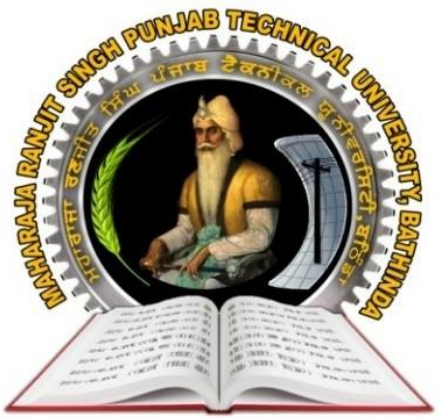
# Maharaja Ranjit Singh Punjab Technical University
# Bathinda-151001




## FACULTY OF ENGINEERING & TECHNOLOGY

## SYLLABUS

## FOR

### B.TECH. COMPUTER SCIENCE & ENGINEERING
### (ARTIFICAL INTELLIGENCE AND MACHINE LEARNING)

**(4 YEARS PROGRAMME)**

**2022 BATCH ONWARDS**

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## GROUP-A
## 1ST SEMESTER

| Course | | Contact Hrs. | | | Marks | | | Credits |
|---|---|---|---|---|---|---|---|---|
| Code | Name | L | T | P | Internal | External | Total | |
| BPHYS1-101 | Physics (Semiconductor Physics) | 3 | 1 | 0 | 40 | 60 | 100 | 4 |
| BMATH1-101 | Mathematics-I (Calculus, Linear Algebra) | 3 | 1 | 0 | 40 | 60 | 100 | 4 |
| BMECE0-101 | Engineering Graphics & Design | 2 | 0 | 0 | 40 | 60 | 100 | 2 |
| BELEE0-101 | Basics Electrical Engineering | 3 | 1 | 0 | 40 | 60 | 100 | 4 |
| BPHYS1-102 | Physics (Semiconductor Physics) Lab. | 0 | 0 | 2 | 60 | 40 | 100 | 1 |
| BMECE0-102 | Engineering Graphics & Design Lab. | 0 | 0 | 6 | 60 | 40 | 100 | 3 |
| BELEE0-102 | Basics Electrical Engineering Lab. | 0 | 0 | 2 | 60 | 40 | 100 | 1 |
| BMNCC0-004 | Drug Abuse: Problem, Management and Prevention | 2 | 0 | 0 | 100 | 0 | 100 | 0 |
| BMNCC0-010 | Universal Human values – I | 22 hrs (to be completed during 21 days SIP)* | | | Satisfactory/ Unsatisfactory | | | 0 |
| ZZZZZ | Introduction to Concerned Branch of Engineering | 2 | 0 | 0 | 100 | 0 | 100 | 0 |
| Total | | 15 | 3 | 10 | 540 | 360 | 900 | 19 |

**Note:**

1. There will be Induction Programme of 3 weeks before start of normal classes.
2. Drug Abuse: Problem, Management and Prevention and Introduction to Concerned Branch of Engineering are non-credit Courses; however, it is necessary to secure atleast E grade in each of them.

*** As per AICTE SIP Manual Hour Plan available at http://fdp-si.aicte-india.org**

## 2ND SEMESTER

| Course | | Contact Hrs. | | | Marks | | | Credits |
|---|---|---|---|---|---|---|---|---|
| Code | Name | L | T | P | Internal | External | Total | |
| BCHEM0-101 | Chemistry-I | 3 | 1 | 0 | 40 | 60 | 100 | 4 |
| BMATH1-201 | Mathematics-II (Probability and Statistics) | 3 | 1 | 0 | 40 | 60 | 100 | 4 |
| BHUMA0-101 | English | 2 | 0 | 0 | 40 | 60 | 100 | 2 |
| BCSCE0-101 | Programming for Problem Solving | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| BCHEM0-102 | Chemistry-I Lab. | 0 | 0 | 2 | 60 | 40 | 100 | 1 |
| BHUMA0-102 | English Lab. | 0 | 0 | 2 | 60 | 40 | 100 | 1 |
| BCSCE0-102 | Programming for Problem Solving Lab. | 0 | 0 | 4 | 60 | 40 | 100 | 2 |
| BMFPR0-101 | Manufacturing Practices | 1 | 0 | 4 | 60 | 40 | 100 | 3 |
| Total | | 12 | 2 | 12 | 400 | 400 | 800 | 20 |

**Note:**

1. Marks of 4 Week Manufacturing Practices Training during Summer Vacation will beincluded in 3rdSemester

## (3rd SEMESTER)

| Course | | Contact Hrs. | | | Marks | | | Credits |
|---|---|---|---|---|---|---|---|---|
| **Code** | **Name** | **L** | **T** | **P** | **Int.** | **Ext.** | **Total** | |
| **BMATH1-301** | Calculus and Ordinary Differential Equation | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| **BCSES1-301** | Computer Peripherals & Interfaces | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| **BCSES1-302** | Data structure &Algorithms | 3 | 1 | 0 | 40 | 60 | 100 | 4 |
| **BCSES1-303** | Digital Electronics | 3 | 1 | 0 | 40 | 60 | 100 | 4 |
| **BCSES1-304** | Data structure & Algorithms Laboratory | 0 | 0 | 4 | 60 | 40 | 100 | 2 |
| **BCSES1-305** | Digital Electronics Laboratory | 0 | 0 | 2 | 60 | 40 | 100 | 1 |
| **BCSES1-306** | IT Workshop (SciLab / MATLAB) Laboratory | 0 | 0 | 4 | 60 | 40 | 100 | 2 |
| **BCSES1-307** | Training-I* | - | - | - | 60 | 40 | 100 | 3 |
| **BHSMC0-007** | Development of Societies | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| **BMNCC0-052** | The Maharaja of People | 2 | 0 | 0 | 100 | - | 100 | 0 |
| **Total 6 Theory & 3 Lab. Courses** | | **17** | **2** | **10** | **540** | **460** | **1000** | **25** |

***NOTE:** Training after the 2nd Semester.

## (4th SEMESTER)

| Course | | Contact Hrs. | | | Marks | | | Credits |
|---|---|---|---|---|---|---|---|---|
| **Code** | **Name** | **L** | **T** | **P** | **Int.** | **Ext.** | **Total** | |
| **BMATH1-401** | Discrete Mathematics | 3 | 1 | 0 | 40 | 60 | 100 | 4 |
| **BCSES1-401** | Computer Organization &Architecture | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| **BCSES1-402** | Operating Systems | 3 | 1 | 0 | 40 | 60 | 100 | 4 |
| **BCSES1-403** | Object Oriented Programming | 3 | 1 | 0 | 40 | 60 | 100 | 4 |
| **BCSES1-404** | Operating Systems Laboratory | 0 | 0 | 2 | 60 | 40 | 100 | 1 |
| **BCSES1-405** | Object Oriented Programming Laboratory | 0 | 0 | 4 | 60 | 40 | 100 | 2 |
| **BHSMC0-016** | Organizational Behaviour | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| **BHSMC0-026** | Universal Human values – II Understanding Harmony | 2 | 1 | 0 | 40 | 60 | 100 | 3 |
| **Total 6 Theory & 2 Lab. Courses** | | **17** | **4** | **06** | **360** | **440** | **800** | **24** |

**(5th SEMESTER)**

| Course | | Contact Hrs. | | | Marks | | | Credits |
|---|---|---|---|---|---|---|---|---|
| **Code** | **Name** | **L** | **T** | **P** | **Int.** | **Ext.** | **Total** | |
| **BCSES2-501** | Introduction To Machine Learning | 3 | 1 | 0 | 40 | 60 | 100 | 4 |
| **BCSES2-502** | Database Management System | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| **BCSES2-503** | Artificial Intelligence | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| **BCSES2-504** | Design & Analysis of Algorithms | 3 | 1 | 0 | 40 | 60 | 100 | 4 |
| **BCSES2-505** | Database Management System Laboratory | 0 | 0 | 2 | 60 | 40 | 100 | 1 |
| **BCSES2-506** | Machine Learning Laboratory | 0 | 0 | 4 | 60 | 40 | 100 | 2 |
| **BCSES2-507** | Training-II* | - | - | - | 60 | 40 | 100 | 4 |
| | **Departmental Elective-I** | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| **BCSED2-511** | Compiler Design | | | | | | | |
| **BCSED2-512** | Formal Language And Automata Theory | | | | | | | |
| **BCSED2-513** | Web Technologies | | | | | | | |
| **BCSED2-514** | Java Programming | | | | | | | |
| **BHSMC0-015** | Finance & Accounting | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| **Total 6 Theory & 2 Lab. Courses** | | **-** | **-** | **-** | **420** | **480** | **900** | **27** |

***NOTE:** During the summer vacation after 4th

**(6th SEMESTER)**

| Course | | Contact Hrs. | | | Marks | | | Credits |
|---|---|---|---|---|---|---|---|---|
| **Code** | **Name** | **L** | **T** | **P** | **Int.** | **Ext.** | **Total** | |
| **BCSES2-601** | Software Engineering | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| **BCSES2-602** | Deep Learning | 3 | 1 | 0 | 40 | 60 | 100 | 4 |
| **BCSES2-603** | Deep Learning Laboratory | 0 | 0 | 2 | 60 | 40 | 100 | 1 |
| **BCSES2-604** | ***Project-I | 0 | 0 | 4 | 60 | 40 | 100 | 2 |
| | **Departmental Elective-II (Select any One)** | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| **BCSED2-611** | Mobile Application Development | | | | | | | |
| **BCSED2-612** | Computer Graphics | | | | | | | |
| **BCSED2-613** | Natural Language Processing | | | | | | | |
| **BCSED2-614** | Computer Networks | | | | | | | |
| | **Departmental Elective-III (Select any One)** | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| **BCSED2-621** | Data Mining | | | | | | | |
| **BCSED2-622** | Data and Visual analytics in AI | | | | | | | |
| **BCSED2-623** | Human Computer Interaction | | | | | | | |
| **BCSED2-624** | Embedded Systems | | | | | | | |
| **XXXX** | **Open Elective**** | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| **Total 5 Theory & 2 Lab. Courses** | | **-** | **-** | **-** | **320** | **380** | **700** | **19** |

**** Open Elective Subject may be chosen from the list of open elective offered by other departments of university**

**(7th SEMESTER)**

| Course | | Contact Hrs. | | | Marks | | | Credits |
|---|---|---|---|---|---|---|---|---|
| **Code** | **Name** | **L** | **T** | **P** | **Int.** | **Ext.** | **Total** | |
| **BCSES2-701** | * Project-II | 0 | 0 | 4 | 60 | 40 | 100 | 2 |
| **BCSES2-702** | ***Training-III | - | - | - | 60 | 40 | 100 | 4 |
| | **Departmental Elective-IV (Select any One)** | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| **BCSED2-711** | Advanced ML | | | | | | | |
| **BCSED2-712** | Soft Computing | | | | | | | |
| **BCSED2-713** | Parallel Processing | | | | | | | |
| **BCSED2-714** | Ad-hoc & Sensor Networks | | | | | | | |
| | **Departmental Elective-V (Select any One)** | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| **BCSED2-721** | Bioinformatics | | | | | | | |
| **BCSED2-722** | Image processing | | | | | | | |
| **BCSED2-723** | Cryptography & Network Security | | | | | | | |
| **BCSED2-724** | Optimization Techniques in ML | | | | | | | |
| **XXXX** | **Open Elective**** | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| **BMNCC0-002** | Environmental Sciences | 2 | 0 | 0 | 100 | 00 | 100 | 0 |
| | **Mandatory Courses- noncredit****** | 2 | 0 | 0 | 100 | 00 | 100 | 0 |
| **BMNCC0-001** | Constitution of India | | | | | | | |
| **BMNCC0-006** | Essence of Indian Knowledge Tradition | | | | | | | |
| **Total** | | **-** | **-** | **-** | **440** | **260** | **700** | **15** |

* Open Elective Subject may be chosen from the list of open elective offered by other departments of university
****Continued from VII Semester, Project work, seminar and internship in industry or at appropriate work place
*****During the summer vacation after 6th semester.
***choose any one subject from mandatory Courses.

**(8th SEMESTER)**

| Course | | Contact Hrs. | | | Marks | | | Credits |
|---|---|---|---|---|---|---|---|---|
| **Code** | **Name** | **L** | **T** | **P** | **Int.** | **Ext.** | **Total** | |
| **BCSES2-801** | Project-III** | 0 | 0 | 10 | 60 | 40 | 100 | 5 |
| | **Departmental Elective-VI** | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| **BCSED2-811** | Enterprise Resource Planning | | | | | | | |
| **BCSED2-812** | Internet of things | | | | | | | |
| **BCSED2-813** | Cloud Computing | | | | | | | |
| **BCSED2-814** | Software Project Management | | | | | | | |
| **XXXX** | **Open Elective*** | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| **XXXX** | **Open Elective*** | 3 | 0 | 0 | 40 | 60 | 100 | 3 |
| **Total** | | **-** | **-** | **-** | **180** | **220** | **400** | **14** |

* Open Elective Subject may be chosen from the list of open elective offered by other departments of university
**Project III to be made by student during the semester.

## PHYSICS (SEMICONDUCTOR PHYSICS)

**Subject Code: BPHYS1-101** **L T PC** **Duration: 38Hrs.**
**3 1 0 4**

**Course Outcomes**

1. Understanding of Quantum theory, Electronic Material, Semiconductors and Light-Semiconductor Interactions and Fiber Optics Communication.
2. Skill enhancement to solve numerical problems related with Quantum theory, Electronic Material, Semiconductors and Light- Semiconductor Interactions and Fiber Optics Communication.
3. Apply knowledge of Quantum theory, Electronic Material, Semiconductors and Light-Semiconductor Interactions and Fiber Optics Communication to go for higher studies in diverse fields.
4. To inculcate and develop the ability to think abstractly.

### UNIT-I

**Quantum Theory: (10 Hrs.)**
Need and origin of Quantum Concept, Wave-particle duality, Matter waves, Group and Phase velocities, Concept of Uncertainty Principle and its application: nonexistence of electron in the nucleus, wave function & its significance, normalization of wave function, Schrodinger wave equation: time independent and dependent, Eigen functions & Eigen values, particle ina box in 1-D. Concept of scattering from a potential barrier and tunneling.

### UNIT-II

**Electronic Materials: (8 Hrs.)**
Free electron theory, Density of states and energy band diagrams, Introduction to bandgap theory, Direct and in direct and gaps. Types of electronic materials: metals, semiconductors and insulators, Occupation probability, Fermi level, Effective mass, phonons.

### UNIT-III

**Semiconductors and Light- Semiconductor Interactions: (12 Hrs.)**
Intrinsic and extrinsic semiconductors, Dependence of Fermi level on carrier- concentration and temperature (equilibrium carrier statistics), Carrier generation and recombination, Carrier transport: diffusion and drift, p-n junction, Metal-semiconductor junction (Ohmic and Schottky), Semiconductor materials of interest for optoelectronic devices. Optical transitions in bulk semiconductors: absorption, spontaneousemission, and stimulated emission; Lasers: principles and working of laser: population inversion, pumping, types of lasers with emphasis on the semi-conductor Lasers.

### UNIT-IV

**Fibre Optics Communication: (8 Hrs.)**
Introduction and importance of use of optical fibres in data transmission, optical fibre as a dielectric wave guide: total internal reflection, numerical aperture and various fibre parameters, losses associated with optical fibres, step and graded index fibres, applications of optical fibres.

**Recommended Books:**

1. Satayaparkash, 'Quantum Mechanics'.
2. A. Ghatak and Lokanathan, 'Quantum Mechanics'.
3. J. Singh, 'Semiconductor Optoelectronics: Physics and Technology', McGraw HillInc.,1995.
4. S.M. Sze, 'Semiconductor Devices: Physics and Technology', Wiley, **2008**.
5. A. Yariv and P. Yeh, 'Photonics: Optical Electronics in Modern Communications', Oxford University Press, New York, **2007**.
6. P. Bhattacharya, 'Semiconductor Optoelectronic Devices', Prentice Hall of India, **1997**.
7. M R Shenoy, 'Online Course: Semiconductor Optoelectronics', NPTEL.
8. Monica Katiyar and Deepak Gupta, 'Online Course: Optoelectronic Materials and

Devices', NPTEL.
9. Ben. G. Streetman, 'Solid State Electronics Devices', Pearson PrenticeHall.

## MATHEMATICS-I (CALCULUS, LINEARALGEBRA)

**Subject Code: BMATH1-101** **L T PC** **Duration: 46Hrs.**
**3 1 0 4**

**Course Outcomes:**

The objective of this course is to familiarize the prospective engineers with techniques in calculus, multivariate analysis and linear algebra. It aims to equip the students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling more advanced level of mathematics and applications that they would find useful in their disciplines.

The students will learn:

1. To apply differential and integral calculus to notions of curvature and to improper integrals. Apart from some other applications they will have a basic understanding of Beta and Gamma functions.
2. The fallouts of Rolle's Theorem that is fundamental to application of analysis to Engineering problems.
3. The tool of power series and Fourier series for learning advanced EngineeringMathematics.
4. To deal with functions of several variables that are essential in most branches of engineering.
5. The essential tool of matrices and linear algebra in a comprehensive manner.

### UNIT–I

**Calculus: (12 Hrs.)**

Rolle's Theorem, Mean value theorems, Taylor's and Maclaurin theorems with remainders; indeterminate forms and L' Hospital's rule; Maxima and minima. Evaluation of definite and improper integrals; Beta and Gamma functions and their properties; Applications of definite integrals to evaluate surface areas and volumes of revolutions.

### UNIT –II

**Sequences and Series: (10 Hrs.)**

Convergence of sequence and series, tests for convergence (Comparison test, Ratio test, Raabe's test, Logarithmic test, Cauchy's root test, Cauchy's Integral test, series of positive and negative terms); Power series, Taylor's series, series for exponential, trigonometric and logarithm functions.

