

**SUBHARTI INSTITUTE OF TECHNOLOGY AND ENGINEERING**  
**SWAMI VIVEKANAND SUBHARTI UNIVERSITY, MEERUT**  
**STUDY & EVALUATION SCHEME**  
**B.Tech.3<sup>rd</sup> Year/5<sup>th</sup> Semester (Information Technology)**  
**w.e.f academic Session 2018-19**

SEMESTER V														
S. No.	Course Code	Course Name	Course Type	Periods			CCA			ESE			Total	Credit
				L	T	P	C T	A T	Total	P S	T E	P E		
1	BECE-508	Signals & Systems	ESC-3	3	0	0	20	10	30	-	70	-	100	3
2	BCSE-501	Database Management Systems	PCC-13	3	0	0	20	10	30	-	70	-	100	3
3	BIT-502	Web Technology	PCC-14	3	0	0	20	10	30	-	70	-	100	3
4	BIT-503	Software Engineering	PCC-15	2	0	0	20	10	30	-	70	-	100	2
5	BHU-501	Humanities II	HSM C-3	3	0	0	20	10	30	-	70	-	100	3
6	BCSE-511 to BCSE-514	Elective-I	PEC-1	3	0	0	20	10	30	-	70	-	100	3
7	BMC-501	Constitution of India/ Essence of Indian Traditional Knowledge(MANDATORY)	MC-2	3	0	0	20	10	30	-	70	-	100	0
8	BCSE-551	Database Management Systems Lab	PCC-16	0	0	4	-	-	-	15	-	35	50	2
9	BIT553	Software Engineering Lab	PCC-17	0	0	4	-	-	-	15	-	35	50	2
<b>TOTAL</b>												<b>700</b>	<b>21</b>	

**SUBHARTI INSTITUTE OF TECHNOLOGY AND ENGINEERING**  
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**STUDY & EVALUATION SCHEME**  
**B.Tech.3<sup>rd</sup> Year/6<sup>th</sup> Semester (Information Technology)**  
**w.e.f academic Session 2018-19**

SEMESTER VI														
S. No.	Course Code	Course Name	Course Type	Periods			CCA				ESE		Total	Credit
				L	T	P	CT	AT	Total	PS	TE	PE		
1	BIT-601	Software Project Management	PCC-18	3	0	0	20	10	30	-	70	-	100	3
2	BCSE-602	Computer Networks	PCC-19	3	0	0	20	10	30	-	70	-	100	3
3	BCSE-611 to BCSE-613	Elective-II	PEC-2	3	0	0	20	10	30	-	70	-	100	3
4	BCSE-621 to BCSE-623	Elective-III	PEC-3	3	0	0	20	10	30	-	70	-	100	3
5	BCSE-001 to BCSE-002	Open Elective-I (Humanities)	OEC-1	3	0	0	20	10	30	-	70	-	100	3
6	BIT-653	Project-1	PROJ	0	0	6	-	-	-	50	-	100	150	3
7	BIT651	Software Project Management Lab	PCC-20	0	0	4	-	-	-	15	-	35	50	2
8	BCSE-652	Computer Networks Lab	PCC-21	0	0	4	-	-	-	15	-	35	50	2
<b>TOTAL</b>													<b>750</b>	<b>22</b>

### **ELECTIVE –I**

1. **BCSE-511 GRAPH THEORY**
2. **BCSE-512 ADVANCED COMPUTER ARCHITECTURE**
3. **BCSE-513 EMBEDDED SYSTEMS**
4. **BCSE-514 ENTERPRISE RESOURCE PLANNING**

### **ELECTIVE-II**

1. **BCSE-611 ARTIFICIAL INTELLIGENCE**
2. **BCSE-612 IMAGE PROCESSING**
3. **BCSE-613 ADVANCE ALGORITHM**

### **ELECTIVE-III**

1. **BCSE-621 MACHINE LEARNING**
2. **BCSE-622 CLOUD COMPUTING**
3. **BCSE-623 COMPUTER GRAPHICS**

### **OPEN ELECTIVE-I**

1. **BCSE-001 SOFT SKILLS & INTERPERSONAL COMMUNICATION**
2. **BCSE-002 HUMAN RESOURCE DEVELOPMENT & ORGANIZATIONAL BEHAVIOUR**

<b>BECE-508</b>	<b>Signals and System</b>	<b>3L:0T:0P</b>	<b>3 credits</b>
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**Course Objective:**

1. Demonstrate an understanding of the fundamental properties of linear systems, by explaining the properties to others.
2. Use linear systems tools, especially transform analysis and convolution, to analyze and predict the behavior of linear systems
3. Gain an appreciation for the importance of linear systems analysis in aerospace systems.

**Unit 1.**

Signals and systems as seen in everyday life, and in various branches of engineering and science. Energy and power signals, continuous and discrete time signals, continuous and discrete amplitude signals. System properties: linearity: additivity and homogeneity, shift-invariance, causality, stability, realizability.

**Unit 2.**

Linear shift-invariant (LSI) systems, impulse response and step response, convolution, input-output behavior with aperiodic convergent inputs. Characterization of causality and stability of linear shift-invariant systems. System representation through differential equations and difference equations.

**Unit 3.**

Periodic and semi-periodic inputs to an LSI system, the notion of a frequency response and its relation to the impulse response, Fourier series representation, the Fourier Transform, convolution/multiplication and their effect in the frequency domain, magnitude and phase response, Fourier domain duality. The Discrete-Time Fourier Transform (DTFT) and the Discrete Fourier Transform (DFT). Parseval's Theorem. The idea of signal space and orthogonal bases,

**Unit 4.**

The Laplace Transform, notion of eigen functions of LSI systems, a basis of eigen functions, region of convergence, poles and zeros of system, Laplace domain analysis, solution to differential equations and system behavior.

The z-Transform for discrete time signals and systems- eigen functions, region of convergence, z-domain analysis.

State-space analysis and multi-input, multi-output representation. The state-transition matrix and its role. The Sampling Theorem and its implications- Spectra of sampled signals. Reconstruction: ideal interpolator, zero-order hold, first-order hold, and so on. Aliasing and its effects. Relation between continuous and discrete time systems.

## **Course Outcome:**

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

Analyze different types of signals. Represent continuous and discrete systems in time and frequency domain using different transforms Investigate whether the system is stable Sampling and reconstruction of a signal

1. Explain the importance of superposition in the analysis of linear systems. (concept test, homework, quiz)
2. Explain the role of convolution in the analysis of linear time invariant systems, and use convolution to determine the response of linear systems to arbitrary inputs. (concept test, homework, quiz)
3. List and apply properties of the unilateral and bilateral Laplace transforms. (concept test, homework, quiz)
4. Use Laplace transforms to solve differential equations, and to determine the response of linear systems to known inputs. (homework, quiz)
5. Demonstrate an understanding of the relationship between the stability and causality of systems and the region of convergence of their Laplace transforms, by correctly explaining the relationship, and using the relationship to determine the stability and causality of systems. (concept test, homework, quiz)
6. Demonstrate an understanding of the relation among the transfer function, convolution, and the impulse response, by explaining the relationship, and using the relationship to solve forced response problems. (concept test, homework, quiz)
7. Explain the relationship between a signal's bandwidth and its duration, and use that relationship to predict and explain the bandwidth requirements for aerospace applications such as Loran navigation, amplitude modulation, etc. (homework, quiz)
8. Explain the fundamentals of modulation, including amplitude modulation, frequency modulation, and sampling (impulse modulation), including the implications of the sampling theorem. (homework, quiz)

## **Text/Reference books:**

- A.V. Oppenheim, A.S. Willsky and I.T. Young, "Signals and Systems", Prentice Hall, 1983.
- R.F. Ziemer, W.H. Tranter and D.R. Fannin, "Signals and Systems - Continuous and Discrete", 4th edition, Prentice Hall, 1998.
- Papoulis, "Circuits and Systems: A Modern Approach", HRW, 1980.
- B.P. Lathi, "Signal Processing and Linear Systems", Oxford University Press, c1998.
- Douglas K. Lindner, "Introduction to Signals and Systems", McGraw Hill International Edition: c1999.
- Robert A. Gabel, Richard A. Roberts, "Signals and Linear Systems", John Wiley and Sons, 1995.
- M. J. Roberts, "Signals and Systems - Analysis using Transform methods and MATLAB", TMH, 2003.
- J. Nagrath, S. N. Sharan, R. Ranjan, S. Kumar, "Signals and Systems", TMH New Delhi, 2001.
- Ashok Ambardar, "Analog and Digital Signal Processing", 2nd Edition, Brooks/ Cole Publishing Company (An international Thomson Publishing Company), 1999.

