracking, risk analysis and Project cost estimation.
CO2	Apply the report writing techniques and standards to project report.
CO3	Monitoring the progress of projects and to assess & evaluate the risk of project.
CO4	To identify the factors that influence people's behavior in a project environment and selection of appropriate people for the project and to improve group working.

UNIT:1 **(10 Hours)**

Project evaluation and project planning: Importance of Software Project Management ,Activities Methodologies, types of Software Projects ,Setting objectives ,Management Principles ,Management Control , Project portfolio Management, Cost-benefit evaluation technology , Strategic program Management , Stepwise Project Planning.

UNIT:2 **(12 Hours)**

Project life cycle and effort estimation: Engineering and production stages, inception, Elaboration, construction, transition phases. Process Models, Choice of Process models, Rapid Application development ,Agile methods, Extreme Programming ,SCRUM ,Managing interactive processes ,Basics of Software estimation: Effort and Cost estimation techniques, COSMIC Full function points , COCOMO II A Parametric Productivity Model ,Staffing Pattern.

UNIT:3 **(14 Hours)**

Activity planning and risk management and control : Objectives of Activity planning, Project schedules ,Activities Sequencing and scheduling ,Network Planning models , Forward Pass & Backward Pass techniques, Critical path (CRM) method ,Risk identification ,Assessment, Monitoring , PERT technique ,Monte Carlo simulation ,Resource Allocation,Creation of critical patterns, Cost schedules.Framework for Management and control, Collection of data Project termination ,Visualizing progress, Cost monitoring ,Earned Value Analysis,Project tracking ,Change control,Software Configuration Management ,Managing contracts, Contract Management.

UNIT:4 **(10 Hours)**

Staffing in software projects :Managing people , Organizational behavior, Best methods of staff selection, Motivation ,The Oldham,Hackman job characteristic model, Ethical and Programmed concerns, Working in teams, Decision making ,Team structures, Virtual teams , Communications genres ,Communication plans**.** Process Automation **:** Automation Building blocks, The Project Environment.

Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert/MOOCS

Text Books 1

1. Bob Hughes, Mike Cotterell and Rajib Mall: Software Project Management – Fifth Edition, Tata McGraw Hill, New Delhi, 2012.
2. Robert K. Wysocki "Effective Software Project Management" – Wiley Publication,2011.
3. Walker Royce: "Software Project Management"- Addison-Wesley, 1998.
4. Gopalaswamy Ramesh, "Managing Global Software Projects" – McGraw Hill Education (India), Fourteenth Reprint 2013.

Course Code	Course Title	L	T	P	C	QP
BITPE8026	**Software Usability Engineering**	**3**	**0**	**0**	**3**	**A**

Pre -Requisite:

Course Educational Objective

CEO1:To introduce the need for human-computer-interaction study or human-centered software design.

CEO2: To explain usability engineering lifecycle for designing a user-friendly software

CEO3:To familiarize information, interaction and GUI design process for enhancing user-experience:

CEO4: To develop usability evaluation skills for software testing.

Course Outcome: At the end of the course, the student will be capable of

CO1	Justify the need to study human-computer-interaction or human-factors while designing software.
CO2	Discuss the process of designing user-friendly software based on usability engineering guidelines
CO3	Apply interaction design and UI design process in enhancing user-experience of an application.
CO4	Conduct usability evaluation of user-interfaces or software applications.

UNIT:1 **(12 Hours)**

HCI AND USABILITY :What is HCI design? Disciplines contributing to HCI, Psychology of everyday things, Importance of human factors in design, Need Satisfaction curve of technology, Levels of human computer interaction What is Usability? benefits and cost savings, usability slogans, attributes of system acceptability, definition of usability, usability trade-Offs , categories of users and individual user differences, generations of user interfaces, scenario-based usability engineering case study - A Virtual Science Fair.