### UNIT –III

**Multivariable Calculus: (12 Hrs.)**

Limit, continuity and partial derivatives, total derivative; Tangent plane and normal line; Maxima, minima and saddle points; Method of Lagrange multipliers; Gradient, curl and divergence: Geometrical interpretation and basic properties, Directional derivative.

### UNIT –IV

**Linear Algebra: (12 Hrs.)**

Inverse and rank of a matrix, rank-nullity theorem; System of linear equations; Symmetric, skew-symmetric and orthogonal matrices; Determinants; Eigenvalues and eigenvectors; Diagonalization of matrices; Cayley-Hamilton Theorem, and Orthogonal transformation.

**Recommended Books:**

1. G.B. Thomas and R.L. Finney, 'Calculus and Analytic Geometry', 9th Edn., Pearson, Reprint, **2002**.
2. Erwin Kreyszig, 'Advanced Engineering Mathematics', 9th Edn, John Wiley & Sons,**2006**.
3. T.Veerarajan,'EngineeringMathematicsforFirstYear',TataMcGrawHill,NewDelhi, **2008.**
4. B.V. Ramana, 'Higher Engineering Mathematics', 11th Reprint, Tata McGraw Hill, New Delhi,**2010**.
5. D. Poole, 'Linear Algebra: A Modern Introduction', 2nd Edn., Brooks/Cole,**2005**.
6. B.S. Grewal, 'Higher Engineering Mathematics', 36th Edn., Khanna Publishers, **2010**.

## ENGINEERING GRAPHICS &DESIGN

**Subject Code: BMECE0-101** **L T P C** **Duration: 30 Hrs.**
**2 0 0 2**

**Course Objective**

1 To understand the concept of Engineering drawing, Drawing instruments, Graphic standards and its application in Engineering.
2 To develop Skills in Preparation of Basic Drawings.
3 To develop Skills in Reading and Interpretation of Engineering Drawings.
4 Understand the concept of projection and acquire visualization skills
5 To prepare the student to communicate effectively.
6 To understand the concept of 2D and 3D drawings

**Course Outcomes**

1 Knowledge of Engineering drawing, drawing instruments and application .
2 Exposure to preparation of simple drawings
3 Inculcate the Concept of 2D and 3D and the related drawings
4 Exposure to creating working drawings
5 Exposure to improved communication and ability to visualize objects

**1.** Introduction
Engineering Drawing/Engineering Graphics/Technical Drawing - a Visual Science. Types of Engineering Drawing, Introduction to drawing equipment and use of instruments. Symbols and conventions in drawing Practice. Types of lines and their use, BIS codes for lines, Technical lettering as per BIS codes, Introduction to Dimensioning, Concepts of scale in drawing, Types of scales. Basic Definition of geometrical objects: Points, lines, planes and solids.

**2.** Theory of Projections - Relevance of projection, Type of projections, Perspective, Orthographic, Axonometric and their basic principles, System of orthographic projection: in reference to quadrants and octants, illustration through simple problems of projection.

**3.** Projection of Points- Projection of points in quadrants and octants. Projection of point on Auxiliary planes.

**4.** Projection of Lines -Parallel to both H P and V P, Parallel to one and inclined to other, and inclined to both, contained in profile plane. True length and angle orientation of straight line: rotation method and auxiliary plane method. Distance between two nonintersecting lines, and trace of line.

**5.** Projection of Planes- Difference between plane and lamina. Projection of lamina Parallel to one and perpendicular to other, Perpendicular to one and inclined to other, Inclined to both reference planes, and Lamina oblique to three reference planes. Application of auxiliary planes, and trace of planes.

**6.** Projection of Solids- Definition of solids, types of solids, and elements of solids. Projection of solids in first or third quadrant, with axis parallel to one and perpendicularto other, axis parallel to one inclined to other, axis inclined to both the principle plane, axis perpendicular to profile plane and parallel to both H P and V P. Visible and invisible details in the projection. Use rotation and auxiliary plane method to draw the projections.

7. Section of Solids Definition of Sectioning and its purpose. Procedure of Sectioning, Types of sectional planes. Illustration through examples.

8. Development of Surface Purpose of development, Parallel line, radial line and triangulation method. Development of prism, cylinder, cone and pyramid surface for bothright angled and oblique solids, and development of surface of sphere.

9. Isometric Projection Classification of pictorial views, Basic Principle of Isometric projection, Difference between isometric projection and isometric drawing. Isometric projection of solids such as cube, prism, pyramid and cylinder, and assignments on isometric projection of simple machine parts.

10. Orthographic Projection Review of principle of Orthographic Projection, Sketch/drawingof blocks, and of simple machine parts.

**Recommended Text/Reference Books**

1. N.D. Bhatt, V.M. Panchal& P.R. Ingle, 'Engineering Drawing', Charotar Publishing House, 2014.
2. M.B. Shah & B.C. Rana, 'Engineering Drawing and Computer Graphics', Pearson Education, 2008.
3. B. Agrawal& C.M. Agrawal, 'Engineering Graphics', TMH Publication, 2012.
4. K.L. Narayana& P. Kannaiah, 'Text book on Engineering Drawing', Scitech Publishers,2008.

## BASIC ELECTRICAL ENGINEERING

**Subject Code: BELEE0-101** **L T PC** **Duration: 42Hrs.**
**3 1 0 4**

**Course Outcomes:**

1. To understand and analyze basic DC and AC circuits.
2. To study the use and working principle of single phase transformers.
3. To study the application and working principles of three phase and single phase induction motors.
4. To introduce to the components of low voltage electrical installations.

### UNIT-1

**DC Circuits: (8 Hrs.)**
Electrical circuit elements (R, L and C), voltage and current sources, Ohm's law, Kirchhoff current and voltage laws, analysis of simple circuits with dcexcitation Superposition, Thevenin and Norton Theorems. Step response of RL, RC circuits.

### UNIT-2

**AC Circuits: (12 Hrs.)**
Representation of sinusoidal waveforms, average, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC series and parallel combinations, series and parallel resonance. Three phase voltage source, phase sequence, three phase balanced circuits, voltage and current relations in star and delta connections.

### UNIT-3

**Transformers: (10 Hrs.)**
Magnetic materials, BH characteristics, Single-phase Transformer, no load and full load

conditions,phasordiagrams,equivalentcircuit,calculationoflossesintransformers,regulation and efficiency, Auto-transformers, their applications and comparison with two winding transformers.

**UNIT-4**

**Electrical Machines: (8 Hrs.)**

Generation of rotating magnetic fields, Construction and working of a three-phase induction motor, Direct-On-Line and Star-Delta starters**.** Construction and working of single-phase motors(Splitphase,shadedpole,capacitorstart,capacitorrun,capacitorstartandrunmotors).

**Electrical Installations: (4Hrs.)**

Components of LT Switchgear: Switch Fuse Unit (SFU), Miniature Circuit Breaker (MCB), Earth Leakage Circuit Breaker (ELCB), Moulded Case Circuit Breaker (MCCB), Types of Wiring, Earthing.

**Recommended Books:**

1. D.P. Kothari and I.J. Nagrath, 'Basic Electrical Engineering', Tata McGraw Hill,**2010**.
2. D.C. Kulshreshtha, 'Basic Electrical Engineering', McGraw Hill,**2009**.
3. L.S. Bobrow, 'Fundamentals of Electrical Engineering', Oxford University Press,**2011**.
4. E. Hughes, 'Electrical and Electronics Technology', Pearson,**2010**.
5. V.D. Toro, 'Electrical Engineering Fundamentals', Prentice Hall, India,**1989**.
6. J.P.S. Dhillon. J.S. Dhillon and D. Singh, 'Principles of Electrical & Electronics Engineering', Kalyani Publishers, New Delhi, **2005**.

## PHYSICS (SEMICONDUCTOR PHYSICS) LAB.

**Subject Code: BPHYS1-102** **L T P C**
**0 0 2 1**

**Course Outcomes:**

1. Able to verify the concepts/laws of basic quantum Semiconductors and electronics.
2. To inculcate and develop scientific aptitude by performing the various experiments.
3. Skill enhancement by solving experimental problems.
4. To inculcate the spirit of teamwork.

**Note: Students will have to perform at least 10 experiments from the given topic/list.**

**Experiments based on Semiconductor Physics:**

1. To study the V-I characteristic of different PN junction diode-Ge andSi.
2. To study the V-I characteristic of Zenerdiode.
3. To study the V-I characteristic of LED.
4. To analyze the suitability of a given Zener diode as a power regulator.
5. To find out the intensity response of a solar cell/Photodiode.
6. To find out the intensity response of a LED.
7. To determine the band gap of a semiconductor.
8. To determine the resistivity of a semiconductor by four probe method.
9. To confirm the de Broglie equation for electrons.
10. To study voltage regulation and ripple factor for a half-wave and a full-wave rectifier without and with different filters.
11. To study the magnetic field of a circular coil carrying current.
12. To find out polarizability of a dielectric substance.
13. To study B-H curve of a ferromagnetic material using CRO.
14. To find out the frequency of AC mains using electric-vibrator.
15. To find the velocity of ultrasound in liquid.
16. To study the Hall effect for the determination of charge current densities.
17. Distinguish between Diamagnetic material, Paramagnetic and ferromagnetic material.

18. Measurement of susceptibility of a liquid or a solution by Quincke's method:
19. AFM experiment to study the sample with the nano-scale objects and measure surface topography with different scales, width and height of nano objects, and force-distance curves.
20. To study the temperature coefficient of Resistance of copper.

**Physics Virtual Lab. Experiments:**

21. To plot the characteristics of thermistor and hence find the temperature coefficient of resistance.
22. To determine the resistivity of semiconductors by Four Probe Method.
23. To study the forward and reverse biased characteristics of PNP and NPN transistors.
24. To study the B-H Curve.
25. To study the Hall effect experiment to determine the charge carrier density.
26. To determine the magnetic susceptibilities of paramagnetic liquids by Quincke's Method.
27. To study the phenomena of magnetic hysteresis and calculate the retentivity, coercivity and saturation magnetization of a material using a hysteresis loop tracer.
28. Verification and design of combinational logic using AND, OR, NOT, NAND and XORgates.

**Note: Any other experiment based on the above mentioned topics may be included.**

## ENGINEERING GRAPHICS & DESIGNLAB.

**Subject Code: BMECE0-102** **L T P C** **Duration: 45 Hrs.**
**0 0 6* 3**

**Course Objective**

1. To have an overview of interactive computer graphics.
2. To learn the various 2D and 3D draw commands for drawing preparation
3. To understand the use of modify commands for making of drawings
4. To learn the dimensioning of drawings
5. To understand the use of the software in different Engineering applications

**Course Outcomes**

1 Understand the basics of computer graphics
2 Expertise to draw 2D and 3D drawings
3 Ability to do editing and dimensioning of drawings
4 Exposure to solid modeling

**1. Overview of Computer Graphics**

Listing the computer technologies that impact on graphical communication, Demonstrating knowledge of the theory of CAD software [such as: The Menu System, Toolbars (Standard, Object Properties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs, Coordinate System), Dialog boxes windows, Shortcut menus (Button Bars), The Command Line (where applicable), The Status Bar, Different methods of zoom as used in CAD, Select and erase objects.; Isometric Views of lines, Planes, Simple and compound Solids];

**2. Customization & CAD Drawing**

Consisting of set up of the drawing page and the printer, including scale settings, Setting up of units and drawing limits; ISO and ANSI standards for coordinate dimensioning and tolerance; Orthographic constraints, Snap to objects manually and automatically; Producing drawings by using various coordinate input entry methods to draw straight lines, Applying various ways of drawing circles;

**3. Annotations, Layering & other Functions**

Applying dimensions to objects, applying annotations to drawings; Setting up and use of

Layers, layers to create drawings, Create, edit and use customized layers; Changing line lengths through modifying existing lines (extend/lengthen); Printing documents to paper using the print command; orthographic projection techniques.

.*Lab work will be performed in two parts:

**(i) Computer Lab (2 hours)** Computer Graphics, CAD Drawing etc.

**(ii) Drawing Hall (04 hours)** Manual practice on drawing sheets of theory content the relevant theory part of Engineering Graphics & Design may also be covered in Lab work.

## BASIC ELECTRICAL ENGINEERING LAB

**Subject Code: BELEE0-102** **L T P C**
**0 0 2 1**

**Course Outcomes:**

1. Get an exposure to common electrical components and their ratings.
2. Make electrical connections by wires of appropriate ratings.
3. Understand the usage of common electrical measuring instruments.
4. Understand the basic characteristics of transformers and electrical induction motors.

### EXPERIMENTS/DEMONSTRATIONS

1. To study basic safety precautions. Introduction and use of measuring instruments – voltmeter, ammeter, multi-meter, oscilloscope. real-life resistors, capacitors and inductors.
2. To verify Ohm's law.
3. To verify Kirchhoff's voltage and current laws.
4. To verify Superposition Theorem.
5. To verify The venin Theorem.
6. To obtain the sinusoidal steady state response of R-L circuit – impedance calculation and verification. Observation of phase differences between current and voltage.
7. To obtain the sinusoidal steady state response of R-C circuit – impedance calculation and verification. Observation of phase differences between current and voltage.
8. To study resonance phenomenon in R-L-C series circuits.
9. To perform open circuit and short circuit test on a single phase transformer and calculate the efficiency.
10. Demonstration of cut-out sections of machines: Induction machine (squirrel cage rotor and slipring arrangement) and single-phase induction machines.
11. To connect, start and reverse the direction of rotation by change of phase-sequence of connectionsof three phase induction motor.
12. To connect, start and reverse the direction of rotation of single-phase induction motor.
13. To demonstrate working of DOL starter for three-phase induction motor.
14. To demonstrate working of star-delta starter for three-phase induction motor.
15. To demonstrate the components of LT switchgear.

## DRUG ABUSE: PROBLEM, MANAGEMENT ANDPREVENTION

**Subject Code: BMNCC0-004** **L T PC** **Duration: 30 Hrs.**
**2 0 0 0**

**Course Outcomes:**

1. Differentiate between physical and psychological dependence of drug abuse.
2. Understanding the consequences of drug abuse.
3. Explain prevention of drug abuse.
4. Identify treatments and management of drug abuse.

### UNIT-I

**Meaning of Drug Abuse:**

Meaning: Drug abuse, Drug dependence and Drug addiction. Nature and extent of drug abuse in India and Punjab.

**UNIT-II**

**Consequences of Drug Abuse:**

Individual: Education, Employment, Income.
Family: Violence.
Society: Crime.
Nation: Law and Order problem.

**UNIT-III**

**Prevention of Drug Abuse:**

Role of Family: Parent-child relationship, Family support, supervision, shipping values, active scrutiny.
School: Counselling, Teacher as role-model, Parent-teacher-health professional coordination, Random testing on students.

**UNIT-IV**

**Treatment and Control of Drug Abuse:**

Medical Management: Medication for treatment and to reduce withdrawal effects.
Psychological Management: Counselling, Behavioural and Cognitive therapy.
Social Management: Family, Group therapy and Environmental intervention.
Treatment: Medical, Psychological and Social Management.
Control: Role of Media and Legislation.

**Recommended Books:**

1. Ram Ahuja, 'Social Problems in India', Rawat Publications, Jaipur, **2003**.
2. 'Extent, Pattern and Trend of Drug Use in India', Ministry of Social Justice and Empowerment, Govt. of India, **2004.**
3. J.A. Inciardi, 'The Drug Crime Connection', Sage Publications, Beverly Hills,**1981**.
4. T. Kapoor, 'Drug Epidemic among Indian Youth', Mittal Publications, New Delhi,**1985**.
5. Kessel, Neil and Henry Walton, 'Alcoholism, Harmond Worth', Penguin Books,**1982**.
6. Ishwar Modi and Shalini Modi, 'Addiction and Prevention', Rawat Publications,Jaipur, **1997.**
7. 'National Household Survey of Alcohol and Drug Abuse', Clinical Epidemiological Unit, All India Institute of Medical Sciences, New Delhi, **2003 &2004**.
8. Ross Coomber and Others, 'Key Concept in Drugs and Society', Sage Publications, New Delhi,**2013**.
9. BhimSain, 'Drug Addiction Alcoholism, Smoking Obscenity', Mittal Publications, New Delhi,**1991**.
10. Ranvinder Singh Sandhu, 'Drug Addiction in Punjab: A Sociological Study', Guru Nanak Dev University, Amritsar,**2009**.
11. Chandra Paul Singh, 'Alcohol and Dependence among Industrial Workers', Shipra,Delhi, **2000**.
12. S. Sussman and S.L. Ames, 'Drug Abuse: Concepts, Prevention andCessation', Cambridge University Press,**2008**.
13. P.S. Verma, 'Punjab's Drug Problem: Contours and Characteristics', Vol. LII, No. 3, P.P. 40-43, Economic and Political Weekly, **2017**.
14. 'World Drug Report', United Nations Office of Drug and Crime,**2016**.
15. 'World Drug Report', United Nations Office of Drug and Crime,**2017**.

## CHEMISTRY-I

**Subject Code: BCHEM0-101** **L T PC** **Duration: 42Hrs.**
**3 1 0 4**

**Course Objectives:**

1. To understand the atomic and & molecular nature of various molecules
2. To understand the band structures
3. To elaborate the applications of spectroscopic techniques
4. To understand the thermodynamic functions and their applications
5. To rationalize periodic properties
6. To understand the concepts of stereochemistry and preparation of organic molecules

**Course Outcomes:**

The concepts developed in this course will aid in quantification of several concepts in chemistry that have been introduced at the 10+2 levels in schools. Technology is beingincreasingly based on the electronic, atomic and molecular level modifications.