BCSE-501	Database Management Systems	3L:0T:0 P	3 Credits
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**Course Objectives:**

1. To understand the different issues involved in the design and implementation of a database system.
2. To study the physical and logical database designs, database modeling, relational, hierarchical, and network models
3. To understand and use data manipulation language to query, update, and manage a database
4. To develop an understanding of essential DBMS concepts such as: database security, integrity, concurrency, distributed database, and intelligent database, Client/Server (Database Server), Data Warehousing.
5. To design and build a simple database system and demonstrate competence with the fundamental tasks involved with modeling, designing, and implementing a DBMS.

**Unit 1**

**Database system architecture:** Data Abstraction, Data Independence, Data Definition Language (DDL), Data Manipulation Language (DML).

**Data models:** Entity-relationship model, network model, relational and object oriented data models, integrity constraints, data manipulation operations.

**Unit 2:**

**Relational query languages:** Relational algebra, Tuple and domain relational calculus, SQL3, DDL and DML constructs, Open source and Commercial DBMS - MYSQL, ORACLE, DB2, SQL server.

**Relational database design:** Domain and data dependency, Armstrong's axioms, Normal forms, Dependency preservation, Lossless design.

**Query processing and optimization:** Evaluation of relational algebra expressions, Query equivalence, Join strategies, Query optimization algorithms.

**Unit 3:**

**Storage strategies:** Indices, B-trees, hashing.

**Unit 4:**

**Transaction processing:** Concurrency control, ACID property, Serializability of scheduling, Locking and timestamp based schedulers, Multi-version and optimistic Concurrency Control schemes, Database recovery.

## Unit 5:

**Database Security:** Authentication, Authorization and access control, DAC, MAC and RBAC models, Intrusion detection, SQL injection.

**Advanced topics:** Object oriented and object relational databases, Logical databases, Webdatabases, Distributed databases, Data warehousing and data mining.

### Course Outcomes

1. For a given query write relational algebra expressions for that query and optimize the developed expressions
2. For a given specification of the requirement design the databases using E R method and normalization.
3. For a given specification construct the SQL queries for Open source and Commercial DBMS -MYSQL, ORACLE, and DB2.
4. For a given query optimize its execution using Query optimization algorithms
5. For a given transaction-processing system, determine the transaction atomicity, consistency, isolation, and durability.
6. Implement the isolation property, including locking, time stamping based on concurrency control and Serializability of scheduling.

### Suggested books:

- “Database System Concepts”, 6th Edition by Abraham Silberschatz, Henry F. Korth, S. Sudarshan, McGraw-Hill.

### Suggested reference books

- “Principles of Database and Knowledge – Base Systems”, Vol 1 by J. D. Ullman, Computer Science Press.
- “Fundamentals of Database Systems”, 5th Edition by R. Elmasri and S. Navathe, Pearson Education
- “Foundations of Databases”, Reprint by Serge Abiteboul, Richard Hull, Victor Vianu, Addison-Wesley

<b>BIT 502</b>	<b>Web Technology</b>	<b>3L:0T:0 P</b>	<b>3 Credits</b>
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### **Course Objectives:**

1. Understand the various steps in designing a creative and dynamic website.
2. They will be able to write html, JavaScript, CSS .
3. They will have clear understanding of hierarchy of objects in HTML and XML.
4. Finally they can create good, effective and customized websites.
5. Know regarding internet related technologies. Systematic way of developing a website.
6. Design dynamic and interactive web pages by embedding Java Script code in HTML. Use Java Script to validate user input.
7. Know the advantages and use of different types of CSS.
8. Understand the HTML and XML DOM. Know how to use Dynamic HTML.
9. Use CGI and perl.
10. Understand the fundamentals of VB Script.
11. Understand the fundamentals of ASP.
12. Understand the fundamentals of AJAX.
13. Understand the fundamentals of Web Hosting.

### **Unit I:**

**Introduction** Introduction to web, protocols governing the web, web development strategies, web applications, web project, web team .

### **Unit II:**

**Web Page Designing** HTML: list, table, images, frames, forms, CSS; XML: DTD, XML schemes, presenting and using XML

### **Unit III:**

**Scripting** Java script: Introduction, documents, forms, statements, functions, objects; Event and event handling; introduction to AJAX, VB Script, CGI

### **Unit IV:**

**Server Site Programming** Introduction to active server pages (ASP), ASP.NET, java server pages (JSP), JSP application design, tomcat server, JSP objects, declaring variables and

methods, debugging, sharing data between JSP pages, Session, introduction to COM/DCOM.

### **Course Outcomes:**

Upon completion of the subject, students will be able to

1. Analyze a web page and identify its elements and attributes.
2. Create web pages using XHTML and Cascading Styles sheets.
3. Build dynamic web pages using JavaScript (client side programming).
4. Write non-trivial programs using C#.
5. Build interactive web applications using ASP.NET and C#.
6. Construct and manipulate web databases using ADO.NET.
7. Create XML documents.
8. Create XML Schema.
9. Build and consume web services.

### **References**

- Xavier, C, “ Web Technology and Design” , New Age International
- Deitel, “Java for programmers”, Pearson Education
- Ivan Bayross,” HTML, DHTML, Java Script, Perl & CGI”, BPB Publication.
- Ramesh Bangia, “Internet and Web Design” , New Age International
- Jackson, “Web Technologies” Pearson Education
- Patel and Barik, ”Introduction to Web Technology & Internet”, Acme Learning

<b>BIT 503</b>	<b>Software Engineering</b>	<b>2L:0T:0 P</b>	<b>2 Credits</b>
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### Course Objectives

The educational objectives of the Software Engineering Program are to produce graduates who, within three years after graduation, are able to:

1. Be employed in industry, government, or entrepreneurial endeavours to demonstrate professional advancement through significant technical achievements and expanded leadership responsibility;
2. Demonstrate the ability to work effectively as a team member and/or leader in an ever-changing professional environment; and
3. Progress through advanced degree or certificate programs in computing, science, engineering, business, and other professionally related fields.

#### Unit-1:

**Introduction** Introduction to Software Engineering, Software Components, Software Characteristics, Software Crisis, Software Engineering Processes, Similarity and Differences from Conventional Engineering Processes, Software Quality Attributes. Software Development Life Cycle (SDLC) Models: Water Fall Model, Prototype Model, Spiral Model, Evolutionary Development Models, Iterative Enhancement Models.

#### Unit-2:

**Software Requirement Specifications (SRS)** Requirement Engineering Process: Elicitation, Analysis, Documentation, Review and Management of User Needs, Feasibility Study, Information Modeling, Data Flow Diagrams, Entity Relationship Diagrams, Decision Tables, SRS Document, IEEE Standards for SRS.

**Software Quality Assurance (SQA):** Verification and Validation, SQA Plans, Software Quality Frameworks, ISO 9000 Models, SEI-CMM Model.

#### Unit-3:

**Software Design** Basic Concept of Software Design, Architectural Design, Low Level Design: Modularization, Design Structure Charts, Pseudo Codes, Flow Charts, Coupling and Cohesion Measures, Design Strategies: Function Oriented Design, Object Oriented Design, Top-Down and Bottom-Up Design. Software Measurement and Metrics: Various Size Oriented Measures: Halstead's Software Science, Function Point (FP) Based Measures, Cyclomatic Complexity Measures: Control Flow Graphs.

#### Unit-4:

**Software Testing** Testing Objectives, Unit Testing, Integration Testing, Acceptance Testing, Regression Testing, Testing for Functionality and Testing for Performance, Top-Down and Bottom-Up Testing Strategies: Test Drivers and Test Stubs, Structural Testing (White Box Testing), Functional Testing (Black Box Testing), Test Data Suit Preparation, Alpha and Beta Testing of Products.

Static Testing Strategies: Formal Technical Reviews (Peer Reviews), Walk Through, Code Inspection, Compliance with Design and Coding Standards.