THE USABILITY ENGINEERING LIFECYCLE :know the user, user-profile questionnaire, field-study◊User research and requirements analysis methods, contextual inquiry and analysis, hierarchical task analysis, ethnography, cultural probe, affinity diagramming, persona, scenarios of use, use cases. setting usability criteria or goals, participatory design (getting users involved),◊Iterative Design guidelines and heuristic evaluation, prototyping and scenarios , examples of problem scenarios, iterative design, interface evaluation, meta methods. simple and natural dialogue, speak the users' language, minimize user memory◊Usability Heuristics load, consistency, feedback, clearly marked exits, shortcuts, good error messages, prevent errors, help and documentation, heuristic evaluation.

UNIT:2 **(8 Hours)**

INFORMATION DESIGN AND INTERACTION DESIGN : Information architecture concepts, stages of action in human-computer◊Information design interaction, perceiving information, interpreting information, making sense of information. selecting system goal, planning action sequence, executing action sequence, study of information and interaction design Goals of UID, User Interface Models , conceptual model and mock-ups of GUI,User Interface Design choosing prototyping alternatives - paper prototyping, rapid prototyping, storyboarding, wireframes, Cost/benefit of good interface design , Case Study.

UNIT:3 **(12 Hours)**

USABILITY EVALUATION :Developing usability specifications for evaluation - case study, criteria for user feedback techniques, formative and summative techniques of evaluation heuristic evaluation, user-interface guideline reviews,◊Usability Inspections (testing without users) cognitive walkthrough, model-based analysis developing usability or test specifications with case study , test◊Usability Testing (testing with users) goals and test plans , getting test users, choosing experimenters, ethical aspects of tests with human subjects, test tasks, stages of a test, performance measurement, thinking-aloud testing, usability laboratories, remote evaluation, observation, user satisfaction questionnaire (rating scale), interviews,◊Methods beyond testing system usability scale (SUS), focus groups, logging actual use, user feedback, choosing a methods.

UNIT:4 **(14 Hours)**

USER-INTERFACE AND USABILITY STANDARDS: User benefits, vendor benefits, dangers of standards, principles of good UI design, national international standards, internationalization - international GUI, guidelines for internationalization , localization and multilocale interfaces, UI standards - control standards, window standards, dialog box standards, message box standards, device interaction standards, feedback standards, developing style guides and toolkits , user documentation- manuals, tutorials, information in the interface

RECENT ADVANCES AND TRENDS : Theoretical solutions, technological solutions, CAUSE tools, emerging paradigms of user interaction collaborative systems, ubiquitous computing , intelligent user-interfaces , simulation and virtual reality , case study , usability issues in organizations- case studies , organizational roles and structures , ethics of usability, web analytics.

Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert/MOOCS

Text Books:

1. Nielsen, J. (1994), “Usability Engineering”, Elsevier.
2. Rosson, M. B., & Carroll, J. M. (2001), “ Usability Engineering: Scenario-Based development of human-computer interaction”, Elsevier.
3. Mayhew, D. (1999), “The Usability Engineering Lifecycle: A Practitioner's Handbook for user interface design”, Morgan Kaufmann

Ref. Books:

1. Cooper A. et. al. (2007), “ The Essentials of Interaction Design”, Wiley
2. Cooper, A. (1995),” The Essentials of User Interface Design”, IDG Books, New Delhi
3. Schneiderman, B. (2005), “ Designing the User Interface”, Pearson Education, New Delhi
4. Dix A. et. al.(1993), “ Human - Computer Interaction”, Prentice Hall, USA

Course Code	Course Title	L	T	P	C	QP
BCHOE8032	**POLLUTION AND ITS CONTROL**	**3**	**0**	**0**	**3**	**A**

Pre -Requisite:

Course Educational Objective

CEO1:

Course Outcome: At the end of the course, the student will be capable of

CO1	Explain about the different types of solid waste
CO2	Understand the various collection and disposal method
CO3	Apply the knowledge to utilize solid waste in different way.
CO4	Develop new method for degradation process of solid waste

UNIT:1

Air Pollution: Air pollution Control Methods–Particulate control devices – Methods of Controlling Gaseous Emissions – Air quality standards.Noise Pollution: Noise standards, Measurement and control methods – Reducing residential and industrial noise – ISO14000.