Quantum theory is more than 100 years old and to understand phenomena at nanometerlevels, one has to base the description of all chemical processes at molecular levels. Thecourse will enable the student to:

1. Analyze microscopic chemistry in terms of atomic and molecular orbitals and intermolecular forces.
2. Rationalize bulk properties and processes using thermodynamic considerations.
3. Distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques
4. Rationalize periodic properties such as ionization potential, electronegativity, oxidation states and electronegativity.
5. List major chemical reactions that are used in the synthesis of molecules.

### UNIT-I

**1. Atomic and Molecular Structure: (12 Hrs.)**

Bohr Theory of Hydrogen atom, Spectrum of H atom, Sommerfeld extension of Bohr Theory, Particle and wave nature of electron, De-Broglie equation, Aufbau principle, Compton effect, Schrodinger wave equation, Laplacian and Hamiltonian operator, Linear Combination of atomic orbitals. Molecular orbitals of diatomic molecules and Energy level diagrams of homo nuclear and hetero nuclear diatomics. Pi-molecular orbitals of butadiene and benzene and aromaticity. Crystal field theory and the energy level diagrams for transition metal ions and their magnetic properties. Band structure of solids and the role of doping on band structures.

### UNIT-II

**2. Spectroscopic Techniques and Applications: (8 Hrs.)** Principles and selection rules of Electronic spectroscopy and Fluorescence spectroscopy along with their applications. Principles and selection rules of Vibrational and rotational spectroscopy of diatomic molecules and their Applications. Nuclear magnetic resonance up to spin-spin coupling and magnetic resonance imaging.

**3. Intermolecular Forces and Potential Energy Surfaces: (4 Hrs.)**

Ideal gas equation, Ionic, dipolar and van Der Waals interactions. Real gas equation. Equations of state of real gases and critical phenomena. Potential energy surfaces of $H_3$, and HCN

## UNIT-III

**4. Use of Free Energy in Chemical Equilibria: (6 Hrs.)**

Ideal Solution, Non Ideal Solutions, Thermodynamic functions: energy, entropy and free energy. Numerical problems based on entropy and free energies. Free energy and emf. Cell potentials, the Nernst equation and applications. Acid base, oxidation reduction and solubility equilibria. Thermodynamic properties of ideal solutions. Introduction to Electrochemical Corrosion and its mechanism. Use of free energy considerations in metallurgy through Ellingham diagrams.

**5. Periodic Properties: (4 Hrs.)**

Effective nuclear charge, penetration of orbitals, variations of s, p, d and f orbital energies of atoms in the periodic table, electronic configurations, atomic and ionic sizes, ionization energies, electron affinity and electronegativity, polarizability, oxidation states, coordination numbers and geometries, hard soft acids and bases principle

## UNIT-IV

**6. Stereochemistry: (4 Hrs.)**

Representations of 3-dimensional structures, structural isomers and stereoisomers, configurations and symmetry and chirality, enantiomers, diastereomers, optical activity, absolute configurations and conformational analysis of butane. Isomerism in transitional metal compounds.

**7. Organic Reactions and Synthesis of a Drug Molecule: (4 Hrs.)**

Introduction to reactions involving substitution, addition, elimination, oxidation, reduction, cyclization and ring openings. Synthesis of a commonly used drug molecule – β lactum, Paracetamol, Chloroquine and Aspirin

**Recommended Books:**

1. B.H. Mahan, 'University Chemistry'.
2. M.J. Sienko and R.A. Plane 'Chemistry: Principles and Applications'.
3. C.N. Banwell, 'Fundamentals of Molecular Spectroscopy'.
4. B.L. Tembe, Kamaluddin and M.S. Krishnan, 'Engineering Chemistry (NPTEL Web-book)
5. P.W. Atkins, 'Physical Chemistry'.
6. K.P.C. Volhardt and N.E. Schore 'Organic Chemistry: Structure and Function', 5th Edn.,http://bcs.whfreeman.com/vollhardtschore5e/default.asp

## MATHEMATICS-II (PROBABILITY AND STATISTICS)

**Subject Code: BMATH1-201** **L T PC** **Duration: 40Hrs.**
**3 1 0 4**

**COURSE OBJECTIVE**

Students will learn

1. Understanding Probability theory.
2. Probability distribution, bivariate distribution, conditional densities
3. Statistical analysis, correlation and regression, moment, skewness and kurtosis.
4. Statistical hypothesis about real world problem, curve fitting, small samples.

**Course Outcomes (CO)**

Students will be able

1. To express the concept of basic probability and its features, expected values and moments.
2. To explain the concept of continuous probability distribution and bivariate distribution
3. To describe basic statistics (moments, skewness, kurtosis, correlation and regression).
4. To explain about applied statistics and small samples.

**UNIT–I**

**Basic Probability: (12 Hrs.)**

Probability spaces, conditional probability, independence; Discrete random variables, Independent random variables, the multinomial distribution, Poisson approximation to the binomial distribution, infinite sequences of Bernoulli trials, sums of independent random variables; Expectation of Discrete Random Variables, Moments, Variance of a sum, Chebyshev's Inequality.

**UNIT –II**

**Continuous Probability Distributions: (6 Hrs.)**

Continuous random variables and their properties, distribution functions and densities, normal, exponential and gamma densities.

**Bivariate Distributions: (6 Hrs.)** Bivariate distributions and their properties, distribution of sums and quotients, conditional densities, Bayes' rule.

**UNIT –III**

**Basic Statistics: (10 Hrs.)**

Measures of Central tendency: Moments, skewness and Kurtosis - Probability distributions: Binomial, Poisson and Normal - evaluation of statistical parameters for these three distributions, Correlation and regression – Rank correlation.

**UNIT –IV**

**Applied Statistics: (8 Hrs.)**

Curve fitting by the method of least squares- fitting of straight lines, second degree parabolas and more general curves. Test of significance: Large sample test for single proportion, difference of proportions, single mean, difference of means, and difference of standard deviations.

**Small Samples: (4 Hrs.)**

Test for single mean, difference of means and correlation coefficients, test for ratio of variances - Chi-square test for goodness of fit and independence of attributes.

**Recommended Books:**

1. E. Kreyszig, 'Advanced Engineering Mathematics', John Wiley & Sons,**2006**

2. P.G. Hoel, S.C. Port and C.J. Stone, 'Introduction to Probability Theory', Universal Book Stall, **2003**.
3. S. Ross, 'A First Course in Probability', Pearson Education India, **2002**.
4. W. Feller, 'An Introduction to Probability Theory and its Applications', Vol.-1,Wiley,**1968**.
5. B.S. Grewal, 'Higher Engineering Mathematics', Khanna Publishers, **2000**.
6. T. Veerarajan, 'Engineering Mathematics', Tata McGraw Hill, New Delhi, **2010**.

## ENGLISH

**Subject Code: BHUMA0-101** **L T PC** **Duration: 25Hrs.**
**2 0 0 2**

**Course Objectives:**

1. Students should be able to enhance language proficiency, critical thinking and analytical skills
2. To expose the students to various spoken skills
3. To strength their professional skills
4. To maintain good linguistic competency and accuracy in grammar

**Course Outcomes:**

1. The students will be able to understand specific piece of information
2. Be able to express themselves in writing for social occasions
3. Be able to identify the language functions in the spoken discourse
4. Improvement of technical communication skills , such as writing reports giving presentations and effectively communicating ideas related to respective field

**UNIT-I**

**1. Vocabulary Building:**

The concept of Word Formation
Root words from foreign languages and their use in English
Acquaintance with prefixes and suffixes from foreign languages in English to form derivatives. Synonyms, antonyms, and standard abbreviations.

**UNIT-II**

**2. Basic Writing Skills:**

Sentence Structures
Use of phrases and clauses in sentencesImportance of proper punctuation Creating coherence
Organizing principles of paragraphs in documentsTechniques for writing precisely

**UNIT-III**

**3. Identifying Common Errors in Writing:**

Subject-verb agreement Noun-pronoun agreement
Misplaced modifiers
Articles
Prepositions
Redundancies
Clichés

**UNIT-IV**

**4. Nature and Style of sensible Writing:**

Describing
Defining
Classifying
Providing examples or evidence
Writing introduction and conclusion

**5. Writing**

**Practices:**

Comprehension
Précis Writing
Essay Writing

**Recommended Books:**

1. Michael Swan, 'Practical English Usage', OUP, **1995**.
2. F.T. Wood, 'Remedial English Grammar', Macmillan, **2007.**
3. William Zinsser, 'On Writing Well', Harper Resource Book, **2001.**
4. Liz Hamp-Lyons and Ben Heasly, 'Study Writing', Cambridge University Press, **2006**.
5. Sanjay Kumar and Pushp Lata, 'Communication Skills', Oxford University Press, **2011**.
6. 'Exercises in Spoken English', Parts. I-III. CIEFL, Hyderabad. Oxford University Press.

## PROGRAMMING FOR PROBLEMSOLVING

**Subject Code: BCSCE0-101** **L T PC** **Duration: 41Hrs.**
**3 0 0 3**

**Course Objectives:**

1. To be familiarize with flow of algorithm to solve simple problems
2. To develop programs to solve basic problems by understanding basic concepts in C like operators, control statements etc.
3. To develop modular, reusable and readable C Programs using the concepts like functions, arrays, strings, pointers and structures.

**Course Outcomes:**

The student will learn

1. To learn the basic terms related to programming and understand arithmetic expressions.
2. To understand the concept of arrays.
3. To implement functions and recursion.
4. To learn structure, pointers and file handling

**UNIT-I**

**1. Introduction to Programming: (6 Hrs.)**

Introduction to components of a computer system (disks, memory, processor, where a program is stored and executed, operating system, compilers etc.)**.** Idea of Algorithm: steps tosolve logical and numerical problems. Representation of Algorithm: Flowchart/Pseudocode with examples. From algorithms to programs; source code, variables (with data types) variables and memory locations, Syntax and Logical Errors in compilation, object and executable code.

**2. Arithmetic Expressions and Precedence: (12Hrs.)**

Conditional Branching and Loops. Writing and evaluation of conditionals and consequentbranching. Iteration and loops.

**UNIT-II**

**3. Arrays: (5 Hrs.)**
Arrays (1-D, 2-D), Character arrays and Strings

**4. Basic Algorithms: (5 Hrs.)**
Searching, Basic Sorting Algorithms (Bubble, Insertion and Selection), Finding roots of equations, notion of order of complexity through example programs (no formal definition required)

**UNIT-III**

**5. Function: (4Hrs.)**
Functions (including using built in libraries), Parameter passing in functions, call by value, passing arrays to functions: idea of call by reference

**6. Recursion: (4Hrs.)**
Recursion, as a different way of solving problems. Example programs, such as Finding Factorial, Fibonacci series, Ackerman function etc. Quick sort or Merge sort.

**UNIT-IV**

**7. Structure: (3 Hrs.)**
Structures, Defining structures and Array of Structures. Pointers: (2Hrs.)
Idea of pointers, Defining pointers, Use of Pointers in self-referential structures, notion of linked list (no implementation)

**8. File Handling:** (only if time is available, otherwise should be done as part of the lab)

**Recommended Text Books:**
1. Byron Gottfried, 'Schaum's Outline of Programming with C', McGraw Hill.
2. E. Balaguruswamy, 'Programming in ANSI C', Tata McGraw Hill.

**Recommended Reference Books:**
1. Brian W. Kernighan and Dennis M. Ritchie, 'The C Programming Language', Prentice Hall of India.

## CHEMISTRY-I LAB

**Subject Code: BCHEM0-101** **L T P C**
**0 0 2 1**

**Course Objectives:**
1. To learn the preparation and standardization of solutions
2. To learn the estimation of various physical properties of given liquid samples
3. To estimate various crucial parameters for water sample
4. To learn the preparation of various molecules and detection of functional groups.

**Course Outcomes:**
The chemistry laboratory course will consist of experiments illustrating the principles of chemistry relevant to the study of science and engineering. Thestudents will learn to:
1. Estimate rate constants of reactions from concentration of reactants/products as a function of time
2. Measure molecular/system properties such as surface tension, viscosity, conductance of solutions, redox potentials, chloride content of water, etc.
3. Synthesize a small drug molecule and analyze a salt sample

**Choice of 10-12 experiments from the following:**

1. Preparation of a standard solution
2. Determination of surface tension and viscosity
3. Thin layer chromatography
4. Determination of total Alkalinity/ Acidity of a water sample.
5. Determination of residual chlorine in water sample
6. Estimation of total, temporary and permanent hardness of water
7. Determination of the rate constant of a reaction
8. Determination of strength of an acid conductometrically
9. Potentiometry - determination of redox potentials and emfs
10. Synthesis of apolymer
11. Saponification /acid value of anoil
12. Detection and confirmation of organic functional groups.
13. Models of spatialorientation
14. Totestthe validity of Lambert Beerlaw/ Determinationof$\lambda_{max}$/ Determination of unknown concentration of a solution.
15. Determination of the partition coefficient of a substance between two immiscible liquids
16. Adsorption of acetic acid bycharcoal
17. Synthesis of a drug – Acetaminophen, Aspirin

## ENGLISH LAB.

**Subject Code: BHUMA0-102** **L T P C**
**0 0 2 1**

**Course Objectives:**

1. To enhance LSRW Skills
2. To improve the fluency in spoken English
3. To familiarize students with the use of English in everyday situations
4. To maintain good linguistic competency and accuracy in grammar

**Course Outcomes:**

1. Identify common errors in spoken and written communication
2. List familiarized with English vocabulary and language proficiency
3. Improve nature and style of sensible writing.
4. Improve acquire employment and work place communication skills.

**Oral Communication**

(This unit involves interactive practice sessions in Language Lab.)

1. Listening Comprehension
2. Pronunciation, Intonation, Stress and Rhythm
3. Common Everyday Situations: Conversations and Dialogues
4. Communication at Workplace
5. Interviews
6. Formal Presentations

## PROGRAMMING FOR PROBLEM SOLVING LAB.

**Subject Code: BCSCE0-102** **L T P C**

**0 0 4 2**

**Course objectives:**

1. To be familiarize with flow of algorithm to solve simple problems
2. To develop programs to solve basic problems by understanding basic concepts in C like operators, control statements etc.
3. To develop modular, reusable and readable C Programs using the concepts like functions, arrays, strings, pointers and structures.

**Course Outcomes:**

1. Correct syntax errors as reported by the compilers and logical errors encountered at run time
2. Develop programs by using decision making and looping constructs.
3. Implement real time applications using the concept of array, pointers, functions and structures.
4. Solve real world problems using matrices, searching and sorting

**NOTE:** The laboratory should be preceded or followed by a tutorial to explain the approachor algorithm to be implemented for the problem given.

**Tutorial 1:** Problem solving using computers:
**Lab1:** Familiarization with programming environment
**Tutorial 2:** Variable types and type conversions:
**Lab 2:** Simple computational problems using arithmetic expressions
**Tutorial 3:** Branching and logical expressions:
**Lab 3**: Problems involving if-then-else structures
**Tutorial 4:** Loops, while and for loops:
**Lab 4:** Iterative problems e.g., sum of series
**Tutorial 5:** 1D Arrays: searching, sorting:
**Lab 5:** 1D Array manipulation
**Tutorial 6:** 2D arrays and Strings
**Lab 6:** Matrix problems, String operations
**Tutorial 7:** Functions, call by value:
**Lab 7:** Simple functions
**Tutorial 8 &9:** Numerical methods (Root finding, numerical differentiation, numericalintegration):
**Lab 8 and 9:** Programming for solving Numerical methods problems
**Tutorial 10:** Recursion, structure of recursive calls
**Lab 10:** Recursive functions
**Tutorial 11:** Pointers, structures and dynamic memory allocation
**Lab 11:** Pointers and structures
**Tutorial 12:** File handling:
**Lab 12:** File operations

## MANUFACTURING PRACTICES (THEORY & LAB)

**Subject Code: BMFPR0-101** **L T PC** **Duration: 80 Hrs.**
**1 0 4 3**

**Course objectives.**

1 Understand the operations of manufacturing methods and processes.
2 Perform the various manufacturing operations.
3 Understand the basics of advanced manufacturing methods.
4. Understanding the basics of computer numerical control machines.

**Course outcomes:**

After the completion of this course students will be able:-

1. To perform various metal forming operations.
2. To perform various metal cutting operations.
3. To perform various metal joining operations.
4. To write simple CNC part programming.

**Lectures & Videos: (10 Hrs.)**

1. Manufacturing Methods- casting, forming, machining, joining, advanced manufacturingMethods.
2. CNC machining, Additive manufacturing.
3. Fitting operations & power tools.
4. Sheet Metal Operations.
5. Electrical &Electronics.
6. Carpentry.
7. Plastic moulding (injection moulding, blow moulding, extrusion moulding), glasscutting.
8. Metalcasting.
9. Welding (arc welding & gas welding), brazing.

**Recommended Text/Reference Books:**

1. S.K. Hajra Choudhury, A.K. Hajra Choudhury and S.K. Nirjhar Roy, 'Elements of Workshop Technology', Vol.-I, **2008** and Vol.-II **2010**, Media Promoters and Publishers Pvt. Ltd., Mumbai.
2. S. Kalpakjian, Steven S. Schmid, 'Manufacturing Engineering and Technology', 4th Edn., Pearson Education India Edn.,**2002**.
3. Gowri P. Hariharan and A. Suresh Babu, 'Manufacturing Technology – I', Pearson,**2008**.
4. Roy A. Lindberg, 'Processes and Materials of Manufacture', 4th Edn., Prentice Hall India, 1998.
5. P.N. Rao, 'Manufacturing Technology', Vol.-I and Vol.-II, Tata McGraw Hill House, 2017.

**Workshop Practice: (70 Hrs.)**

1. Machine shop **(10Hrs.)**
2. Fitting shop **(8Hrs.)**
3. Carpentry **(6Hrs.)**
4. Electrical & Electronics **(8 Hrs.)**
5. Welding shop **(8 Hrs. (Arc welding 4 Hrs. + Gas welding 4Hrs.)**
6. Casting **(8Hrs.)**
7. Sheet Metal Operations **(10 Hrs.)**
8. Smithy **(6Hrs.)**
9. Plastic moulding& Glass Cutting **(6Hrs.)**
10. Examinations could involve the actual fabrication of simple components, utilizing one ormore of the techniques covered above.