#### Unit-V:

**Software Maintenance and Software Project Management** Software as an Evolutionary Entity, Need for Maintenance, Categories of Maintenance: Preventive, Corrective and Perfective Maintenance, Cost of Maintenance, Software Re-Engineering, Reverse Engineering. Software Configuration Management Activities, Change Control Process, Software Version Control, An Overview of CASE Tools. Estimation of Various Parameters such as Cost, Efforts, Schedule/Duration, Constructive Cost Models (COCOMO), Resource

## Allocation Models, Software Risk Analysis and Management.

### Course Outcomes

Graduates of the program are expected to demonstrate:

1. an ability to apply knowledge of mathematics, science, and engineering.
2. an ability to design and conduct experiments, as well as to analyze and interpret data.
3. an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
4. an ability to function on multi-disciplinary teams.
5. an ability to identify, formulate, and solve engineering problems.
6. an understanding of professional and ethical responsibility.
7. an ability to communicate effectively.
8. the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.
9. a recognition of the need for, and an ability to engage in, life-long learning.
10. a knowledge of contemporary issues.
11. an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.
12. the ability to analyze, design, verify, validate, implement, apply, and maintain software systems
13. the ability to appropriately apply discrete mathematics, probability and statistics, and relevant topics in computer science and supporting disciplines to complex software systems.
14. the ability to work in one or more significant application domains.

### References:

- R. S. Pressman, Software Engineering: A Practitioners Approach, McGraw Hill.
- Rajib Mall, Fundamentals of Software Engineering, PHI Publication.
- K. K. Aggarwal and Yogesh Singh, Software Engineering, New Age International Publishers.
- Pankaj Jalote, Software Engineering, Wiley
- Carlo Ghezzi, M. Jarayeri, D. Manodrioli, Fundamentals of Software Engineering, PHI Publication.
- Ian Sommerville, Software Engineering, Addison Wesley.
- Kassem Saleh, "Software Engineering", Cengage Learning.
- Pfleeger, Software Engineering, Macmillan Publication.

<b>BMC-501</b>	<b>CONSTITUTION OF INDIA</b>	<b>0L:0T:0 P</b>	<b>0 CREDITS</b>
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### **Course Objectives:**

Students will be able to:

Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.

To address the growth of Indian opinion regarding modern Indian intellectuals' constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.

To address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution.

### **Unit-I**

**History of Making of the Indian Constitution:** History, Drafting Committee, (Composition & Working)

### **Unit-II**

**Philosophy of the Indian Constitution:** Preamble, Salient Features

### **Unit-III**

**Contours of Constitutional Rights & Duties:** Fundamental Rights, Right to Equality, Right to Freedom, Right against Exploitation, Right to Freedom of Religion, Cultural and Educational Rights, Right to Constitutional Remedies, Directive Principles of State Policy, Fundamental Duties.

### **Unit-IV**

**Organs of Governance:** Parliament, Composition, Qualifications and Disqualifications, Powers and Functions, Executive, President, Governor, Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualifications, Powers and Functions

### **Unit-V**

**Local Administration:** District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation. Pachayati raj: Introduction, PRI: Zila Pachayat. Elected officials and their roles, CEO Zila Pachayat: Position and role. Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy

### **Unit-VI**

**Election Commission:** Election Commission: Role and Functioning. Chief Election Commissioner and Election Commissioners. State Election Commission: Role and Functioning. Institute and Bodies for the welfare of SC/ST/OBC and women.

### ***Suggested reading***

The Constitution of India, 1950 (Bare Act), Government Publication.

Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.

M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.

D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.

***Course Outcomes:***

Students will be able to:

1. Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
2. Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
3. Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.
4. Discuss the passage of the Hindu Code Bill of 1956.

<b>BCSE-551</b>	<b>Database Management System LAB</b>	<b>0L:0T:4 P</b>	<b>2 CREDITS</b>
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### **Course Objectives:**

The major objective of this lab is to provide a strong formal foundation in database concepts, technology and practice to the participants to groom them into well-informed database application developers. Rather than imparting isolated knowledge/experience fragments in each of concepts, technology and practice, the course will aim at achieving a good blend of the three. The overriding concern, therefore, is to include just enough concepts and theory to motivate and enrich the practical component, and to include technology component to maximize the relevance of the course to the industry without sacrificing the long-term objectives of rig our and foundational strength that can with stand the vagaries of technological advances. The sub-objectives are:

1. To provide a sound introduction to the discipline of database management as a subject in its own right, rather than as a compendium of techniques and product-specific tools.
2. To familiarize the participant with the nuances of database environments towards an information-oriented data-processing oriented framework
3. To give a good formal foundation on the relational model of data
4. To present SQL and procedural interfaces to SQL comprehensively
5. To give an introduction to systematic database design approaches covering conceptual design, logical design and an overview of physical design

### **List of Programs:**

1. Write the queries for Data Definition and Data Manipulation Language.
2. Write SQL queries using logical operations (=,<,>,etc)
3. Write SQL queries using SQL operators
4. Write SQL query using character, number, date and group functions
5. Write SQL queries for relational algebra
6. Write SQL queries for extracting data from more than one table
7. Write SQL queries for sub queries, nested queries
8. Write program by the use of PL/SQL
9. Concepts for ROLL BACK, COMMIT & CHECK POINTS
10. Create VIEWS, CURSORS and TRGGERS & write ASSERTIONS.
11. Create FORMS and REPORTS

## **Learning Outcomes:**

After undergoing this laboratory module, the participant should be able to:

1. Understand, appreciate and effectively explain the underlying concepts of database technologies
2. Design and implement a database schema for a given problem-domain
3. Normalize a database
4. Populate and query a database using SQL DML/DDI commands.
5. Declare and enforce integrity constraints on a database using a state-of-the-artRDBMS
6. Programming PL/SQL including stored procedures, stored functions, cursors,packages.

Note:

1. The queries to be implemented on DBMS using SQL
2. Students are advised to use Developer 2000/Oracle9i or other latest version for above experiments.. However student may use Power Builder/SQL SERVER . Mini Projects may also be planned & carried out through out the semester to understand important concepts of database.

<b>BIT 553</b>	<b>SOFTWARE ENGINEERING LAB</b>	<b>0L:0T:4 P</b>	<b>2 CREDITS</b>
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### **Course Objectives**

The Software Engineering Lab has been developed by keeping in mind the following objectives:

1. To impart state-of-the-art knowledge on Software Engineering and UML in an interactive manner.
2. Present case studies to demonstrate practical applications of different concepts
3. Provide a scope to students where they can solve small, real life problems

### **Outcomes**

1. Case Study based on Software life cycle.
2. Develop, implement, and demonstrate the learning through a project that meets stated specifications.
3. You will learn User Interface Design.
4. Understand Software Cost Estimation and web engineering.

<b>BIT 601</b>	<b>Software Project Management</b>	<b>3L:0T:0 P</b>	<b>3 CREDITS</b>
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**Course Objectives:**

- To introduce software project management and to describe its distinctive characteristics
- To discuss project planning and the planning process
- To show how graphical schedule representations are used by project management
- To discuss the notion of risks and the risk management process

**UNIT-I: Introduction and Software Project Planning**

Fundamentals of Software Project Management (SPM), Need Identification, Vision and Scope document, Project Management Cycle, SPM Objectives, Management Spectrum, SPM Framework, Software Project Planning, Planning Objectives, Project Plan, Types of project plan, Structure of a Software Project Management Plan, Software project estimation, Estimation methods, Estimation models, Decision process.

**UNIT-II: Project Organization and Scheduling**

Project Elements, Work Breakdown Structure (WBS), Types of WBS, Functions, Activities and Tasks, Project Life Cycle and Product Life Cycle, Ways to Organize Personnel, Project schedule, Scheduling Objectives, Building the project schedule, Scheduling terminology and techniques, Network Diagrams: PERT, CPM, Bar Charts: Milestone Charts, Gantt Charts.

**UNIT-III: Project Monitoring and Control**

Dimensions of Project Monitoring & Control, Earned Value Analysis, Earned Value Indicators:

Budgeted Cost for Work Scheduled (BCWS), Cost Variance (CV), Schedule Variance (SV), Cost Performance Index (CPI), Schedule Performance Index (SPI), Interpretation of Earned Value Indicators, Error Tracking, Software Reviews, Types of Review: Inspections, Deskchecks, Walkthroughs, Code Reviews, Pair Programming.

**UNIT-IV: Software Quality Assurance and Testing**

Testing Objectives, Testing Principles, Test Plans, Test Cases, Types of Testing, Levels of Testing, Test Strategies, Program Correctness, Program Verification & validation, Testing Automation & Testing Tools, Concept of Software Quality, Software Quality Attributes, Software Quality Metrics and Indicators, The SEI Capability Maturity Model (CMM), SQA Activities, Formal SQA Approaches: Proof of correctness, Statistical quality assurance, Cleanroom process.