UNIT:2

Industrial wastewater Management: – Strategies for pollution control – Volume and Strength reduction – Neutralization – Equalization – Proportioning – Common Effluent Treatment Plants – Recirculation of industrial wastes – Effluent standards.

UNIT:3

Solid Waste Management: solid waste characteristics – basics of on-site handling and collection – separation and processing – Incineration- Composting-Solid waste disposal methods – fundamentals of Land filling. Environmental Sanitation: Environmental Sanitation Methods for Hostels and Hotels, Hospitals, Swimming pools and public bathing places, social gatherings (melas and fares), Schools and Institutions, Rural Sanitation-low cost waste disposal method

UNIT:4

Hazardous Waste: Characterization – Nuclear waste – Biomedical wastes – Electronic wastes – Chemical wastes – Treatment and management of hazardous waste-Disposal and Control methods. Sustainable Development: Definition- elements of sustainable developments-Indicators of sustainable development- Sustainability Strategies- Barriers to Sustainability–Industrialization and sustainable development – Cleaner production in achieving sustainability- sustainable development

Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert/MOOCS

Text Books:

1: Environmental Engineering, by Ruth F. Weiner and Robin Matthews – 4th Edition Elesevier, 2003.

2: Environmental Science and Engineering by J.G. Henry and G.W. Heinke – Pearson Education.

Ref. Books: 1. Environmental Engineering by Mackenzie L Davis & David A Cornwell. McGraw Hill

Course Code	Course Title	L	T	P	C	QP
BECOE8031	**SATELLITE COMMUNICATION**	**3**	**0**	**0**	**3**	**A**

Pre -Requisite:

Course Educational Objective

CEO1:

Course Outcome: At the end of the course, the student will be capable of

CO1	Understand the motion of satellite in the orbit and its link design.
CO2	Compute the coverage angle, angle of visibility and consequently determine the coverage area.
CO3	Demonstrate the impacts of GPS, Navigation, constellation design for tracking and launching with various multiple access techniques like TDMA, CDMA, FDMA, and DAMA
CO4	Relate the coverage area with the beam width of satellite antenna and analyze the propagation on satellite with hydrometric and non-hydrometric effect.
CO5	Design antenna systems to accommodate the needs of a particular satellite system.
CO6	Able to study the design of Earth station and tracking of the satellites.

UNIT:1

INTRODUCTION TO SATELLITE COMMUNICATION: Orbital mechanics and parameters look angle determination, Launches and Lunch vehicle, Orbital effects in communication system performance. Attitude and orbit control system (AOCS), TT&C, Description of spacecraft System ; Transponders,

SATELLITE LINK DESIGN: Basics of transmission theory, system noise temperature and G/T ratio, Uplink and Downlink design, design of satellite links for specified (C/N) performance.

UNIT:2

ANALOG TELEPHONE AND TELEVISION TRANSMISSION: Energy dispersal, digital transmission

MULTIPLE ACCESSES: Multiplexing techniques for satellite links, Comprehensive study on FDMA, TDMA and CDMA; Spread Spectrum Transmission and Reception; Estimating Channel requirements, SPADE, Random access

UNIT:3

PROPAGATION ON SATELLITE: Earth paths and influence on link design; Quantifying attenuation and depolarization, hydrometric & non hydrometric effects, ionosphere effects, rain and ice effects.

SATELLITE ANTENNAS: Types of antenna and relationships; Basic Antennas Theory – linear, rectangular & circular aperture; Gain, pointing loss,

UNIT:4

EARTH STATION TECHNOLOGY: Earth station design; Design of large antennas – Cassegrain antennas, optimizing gain of large antenna, antenna temperature, feed system for large cassegrain antennas,

DESIGN OF SMALL EARTH STATION ANTENNAS: Front fed paraboloid reflector antennas, offset fed antennas, beam steering, Global Beam Antenna, equipment for earth station.