## INTRODUCTION TO COMPUTER SCIENCE & ENGINEERING

**Subject Code: BMNCC0-014** **L T PC** **Duration: 24Hrs.**
**2 0 0 0**

**Course Outcomes:**

1. Basic knowledge of Computer Science and Engineering
2. Exploring Computer Science Fields and Opportunities
3. Understanding Computer Hardware and Software
4. Software Types and Operating Systems

### UNIT-I

Introduction to Computer Science & Engineering, Difference between science & engineering, Applications of Computer Science & engineering.

### UNIT-II

Different branches/fields of Computer Science, Scope of Computer Science in industry, self-employment etc.

### UNIT-III

Introduction to Computer, parts of computer system. Difference between Hardware & software, Configuration of computer systems, Types of memory-RAM, ROM, Introduction toUPS-Online and Offline, printers etc.

### UNIT-IV

Different types of Software- Application software and System Software, Types of Languages-High level and low level languages, Introduction to Operating System.

## Calculus and Ordinary Differential Equation

**Subject Code- BMATH1- 301** **L T P C** **Duration – 45hrs**
**3 0 0 3**

**Course Objectives:**
Students will learn
1. Basics of sequence and series and their results to check convergence.
2. Multivariable concepts and their real life problems.
3. Green's theorem, stokes theorem, and Gauss theorem and their applications.
4. Linear, non-linear ordinary differential equations of first and higher order.

**Course Outcomes (CO)**
Students will be able
1. To apply concepts of convergence of sequence and series.
2. To apply green's theorem, stroke's theorem and green's theorem in real life situations.
3. To solve linear and non-linear ordinary differential equations.
4. To solve second and higher order linear, non-linear differential equation.

**COURSE CONTENT**

**UNIT-I (12 Hrs)**

Sequences and Series: Basic concept of Convergence, tests for convergence, power series, Taylor's series, Series for exponential, trigonometric and logarithmic functions.

Multivariable Calculus: Partial derivatives, directional derivatives, total derivative, Tangent plane and normal line, Maxima, minima and saddle points, Method of Lagrange multipliers.

**UNIT-II (11 Hrs)**

Multiple Integration: double and triple integrals (Cartesian and polar), change of order of integration in double integrals, Change of variables, Theorems of Green, Gauss and Stokes (without proof), orthogonal curvilinear coordinates, Simple applications involving cubes, sphere and rectangular parallelepipeds.

**UNIT-III (11 Hrs)**

First order ordinary differential equations: Exact, linear and Bernoulli's equations, Euler's equations, Equations not of first degree: equations solvable for p, equations solvable for y, equations solvable for x and Clairaut's type.

**UNIT-IV (11 Hrs)**

Ordinary differential equations of higher orders: Second order linear differential equations with variable coefficients, method of variation of parameters, Cauchy-Euler equation; Power series solutions; Legendre polynomials, Bessel functions of the first kind and their properties.

**RECOMMENDED BOOKS**

1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
2. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
3. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.
4. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
5. W. E. Boyce and R. C. DiPrima, Elementary Differential Equations and Boundary Value Problems, 9th Edition, Wiley India, 2009.
6. S. L. Ross, Differential Equations, 3rd Ed., Wiley India, 1984.
7. Earl A. Coddington, An Introduction to Ordinary Differential Equations, Prentice Hall India, 1995.

## COMPUTER PERIPHERALS & INTERFACES

**Subject Code- BCSES1-301** **L T P C** **Duration – 45 hrs.**
**3 0 0 3**

**COURSE OBJECTIVCE**

To learn the functional and operational details of various peripheral devices.

**COURSE OUTCOMES**

1. To be able to learn system resources, IDE & SCSI Interfaces.
2. To be able to learn different video Hardware.
3. To learn different, I/O Interfaces and Input/ Output Driver Software Aspects.
4. To be able to design and implement different peripheral devices.

**COURSE CONTENT**

**UNIT I (12 Hrs)**

**SYSTEM RESOURCES:** Interrupt, DMA Channel, I/O Port Addresses and resolving and resolving the conflict of resources. I/O buses- ISA, EISA, Local bus, VESA Local bus, PCI bus, PCI Express, Accelerated graphics port bus.

**IDE & SCSI Interfaces:** IDE origin, IDE Interface ATA standards. ATA feature, ATA RAID and SCSI RAID, SCSI Cable and pin Connector pin outs SCSI V/s IDE Advantages and limitation, SATA, SSD drives.

**UNIT II (11 Hrs)**

**Video Hardware:** Video display technologies, DVI Digital signals for CRT Monitor, LCD, LED, OLED Panels, Video adapter types, Integrated Video/ Motherboard chipset, Video RAM, Video driver and multiple Monitor, Graphic accelerators. Advanced 3D Technologies, TV Tuner and Video Capture upgrades troubleshooting Video Cards and Drivers.

**UNIT III (11 Hrs)**

**I/O Interfaces:** I/O Interfaces from USB1.0, 2.0, 3.0, lighting port, I/O Interface from serial, Parallel to SCSI converter. Testing of serial andparallel port, USB Mouse/ Keyboard Interfaces like HDMI

**Input/ Output Driver software aspects:** Role of device driver DOS and UNIX/ LINUX device drivers.

**UNIT IV (11 Hrs)**

Design & Integration of Peripheral devices to a computer system as a Case Study.

**Future Trends**: Detailed Analysis of recent Progress in the Peripheral devices. Some aspects of cost Performance analysis and applications of latest digital devices like WiFi-LED projectors, HDMI devices, wireless printers and other devices

**RECOMMENDED BOOKS**

1. Douglas V. Hall, "Microprocessors and Interfacing", Tata McGraw Hill 2006.
2. Barry B. Brey & C.R. Sarma, "The intel microprocessors," Pearson 2003.
3. P. Pal Chandhari, "Computer Organization and design" Prentice Hall of India Pvt. Ltd, 1994.
4. Del Corso, H. Kirrman, JD Nicond "Microcomputer buses & links" Academic Press 1986.

## DATA STRUCTURE & ALGORITHMS

**Subject Code- BCSES1-302** **L T P C** **Duration – 60hrs**
**3 1 0 4**

**COURSE OBJECTIVE**

1. To impart the basic concepts of data structures, algorithms and time complexity.
2. To understand concepts about stacks and queues.
3. To understand concepts about linked lists and trees.
4. To enable them to learn and write algorithms for hashing, sorting and graphs.

**COURSE OUTCOMES**

1. To impart the basic concepts of data structures, algorithms and time complexity.
2. To understand concepts about stacks and queues
3. To understand concepts about linked lists and trees
4. To enable them to learn and write algorithms for hashing, sorting and graphs

**COURSE CONTENT**

**UNIT-I (15 Hrs)**

**Introduction**: Basic Terminologies: Elementary Data Organizations, Data Structure Operations: insertion, deletion, traversal etc.; Analysis of an Algorithm, Asymptotic Notations, Time-Space trade off. Searching: Linear Search and Binary Search Techniques and their complexity analysis.

**UNIT-II (15 Hrs)**

**Stacks and Queues**: ADT Stack and its operations: Algorithms and their complexity analysis, Applications of Stacks: Expression Conversion and evaluation –corresponding algorithms and complexity analysis. ADT queue, Types of Queue: Simple Queue, Circular Queue, Priority Queue; Operations on each types of Queues: Algorithms and their analysis.

**UNIT-III (15 Hrs)**

**Linked Lists:** Singly linked lists: Representation in memory, Algorithms of several Operations: Traversing, Searching, Insertion into, Deletion from linked list; Linked representation of Stack and Queue, Header nodes, doubly linked list: operations on it and algorithmic analysis; Circular Linked Lists: all operations their algorithms and the complexity analysis.

**Trees:** Basic Tree Terminologies, Different types of Trees: Binary Tree, Binary Search trees, Binary Search Tree, Tree operations on each of the trees and their algorithms with complexity analysis. Introduction to B Tree, B+ Tree and AVL Tree

**UNIT-IV (15 Hrs)**

**Sorting and Hashing:** Objective and properties of different sorting algorithms: Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort; Performance and comparison among all the methods, Hashing.

**Graph:** Basic Terminologies and Representations, Graph search and traversal algorithms and complexity analysis.

**RECOMMENDED BOOKS:**

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

**SUGGESTED REFERENCE BOOKS:**

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

## Digital Electronics

**Subject Code- BCSES1-303** **L T P C** **Duration – 60 Hrs**
**3 1 0 4**

**COURSE OBJECTIVE**

To learn the basic methods for the design of digital circuits and provide the fundamental concepts used in the design of digital systems.

**COURSE OUTCOMES:** At the end of this course, students will demonstrate the ability to

1. Understand working of logic families and logic gates.
2. Design and implement Combinational and Sequential logic circuits.
3. Understand the process of Analog to Digital conversion and Digital to Analog conversion.
4. Be able to use PLDs to implement the given logical problem.

**COURSE CONTENT**

**UNIT-I (15hrs)**

**Fundamentals of Digital Systems and logic families:** Digital signals, digital circuits, AND, OR, NOT, NAND, NOR and Exclusive-OR operations, Boolean algebra, examples of IC gates, number systems-binary, signed binary, octal hexadecimal number, binary arithmetic, one's and two's complements arithmetic, codes, error detecting and correcting codes, characteristics of digital lCs, digital logic families, TTL, Schottky TTL and CMOS logic, interfacing CMOSand TTL, Tri-state logic.

**Combinational Digital Circuits:** Standard representation for logic functions, K-map representation, simplification of logic functions using K-map, minimization of logical functions. Don't care conditions, Multiplexer, De-Multiplexer/Decoders, Adders, Subtractors, BCD arithmetic, carry look ahead adder, serial adder, ALU, elementary ALU design, popular MSI chips, digital comparator, paritychecker/generator, code converters, priority encoders, decoders/drivers for display devices, Q-M method of function realization.

**UNIT-II (15hrs)**

**Sequential circuits and systems:** A 1-bit memory, the circuit properties of Bistable latch, the clocked SR flip flop, J- K-T and D types flip flops, applications of flip flops, shift registers, applications of shift registers, serial to parallel converter, parallel to serial converter, ring counter, sequence generator, ripple (Asynchronous) counters, synchronous counters, counters design using flip flops, special counter IC's, asynchronous sequential counters, applications of counters.

**UNIT-III (15hrs)**

**A/D and D/A Converters:** Digital to analog converters: weighted resistor/converter, R-2R Ladder D/A converter, specifications for D/A converters, examples of D/A converter lCs, sample and hold circuit, analog to digital converters: quantization and encoding, parallel comparator A/D converter, successive approximation A/D converter, counting A/D converter, dual slope A/D converter, A/D converter using Voltage to frequency and voltage to time conversion, specifications of A/D converters, example of A/D converter ICs

**UNIT-IV (15hrs)**

**Semiconductor memories and Programmable logic devices:** Memory organization and operation, expanding memory size, classification and characteristics of memories, sequential memory, read only memory (ROM), read and write memory (RAM), content addressable memory (CAM), charge de coupled device memory (CCD), commonly used memory chips, ROM as a PLD, Programmable logic array, Programmable array logic, complex Programmable logic devices (CPLDS), Field Programmable Gate Array (FPGA).

**RECOMMENDED BOOKS**

1. R. P. Jain, "Modern Digital Electronics", McGraw Hill Education, 2009.
2. M. M. Mano, "Digital logic and Computer design", Pearson Education India, 2016.
3. A. Kumar, "Fundamentals of Digital Circuits", Prentice Hall India, 2016.

## DATA STRUCTURE & ALGORITHMS LABORATORY

**Subject Code- BCSES1-304** **L T P C**
**0 0 4 2**

**COURSE OUTCOMES**

**1 .** To implementing searching algorithms and operations on stacks.
**2 .** To enable the students to learn and implement sorting algorithms.
**3 .** To implement operations for different types of queues.
**4 .** To implement programs related to various types of Linked Lists.

**PRACTICALS**

1. Write a program for Linear search methods.
2. Write a program for Binary search methods.
3. Write a program for insertion sort, selection sort and bubble sort.
4. Write a program to implement Stack and its operation.
5. Write a program for quick sort.
6. Write a program for merge sort.
7. Write a program to implement Queue and its operation.
8. Write a program to implement Circular Queue and its operation.
9. Write a program to implement singly linked list for the following operations: Create, Display, searching, traversing and deletion.
10. Write a program to implement doubly linked list for the following operations: Create, Display, inserting, counting, searching, traversing and deletion.
11. Write a program to implement circular linked list for the following operations: Create, Display, inserting, counting, searching, traversing and deletion.

## DIGITAL ELECTRONICS LABORATORY

**Subject Code- BCSES1-305** **L T P C**
**0 0 2 1**

**COURSE OUTCOMES**

**1** To Familiarization with Digital Trainer Kit and associated equipment.
**2** To Study and design of TTL gates
**3** To learn the formal procedures for the analysis and design of combinational circuits.
**4** To learn the formal procedures for the analysis and design of sequential circuits

**PRACTICALS:** Implementation all experiments with help of Bread- Board.

1. Study of Logic Gates: Truth-table verification of OR, AND, NOT, XOR, NAND and NOR gates; Realization of OR, AND, NOT and XOR functions using universal gates.
2. Half Adder / Full Adder: Realization using basic and XOR gates. 13 13 Punjab Technical University B.Tech. Computer Science Engineering (CSE)
3. Half Subtractor / Full Subtractor: Realization using NAND gates.
4. 4-Bit Binary-to-Gray & Gray-to-Binary Code Converter: Realization using XOR gates.
5. 4-Bit and 8-Bit Comparator: Implementation using IC7485 magnitude comparator chips.

6. Multiplexer: Truth-table verification and realization of Half adder and Full adder using IC74153 chip.
7. Demultiplexer: Truth-table verification and realization of Half subtractor and Full subtractor using IC74139 chip.
8. Flip Flops: Truth-table verification of JK Master Slave FF, T-type and D-type FF using IC7476 chip.
9. Asynchronous Counter: Realization of 4-bit up counter and Mod-N counter using IC7490 & IC7493 chip.
10. Synchronous Counter: Realization of 4-bit up/down counter and Mod-N counter using IC74192 & IC74193 chip.
11. Shift Register: Study of shift right, SIPO, SISO, PIPO, PISO & Shift left operations using IC7495 chip.
12. DAC Operation: Study of 8-bit DAC (IC 08/0800 chip), obtain staircase waveform using IC7493 chip.
13. ADC Operations: Study of 8-bit ADC.

## IT WORKSHOP (SciLab / MATLAB) LABORATORY

**Subject Code- BCSES1-306** **L T P C**
**0 0 4 2**

**COURSE OUTCOMES**

1. Introduction to Sci Labs / MATLAB environment and types of Sci Labs / MATLAB files.
2. To be able to write programs for Matrix manipulations.
3. MATLAB code for computing factorial of a number
4. To be able to write programs using functions and plotting results

**Following experiments to be conducted using Sci Labs / MATLAB**

1. Introduction to Sci Labs / MATLAB environment and types of Sci Labs / MATLAB files.
2. Use of help command to get help about different inbuilt functions.
3. Write a program to show the output of various unary and binary operators.
4. Write programs for Matrix Manipulations, (reshaping matrices, expanding matrix size, appending or deleting a row/column to a matrix, concatenation of matrices).
5. Write programs which demonstrate the use special matrices.
6. Write programs to show output for various matrix and array operations.
7. Write programs for demonstrating the use for various control statements.
8. Write a MATLAB code for computing factorial of a number n. Assume n is already defined. The code should return a scalar, not a vector.
9. Write programs using functions and plot results.

*other programs related to some application area may also be done

## TRAINING-1

**Subject Code- BCSES1-307** | **L T P C** **0 0 0 3** | **Duration – 4 WEEKS**

Training after the 2nd Semester, students are required to be involved in Inter/ Intra Institutional Activities viz; Training with higher Institutions; Soft skill training organized by Training and Placement Cell of the respective institutions; contribution at incubation/ innovation /entrepreneurship cell of the institute; participation in conferences/ workshops/ competitions etc.; Learning at Departmental Lab/Tinkering Lab/ Institutional workshop; Working for consultancy/ research project within the institutes and Participation in all the activities of Institute's Innovation Council for eg: IPR workshop/Leadership Talks/ Idea/Design/ Innovation/ Business Completion/ Technical Expos etc.

## DEVELOPMENT OF SOCIETIES

**Subject Code- BHSMC0-007** | **L T P C** **3 0 0 3** | **Duration – 45hrs**

**Course Outcomes**

Students will be able to

**1** Become familiar with development of different social systems, connectedness of human being with society and able to evaluate different models of social development.

**2** Develop ideas about political system and identify discriminating features of various governing systems.

**3** Build up knowledge about different economic systems and evaluate various ideas of economic developmental ideologies.

**4** Understand the relationship between human and society both historically and analytically

**Course objectives**

To make the students

**1.** To Understand societal development and various societal models

**2.** To understand and analyze different political systems

**3.** To develop knowledge about economic systems and ideologies

**4** To understand the economic development in different periods of history.

**UNIT-I (15 hrs)**

Social Development: Concepts behind the origin of Family, Clan and Society, Different Social Systems, Relation between Human being and Society, Comparative studies on different models of Social Structures and their evolution

**UNIT-II (15 hrs)**

Political Development: Ideas of Political Systems as learnt from History, Different models of Governing system and their comparative study

**UNIT-III (15 hrs)**

Economic Development: Birth of Capitalism, Socialism, Marxism, Concept of development in pre-British, British and post British period- Barter, Jajmani, Idea of development in current context., E. F. Schumacher's idea of development, Buddhist economics. Gandhian idea of development. Swaraj and Decentralization.