**UNIT-V: Project Management and Project Management Tools**

Software Configuration Management: Software Configuration Items and tasks, Baselines, Plan for Change, Change Control, Change Requests Management, Version Control, Risk Management: Risks and risk types, Risk Breakdown Structure (RBS), Risk Management Process: Risk identification, Risk analysis, Risk planning, Risk monitoring, Cost Benefit Analysis, Software Project Management Tools: CASE Tools, Planning and Scheduling Tools,

MS-Project.

### ***OUTCOMES***

Having completed this subject guide, including the Essential reading and activities, you should be able to:

- demonstrate that you have acquired a structured view of the overall process of software development, with greater understanding of its main phases, specific notations and the specification and development tools employed
- show that you have developed a broader understanding of software engineering as a discipline, recognising its relationship and interactions with other computing and design disciplines
  - demonstrate the ability to structure a problem into natural components and evaluate critically a piece of analysis and development work
  - demonstrate your understanding of the implications of computer and network architectures for system-level design and development
  - demonstrate that you understand how to identify, select and apply appropriate methods and tools for the development of solutions to specific real-world problems
  - show that you can explain what it means to work effectively as part of a software development project team following a recognised development methodology, including the need to communicate effectively through written, oral and other forms of technical presentation

### **References:**

1. M. Cotterell, Software Project Management, Tata McGraw-Hill Publication.
2. Royce, Software Project Management, Pearson Education
3. Kieron Conway, Software Project Management, Dreamtech Press
4. S. A. Kelkar, Software Project Management, PHI Publication.

<b>BCSE-602</b>	<b>Computer Networks</b>	<b>3L:0T: 0P</b>	<b>3 Credits</b>
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### **Course Objectives**

To develop an understanding of modern network architectures from a design and performance perspective.

To introduce the student to the major concepts involved in wide-area networks (WANs), local area networks (LANs) and Wireless LANs (WLANs).

To provide an opportunity to do network programming To provide a WLAN measurement ideas.

#### **Unit 1:**

Data communication Components: Representation of data and its flow Networks , Various Connection Topology, Protocols and Standards, OSI model, Transmission Media, LAN: Wired LAN, Wireless LANs, Connecting LAN and Virtual LAN, Techniques for Bandwidth utilization: Multiplexing - Frequency division, Time division and Wave division, Concepts on spread spectrum.

#### **Unit 2:**

Data Link Layer and Medium Access Sub Layer: Error Detection and Error Correction - Fundamentals, Block coding, Hamming Distance, CRC; Flow Control and Error control protocols - Stop and Wait, Go back – N ARQ, Selective Repeat ARQ, Sliding Window,

Piggybacking, Random Access, Multiple access protocols -Pure ALOHA, Slotted ALOHA, CSMA/CD,CDMA/CA

#### **Unit 3:**

Network Layer: Switching, Logical addressing – IPV4, IPV6; Address mapping – ARP, RARP, BOOTP and DHCP–Delivery, Forwarding and Unicast Routing protocols.

#### **Unit 4:**

**Transport Layer:** Process to Process Communication, User Datagram Protocol (UDP),Transmission Control Protocol (TCP), SCTP Congestion Control; Quality of Service, QoS improving techniques: Leaky Bucket and Token Bucket algorithm.

#### **Unit 5:**

**Application Layer:** Domain Name Space (DNS), DDNS, TELNET, EMAIL, File Transfer Protocol (FTP), WWW, HTTP, SNMP, Bluetooth, Firewalls, Basic concepts of Cryptography

## **Suggested books**

1. Data Communication and Networking, 4th Edition, Behrouz A. Forouzan, McGraw-Hill.
2. Data and Computer Communication, 8th Edition, William Stallings, Pearson Prentice Hall India.
3. Computer Networks, 8th Edition, Andrew S. Tanenbaum, Pearson New International Edition.
4. Internetworking with TCP/IP, Volume 1, 6th Edition Douglas Comer, Prentice Hall of India.
5. TCP/IP Illustrated, Volume 1, W. Richard Stevens, Addison-Wesley, United States of America.

## **Course Outcomes**

1. Explain the functions of the different layer of the OSI Protocol.
2. Draw the functional block diagram of wide-area networks (WANs), local area networks (LANs) and Wireless LANs (WLANs) describe the function of each block.
3. For a given requirement (small scale) of wide-area networks (WANs), local area networks (LANs) and Wireless LANs (WLANs) design it based on the market available component
4. For a given problem related TCP/IP protocol developed the network programming.
5. Configure DNS DDNS, TELNET, EMAIL, File Transfer Protocol (FTP), WWW, HTTP, SNMP, Bluetooth, Firewalls using open source available software and tools.

<b>BIT-651</b>	<b>Software Project Mngement Lab</b>	<b>0L:0T: 4P</b>	<b>2 Credits</b>
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S.NO	NAME OF EXPERIMENTS
1.	Make an analysis of different s/w design tools available in the market.
2.	Write the SRS of your mini project
3.	Estimate the effort and cost required to build the above software. Use any estimation technique
4.	Draw ER diagrams ,DFDs till level-2
5.	Design a data dictionary
6.	Compare the project life cycle of the following: a) An engineering product, say a nuclear power station project.
7.	b) An housing project.
8.	c) A computer installation project.
9.	Prepare a project life cycle chart.
10.	Analysis of SDLC and draw its DFD diagram.

<b>BCSE-652</b>	<b>Computer Networks Lab</b>	<b>0L:0T: 4P</b>	<b>2 Credits</b>
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**Objectives:**

1. *To provide an opportunity to do network programming using TCP/IP.*
2. *To introduce the student to the major concepts involved in wide-area networks (WANs), local area networks (LANs) and Wireless LANs (WLANs).*
3. *To expose students to emerging technologies and their potential impact*

**List of Experiments:-**

1. Write a program for error detecting code using CRC-CCITT (16-bits).
2. Write a program for frame sorting technique used in buffers.
3. Write a program for distance vector algorithm to find suitable path for transmission.
4. Write a program for spanning tree algorithm (Kruskal's/Prim's) to find loop less path.
5. Using TCP/IP sockets, write a client-server program to make client sending the file name and the server to send back the contents of the requested file if present.
6. Implement the above program using as message queues or FIFOs as IPC channels.
7. Write a program for simple RSA algorithm to encrypt and decrypt the data.
8. Write a program for Hamming Code generation for error detection and correction.
9. Write a program for congestion control using Leaky bucket algorithm.
10. Write a program for control the smtp.

**Outcomes:**

*Upon the completion of the course students will be able to do*

1. *Explain the importance of data communications and the Internet in supporting business communications and daily activities.*
2. *Explain how communication works in data networks and the Internet.*
3. *Recognize the different internetworking devices and their functions.*
4. *Explain the role of protocols in networking.*
5. *Analyse the services and features of the various layers of data networks.*
6. *Design, calculate, and apply subnet masks and addresses to fulfill networking requirements.*
7. *Analyse the features and operations of various application layer protocols such as Http, DNS, and SMTP.*

## ELECTIVE SUBJECTS

### ELECTIVE 1:

BCSE-511	Graph Theory	3L:0P:0T	3 Credit
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#### Objective :

1. To Learn about Graphs, Trees,.
2. To Study about Cuts sets and cut vertices
3. To study Vector Space of graph and vectors.

#### Detailed contents

##### Unit 1:

Graphs, Sub graphs, some basic properties, various example of graphs & their sub graphs, walks, path & circuits, connected graphs, disconnected graphs and component, euler graphs, various operation on graphs, Hamiltonian paths and circuits, the traveling sales man problem.

##### Unit 2:

Trees and fundamental circuits, distance diameters, radius and pendent vertices, rooted and binary trees, on counting trees, spanning trees, fundamental circuits, finding all spanning trees of a graph and a weighted graph, algorithms of primes, Kruskal and Dijkstra Algorithms.

##### Unit 3:

Cuts sets and cut vertices, some properties, all cut sets in a graph, fundamental circuits and cut sets , connectivity and separability, network flows Planer graphs, combinatorial and geometric dual: Kuratowski graphs, detection of planarity, geometric dual, Discussion on criterion of planarity, thickness and crossings.