Teaching Methods: Chalk& Board/ PPT/Video Lectures/Lecture by Industry Expert/MOOCS

TEXT BOOKS

1. Satellite Communication, T. Pratt, C. Bostian, John Wiley Co, 2nd Edition.
2. Satellite Communication, Principles & Applications, R.N.Mutagi, Oxford University Press, 1st Edition, 2016

Ref. Books:

1. Digital Communication with Satellite and Fiber Optic Application, HarlodKolimbins, PHI
2. Satellite Communication, Robert M. Gagliardi, CBS Publishers
3. Satellites Communication Systems, Richharia. BSP BOOKS PVT LTD.
4. Satellites Communication Engg., MichealKolawole, BSP BOOKS PVT LTD

Course Code	Course Title	L	T	P	C	QP
BMEPE8014	**ADVANCED COMPUTER GRAPHICS AND SOLID MODELING**	**3**	**0**	**0**	**3**	**A**

Pre -Requisite:

Course Educational Objective

CEO1: To Introduce various Graphics Applications in real world scenario Introduce advanced techniques for creating, manipulating, and editing solid models.

CEO2: Refine solid modeling, assembly modeling, and engineering drawing skills using commercial software.

CEO3: Introduce computer animation as a technical presentation method.

CEO4: To be learn more about 2D, 3D and Curve applications Applying efficient graphics technique to solve engineering problems

Course Outcome: At the end of the course, the student will be capable of

CO1	Explain about graphics primitives and work with coordinate spaces, coordinate conversion, and transformations of graphics objects.
CO2	Analyse line, circle, ellipse and character generation algorithms.
CO3	Explain various 3D projections and current models for curves and surfaces.
CO4	Apply appropriate techniques and by using modern tools, to generate & analyse 3D solid models in order to solve Mechanical Engineering problems.

UNIT:1 **(10 Hours)**

Introduction: Computer I/O devices- Video display devices- Refresh CRT - Raster scan display - Color CRT monitor - Co-ordinate representation - Ggraphic displays in engineering workstations - 2D graphics Transformations- 3D geometry, primitives and transformations

UNIT:2 **(08 Hours)**

Basic raster graphics algorithm for drawing 2D primitive - Output characteristics: Aspect ratio - Line drawing algorithm - DDA algorithm - Circle generation algorithm - Mid point circle algorithm - Ellipse generation algorithm

UNIT:3 **(10 Hours)**

Classification of Geometric Modeling - Wire frame, Surface and Solid Modeling, applications -representation of curves and surfaces - Parametric form - Design of curved shapes- Cubic spline - Bezier curve - B-spline curve - Design of Surfaces - features of Surface Modeling

UNIT:4 **(10 Hours)**

Introduction to 3-D modelling - Generation of various 3D Models through Protrusion - revolve, shell sweep - Creation of various features - Study of parent child relationships - Feature based and Boolean based modeling - Constructive solid geometry.

Standards for computer graphics (GKS) and Data exchange standards: IGES, STEP - Data structures for Entity storage - Data structures for interactive modeling.

Teaching Methods: Chalk& Board/ PPT/Video Lectures

Text Books:

1. Saxena, A., Sahay, B., Computer Aided Engineering Design, Springer, 2005
2. Computer Graphics, D. Hearn and M.P. Baker (C Version), Pearson Education

Ref. Books:

1. Anand, V. B., Computer and Geometric Modeling for Engineers, John Wiley & Sons.
2. Hoffmann, C.M., Geometric & Solid Modeling, An Introduction, Morgan Kaufman.
3. Computer Graphics, Z. Xiang, R. A. Plastock, Schaum's Outlines, McGrow Hill