**RECOMMENDED BOOKS:**

**TEXTBOOK:**

1. 'Indian Society' by Dr S.K Jena & B.N Mohanty
2. 'Indian Society' by C.N Shankar Rao
3. 'Foundations of Political Science, Indian Constitution & Government' by Gulshan Rai, SomNathVerma& Suresh Kumar

***REFERENCE BOOKS:**

1. 'The Interpretation of Cultures: Selected Essays' by Geertz & Clifford. 1973, New York
2. 'Dictionary of Modern Sociology Hoult' by Thomas Ford, ed. 1969) Totowa, New Jersey, United States: Littlefield, Adams & Co.
3. 'Sociology –In a Changing Society' by William Korblum
4. 'The Origin of Humankind' by Leakey, Richard 1996, New York Basic Books

**4. OTHER SESSIONS**

*TUTORIALS:

*LABORATORY:

*PROJECT: Possible projects in this course could be

a) Interact with local communities and understand their issues.

b) Study local cottage industry and agricultural practices. Role of engineering and specialized knowledge.

c) Evaluation of technology in the context of its application. Social impact of technology. Environmental impact of technology. Evaluation from a holistic perspective.

## THE MAHARAJA OF PEOPLE

**Subject Code: BMNCC0-052** **L T P C** **Duration: 30 Hrs.**
**2 0 0 0**

### UNIT-I (8 Hrs)

**The Early Life:** Early life of Maharaja Ranjit Singh, First battle, Death of Father, Act of bravery, Unifying Punjab, Coronation

### UNIT-II (8 Hrs)

**Conquests:** Jhang, Kasoor, Multan, Peshawar, Naushehra, Annexation of Peshawar into Sikh Kingdom, Jamraudh, Kashmir, Ladakh, Tibbet, Formation of State of J & K

### UNIT-III (8 Hrs)

**Administrative Capabilities**

**Administration:** Central Govt., Provincial & local Govt., Financial Administration, Judicial systems, Secular State, Military System, Creation of a regular force, Organization of Army, Recruitment & Payment, Education System, Pattern of the arts, a unique portrait, Touchstone, The court of Maharaja Ranjit Singh, Europeans at Sikh Court

### UNIT-IV (6 Hrs)

**The Legacy:** Diamond Kohinoor, Love for common Folk, A ruler much ahead of his times, Graciousness of Maharaja, True Nationalist, Maharaja's Notion of Nationalism & Secularism, the last journey, The enduring legacy of Maharaja, Secrets of popularity of Maharaja, Nature of Maharaja's polity.

**Recommended Books:**

1. Rajmohan Gandhi: Punjab: A History from Aurangzeb to Mountbatten, 2013.
2. Grewal, J.S.: The Sikhs of the Punjab, Cambridge University Press, 1968.
3. Khushwant Singh: A History of the Sikhs Vol. 1 1469-1839, Oxford University Press, 1963.
4. Untold story of Maharaja Ranjit Singh

## DISCRETE MATHEMATICS

**Subject Code- BMATH1-401** **L T P C** **Duration – 60 hrs.**
**3 1 0 4**

### COURSE OBJECTIVE

Throughout the course, students will be expected to demonstrate their understanding ofDiscrete Mathematics by being able to do each of the following:

1. Use mathematically correct terminology and notation.
2. Construct correct direct and indirect proofs.
3. Use division into cases in a proof.
4. Use counterexamples.
5. Apply logical reasoning to solve a variety of problems.

### COURSE OUTCOMES

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

1. For a given logic sentence express it in terms of predicates, quantifiers, andlogical connectives
2. For a given a problem, derive the solution using deductive logic and prove thesolution based on logical inference
3. For a given a mathematical problem, classify its algebraic structure
4. Evaluate Boolean functions and simplify expressions using the properties of Boolean Algebra
5. Develop the given problem as graph networks and solve with techniques of graph theory.

### COURSE CONTENTS

#### UNIT-I (15 hrs)

**Sets, Relation and Function:** Operations and Laws of Sets, Cartesian Products, Binary Relation, Partial Ordering Relation, Equivalence Relation, Image of a Set, Sumand Product of Functions, Bijective functions, Inverse and Composite Function, Size of a Set, Finite and infinite Sets, Countable and uncountable Sets, Cantor's diagonal argument and The Power Set theorem, Schroeder-Bernstein theorem.

**Principles of Mathematical Induction**: The Well-Ordering Principle, Recursive definition, The Division algorithm: Prime Numbers, The Greatest Common Divisor: Euclidean Algorithm, The Fundamental Theorem of Arithmetic.

#### UNIT-II (15 hrs)

Basic counting techniques-inclusion and exclusion, pigeon-hole principle, permutation and combination.

Propositional Logic: Syntax, Semantics, Validity and Satisfiability, Basic Connectives and Truth Tables, Logical Equivalence: The Laws of Logic, Logical Implication, Rules of Inference, The use of Quantifiers. Proof Techniques: Some Terminology, Proof Methods and Strategies, Forward Proof, Proof by Contradiction, Proof by Contraposition, Proofof Necessity and Sufficiency.

#### UNIT-III (15 hrs)

**Algebraic Structures and Morphism:** Algebraic Structures with one Binary Operation, Semi Groups, Monoids, Groups, Congruence Relation and Quotient Structures, Free and Cyclic Monoids and Groups, Permutation Groups, Substructures, Normal Subgroups, Algebraic Structures with two Binary Operation, Rings, Integral Domain and Fields. Boolean Algebra and Boolean Ring, Identities of Boolean Algebra, Duality, Representation of Boolean Function, Disjunctive and Conjunctive Normal Form

**UNIT-IV (15 hrs)**

**Graphs and Trees:** Graphs and their properties, Degree, Connectivity, Path, Cycle, Sub Graph, Isomorphism, Eulerian and Hamiltonian Walks, Graph Colouring, Colouring maps and Planar Graphs, Colouring Vertices, Colouring Edges, List Colouring, Perfect Graph, definition properties and Example, rooted trees, trees and sorting, weighted trees and prefix codes, Bi-connected component and Articulation Points, Shortest distances.

**RECOMMENDED BOOKS:**

1. Kenneth H. Rosen, Discrete Mathematics and its Applications, Tata McGraw – Hill
2. Susanna S. Epp, Discrete Mathematics with Applications, 4th edition, Wadsworth Publishing Co. Inc.
3. Satinder Bal Gupta, Discrete Mathematics and structures, University Science Press, New Delhi.
4. C L Liu and D P Mohapatra, Elements of Discrete Mathematics A Computer Oriented Approach, 3rd Edition by, Tata McGraw – Hill.

**SUGGESTED REFERENCE BOOKS:**

1. J.P. Tremblay and R. Manohar, Discrete Mathematical Structure and It's Application toComputer Science", TMG Edition, TataMcgraw-Hill
2. Norman L. Biggs, Discrete Mathematics, 2nd Edition, Oxford University Press. Schaum's Outlines Series, Seymour Lipschutz, Marc Lipson,
3. Discrete Mathematics, Tata McGraw - Hill

## COMPUTER ORGANIZATION & ARCHITECTURE

**Subject Code- BCSES1-401** **L T P C** **Duration – 45hrs**
**3 0 0 3**

**COURSE OBJECTIVE**

To expose the students to the following:
1. How Computer Systems work & the basic principles
2. Instruction Level Architecture and Instruction Execution
3. The current state of art in memory system design
4. How I/O devices are accessed and its principles.
5. To provide the knowledge on Instruction Level Parallelism
6. To impart the knowledge on micro programming
7. Concepts of advanced pipelining techniques.

**COURSE OUTCOMES**

**1.** Draw the functional block diagram of a single bus architecture of a computer and describe the function of the instruction execution cycle, RTL interpretation of instructions,addressing modes, instruction set.
**2.** Write assembly language program for specified microprocessor for computing16 bit multiplication, division and I/O device interface (ADC, Control circuit, serialport communication).
**3.** Write a flowchart for Concurrent access to memory and cache coherency in Parallel Processors and describe the process.
**4.** Given a CPU organization and instruction, design a memory module and analyze its operation by interfacing with the CPU.

**5.** Given a CPU organization, assess its performance, and apply design techniques to enhance performance using pipelining, parallelism and RISC methodology

**COURSE CONTENT**

**UNIT-I (11 hrs)**

**Functional blocks of a computer**: CPU, memory, input-output subsystems, control unit. Instruction set architecture of a CPU–registers, instruction execution cycle, RTL interpretation of instructions, addressing modes, instruction set. Case study – instruction sets of some common CPUs.

**Data representation**: signed number representation, fixed and floating pointer presentations, character representation. Computer arithmetic – integer addition and subtraction, ripple carry adder, carry look ahead adder etc. multiplication shift and add.

**UNIT-II (12 hrs)**

Introduction to x86 architecture.

**CPU control unit design**: hardwired and micro-programmed design approaches.

**Memory system design**: semiconductor memory technologies, memory organization.

**UNIT-III (11 hrs)**

**Peripheral devices and their characteristics**: Input-output subsystems, I/O device interface, I/O transfers–program controlled, interrupt driven and DMA, software interrupts and exceptions. Programs and processes–role of interrupts in process state transitions.

**UNIT-IV (11 hrs)**

**Pipelining:** Basic concepts of pipelining, throughput and speedup, pipeline hazards.

**Parallel Processors:** Introduction to parallel processors.

**Memory organization**: Memory interleaving, concept of hierarchical memory organization, cache memory, cache size vs. block size, mapping, replacement algorithms.

**RECOMMENDED BOOKS:**

1. "Computer Organization and Design: The Hardware/Software Interface", 5th Edition by David A. Patterson and John L. Hennessy, Elsevier.
2. "Computer Organization and Embedded Systems", 6th Edition by Carl Hamacher, McGraw Hill Higher Education.

**SUGGESTED REFERENCE BOOKS:**

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

## OPERATING SYSTEMS

**Subject Code- BCSES1-402** | **L T P C** **3 1 0 4** | **Duration – 60hrs**

**COURSE OBJECTIVE**

To learn the fundamentals of Operating Systems.

1. To learn the mechanisms of OS to handle processes and threads and their communication
2. To learn the mechanisms involved in memory management in contemporary OS
3. To gain knowledge on distributed operating system concepts that includes architecture, Mutual exclusion algorithms, deadlock detection algorithms and agreement protocols
4. To know the components and management aspects of concurrency management
5. To learn to implement simple OS mechanisms

**COURSE OUTCOMES**

**At the end of this course, students will demonstrate the ability to1.**

Create processes and threads.

2. Develop algorithms for process scheduling for a given specification of CPU utilization, Throughput, Turnaround Time, Waiting Time, Response Time.
3. For a given specification of memory organization develop the techniques for optimally allocating memory to processes by increasing memory utilization and for improving the access time.
4. Design and implement file management system and For a given I/O devices and OS (specify) develop the I/O management functions in OS as part of a uniform device abstraction by performing operations for synchronization between CPU and I/O controllers.

**COURSE CONTENT**

**UNIT-I (15hrs)**

**Introduction:** Concept of Operating Systems, Generations of Operating systems, Types of Operating Systems, OS Services, System Calls, Structure of an OS-Layered, Monolithic, Microkernel Operating Systems, Concept of Virtual Machine. Case study on UNIX and WINDOWS Operating System.

**UNIT-II (16hrs)**

**Processes:** Definition, Process Relationship, Different states of a Process, Process State transitions, Process Control Block (PCB), Context switching

**Process Scheduling:** Foundation and Scheduling objectives, Types of Schedulers, **Scheduling criteria:** CPU utilization, Throughput, Turnaround Time, Waiting Time, Response Time;

**Scheduling algorithms**: Pre-emptive and Non pre-emptive, FCFS, SJF, RR; Multiprocessor scheduling: Real Time scheduling: RM and EDF.

**Inter-process Communication:** Critical Section, Race Conditions, Mutual Exclusion, Hardware Solution, Strict Alternation, Peterson's Solution, The Producer\ Consumer Problem, Semaphores, Event Counters, Monitors, Message Passing, Classical IPC Problems: Reader's & Writer Problem, Dinning Philosopher Problem etc.

**UNIT-III (15hrs)**

**Deadlocks**: Definition, Necessary and sufficient conditions for Deadlock, Deadlock Prevention, Deadlock Avoidance: Banker's algorithm, Deadlock detection and Recovery.

**Memory Management:** Basic concept, Logical and Physical address map, Memory allocation: Contiguous Memory allocation – Fixed and variable partition–Internal and External fragmentation and Compaction; Paging: Principle of operation – Page allocation
-Hardware support for paging, Protection and sharing, Disadvantages of paging.

**Virtual Memory**: Basics of Virtual Memory – Hardware and control structures – Locality of reference, Page fault , Working Set , Dirty page/Dirty bit – Demand paging, Page Replacement algorithms: Optimal, First in First Out (FIFO), Second Chance (SC),Not recently used (NRU) and Least Recently used (LRU).

**UNIT-IV (14hrs)**

**File Management:** Concept of File, Access methods, File types, File operation, Directory structure, File System structure, Allocation methods (contiguous, linked, indexed), Free-space management (bit vector, linked list, grouping), directory implementation(linear list, hashtable), efficiency and performance.

**Disk Management**: Disk structure, Disk scheduling - FCFS, SSTF, SCAN, C-SCAN, Disk reliability, Disk formatting, Boot-block, Bad blocks

**RECOMMENDED BOOKS**

1. Operating System Concepts Essentials, 9th Edition by AviSilberschatz, Peter Galvin, Greg Gagne, Wiley Asia Student Edition.
2. Operating Systems: Internals and Design Principles, 5th Edition, William Stallings, Prentice Hall of India.

**SUGGESTED REFERENCE BOOKS:**

1. Operating System: A Design-oriented Approach, 1st Edition by Charles Crowley, Irwin Publishing
2. Operating Systems: A Modern Perspective, 2nd Edition by Gary J. Nutt, Addison-Wesley
3. Design of the Unix Operating Systems, 8th Edition by Maurice Bach, Prentice-Hall of India
4. Understanding the Linux Kernel, 3rd Edition, Daniel P. Bovet, Marco Cesati, O'Reilly and Associates

## OBJECT ORIENTED PROGRAMMING

**Subject Code- BCSES1-403** **L T P C** **Duration – 60 hrs**
**3 1 0 4**

**COURSE OBJECTIVE**

To introduce the principles and paradigms of Object Oriented Programming Language for design and implement the Object Oriented System

**COURSE OUTCOME**

1. To introduce the basic concepts of object oriented programming language and its representation
2. To allocate dynamic memory, access private members of class and the behavior of inheritance and its implementation.
3. To introduce polymorphism, interface design and overloading of operator.
4. To handle backup system using file, general purpose template and handling of raised exception during programming

**COURSE CONTENT**

**UNIT-I (15hrs)**

Introduction to C++, C++ Standard Library, Illustrative Simple C++ Programs. Header Files, Namespaces, Application of object oriented programming.

Object Oriented Concepts, Introduction to Objects and Object Oriented Programming, Encapsulation, Polymorphism, Overloading, Inheritance, Abstract Classes, Accessifier (public/ protected/ private), Class Scope and Accessing Class Members, Controlling Access Function, Constant, Class Member, Structure and Class

**UNIT-II (15hrs)**

This Pointer, Dynamic Memory Allocation and Deallocation (New and Delete), Static Class Members, Constructors, parameter Constructors and Copy Constructors, Deconstructors, Introduction of inheritance, Types of Inheritance, Overriding Base Class Members in aDerived Class, Public, Protected and Private Inheritance

**UNIT-III (15hrs)**

Polymorphism, Pointer to Derived class, Virtual Functions, Pure Virtual Function, Abstract Base Classes, Static and Dynamic Binding

Fundamentals of Operator Overloading, Rules for Operators Overloading, Implementation of Operator Overloading Like <<,>> Unary Operators, Binary Operators.

Basics of C++ Exception Handling, Try, Throw, Catch, multiple catch, Re-throwing an Exception.

**UNIT-IV (15hrs)**

Text Streams and binary stream, Sequential and Random Access File, Stream Input/ Output Classes, Stream Manipulators.

Templates: Function Templates, Overloading Template Functions, Class Template, Class Templates

Introduction: design patterns, Classifications

Introduction: model- view- controller pattern

**RECOMMENDED BOOKS:**

4. Robert Lafore, 'Object Oriented Programming in Turbo C++', 2nd Ed., The WAITE Group Press, **1994**.
5. Herbert shield, 'The complete reference C ++', 4th Ed., Tata McGraw Hill, **2003**.
6. Shukla, 'Object Oriented Programming in C++', Wiley India, 2008.
7. H M Deitel and P J Deitel, 'C++ How to Program', 2nd Ed., Prentice Hall, **1998**.
8. D Ravichandran, 'Programming with C++', 3rd Ed., Tata McGraw Hill, **2003**.
9. Bjarne Stroustrup, 'The C++ Programming Language', 4th Ed.,Addison Wesley,**2013**.
10. R. S. Salaria, 'Mastering Object-Oriented Programming with C++', Salaria Publishing House, **2016**.

## OPERATING SYSTEMS LABORATORY

**Subject Code- -BCSES1-404** **L T P C**
**0 0 2 1**

**COURSE OUTCOMES**

1. To be able to install various operating systems
2. To learn commands for files and directories.
3. To learn about background processes and commands to print something.
4. To be able to learn shell programming.

1. Installation Process of various operating systems
2. Virtualization, Installation of Virtual Machine Software and installation of Operating System on Virtual Machine
3. Commands for files & directories: cd, ls, cp, md, rm, mkdir, rmdir. Creating and viewing files using cat. File comparisons. Disk related commands: checking disk free spaces. Processes in linux, connecting processes with pipes, background processing, managing multiple processes. Manual help. Background process: changing process priority, scheduling of processes at command, batch commands, kill, ps, who, sleep. Printing commands, grep, fgrep, find, sort, cal, banner, touch, file. File related commands ws, sat, cut, grep.
4. Shell Programming: Basic of shell programming, various types of shell, ShellProgramming in bash, conditional & looping statement, case statements, parameter passing and arguments, shell variables, shell keywords, creating shell programs for automate system tasks, report printing.