##### Unit 4:

Vector space of a graph and vectors, basis vector, cut set vector, circuit vector, circuit and cut set subspaces, Matrix representation of graph – Basic concepts; Incidence matrix, Circuit matrix, Path matrix, Cut-set matrix and Adjacency matrix.

## **Unit 5:**

Coloring, covering and partitioning of a graph, chromatic number, chromatic partitioning, chromatic polynomials, matching, covering, four color problem Discussion of Graph theoretic algorithm wherever required.

### **Course Outcome :**

1. Student can understand about different graphs,
2. Designing travelling salesman problem,
3. To develop the method of colouring .

### **References**

- Deo, N, Graph theory with applications to Engineering and Computer Science, PHI
- Gary Chartrand and Ping Zhang, Introduction to Graph Theory, TMH
- Robin J. Wilson, Introduction to Graph Theory, Pearson Education
- Harary, F, Graph Theory, Narosa
- Bondy and Murthy: Graph theory and application. Addison Wesley.
- V. Balakrishnan, Schaum's Outline of Graph Theory, TMH
- Geir Agnarsson, Graph Theory: Modeling, Applications and Algorithms, Pearson Education

<b>BCSE-512</b>	Advanced Computer Architecture	3L:0P:0T	3 Credits
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### **COURSE OBJECTIVE:**

- know the classes of computers, and new trends and developments in computer architecture
- Understand pipelining, instruction set architectures, memory addressing.
- Understand the performance metrics of microprocessors, memory, networks, and disks
- Understand the various techniques to enhance a processors ability to exploit Instruction-level parallelism (ILP), and its challenges.
- Understand exploiting ILP using dynamic scheduling, multiple issue, and speculation.

#### **Unit 1:**

Introduction Parallel Computing, Parallel Computer Model, Program and Network Properties, Parallel Architectural Classification Schemes, Flynn's & Feng's Classification, Performance Metrics and Measures, Speedup Performance Laws: Multiprocessor System and Interconnection Networks; IEEE POSIX Threads: Creating and Exiting Threads, Simultaneous Execution of Threads, Thread Synchronization using Semaphore and Mutex, Canceling the Threads.

#### **Unit 2:**

Pipelining and Memory Hierarchy Basic and Intermediate Concepts, Instruction Set Principle; ILP: Basics, Exploiting ILP, Limits on ILP; Linear and Nonlinear Pipeline Processors; Super Scalar and Super Pipeline Design; Memory Hierarchy Design: Advanced Optimization of Cache Performance, Memory Technology and Optimization, Cache Coherence and Synchronization Mechanisms.

#### **Unit 3:**

Thread and Process Level Parallel Architecture Introduction to MIMD Architecture, Multithreaded Architectures, Distributed Memory MIMD Architectures, Shared Memory MIMD Architecture, Clustering, Instruction Level Data Parallel Architecture, SIMD Architecture, Fine Grained and Coarse Grained SIMD Architecture, Associative and Neural Architecture, Data Parallel Pipelined and Systolic Architectures, Vector Architectures.

#### **Unit 4:**

Parallel Algorithms PRAM Algorithms: Parallel Reduction, Prefix Sums, Preorder Tree Traversal, Merging two Sorted lists; Matrix Multiplication: Row Column Oriented Algorithms, Block Oriented Algorithms; Parallel Quicksort, Hyper Quicksort; Solving Linear Systems: Gaussian Elimination, Jacobi Algorithm; Parallel Algorithm Design Strategies.

#### **Unit 5:**

Developing Parallel Computing Applications OpenMP Implementation in 'C': Execution Model, Memory Model; Directives: Conditional Compilation, Internal Control Variables, Parallel Construct, Work Sharing Constructs, Combined Parallel Work-Sharing Constructs, Master and Synchronization Constructs; Run-Time Library Routines: Execution Environment Routines, Lock Routines, Timing Routines; Simple Examples in 'C'.

**Course Outcome :**

1. The performance metrics of microprocessors, memory, networks, and disks
2. The various techniques to enhance a processors ability to exploit Instruction-level parallelism (ILP), and its challenges.
3. Exploiting ILP using dynamic scheduling, multiple issue, and speculation.
4. Multithreading by using ILP and supporting thread-level parallelism (TLP).
5. The performance and efficiency in advanced multiple-issue processors.
6. Symmetric shared-memory architectures and their performance.
7. Multiprocessor cache coherence using the directory based and snooping class of protocols.

**Reference Books:-**

- Kai Hwang, "Advance Computer Architecture", TMH
  - Matthew, "Beginning Linux Programming", SPD/WROX
  - Hennessy and Patterson, "Computer Architecture: A Quantitative Approach", Elsevier
  - Dezso and Sima, "Advanced Computer Architecture", Pearson
  - Quinn, "Parallel Computing: Theory & Practice", TMH
  - 6. Quinn, "Parallel Programming in C with MPI and Open MP", TMH
- Open MP Specification and Usage ([www.openmp.org](http://www.openmp.org)) (TCS-041) REAL TIME SYSTEMS

<b>BCSE-513</b>	<b>EMBEDDED SYSTEMS</b>	3L:0P:0T	3 Credits
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**Course Objective :**

To study the embedded systems, real time operating system issues.

**Unit 1 :**

Introduction to embedded systems: Classification, Characteristics and requirements

**Unit 2:**

Timing and clocks in Embedded systems, Task Modeling and management, Real time operating system issues.

**Unit 3:**

Signals, frequency spectrum and sampling, digitization (ADC, DAC), Signal Conditioning and Processing. Modeling and Characterization of Embedded Computation System.

**Unit 4:**

Embedded Control and Control Hierarchy, Communication strategies for embedded systems: Encoding and Flow control.

**Unit 5:**

Fault-Tolerance Formal Verification.

**Course Outcome :**

1. To develop the Embedded System ,
2. understand the different models ,
3. clock and timings.

**Reference Books:**

- H.Kopetz, “Real-Time Systems”, Kluwer, 1997.
- R.Gupta, “Co-synthesis of Hardware and Software for Embedded Systems”, Kluwer 1995.cryptography and Network Security”, TMH

<b>BCSE-514</b>	<b>Enterprise Resource Planning</b>	<b>3L:0P:0T</b>	<b>3 Credits</b>
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**Course Objective :**

1. To study of ERP model,
2. Data ware housing,
3. ERP Market.

**Unit 1:**

ERP Introduction, Benefits, Origin, Evolution and Structure: Conceptual Model of ERP, The Evolution of ERP, The Structure of ERP.

**Unit 2:**

Business Process Reengineering, Data ware Housing, Data Mining, Online Analytic Processing(OLAP), Product Life Cycle Management(PLM),LAP, Supply chain Management.

**Unit 3:**

ERP Marketplace and Marketplace Dynamics: Market Overview, Marketplace Dynamics, The Changing ERP Market.

ERP- Functional Modules: Introduction, Functional Modules of ERP Software, Integration of ERP, Supply chain and Customer Relationship Applications.

**Unit 4:**

ERP Implementation Basics, ERP Implementation Life Cycle, Role of SDLC/SSAD, Object Oriented Architecture, Consultants, Vendors and Employees,

**Unit 5:**

ERP & E-Commerce, Future Directives- in ERP, ERP and Internet, Critical success and failure factors, Integrating ERP into organizational culture.

Using ERP tool: either SAP or ORACLE format to case study

**Course Outcome :**

1. Implementation of ERP,
2. Supply chain Management,
3. to understand Vendors and Employees, to use of ERP tool

**References:**

- Alexis Leon, “ERP Demystified”, Tata McGraw Hill
- Rahul V. Altekhar “Enterprise Resource Planning”, Tata McGraw Hill,
- Vinod Kumar Garg and Venkitakrishnan N K, “Enterprise Resource Planning – Concepts and Practice”, PHI
- Joseph A Brady, Ellen F Monk, Bret Wagner, “Concepts in Enterprise Resource Planning”, Thompson Course Technology
- Mary Summer, “Enterprise Resource Planning”- Pearson Education

*ELECTIVE 2:*

<b>BCSE-611</b>	Artificial Intelligence	3L:0P:0T	3 Credits
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**Course Objective :**

1. To study of Application of artificial intelligence based system,
2. Search strategies, FOPL, Bayesian Network.

**Unit 1:**

Introduction : Introduction to Artificial Intelligence, Foundations and History of Artificial Intelligence, Applications of Artificial Intelligence, Intelligent Agents, Structure of Intelligent Agents. Computer vision, Natural Language Processing.