## OBJECT ORIENTED PROGRAMMING USING C++ LABORATORY

**Subject Code- BCSES1-405** **L T P C**
**0 0 4 2**

**COURSE OUTCOMES**

1. To learn the concept of classes and objects.
2. To be able to implement constructors and destructors.
3. To implement initializer list and operator overloading
4. To learn type casting and inheritance.

**PRACTICALS**

1. Classes and Objects- Write a program that uses a class where the member functions are defined inside a class.
2. Classes and Objects- Write a program that uses a class where the member functions are defined outside a class.
3. Classes and Objects- Write a program to demonstrate the use of static data members.
4. Classes and Objects- Write a program to demonstrate the use of const data members.
5. Constructors and Destructors- Write a program to demonstrate the use of zero argument and parameterized constructors.
6. Constructors and Destructors- Write a program to demonstrate the use of explicit constructor.
7. Initializer Lists- Write a program to demonstrate the use of initializer list.
8. Operator Overloading- Write a program to demonstrate the overloading of increment and decrement operators.
9. Operator Overloading- Write a program to demonstrate the overloading of binary arithmetic operators.
10. Typecasting- Write a program to demonstrate the typecasting of basic type to class type.
11. Typecasting- Write a program to demonstrate the typecasting of class type to basic type.
12. Typecasting- Write a program to demonstrate the typecasting of class type to class type.
13. Inheritance- Write a program to demonstrate the multilevel inheritance

## ORGANIZATIONAL BEHAVIOR

**Subject Code- BHSMC0-016** **L T P C** **Duration – 45hrs**
**3 0 0 3**

**Course Objectives:** The course aims to provide an understanding of basic concepts, theories and techniques in the field of human behavior at the individual, group and organizational levels in the changing global scenario. The course must be taught using case study method.

**Course Outcomes:-**

1. After Studying this course the students will equip with ability to identify, explore and examine factors
2. Impinge on Individual and group behavior in organizations in the new millennium
3. Explain the terminology associated with organizational behavior
4. Incorporate and apply the predominate organization behavior theories to gain
5. knowledge of contemporary issues in organizational behavior
6. Frameworks to work with real life organizational issues concerned with human behavior at work place

**UNIT-I (12Hrs)**

**Organizational Behaviour:** Concepts, Theories and organization aspects of OB, Contributing Disciplines to OB, challenges and opportunities for OB. Foundations of Individual Behaviour: Biographical Characteristics, Course, Theories of Course, Attitudes,

Attitude Change, Values & Believes, Prejudices Personality: Determinants of Personality, Perception, Attribution Theory, Person's Perception.

**UNIT-II (11Hrs)**

**Motivation**: Definition & Process, Early Theories of Motivation, Contemporary Theories of Motivation, Nature and process of Motivation, Application of Motivation Concept. Job Satisfaction: Nature & Significance of Job satisfaction. Leadership: Nature Significance & Theories; Leadership Effectiveness Model; Leadership Traits & Skills; Behavioural Styles in Leadership. Transactional Analysis, Life Position, Johari Window Model.

**UNIT-III (11Hrs)**

**Foundations of Group Behaviour:** Nature & Concept of Group Formation, Stages of Group Formation, Theories of Group Formation. Teams, Difference between Group and Team Group Decision Making: Meaning & Nature, Decision Making Process; Decision Making Styles; Advantages & disadvantages of Decision Making; Techniques of Decision Making; Group Size & Decision Making.

**UNIT-IV (11Hrs)**

**Organizational Change & Development:** Meaning & Definition, Change Agents, Change Models, Resistance to Change. Power and Politics in Organization: Nature & Concepts, Sources & Types of Power, Techniques of Politics. Stress Management: Meaning and Concept of Stress, Stress in Organizations

**Recommended Books**

1. Robbins, 'Organization Behavior', Pearson Education.
2. Luthans, Organization Behavior', Tata McGraw Hill.
3. Hersey, 'Management of Organizational Behavior', Prentice Hall India.
4. Aswathappa, 'Organization Behavior', Himalaya Publications.
5. L.M. Prasad, 'Organization Behavior', Sultan Chand & Sons
6. Parikh, Gupta, 'Organizational Behavior', Tata McGraw Hill

## UNIVERSAL HUMAN VALUES 2: UNDERSTANDING HARMONY

**Subject Code: BHSMC0-026** **L T P C** **Duration: 45Hrs**
**2 1 0 3**

**Course Objectives**

This course is intended to provide a much needed orientational input in value education to the young enquiring minds.

**Course Outcomes**

1. To help the students appreciate the essential complementarity between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.
2. To facilitate the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understandingof the Human reality and the rest of existence. Such a holistic perspective forms the basis of Universal Human Values and movement towards value-based living in a natural way.
3. To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behavior and mutually enriching interaction with Nature.

**UNIT I (09 Hrs.)**

***Introduction to Value Education Lecture***: Understanding Value Education, Self-exploration as the Process for Value Education, Continuous Happiness and Prosperity – the Basic Human Aspirations, Right Understanding, Relationship and Physical Facility, Happiness and Prosperity – Current Scenario, Method to Fulfill the Basic Human Aspirations

**UNIT II (12 Hrs.)**

***Harmony in the Human Being***: Understanding Human being as the Co-existence of the Selfand the Body Lecture 8: Distinguishing between the Needs of the Self and the Body, The Body as an Instrument of the Self, Understanding Harmony in the Self, Harmony of the Self with the Body, Programme to ensure self-regulation and Health

**UNIT III (09 Hrs.)**

***Harmony in the Family and Society*** : Harmony in the Family – the Basic Unit of Human Interaction, Values in Human-to-Human Relationship, 'Trust' – the Foundational Value in Relationship, 'Respect' – as the Right Evaluation, Exploring the Feeling of Respect, Understanding Harmony in the Society, Vision for the Universal Human Order

**UNIT IV (15 Hrs.)**

***Harmony in the Nature/Existence***: Understanding Harmony in the Nature, Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature, Realizing Existence as Co-existence at All Levels, The Holistic Perception of Harmony in Existence

***Implications of the Holistic Understanding – a Look at Professional Ethics***: Natural Acceptance of Human Values, Definitiveness of (Ethical) Human Conduct, A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order, Competence in Professional Ethics, Holistic Technologies, Production Systems and Management Models-Typical Case Studies, Strategies for Transition towards Value-based Life and Profession

***Suggested Readings***:

***Text Book and Teachers Manual***

a. The Textbook A Foundation Course in Human Values and Professional Ethics, R R Gaur,R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1
b. The Teacher's Manual Teachers' Manual for A Foundation Course in Human Values and Professional Ethics, R R Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978- 93-87034-53-2 3.2

**Recommended Books**

1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff(Book).
4. The Story of My Experiments with Truth - by Mohandas KaramchandGandhi
5. Small is Beautiful - E. F Schumacher.
6. Slow is Beautiful - Cecile Andrews
7. Economy of Permanence - J CKumarappa
8. Bharat Mein Angreji Raj - PanditSunderlal
9. Rediscovering India - by Dharampal
10. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi
11. India Wins Freedom - Maulana Abdul Kalam Azad
12. Vivekananda - Romain Rolland (English)
13. Gandhi - Romain Rolland (English)

# 5th SEMESTER

## INTRODUCTION TO MACHINE LEARNING

**Subject Code: BCSES2-501** **L T P C** **Duration: 60 Hrs.**
**3 1 0 4**

**Course Objective:**
The students will understand the basics of Machine Learning. They will also learn and will be able to apply different machine learning models to various datasets.

**Course Outcomes:** After completion of course, students would be able to:
1. Understand basic applications and issues of Machine Learning
2. Understand the different types of datasets
3. Analyze and work with different datasets
4. Analyze various Machine Learning techniques and algorithms

**Detailed Contents:**

**Module 1: Introduction (15 Hours)**
What Is Machine Learning? How Do We Define Learning?, How Do We Evaluate Our Networks?, How Do We Learn Our Network?, What are datasets and how to handle them?, Feature sets, Dataset division: test, train and validation sets, cross validation. Applications of Machine Learning, processes involved in Machine Learning.

**Module 2: Supervised learning (15 Hours)**
Introduction to Machine Learning Techniques: Supervised Learning, Unsupervised Learning and Reinforcement Learning, Real life examples of Machine Learning.

Classification and Regression: K-Nearest Neighbor, Linear Regression, Logistic Regression, Support Vector Machine (SVM), Evaluation Measures: SSE, MME, R2, confusion matrix, precision, recall, F-Score, ROC-Curve.

**Module 3: Unsupervised learning (15 Hours)**
Introduction to clustering, Types of Clustering: Hierarchical, Agglomerative Clustering and Divisive clustering; Partitional Clustering - K-means clustering.

**Module 4: Miscellaneous (15 Hours)**
Dimensionality reduction techniques: PCA, LDA, ICA. Introduction to Deep Learning, Gaussian Mixture Models, Natural Language Processing, Computer Vision.

**Text Books/Suggested References:**
1. Introduction to Machine Learning, By Jeeva Jose, Khanna Book Publishing Co., 2020.
2. Machine Learning for Dummies, By John Paul Mueller and Luca Massaron, For Dummies,2016.
3. Machine Learning, By Rajeev Chopra, Khanna Book Publishing Co., 2021.
4. Machine Learning: The New AI, By Ethem Alpaydin, The MIT Press, 2016.
5. Machine Learning, Tom M. Mitchell, McGraw Hill Education, 2017.
6. https://www.udacity.com/course/intro-to-machine-learning--ud120
7. https://www.coursera.org/learn/machine-learning-duke

## DATABASE MANAGEMENT SYSTEM

**Subject Code: BCSES2-502** **L T P C** **Duration: 45 Hrs.**
**3 0 0 3**

### COURSE OBJECTIVE:

This course will help student to understand the concepts used in database management systems. They will also help to create database using DDL and DML. They will learn to implement database security and various advanced topics will also be covered.

### COURSE OUTCOMES:

1. To be able to learn different DBMS languages, data models and normalization.
2. For a given specification construct the SQL queries for Open source and Commercial DBMS-MYSQL, ORACLE, and DB2.
3. Able to learn about query processing and transaction processing system
4. Implement database security and recovery techniques.

### COURSE CONTENTS:

**UNIT I (11 Hrs)**

**Database system architecture:** introduction, 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.

**UNIT II (11 Hrs)**

**Relational query languages:** Relational algebra, Tuple and domain relational calculus, SQL3, DDL and DML constructs, introduction to MYSQL, ORACLE, DB2, SQL server.

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

**UNIT III (12 Hrs)**

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

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

**UNIT IV (11 Hrs)**

**Database recovery**: Introduction, log based recovery, shadow page recovery. **Database Security:** Authentication, Authorization and access control, DAC, MAC and RBAC models, introduction to SQL injection.

**Advanced topics:** Introduction to Object oriented, Distributed databases.

### RECOMMENDED BOOKS

1. "Database System Concepts", 6th Edition by Abraham Silberschatz, Henry F.Korth, S. Sudarshan, McGraw-Hill.
2. "Principles of Database and Knowledge – Base Systems", Vol 1 by J. D. Ullman, Computer Science Press.
3. "Fundamentals of Database Systems", 5th Edition by R. Elmasri and S. Navathe, Pearson Education
4. "Foundations of Databases", Reprint by Serge Abiteboul, Richard Hull, Victor Vianu, Addison-Wesley.

## ARTIFICIAL INTELLIGENCE

**Subject Code: BCSES2-503** **L T P C** **Duration: 45 Hrs.**
**3 0 0 3**

**Course Objective:**
Students will learn the basic concepts and techniques of Artificial Intelligence. They should be able to develop AI algorithms for solving practical problems.

**Course outcomes:** After completion of course, students would be able to:
1. Understand the basic concepts and techniques of Artificial Intelligence.
2. Apply AI algorithms for solving practical problems
3. Describe human intelligence and AI and Apply basics of Fuzzy logic and neural networks.
4. Explain how intelligent system works and Explain Expert System and implementation
   Detailed Contents:

**Module 1: Introduction (11 Hours)**
Artificial Intelligence and its applications, Artificial Intelligence Techniques, Level of models, criteria of success, Intelligent Agents, Nature of Agents, Learning Agents. AI Techniques, advantages, and limitations of AI, Impact and Examples of AI, Application domains of AI. The AI Ladder - The Journey for Adopting AI Successfully, Hotbeds of AI Innovation.

**Module 2: Problem solving techniques (12 Hours)**
State space search, control strategies, heuristic search, problem characteristics, production system characteristics., Hill climbing, best first search, A* search, Constraint satisfaction problem, Mean-end analysis, Min-Max Search, Alpha-Beta Pruning, Iterative Deepening. LOGIC: Propositional logic, predicate logic, Resolution, Resolution in proportional logic and predicatelogic.

**Module 3: Knowledge Representation schemes and reasoning (11 Hours)**
Mapping between facts and representations, Approaches to knowledge representation, procedural vs declarative knowledge, Forward vs. Backward reasoning, Matching, conflict resolution, Non- monotonic reasoning, Default reasoning, statistical reasoning, fuzzy logic Weak and Strong filler structures, semantic nets, frame, conceptual dependency.

**Module 4: Planning (11 Hours)**
The Planning problem, planning with state space search, partial order planning, planning graphs, planning with propositional logic, Analysis of planning approaches, Hierarchical planning, conditional planning, Continuous and Multi Agent planning.

**Text Books/Suggested References:**
1. A Classical Approach to Artificial Intelligence, M.C. Trivedi, Khanna Book Publishing, 2019.
2. Artificial Intelligence: A modern approach by Stuart Russel, Pearson Education, 2010.
3. Artificial Intelligence by Rich and Knight, The McGraw Hill, 2017.
4. Artificial Intelligence: A new synthesis by Nils and Nilson, Elsevier, 1997.
5. Artificial Intelligence by Luger, Pearson Education, 2002.
6. Artificial Intelligence by Padhy, Oxford Press, 2005.
7. https://www.edx.org/course/artificial-intelligence-ai
8. https://www.udemy.com/course/artificial-intelligence-az/

## DESIGN & ANALYSIS OF ALGORITHMS

**Subject Code: BCSES2-504** **L T P C** **Duration: 60 Hrs.**
**3 1 0 4**

**COURSE OBJECTIVE:**

1. Analyze the asymptotic performance of algorithms.
2. Write rigorous correctness proofs for algorithms.
3. Demonstrate a familiarity with major algorithms and data structures.
4. Apply important algorithmic design paradigms and methods of analysis.
5. Synthesize efficient algorithms in common engineering design situations.

**COURSE OUTCOMES:**

1. For a given algorithms analyze worst-case running times of algorithms based on asymptotic analysis.
2. Describe the algorithmic strategies.
3. Describe the different graph and tree traversal algorithms.
4. Describe the tractable and intractable problems.

**UNIT I (15 Hrs)**

**Introduction:** Characteristics of algorithm. Analysis of algorithm: Asymptotic analysis of complexity bounds – best, average and worst-case behaviour; Performance measurements of Algorithm, Time and space trade-offs, Analysis of recursive algorithms through recurrence relations: Substitution method, Recursion tree method and Masters' theorem.

**UNIT II (15 Hrs)**

**Fundamental Algorithmic Strategies:** Brute-Force, Greedy, Dynamic Programming, Branch and Bound and Backtracking methodologies for the design of algorithms; Illustrations of these techniques for Problem Solving, Bin Packing, Knap Sack TSP. Heuristics –characteristics and their application domains.

**UNIT III (15 Hrs)**

**Graph and Tree Algorithms:** Traversal algorithms: Depth First Search (DFS) and Breadth First Search (BFS); Shortest path algorithms, Transitive closure, Minimum Spanning Tree, Topological sorting, Network Flow Algorithm.

**UNIT IV (15 Hrs)**

**Tractable and Intractable Problems:** Computability of Algorithms, Computability classes – P, NP, NP-complete and NP-hard. Cook's theorem, Standard NP-complete problems, and Reduction techniques. Introduction to recent advancements in design and analysis of algorithms.

**RECOMMENDED BOOKS:**

1. Introduction to Algorithms, 4TH Edition, Thomas H Cormen, Charles E Lieserson, Ronald L Rivest and Clifford Stein, MIT Press/McGraw-Hill.
2. Fundamentals of Algorithms – E. Horowitz et al.
3. Algorithm Design, 1ST Edition, Jon Kleinberg and ÉvaTardos, Pearson.
4. Algorithm Design: Foundations, Analysis, and Internet Examples, Second Edition, Michael T Goodrich and Roberto Tamassia, Wiley.
5. Algorithms—A Creative Approach, 3RD Edition, UdiManber, Addison-Wesley,Reading, MA.

## DATABASE MANAGEMENT SYSTEM LABORATORY

**Subject Code: BCSES2-505** **L T P C**
**0 0 2 1**

**COURSE OBJECTIVE:**

To learn the implementation of SQL queries to perform DBMS operations.

**COURSE OUTCOMES:**

1. To understand basic DDL, DML, DCL commands.
2. To understand the SQL queries using SQL operators and implement the database constraints.
3. To understand the concept of relational algebra and SQL functions.
4. To implement sub queries and transaction processing.

**PRACTICALS:**

1. Write the queries for Data Definition Language (DDL) in RDBMS.
2. Write the queries for Data Manipulation Language (DML) in RDBMS.
3. Write the queries for Data Control Language (DCL) in RDBMS.
4. Write SQL queries using logical operators
5. Write SQL queries using SQL operators
6. Write SQL query using character, number, date and group functions
7. Write SQL queries for relational algebra
8. Write SQL queries for extracting data from more than one table
9. Write SQL queries for sub queries, nested queries
10. Concepts for ROLL BACK, COMMIT & CHECK POINTS.
11. Case studies on normalization

## MACHINE LEARNING LABORATORY

**Subject Code: BCSES2-506** **L T P C**
**0 0 4 2**

**Course Objective:**
The students will understand the basics of Machine Learning. They will also learn and will be able to apply different machine learning models to various datasets.