**Unit 2:**

Introduction to Search : Searching for solutions, Uniformed search strategies, Informed search strategies, Local search algorithms and optimistic problems, Adversarial Search, Search for games, Alpha - Beta pruning.

**Unit 3:**

Knowledge Representation & Reasoning: Propositional logic, Theory of first order logic, Inference in First order logic, Forward & Backward chaining, Resolution, Probabilistic reasoning, Utility theory, Hidden Markov Models (HMM), Bayesian Networks.

**Unit 4:**

Machine Learning : Supervised and unsupervised learning, Decision trees, Statistical learning models, Learning with complete data - Naive Bayes models, Learning with hidden data - EM algorithm, Reinforcement learning,

**Unit 5:**

Pattern Recognition : Introduction, Design principles of pattern recognition system, Statistical Pattern recognition, Parameter estimation methods - Principle Component Analysis (PCA) and Linear Discriminant Analysis (LDA), Classification Techniques – Nearest Neighbor (NN) Rule, Bayes Classifier, Support Vector Machine (SVM), K – means clustering.

**Course Outcome :**

1. To implement the concept of artificial intelligence based system,
2. To implement the HMM ,Bayesian Network model .

**References:**

- Stuart Russell, Peter Norvig, “Artificial Intelligence – A Modern Approach”, Pearson Education
- Elaine Rich and Kevin Knight, “Artificial Intelligence”, McGraw-Hill
- E Charniak and D McDermott, “Introduction to Artificial Intelligence”, Pearson Education
- Dan W. Patterson, “Artificial Intelligence and Expert Systems”, Prentice Hall of India,

<b>BCSE-612</b>	<b>IMAGE PROCESSING</b>	<b>3L:0P:0T</b>	<b>3 Credits</b>
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### **Course Objectives:**

Comprehensive, theory based understanding of the underpinning natural and physical sciences and the engineering fundamentals applicable to the engineering discipline;

1. Conceptual understanding of the mathematics, numerical analysis, statistics, and computer and information sciences which underpin the engineering discipline;
2. In-depth understanding of specialist bodies of knowledge within the engineering discipline;
3. Discernment of knowledge development and research directions within the engineering discipline;
4. Application of established engineering methods to complex engineering problem solving;
5. Fluent application of engineering techniques, tools and resources; and
6. Application of systematic engineering synthesis and design processes.

### **Detailed content**

#### **Unit 1:**

Introduction and Fundamentals Motivation and Perspective, Applications, Components of Image Processing System, Element of Visual Perception, A Simple Image Model, Sampling and Quantization. Image Enhancement in Frequency Domain Fourier Transform and the Frequency Domain, Basis of Filtering in Frequency Domain, Filters – Low-pass, High-pass; Correspondence Between Filtering in Spatial and Frequency Domain; Smoothing Frequency Domain Filters – Gaussian Lowpass Filters; Sharpening Frequency Domain Filters – Gaussian Highpass Filters; Homomorphic Filtering.

#### **Unit 2:**

Image Enhancement in Spatial Domain Introduction; Basic Gray Level Functions – Piecewise-Linear Transformation Functions: Contrast Stretching; Histogram Specification; Histogram Equalization; Local Enhancement; Enhancement using Arithmetic/Logic Operations – Image Subtraction, Image Averaging; Basics of Spatial Filtering; Smoothing - Mean filter, Ordered Statistic Filter; Sharpening – The Laplacian.

#### **Unit 3:**

Image Restoration A Model of Restoration Process, Noise Models, Restoration in the presence of Noise only-Spatial Filtering – Mean Filters: Arithmetic Mean filter, Geometric Mean Filter, Order Statistic Filters – Median Filter, Max and Min filters; Periodic Noise Reduction by Frequency Domain Filtering – Bandpass Filters; Minimum Mean-square Error Restoration.

#### **Unit 4:**

Morphological Image Processing Introduction, Logic Operations involving Binary Images, Dilation and Erosion, Opening and Closing, Morphological Algorithms – Boundary Extraction, Region Filling, Extraction of Connected Components, Convex Hull, Thinning, Thickening

#### **Unit 5:**

Registration Introduction, Geometric Transformation – Plane to Plane transformation, Mapping, Stereo Imaging – Algorithms to Establish Correspondence, Algorithms to Recover Depth Segmentation Introduction, Region Extraction, Pixel-Based Approach, Multi-level Thresholding, Local Thresholding, Region-based Approach, Edge and Line Detection: Edge Detection, Edge Operators, Pattern Fitting Approach, Edge Linking and Edge Following, Edge Elements Extraction by Thresholding, Edge Detector Performance, Line Detection, Corner Detection.

#### **Course Outcome:**

On successful completion of the course, you should be able to:

1. Describe the basic issues and the scope (or principal applications) of image processing, and the roles of image processing and systems in a variety of applications;
2. Demonstrate a good understanding of the history and the current state-of-the-art image processing systems and applications which constantly push the boundaries and raise challenges in other fields of studies such as mathematics, physics, and computer systems engineering;
3. Identify areas of knowledge which are required, select an appropriate approach to a given image processing task, and critically evaluate and benchmark the performance of alternative techniques for a given problem by simulation using, e.g., Matlab;
4. Implement image processing tasks with a high level of proficiency via software and hardware systems;
5. Identify potential applications of image processing to advancement of knowledge in sciences and engineering with benefits in, e.g., policing, public safety and security, and social issues such as privacy; and
6. Demonstrate a high level of self-directed learning ability and good oral and written communication skills on technical topics of image processing and systems engineering.

#### **Reference book :**

- Digital Image Processing 2nd Edition, Rafael C. Gonzalvez and Richard E. Woods. Published by: Pearson Education.
- Digital Image Processing and Computer Vision, R.J. Schalkoff. Published by: John Wiley and Sons, NY.
- Fundamentals of Digital Image Processing, A.K. Jain. Published by Prentice Hall, Upper Saddle River, NJ.

BCSE-613	<b>Advance Algorithm</b>	<b>3L:0P:0T</b>	<b>3 Credits</b>
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## Detailed content

### Unit 1:

Design Paradigms: Overview : Overview of Divide and Conquer, Greedy and Dynamic Programming strategies. Basic search and traversal techniques for graphs, Backtracking, Branch and Bound.

### Unit 2:

Max Flow Problem String Matching Introduction to string-matching problem, Naïve algorithm, Rabin Karp, Knuth Morris Pratt, BoyerMoore algorithms and complexity analysis.

### Unit 3:

Theory of NP- Hard and NP-Complete Problems. P, NP and NP-Complete complexity classes; A few NP-Completeness proofs; Other complexity classes.

### Unit 4:

Approximation Algorithms Introduction, Combinatorial Optimization, approximation factor, PTAS, FPTAS, Approximation algorithms for vertex cover, set cover, TSP, knapsack, bin packing, subset-sum problem etc. Analysis of the expected time complexity of the algorithms.

### Unit 5:

Parallel Algorithms Introduction, Models, speedup and efficiency, Some basic techniques, Examples from graph theory, sorting, Parallel sorting networks. Parallel algorithms and their parallel time and processors complexity. Probabilistic Algorithms & Randomized Algorithms Numerical probabilistic algorithms, Las Vegas and Monte Carlo algorithms, Game-theoretic techniques, Applications on graph problems

### Text Books :

- Introduction to Algorithms : T.H. Cormen, C.E.Leiserson and R.L. Rivest
- Fundamentals of Algorithmics : G.Brassard and P.Bratley
- Approximation Algorithms: Vijay V.Vazirani 4. Randomized Algorithms: R. Motwani and P.Raghavan

**Reference book:** Algorithmics :The spirit of computing: D.Harel

*ELECTIVE 3:*

<b>BCSE-621</b>	<b>Machine learning</b>	<b>3L:0P:0T</b>	<b>3 Credits</b>
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**COURSE OBJECTIVE**

1. To learn the concept of how to learn patterns and concepts from data without being explicitly programmed in various IOT nodes.
2. To design and analyse various machine learning algorithms and techniques with a modern outlook focusing on recent advances.
3. Explore supervised and unsupervised learning paradigms of machine learning.
4. To explore Deep learning technique and various feature extraction strategies.

**Detailed content**

**Unit-1**

**Supervised learning (Regression/Classification)** Basic methods: Distance-based methods, Nearest-Neighbours, Decision Trees, Naive Bayes. Linear models: Linear Regression, Logistic Regression, Generalized Linear Models. Support Vector Machines, Nonlinearity and Kernel Methods Beyond Binary Classification: Multi-class/Structured Outputs, Ranking.

**Unit-2**

**Unsupervised Learning** clustering: K-means/Kernel K-means Dimensionality Reduction: PCA and kernel PCA Matrix Factorization and Matrix Completion Generative Models (mixture models and Latent factor models)

**Unit 3**

Evaluating Machine Learning algorithms and Model Selection, Introduction to Statistical Learning Theory. Ensemble Methods (Boosting, Bagging, Random Forests)

**Unit 4**

Sparse Modeling and Estimation, Modeling Sequence/Time-Series Data. Deep Learning and Feature Representations Learning.

**Unit 5**

Scalable Machine Learning (Online and Distributed Learning) A selection from some other advanced topics, e.g., Semi-supervised Learning, Active Learning, Reinforcement Learning, Inference in Graphical Models, Introduction to Bayesian Learning and Inference.

Recent trends in various learning techniques of machine learning and classification  
Methods for IOT applications. Various models for IOT applications.

### **COURSE OUTCOMES**

1. After completion of course, students would be able to:
2. Extract features that can be used for a particular machine learning approach in various
3. IOT applications.
4. To compare and contrast pros and cons of various machine learning
5. techniques and to get an insight of when to apply a particular machine learning approach.
6. To mathematically analyse various machine learning approaches and paradigms.

### **References:**

- Kevin Murphy, Machine Learning: A Probabilistic Perspective, MIT Press, 2012
- Trevor Hastie, Robert Tibshirani, Jerome Friedman, The Elements of Statistical Learning, Springer 2009 (freely available online)
- Christopher Bishop, Pattern Recognition and Machine Learning, Springer, 2007.

<b>BCSE-622</b>	Cloud Computing	3L:0P:0T	3 Credit
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## **Course Description**

The course presents a top-down view of cloud computing, from applications and administration to programming and infrastructure. Its main focus is on parallel programming techniques for cloud computing and large scale distributed systems which form the cloud infrastructure. The topics include: overview of cloud computing, cloud systems, parallel processing in the cloud, distributed storage systems, virtualization, security in the cloud, and multicore operating systems. Students will study state-of-the-art solutions for cloud computing developed by Google, Amazon, Microsoft, Yahoo, VMWare, etc. Students will also apply what they learn in one programming assignment and one project executed over Amazon Web Services.

## **Detailed Contents**

### **Unit 1:**

Introduction- Objectives, From collaborative to the Cloud – A short history Client – Server Computing, Peer-to-Peer Computing, Distributed Computing, Collaborative Computing, Cloud Computing, Functioning of Cloud Computing, Cloud Architecture, Cloud Storage, Cloud Services, Industrial Applications.

Business Values, Introduction-Objectives, Service Modeling, Infrastructure Services, Platform Services, Software Services - Software as service modes- Massively scaled software as a service- Scale of Economy, Management and Administration.

Inside Cloud Computing- Introduction- Objectives, Feeling Sensational about Organization, Making Strategy Decisions- Governance Issues- Monitoring Business Processes- IT Cost Management,

Cloud Service Administration- Service Level Agreements and Monitoring-Support Services- Accounting Services, Resource Management- IT Security- Performance Management- Provisioning- Service Management, Untangling Software Dependencies.

### **Unit 2:**

Cloud Computing Technology- Introduction-Objectives, Clients – Mobile – Thin – Thick, Security - Data Linkage - Offloading Work - Logging - Forensics - Development – Auditing, Network- Basic Public Internet- The Accelerated Internet- Optimised Internet Overlay- Site-to-Site VPN- Cloud Providers- Cloud Consumers - Pipe Size- Redundancy, Services- Identity- Integration- Mapping- Payments- Search.

Accessing the Cloud- Introduction-Objectives, Platforms- Web Application Framework- Web Hosting Services- Proprietary Methods, Web Applications- API's in Cloud Computing, Browsers for Cloud Computing- Internet Explorer- Mozilla Firefox- Safari- Chrome.

Data Management- Introduction- Objectives, Data Security- Data Location- Data Control- Securing data for transport, Scalability and Cloud Services- Large Scale Data Processing- Databases and Data Stores- Data Archival.

### **Unit 3:**

Information Storage in Cloud Computing- Introduction- Objectives, Storage as a Service, Storage Providers- Amazon Simple Storage Service- Nirvanix- Google Bigtable Datastore- MobileMe- Live Mesh, Storage Security, Merits and Demerits of Storage.

Discovery of Private and Hybrid Clouds- Introduction- Objectives, Need for Privacy- Defining a private cloud- Public, Private, and Hybrid Clouds – A Comparison, Examining the Economics of the private cloud- Assessing capital expenditures- Vendor Private Cloud Offerings, The Up Key Vendors- Service Oriented- Systems Integrators- Technology Enablers.

Cloud Computing Standards- Introduction- Objectives, Best Practices and Standards, Practical Issues- Interoperability- Portability- Integration- Security, Standards Organizations and Groups- Cloud Security Alliance- Distributed Management Task Force (DMTF)- National Institute of Standards and Technology (NIST)- Open Cloud Consortium (OCC)- Open Grid Forum (OGF)- Object Management Group (OMG)- Storage Networking Industry Association (SNIA)- Cloud Computing Interoperability Forum (CCIF)- Vertical Groups.

#### **Unit 4:**

Desktop and Device Management- Introduction- Objectives, Desktop Virtualization- Across Industries- Client Desktops, Desktop placement in the cloud- Merits- Desktop as a Service (DaaS), Desktop Management- Watching the four areas- Asset Management.

Cloud Governance-Introduction-objectives, IT Governance, Deciding the Governor, Risk Assessment of running the cloud- Understanding possible risks- Performance monitoring and measurement- Measurement Methods, Working of Governance- Establishment of the Governance Body- IT Service Performance – Monitoring and Measuring- Cataloging control and Compliance Data.

#### **Unit 5:**

Migrating to the Cloud- Introduction- Objectives, Cloud Services for individuals- Available Services - Skytap Solution, Cloud Services Aimed at the mid – market, Enterprise Class Cloud Offerings- MS Exchange - VMotion- VMWare vCenter Converter- Hyper – V Live Migration, Migration- Applications needed for migration - Moving existing data to cloud- Using the Wave approach.

Migrating to the Cloud- Introduction- Objectives, Analyzing the Services- Establishing a Baseline and Metrics- Tools, Best Practices- Finding the Right vendor- Phased-in Vs Flash-cut Approaches- Bringing in Creativity, How Cloud computing might evolve- Researcher Predictions- Responding to Changes- Getting ready.

**Course Outcomes** a. Analyze the trade-offs between deploying applications in the cloud and over the local infrastructure. b. Compare the advantages and disadvantages of various cloud computing platforms. c. Deploy applications over commercial cloud computing infrastructures such as Amazon Web Services, Windows Azure, and Google AppEngine. d. Program data intensive parallel applications in the cloud. e. Analyze the performance, scalability, and availability of the underlying cloud technologies and software. f. Identify security and privacy issues in cloud computing. g. Explain recent research results in cloud computing and identify their pros and cons. h. Solve a real-world problem using cloud computing through group collaboration.

<b>BCSE-623</b>	Computer Graphics	3L:0P:0T	3 Credit
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**Objective:**

1. To develop an understanding of computer graphics, transformation,
2. To develop an understanding of curves and surface, Three dimensional , 3 D object representation

**Detailed content**

**Unit 1:**

Introduction and Line Generation: Types of computer graphics, Graphic Displays- Random scan displays, Raster scan displays, Frame buffer and video controller, Points and lines, Line drawing algorithms, Circle generating algorithms, Mid point circle generating algorithm, and parallel version of these algorithms.

**Unit 2:**

Transformations: Basic transformation, Matrix representations and homogenous coordinates, Composite transformations, Reflections and shearing. Windowing and Clipping: Viewing pipeline, Viewing transformations, 2-D Clipping algorithms Line clipping algorithms such as Cohen Sutherland line clipping algorithm, Liang Barsky algorithm, Line clipping against non rectangular clip windows; Polygon clipping – Sutherland Hodgeman polygon clipping, Weiler and Atherton polygon clipping, Curve clipping, Text clipping.