**Course Outcomes:** After completion of course, students would be able to
1. Understand basic applications and issues of Machine Learning
2. Understand the different types of datasets
3. Analyze and work with different datasets
4. Analyze various Machine Learning techniques and algorithms

**Practicals:**
1. Python Introduction:
2. Loops and Conditions and other preliminary stuff,
3. Functions, Classes and Modules,
4. Exceptions, Database access,
5. Mathematical computing with Python packages like: numpy, Mat- plotLib, pandas Tensor Flow, Keras
6. Implement basic ML models like SVM, KNN, K-Means, Logistic Regression, Linear Regression

## COMPILER DESIGN

**Subject Code: BCSED2-511** **L T P C** **Duration: 45 Hrs.**
**3 0 0 3**

**COURSE OBJECTIVE:**

This course will help students to understand the process involved in a compiler. This course will make student aware about the working of top down and bottom up parsers. This will helpstudents to better understand the different phases of compilation and generation of target code for a machine.

**COURSE OUTCOMES:**

1. For a given grammar specification, develop the lexical analyser.
2. For a given parser specification design top-down and bottom-up parsers.
3. Use syntax directed translation schemes to develop intermediate code.
4. Learn algorithms to generate code for a target machine

**UNIT I (10 Hrs)**

**Introduction:** Phases of compilation and overview.

**Lexical Analysis (scanner):** Regular languages, finite automata, regular expressions, from regular expressions to finite automata, scanner generator (LEX).

**UNIT II (10 Hrs)**

**Syntax Analysis (Parser):** Context-free languages and grammars, push-down automata, LL(1) grammars and top-down parsing, operator grammars, LR(O), SLR(1), LR(1), LALR(1) grammars and bottom-up parsing, ambiguity and LR parsing, LALR(1) parser generator (YACC)

**Semantic Analysis:** Attribute grammars, syntax directed definition, evaluation and flow of attribute in a syntax tree. Symbol Table: Its structure, symbol attributes and management. Run-time environment: Procedure activation, parameter passing, value return, memory allocation, and scope.

**UNIT III (15 Hrs)**

**Intermediate Code Generation:** Translation of different language features, different types of intermediate forms.

**Code Improvement (optimization):** control-flow, data-flow dependence etc.; Code improvement local optimization, global optimization, loop optimization, peep-hole optimization etc.

**UNIT IV (10 Hrs)**

**Target code generation**: Architecture dependent code improvement: instruction scheduling, Introduction to code generation, Target Machine, Register allocation, issues in code generation, A simple code generation algorithm.

**RECOMMENDED BOOKS**

1. V. Aho, R. Sethi, and J. Softec, D. Ullman, ‘Compilers: Principles, Techniques and Tools’, 2nd Edn., Addison-Wesley, **2006**.
2. Fischer and R. LeBlanc, ‘Crafting a Compiler’, Benjamin Cummings, **2009.**
3. C. Fischer and R. LeBlanc, ‘Crafting a Compiler in C’, Benjamin Cummings, **1991**.
4. C. Holub, ‘Compiler Design in C’, Prentice-Hall Inc., **1993**.
5. ‘Modern Compiler Implementation in C: Basic Design’, Cambridge Press, **2004**.
6. ‘Modern Compiler Implementation in Java: Basic Design’, 2nd Edn., Cambridge Press, **2002**.
7. Fraser and Hanson. A Retargetable C, ‘Compiler: Design and Implementation’, Addison-Wesley, **1995**.

## FORMAL LANGUAGE AND AUTOMATA THEORY

**Subject Code: BCSED2-512** **L T P C** **Duration: 45 Hrs.**
**3 0 0 3**

### COURSE OBJECTIVE:

1. Develop a formal notation for strings, languages and machines.
2. Design finite automata to accept a set of strings of a language.
3. Identify the hierarchy of formal languages, grammars and machines.

### COURSE OUTCOMES:

1. Design finite automata to accept a set of strings of a language.
2. Design context free grammars to generate strings of context free language.
3. Design Turing machine for accepting context sensitive languages.
4. To learn Rice's theorem.

### UNIT I (11 Hrs)

**Introduction:** Alphabet, languages and grammars, productions and derivation, Chomsky hierarchy of languages.

**Regular languages and finite automata:** Regular expressions and languages, deterministic finite automata (DFA) and equivalence with regular expressions, nondeterministic finiteautomata (NFA) and equivalence with DFA, regular grammars and equivalence with finite automata, properties of regular languages, pumping lemma for regular languages, minimizationof finite automata.

### UNIT II (12 Hrs)

**Context-free languages and pushdown automata:** Context-free grammars (CFG) and languages (CFL), Chomsky and Greibach normal forms, nondeterministic pushdown automata (PDA) and equivalence with CFG, parse trees, ambiguity in CFG, pumping lemma for context-free languages, deterministic pushdown automata, closure properties of CFLs.

### UNIT III (12 Hrs)

**Context sensitive languages:** Context-sensitive grammars (CSG) and languages, linear bounded automata and equivalence with CSG.

**Turing machines:** The basic model for Turing machines (TM),Turing-recognizable (recursively enumerable) and Turing-decidable (recursive) languages and their closure properties, variants of Turing machines, nondeterministic TMs and equivalence with deterministic TMs, unrestricted grammars and equivalence with Turing machines, TMs as enumerators.

### UNIT IV (10 Hrs)

**Undecidability:** Church-Turing thesis, universal Turing machine, the universal and diagonalization languages, reduction between languages and Rice's theorem, undecidable problems about languages.

### RECOMMENDED BOOKS

1. John E. Hopcroft, Rajeev Motwani and Jeffrey D. Ullman, Introduction to Automata Theory, Languages, and Computation, Pearson Education Asia.
2. Harry R. Lewis and Christos H. Papadimitriou, Elements of the Theory of Computation, Pearson Education Asia.
3. Dexter C. Kozen, Automata and Computability, Undergraduate Texts in Computer Science, Springer.
4. Michael Sipser, Introduction to the Theory of Computation, PWS Publishing.
5. John Martin, Introduction to Languages and The Theory of Computation, Tata McGrawHill.

## WEB TECHNOLOGIES

**Subject Code: BCSED2-513** **L T P C** **Duration: 45 Hrs.**
**3 0 0 3**

**COURSE OBJECTIVE:**

1. Designing the HTML pages along with style sheets
2. Familiar with client and server side scripting.
3. Able to develop a web application.
4. Students will gain the skills and project-based experience needed for entry into web application and development careers.

**COURSE OUTCOMES:**

1. To understand the HTML and Style Sheets
2. To have knowledge of client side scripting using JSP.
3. To understand the basics and object oriented concepts of PHP.
4. To access database using PHP programming.

**UNIT – I (12 Hrs)**

**Introduction, History of HTML, Structure of HTML Document:** Text Basics, Structure of HTML Document: Images and Multimedia, Links and webs, Document Layout, Creating Forms, Frames and Tables.

**Style sheets** : Need for CSS, introduction to CSS, basic syntax and structure, using CSS, background images, colors and properties, manipulating texts, using fonts, borders and boxes, margins, padding lists, positioning using CSS.

**UNIT – II (09 Hours)**

**Javascript** : What is Javascript, Client side scripting, Data types, variables, operators, conditional statements, loops and repetition, array object, date object, string object, Document object model - Event handling.

**UNIT – III (12 Hours)**

Introduction to PHP, Writing PHP, Control Structures, if-else, switch,? operator, while, do- while, for, for each, break, continue, goto, exit, arrays, functions

Introduction – Declaring a class – Objects – constructor – Destructor – Public, private, protected – Static properties and method – Inheritance

**UNIT – IV (12 Hours)**

Working with data, form element, Get, Post, Request, Cookies, Sessions and Access Control: Cookies - PHP and HTTP Authentication – sessions - using Auth_HTTP to Authenticate.

Working MySQL with PHP-database connectivity- usage of MYSQL commands in PHP, processing result sets of queries- handling errors-debugging and diagnostic functions- validating user input through Database layer and Application layer- formatting query output.

**RECOMMENDED BOOKS:**

1. PHP: The Complete Reference, “Steven Holzner”, Tata McGraw Hill.
2. Programming PHP, “Kevin Tetroi”, O' Reilly.
3. Robin Nixon, Learning PHP, MySQL, and JavaScript, Shroff/O'Reilly
4. VikramVaswani, “PHP and MySQL”, Tata McGraw-Hill, 2005
5. Marty Hall, Larry Brown, ‘Core Servlets and Java Server Pages Vol. 1: Core

Technologies', 2nd Edn., Pearson, 2003.
6. Dietel, Niet, 'Internet and World Wide Web – How to Program', 5th Edn., PHI/Pearson Education,2011.
7. Wang, 'An Introduction to web Design and Programming', 1st Edn.,Cengage COURSE,2003.
8. Thomas A Powell, The Complete Reference HTML & CSS, 5th Edition, Tata McGraw Hill
9. Laura Lemay, Rafe Colburn, Jennifer Kyrnin, 'Mastering HTML, CSS &Javascript Web Publishing',Sams Teach Yourself.
10. Sebesta, 'Programming World Wide Web', 4th Edn., Pearson, 2008

## JAVA PROGRAMMING

**Subject Code: BCSED2-514** **L T P C** **Duration: 45 Hrs.**
**3 0 0 3**

**COURSE OBJECTIVE:**

1. To learn the basic and advanced concepts of Java Programming language.
2. To experience the working environment required for programming in Java language and enhances their programming skills.

**COURSE OUTCOMES:**

1. To learn the basics of Java and to understand the implementation of Classes and Inheritance with respect to Java.
2. To describe the concept of handling of exceptions and multithreading.
3. To understand how to implement I/O, Applets and Graphics in Java
4. To comprehend the advanced topics of Java Programming

**UNIT-I (12 Hrs)**

**Introduction to Java:** Features of Java, difference between Java and C++, JVM, Bytecode, data types, variables, arrays, Type Conversion and Casting.

**Classes and Inheritance:** Class Fundamentals, methods, constructors, garbage collection, this keyword, Overloading constructors, Nested and Inner classes. Basics and types of inheritance, Method Overriding, Abstract Classes, final keyword, packages and interfaces.

**UNIT-II (12 Hrs)**

**Exception Handling:** Basics, Exception Types, uncaught exceptions, try and catch, throwing exceptions.

**Introduction to Multithreading**: Java thread model, thread priorities, synchronization, interthread communication, creating, suspending, resuming threads.

**UNIT-III (12 Hrs)**

**I/O:** Input/Output, reading and writing files.

**Applets and Graphics:** Applet basics, Applet class, Applet initialization and termination, event handling, keyboard and mouse events, AWT class, Layout managers, panels, canvases, Frame windows, drawing lines, rectangles, ellipses.

**UNIT-IV (09 Hrs)**

**Advance Concepts**: JDBC Connectivity, Introduction to Java Beans, Java Swings, Java Server Pages.

**RECOMMENDED BOOKS:**

1. Patrick Naughton & Herbert Schildt, 'The Complete Reference Java 2', 5th Edn., Tata McGraw Hill, **2002**.
2. Balagurusamy, 'Programming in JAVA', BPB Publications, **2006**.
3. Deitel and Deitel, 'Java: How to Program', 10th Edn., Pearson Education, **2014**

## FINANCE & ACCOUNTING

**Subject Code: BHSMC0-015** **L T P C** **Duration: 45 Hrs.**
**3 0 0 3**

**Course Objectives:**

The main aim of this course is:

1. To provide an in-depth view of the process in financial management of the firm
2. To develop knowledge on the allocation, management and funding of financial resources.
3. To improving students' understanding of the time value of money concept and the role of a financial manager in the current competitive business scenario.
4. To enhancing student's ability in dealing short-term and long term dealing with day-to-day working capital decision and raising finance.

**Course Outcomes:** After completing this course the students should be able to:

1. Explain the concept of fundamental financial concepts, especially time value of money.
2. Apply capital budgeting projects using traditional methods.
3. Analyze he main ways of raising capital and their respective advantages and disadvantages in different circumstances
4. Integrate the concept and apply the financial concepts to calculate ratios and do the capital budgeting.

### Unit-I (12 Hrs.)

Introduction to Accounting: Meaning, Objectives, Basic Accounting Terms. Accounting Principles: Meaning and Nature, Accounting Concepts, Bases of Accounting, Nature of Accounts, Origin of Transactions Source Documents and Vouchers Accounting Equations Rules of Debit and Credit Recording of Transactions: Book of Original Entry-Journal, Ledger Posting from Journal and Ledger Balancing, Subsidiary Books

### Unit-II (11 Hrs.)

Nature, Scope and Objectives of Financial Management, Profit Maximization Vs Wealth Maximization, Financial Planning, Forms of Business Organization, Role of Financial Manager.

Capital Structure – Introduction, Factors Affecting Capital Structure, Liquidity Ratios. Capital Structure Theories: Net Income Approach, Net Operating Income Approach, Traditional Approach, Modigliani-Miller Model (MM).

### Unit-III (11 Hrs.)

Working Capital Decision: Meaning, Nature and Scope of Working Capital - Component of Working Capital – Factors affecting Working Capital, Working Capital Strategies, Capital Budgeting Techniques: Discounted and Non-Discounted Methods (Pay Back, ARR, NPV, IRR, Benefit Cost Ratio), Long Term and Short Term Sources of Funds.

### Unit-IV (11 Hrs.)

Long Term Sources of Funds: Equity share, Preference shares, Debentures, Bonds, Warrants, Venture capital and Ploughing back of profits. Short Term Sources of Funds: Commercial Paper, Certificate of Deposit, Treasury Bills.

**Recommended Books**

1. Brigham, "Financial Management: Text & Cases", Cengage Learning.
2. Brealy & Myres, "Principles of Corporate Finance", Tata McGraw Hill.
3. Ambrish Gupta, "Financial Accounting for Management", 2nd Edn., Pearson Education.
4. I.M. Pandey, "Financial Management", Vikas Publishers.
5. S.P. Jain and K.L. Narang, Principles of Accounting",Kalyani Publishers, New Delhi,2004.

# 6th SEMESTER

## SOFTWARE ENGINEERING

**Subject Code: BCSES2-601** **L T P C** **Duration: 45 Hrs.**
**3 0 0 3**

**COURSE OBJECTIVE:**

To enable the students to learn the principles and methodologies followed to develop good software.

**COURSE OUTCOMES:**

1. To study how software engineering principles evolve and to analyze the varioussoftware models that can be followed to develop software.
2. To understand the software analysis and design step of software development.
3. To study coding, testing and reliability of a software.
4. To highlight the various management activities and related terms of a software.

### UNIT-I (10 Hrs)

**Introduction**: Evolution and impact of Software engineering, Software crisis, Principles of Software Engineering, Feasibility study

**Software Life Cycle Models**: Waterfall, prototyping, Evolutionary, and Spiral models, Comparison of software models.

### UNIT-II (11 Hrs)

**Scheduling and Planning**: Management Activities, Project planning and control, cost estimation, project scheduling using PERT and GANTT charts.

**Requirement Analysis**: Functional and Non-functional requirements, Requirements gathering, Requirements analysis and specification.

### UNIT-III (14 Hrs)

**Software Design**: Basic principles of software design, modularity, cohesion, coupling and layering, function-oriented software design: DFD and Structure chart, object modeling using UML, Object-oriented software development, Design specifications, Design metrics, Verification and validation, User Interface design.

**Coding**: Coding standards and Code review techniques, Coding styles, Coding metrics. **Software Testing**: Fundamentals of testing, Types of software testing, White-box, and black- box testing, test case design techniques, mutation testing and Testing metrics.

### UNIT-IV (10 Hrs)

**Reliability**: Software reliability metrics, reliability growth modelling.

**Software Quality Management**: Risk Management, Quality management, ISO and SEI CMMI, Six Sigma, Computer aided software engineering, Software maintenance, Software Configuration Management, Component-based software developments

**RECOMMENDED BOOKS:**

1. Pressman, „Software Engineering: A Practitioner‟s Approach‟, 3rd Edn., TMH, **2004**
2. Flecher and Hunt, „Software Engineering and CASE: Bridging and Culture Gap‟, **2000**.
3. Shepperd, „Software Engineering, Metrics‟, Vol.-1 (EN), McMillan, **1999.**
4. Robert S. Arnold, „Software Re–engineering‟, IEEE Computer Society, **1994**.
5. Pankaj Jalote, „An Integrated Approach to Software Engineering‟, 3rd Edn., Narosa Publishers, **2006**.
6. Ghezzi, Cario, Fundamentals of Software Engineering‟, 2nd Edn., PHI, **2002**.

## DEEP LEARNING

**Subject Code: BCSES2-602** **L T P C** **Duration: 60 Hrs.**
**3 1 0 4**

**Course Objectives:** After completion of course, students would be able to Understand the fundamentals of deep learning and the main research activities in this field.

**Course Outcomes:** After completion of course, students would be able to:

1. Understand the fundamentals of deep learning and the main research activities in this field
2. Remember architectures and optimization methods for deep neural network training
3. Implement, apply and test relevant learning algorithms in Tensor Flow
4. Critically evaluate the method's applicability in new contexts and construct new applications

**Detailed Contents:**

**Module 1: Introduction (15 Hours)**

History of Deep Learning, McCulloch Pitts Neuron, Multilayer Perceptrons (MLPs), Representation Power of MLPs, Sigmoid Neurons, Feed Forward Neural Networks, Back propagation

**Module 2: Activation functions and parameters (15 Hours)**

Gradient Descent (GD), Momentum Based GD, Nesterov Accelerated GD, Stochastic GD, Principal Component Analysis and its interpretations, Singular Value Decomposition, Parameters v/s Hyper-parameters

**Module 3: Auto-encoders & Regularization (15 Hours)**

Auto encoders , Regularization in auto encoders, Denoising auto encoders, Sparse auto encoders, Regularization: Bias Variance Tradeoff, L2 regularization, Early stopping, Dataset augmentation, Encoder Decoder Models, Batch Normalization

**Module 4: Deep Learning Models (15 Hours)**

Introduction to CNNs, Architecture, Convolution/pooling layers, CNN Applications, LeNet, AlexNet, ZF-Net, VGGNet, GoogLeNet, ResNet. Introduction to RNNs, Back propagation through time (BPTT), Vanishing and Exploding Gradients, Truncated BPTT, GRU, LSTMs. Deep Learning Applications: Image Processing, Natural Language Processing, Speech recognition, Video Analytics.