**Unit 3:**

Three Dimensional: 3-D geometric primitives, 3-D Object representation, 3-D Transformation, 3-D viewing, projections, 3-D Clipping.

**Unit 4:**

Curves and Surfaces: Quadric surfaces, Spheres, Ellipsoid, Blobby objects, Introductory concepts of Spline, Bspline and Bezier curves and surfaces. Hidden Lines and Surfaces: Back Face Detection algorithm, Depth buffer method, A- buffer method, Scan line method

**Unit 5:**

basic illumination models – Ambient light, Diffuse reflection, Specular reflection and Phong model, Combined approach, Warn model, Intensity Attenuation, Color consideration, Transparency and Shadows.

**Course Outcome :**

Drawing of images , Making of 3 D Images , Working of different shaped images.

**References:**

1. Donald Hearn and M Pauline Baker, “Computer Graphics C Version”, Pearson Education
2. Amrendra N Sinha and Arun D Udai,” Computer Graphics”, TMH

## OPEN ELECTIVE I:

BCSE-001	Soft Skills & Interpersonal Communication	0L:0T:4 P	
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### Course Objectives:

- 1) To help the students in building interpersonal skills.
- 2) To develop skill to communicate clearly.
- 3) To enhance team building and time management skills.
- 4) To learn active listening and responding skills.

### Course Outcomes:

On completion of the course, learner will be able to:

- 1) Make use of techniques for self-awareness and self-development.
- 2) Apply the conceptual understanding of communication into everyday practice.
- 3) Understand the importance of teamwork and group discussions skills.
- 4) Develop time management and stress management.
- 5) Apply business etiquette skills effectively an engineer requires.

### UNIT- I:

Self Awareness & Self Development :

Self Assessment ,Self evaluation , Self discipline , Self Appraisal ,Self-Awareness ,Self criticism ,Self-Esteem ,Positive thinking ,Thoughtfulness and responsible approach ,Perceptions And Attitudes ,Values And Belief Systems ,General Etiquettes

### UNIT- II:

Personal success factors:

Swot analysis ,Handling Failure ,Knowing yourself ,Identifying one's strength and failures ,Importance Of First Impression

### Unit- III:

Managing self :

Emotions ,Ego ,Pride ,Stress ,Achievements ,Confidence improvement ,Johari's Window ,Complex problem solving and creativity ,Recognition of one's own limitations and deficiencies ,Determining How Well You Perceive What's Going On Around You ,Interpersonal Skills And ,Communication Skills ,Learning About Commitment And ,How To Move Things Forward ,Making Key Decisions ,Handling Your And Other People's Stress ,Empowering, Motivating And ,Inspiring Others ,Leading By Example ,Effective Feedback

**Unit- IV:**

Ethics in engineering practice and research :

Introduction to ethical reasoning & ,Engineering ethics ,Rights and responsibilities regarding intellectual property ,Workplace rights and responsibilities ,Central professional responsibilities of engineers ,Responsibilities for environment and society

**Text Books:**

1. Communication Skills by Sanjay Kumar and Pushpa Lata, Oxford University Press.
2. Developing Communication Skill by Krishna Mohan, Meera Banerji, McMillan India Ltd.
3. English for Business Communication by Simon Sweeney, Cambridge University Press.

**Reference Books:**

1. Ethics in Engineering Practice and Research by Caroline & Whitbeck, Cambridge University Press.
2. NASSCOM-Global Business Foundation Skills: Accenture, Convergys, Dell et.al. Foundation Books: Cambridge University Press.
3. Thinks and Grow Rich by Napoleon Hill, Ebury Publishing, ISBN 9781407029252.
4. Awaken the Giant Within by Tony Robbins HarperCollins Publishers, ISBN139780743409384.

<b>BCSE-002</b>	Human Resource Development & Organizational Behavior	3L:0P:0T	3 Credit
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### **Course Objectives**

1. Objective of the course is to give a basic perspective of Management theories and Practices.
2. This will form foundation to study other functional areas of management and to
3. Provide the students with the conceptual framework and the theories underlying
4. Organizational Behavior.

### **Unit 1**

Role of Management – Concept – Significance – Functions – principles of Management - Patterns of

Management: Scientific – Behavioral – Systems – Contingency

### **Unit 2**

Decision Making & Controlling – Process – Techniques. Planning – Process – Problems — Making It

Effective. Controlling - System of Controlling – Controlling Techniques – Making Controlling

Effective

### **Unit 3**

Organizational Behavior – Introduction to OB – Organizing Process – Departmentation Types –

Making Organizing Effective - Understanding Individual Behavior – Perception – Learning –

Personality Types – Johor window- Transactional Analysis

### **Unit 4**

Group Dynamics & Motivation – Benefits of Groups – Types of Groups – Group Formation and

Development, Motivation – Concept of Motivation - Motivational Theories of Maslow, Herzberg,

David McClelland, and Porter and Lawler

### **Unit 5**

Leadership and Organizational Culture and Climate: Leadership – Traits Theory – Managerial Grid –

Transactional Vs Transformational Leadership – Qualities of good Leader, Change Management –Organizational Behavior – Introduction to OB – Organizing Process – Departmentation Types –

Making Organizing Effective - Understanding Individual Behavior – Perception – Learning – Personality Types – Johor window- Transactional Analysis

### **Outcomes**

1. Demonstrate an understanding of the forces that shape the business and economic structure
2. Explain why business ethics is an integral part of every business organization.
3. Understand the business and related factors; and business's dependency on the interactions with different environmental variables.
4. Develop analytical skills and widen the understanding of macro environmental issues by applying the knowledge of macroeconomic policies and their impact on business organization and strategy

### **Text/Reference Books:**

1. Organizational Behavior, Stephen P. Robbins, Pearson Education
2. Organizational Behaviour, S.S.Khanka, S.Chand
3. Organizational Behavior , Mishra .M.N ,Vikas

<b>BHU-501</b>	Humanities II	3L:0P:0T	3 Credit
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### **Course Objectives:**

- 1.To help the students to understand the importance and types of relationship with expressions.
2. To develop the competence to think about the conceptual framework of undivided society as well as universal human order.
3. To help the students to develop the exposure for transition from current state to the undivided society and universal human order.

### **Unit-1**

**Introduction to the course:** Basic aspiration of a Human Being and program for its fulfillment, Need for family and relationship for a Human Being, Humanhuman relationship and role of behavior in its fulfillment, Human-rest of Nature relationship and role of work in its fulfillment, Comprehensive Human Goal, Need for Undivided Society, Need for Universal Human Order, an appraisal of the Current State, Appraisal of Efforts in this Direction in Human History.

### **unit-2**

**Understanding Human-Human Relationship & its fulfillment:** Recognition of Human-Human Relationship, Recognition of feelings in relationship, Established Values and Expressed Values in Relationship, interrelatedness of feelings and their fulfillment, Expression of feelings, Types of relationship and their purpose, mutual evaluation in relationship, Meaning of justice in relationship, Justice leading to culture, civilization and Human Conduct.

### **Unit-3**

**Justice from family to world family order:** Undivided Society as continuity and expanse of Justice in behavior – family to world family order, continuity of culture and civilization, Universal Order on the basis of Undivided Society, Conceptual Framework for Universal human order, Universal Human Order as continuity and expanse of order in living: from family order to world family order, a conceptual framework for universal human order.

### **Unit-4**

**Program for Ensuring Undivided Society and Universal Human Order:** Education – Sanskar, Health – Sanyam, Production-work, Exchange – storage, Justice-preservation.

### **Unit-5**

**Human Tradition:** Scope and Steps of Universal Human Order, Human Tradition ( Ex. Family order to world family order), Steps for transition from the current state, Possibilities of participation of students in this direction, Present efforts in this direction, Sum up.

### **Text books:**

1. Avartansheel Arthshastra, A. Nagraj, Divya Path Sansthan, Amarkantak, India.
2. Toward a True Kinship of Faiths: How the World's Religions Can Come Together Dalai Lama XIV, 2011.

3. .Science & Humanism – towards a unified worldview, P. L. Dhar & R. R. Gaur (1990), Commonwealth Publishers, New Delhi
4. Lohiya Ke Vichar, Lok Bharti , Rammanohar Lohiya, 2008.
5. Energy and Equity, Ivan Illich (1974), The Trinity Press, Worcester & Harper Collins, USA.
6. Manaviya Sanvidhan, A. Nagraj, Divya Path Sansthan, Amarkantak, India