**Text Books/Suggested References:**

1. Ian Good fellow, Yoshua Bengio, Aaron Courville. Deep Learning, the MIT press, 2016Bengio, Yoshua. " Learning deep architectures for AI." Foundations and trends in Machine Learning 2.1, Now Publishers, 2009
2. Deep Learning, Rajiv Chopra, Khanna Book Publishing, Delhi 2020.https://nptel.ac.in/courses/106/106/106106184/
3. https://www.coursera.org/specializations/deep-learning

## DEEP LEARNING LABORATORY

**Subject Code: BCSES2-603** **L T P C**
**0 0 2 1**

**Course Outcomes:** After completion of course, students would be able to:

1. Understand the fundamentals of deep learning and the main research activities in this field.
2. Remember architectures and optimization methods for deep neural network training.
3. Implement, apply and test relevant learning algorithms in Tensor Flow.
4. Critically evaluate the method's applicability in new contexts and construct new applications.

**Laboratory/ Practicals (if any): Mention list of Practicals**

1. Implementation of following deep learning algorithms in Python using Tensor Flow: ConvolutionNeural Network.
2. Implementation of following deep learning algorithms in Python using Tensor Flow: Recurrent NeuralNetwork.
3. Project work involving application of Deep Learning

## MOBILE APPLICATION DEVELOPMENT

**Subject Code: BCSED2-611** **L T P C** **Duration: 45 Hrs.**
**3 0 0 3**

**COURSE OBJECTIVE:**

This course will help to manage mobile application data by integrating them with cloud services. This course also helps to understand different testing methodologies for mobile application.

**COURSE OUTCOMES:**

1. To learn application models of mobile application frameworks.
2. To learn Mobile OS architectures.
3. To be database access in different mobile OS.
4. To learn testing methodologies for mobile applications.

**UNIT I (11Hrs)**

**Introduction to mobile devices:** Introduction to Mobile Computing, Introduction to Android Development Environment, Mobile devices vs. desktop devices, ARM and intel architectures, Power management, screen resolution, Touch interfaces, Application deployment, App Store, Google play, Windows Store.

**UNIT II (11 Hrs)**

**Mobile OS Architectures:** Comparing and contrasting architectures of all three- Android, iOS and Windows, Underlying OS, Kernel structure and native level programming. Approaches to power management, Security.

**UNIT III (12 Hrs)**

**Android/iOS/Win8 Apps:** DB Access, network access, contacts/ photos/ etc. Underneath the frameworks: Native level programming on Android, Low Level programming on iOS, Windows low level APIs

**Intents and services:** Android intents and services, characteristics of mobile applications, Successful mobile development.

**UNIT IV (11 Hrs)**

**Storing and Retrieving data:** Synchronization and replication of mobile data, Android storing and retrieving data, working with content provider, Putting it all together: packaging and deploying, Performance best practices, Android field service app.

**RECOMMENDED BOOKS:**

1. Bill Philips, Chris Stewart, Brian Hardy, “Android Programming”.
2. Brian Fling, “Mobile Design and Development”.
3. Valentino Lee, Heather Schneidar, “Mobile applications: Architecture, Design, Development”.

## COMPUTER GRAPHICS

**Subject Code: BCSED2-612** **L T P C** **Duration: 45 Hrs.**
**3 0 0 3**

**COURSE OBJECTIVE:**

1. Understanding the fundamental graphical operations and the implementation on computer,
2. To get a glimpse of recent advances in computer graphics.
3. Understanding user interface issues that make the computer easy for the novice to use.

**COURSE OUTCOME:**

1. Able to learn about the basics of graphics, its applications, uses and Knowledge to draw different shapes in graphics on computer.
2. Ability to apply different 2-D and 3-D transformations on an object.
3. Learn clipping operations and various object filling techniques, different projections techniques. Various hidden surface removal.
4. Knowledge of Rendering techniques, Fractals and different colour models.

**UNIT I (12 Hrs)**

**Introduction**: Computer Graphics and its applications, Elements of a Graphics, Graphics Systems: Video Display Devices, Raster Scan Systems, Random Scan Systems, Input devices. **Basic Raster Graphics**: Scan conversion- Point plot technique, Line drawing, Circle generating and Ellipse generating algorithms.

**UNIT II (11 Hrs)**

**Two-dimensional Geometric Transformations**: Basic Transformations-Translation, Rotation and Scaling, Matrix Representation and Homogeneous Coordinates, Composite Transformations, Reflection and Shearing transformations.

**Elementary 3D Graphics**: Matrix Representation of 3D transformations, Plane projections and its types, Vanishing points, Specification of a 3D view.

**UNIT III (11 Hrs)**

**Clipping:** Window to viewport transformation, Clipping Operations- Point Clipping, Line Clipping, Polygon Clipping and Text Clipping.

**Filling Techniques**: Scan line algorithms, Boundary-fill algorithm, Flood-fill algorithm. **Visibility**: Image and object precision, Hidden edge/surface removal or visible edge/surface determination techniques; z buffer algorithms, Depth sort algorithm, Scan line algorithm and Floating horizon technique.

**UNIT IV (11 Hrs)**

**Color Models:** Properties of Light, Intuitive Color Concepts, RGB Color Model, CMY Color Model, HLS and HSV Color Models, Conversion between RGB and CMY color Models, Conversion between HSV and RGB color models, Color Selection and Applications.

**Advance Topics**: Introduction of Rendering, Fractals, Gourard and Phong shading.

**RECOMMENDED BOOKS:**

1. Donald Hearn and M. Pauline Baker, 'Computer Graphics', 4th Edn.**,** PHI/Pearson Education, **2010**.
2. Zhigand Xiang, Roy Plastock, Schaum's Outlines, **'**Computer Graphics**',** 2nd Edn., Tata Mc-Graw Hill, **2001**.
3. C. Foley, Van Dam, Feiner and Hughes, **'**Computer Graphics Principles & Practice**'**, 3rdEdn., Pearson Education**, 2013.**
4. Roy A. Plastock, Gordon Kalley, 'Computer Graphics', 1st Edn., Schaum's Outline Series, **1986**.

## NATURAL LANGUAGE PROCESSING

**Subject Code: BCSED2-613** **L T P C** **Duration: 45 Hrs.**
**3 0 0 3**

**Course Objective:**
The students should be able to study language and the tools that are available to efficiently study and analyze large collections of text. They should learn about and discuss the effects of electronic communication on our language.

**Course Outcomes:** After completion of course, students would be able to:
1. Understand language and the tools that are available to efficiently study and analyse large collections of text.
2. Analyze and discuss the effects of electronic communication on our language
3. Learn natural language processing with manual and automated approaches.
4. Learn computational frameworks for natural language processing.

**Module 1: Introduction (10 hours)**
A computational framework for natural language, description of English or an Indian language in the frame work, lexicon, algorithms and data structures for implementation of the framework, Finite state automata, the different analysis levels used for NLP (morphological, syntactic, semantic, pragmatic, Recursive and augmented transition networks. Applications like machine translations.

**Module 2: Word level Semantic and syntactic analysis (10 hours)**
Word Level Analysis: Semantic Analysis: Meaning Representation, Lexical Semantics, Ambiguity, Word Sense Disambiguation. Discourse Processing: cohesion, Reference Resolution, Discourse Coherence and Structure. Knowledge Representation, reasoning.
Regular Expressions, Finite-State Automata, Morphological Parsing, Spelling Error Detection and correction, Words and Word classes, Part-of Speech Tagging. Syntactic Analysis: Context-free Grammar.

**Module 3: Natural language generation (15 hours)**
Natural Language Generation (NLG): Architecture of NLG Systems, Generation Tasks and Representations, Application of NLG. Machine Translation: Problems in Machine Translation, Characteristics of Indian Languages, Machine Translation Approaches, Translation involving Indian Languages.

**Module 4: Information retrieval and lexical resources (10 hours)**
Information Retrieval: Design features of Information Retrieval Systems, Classical, Non-classical, Alternative Models of Information Retrieval, valuation Lexical Resources: World Net, Frame Net, Stemmers, POS Tagger.

**Text Books/Suggested References:**
1. Natural Language understanding by James Allen, Pearson Education, 2002.
2. NLP: A Paninian Perspective by Akshar Bharati, Vineet Chaitanya, and Rajeev Sangal, Prentice Hall, 2016.
3. Meaning and Grammar by G. Chirchia and S. McConnell Ginet, MIT Press, 1990.
4. An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition by Daniel Jurafsky and James H. Martin, Pearson Education, 2006.
5. Natural language processing in Prolog by Gazdar, & Mellish, Addison-Wesley
6. https://www.coursera.org/specializations/natural-language-processing

## COMPUTER NETWORKS

**Subject Code: BCSED2-614** **L T P C** **Duration: 45 Hrs.**
**3 0 0 3**

**COURSE OBJECTIVE:**

1. To develop an understanding of modern network architectures from a designand performance perspective.
2. To provide an opportunity to do network programming
3. To provide a WLAN measurement ideas.

**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 problem related TCP/IP protocol developed the network programming.
4. Configure DNS DDNS, TELNET, EMAIL, File Transfer Protocol (FTP), WWW, HTTP, SNMP, Bluetooth, Firewalls using open source available software and tools.

**UNIT I (10 Hrs)**

**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 II (10 Hrs)**

**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 III (15 Hrs)**

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

**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 IV (10 Hrs)**

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

**RECOMMENDED 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.

## DATA MINING

**Subject Code: BCSED2-621** **L T P C** **Duration: 45 Hrs.**
**3 0 0 3**

**COURSE OBJECTIVE:**

1. To cover powerful data mining techniques including clustering, association rules, and classification.
2. Web mining is also introduced.

**COURSE OUTCOMES:**

1. To introduce the basic concepts of Data Mining techniques.
2. To have knowledge of decision trees and algorithms used for it.
3. To learn the concept of search engines.
4. To understand web mining.

### UNIT-I (12 Hrs)

**Data Mining:** Introduction to data mining, introduction to data warehousing, architecture of data warehouse, association rules in mining, Naive algorithm, Apriori algorithm, direct hashing and pruning (DHP), Dynamic Item set counting (DIC), Mining frequent pattern without candidate generation (FP, growth), performance evaluation of algorithms.

### UNIT-II (11 Hrs)

**Classification:** Introduction, decision tree, tree induction algorithms – split algorithm based on information theory, split algorithm based on Gini index; naïve Bayes method; estimating predictive accuracy of classification method

### UNIT-III (11 Hrs)

**Cluster Analysis:** Introduction, partitional methods, hierarchical methods, density basedmethods, dealing with large databases, cluster software; Search engines: Characteristics of Search engines, Search Engine Functionality, Search Engine Architecture, Ranking of web pages, The search engine history, Enterprise Search, Enterprise Search Engine Software.

### UNIT IV (11 Hrs)

**Web Data Mining:** Web Terminology and Characteristics, Locality and Hierarchy in the web, Web Content Mining, Web Usage Mining, Web Structure Mining, Web mining Software.

**RECOMMENDED BOOKS:**

1. Carlo Vercellis, „Business Intelligence: Data Mining and Optimization for DecisionMaking", 1st Edn., WILEY, **2009**.
2. J. Han, M. Kamber and J. Pei, „Data Mining Concepts and Techniques", 3rd Edn., Morgan Kaufmann Publishers, **2011**.
3. V. Pudi, P.R. Krishana, „Data Mining", 1st Edn., Oxford University Press, **2009**.
4. P. Adriaans, D. Zantinge, „Data Mining", 1st Edn., Pearson Education Press, **1996**.
5. P. Pooniah, „Data Warehousing Fundamentals", 1st Edn., Willey Interscience Publication, **2001**.

## DATA AND VISUAL ANALYTICS IN AI

**Subject Code: BCSED2-622** **L T P C** **Duration: 45 Hrs.**
**3 0 0 3**

**Course Objective:**
The student will be able to understand techniques and algorithms for creating effective visualizations based on principles from graphic design. They will also be introduced to several industry-standard software tools to create a compelling and interactive visualization of various types of data.

**Course Outcomes:** After completion of course, students would be able to:
1. Understand the key techniques and theory used in visualization, including data models, graphicalperception, and techniques for visual encoding and interaction.
2. Apply knowledge to a number of common data domains and corresponding analysis tasks,including multivariate data, networks, text, and cartography.
3. Describe big data and use cases from selected business domains.
4. Explain No SQL big data management and other technologies such as Hadoop and HDFS

**Module 1: Introduction (11 hours)**
Data for Graphics, Design principles, Value for visualization, Categorical, time series, and statistical data graphics, Introduction to Visualization Tools

**Module 2: Graphics Pipeline and Aesthetics and Perception (11 hours)**
Introduction, Primitives: vertices, edges, triangles, Model transforms: translations, rotations, scaling, View transform, Perspective transform, window transform, Graphical Perception Theory, Experimentation, and the Application, Graphical Integrity, Layering and Separation, Color and Information, Using Space

**Module 3: Visualization Design (12 hours)**
Visual Display of Quantitative Information, Data-Ink Maximization, Graphical Design, ExploratoryData Analysis, Heat Map. Multidimensional Data and Interaction: Query, Analysis and Visualization of Multi-Dimensional Relational Databases, Interactive Exploration, Tsne , Interactive Dynamics for Visual Analysis, Visual Queries, Finding Patterns in Time Series Data, Trend visualization, Animation, Dashboard, Visual Storytelling

**Module 4: Collaboration (11 hours)**
Graph Visualization and Navigation, Online Social Networks, Social Data Analysis, CollaborativeVisual Analytics, Text, Map, Geospatial data

**Text Books/Suggested References:**
1. The Visual Display of Quantitative Information by E. Tufte, Graphics Press, 2nd Edition, 2001
2. Beginner's Guide for Data Analysis using R Programming, Jeeva Jose, Khanna Publishing 2019.
3. Data Visualization Handbook by J. Koponen, J. Hildén, CRC Press, 2019.
4. The Book of Trees: Visualizing Branches of Knowledge by M. Lima, Princeton ArchitecturalPress, 2014.
5. Handbook of Graph Drawing and Visualization by R. Tamassia, CRC Press, 2013
6. Interactive Data Visualization for the Web by S. Murray O'Reilly Press, 2nd Edition, 2017.

## HUMAN COMPUTER INTERACTION

**Subject Code: BCSED2-623** **L T P C** **Duration: 45 Hrs.**
**3 0 0 3**

**COURSE OBJECTIVE:**

1. Describe and apply core theories, models and methodologies from the field of HCI
2. Discuss current research in the field of HCI

**COURSE OUTCOMES:**

1. To have knowledge of task centred systems design.
2. Understand the fundamental aspects of designing and evaluating interfaces
3. To understand different design principles.
4. To learn different HCI design standards.

### Unit-I (11 Hrs)

**Introduction, Task-centred system design, User-centred design and prototyping:** Human-Computer Interaction. Task-centred system design: Task-centered process, development of task examples, evaluation of designs through a task-centered walk-through.

**User-centred design and prototyping**: Assumptions, participatory design, methods for involving the user, prototyping, low fidelity prototypes, medium fidelity

### UNIT- II (12 Hrs)

**Methods for evaluation of interfaces with users and Psychology of everyday things:** Goals of evaluation, approaches, ethics, introspection, extracting the conceptual model, direct observation, constructive interaction, interviews and questionnaires, continuous evaluation via user feedback and field studies, choosing an evaluation method.

**Psychology of everyday things:** Psychopathology of everyday things, examples, concepts for designing everyday things. Beyond screen design: characteristics of good representations, information visualization, Tufte‟s guidelines, visual variables, metaphors, direct manipulation.

### UNIT III (11 Hrs)

**Graphical screen design, Design principles and usability heuristics:** Graphical design concepts, components of visible language, graphical design by grids. Design principles and usability heuristics: Design principles, principles to support usability, golden rules and heuristics, HCI patterns

### UNIT IV (11 Hrs)

**HCI design standards, Past and future of HCI:** Process-oriented standards, product- oriented standards, strengths and limitations of HCI Standards. Past and future of HCI: The past, present and future, perceptual interfaces, context-awareness and perception

**Recommended Books**

1. Dix A., Finlay J., Abowd G. D. and Beale R., Human Computer Interaction, Pearson Education, 3rd edition, 2005.
2. Preece J., Rogers Y., Sharp H., Baniyon D., Holland S. and Carey T. Human Computer Interaction, Addison Wesley, 1st edition, 1994.

## EMBEDDED SYSTEMS

**Subject Code: BCSED2-624** **L T P C** **Duration: 45 Hrs.**
**3 0 0 3**

**COURSE OBJECTIVE:**
This course helps to understand the basic concepts of embedded systems.

**COURSE OUTCOMES:**
1. To learn specifications and analysis of embedded systems.
2. To estimate hardware and software costs.
3. To learn arm programming instruction set.
4. To learn IDE.

**Unit-I (11 Hrs)**

**Introduction:** Specifications and analysis of embedded systems, interface to the real time operating systems, verification of embedded systems like formal verification, co simulation

**Unit-II (11 Hrs)**

Estimation of hardware and software costs, partitioning, synthesis (hardware, software, memory, bus), retargetable usage of the software, specification and verification of the OS schedules, hard and soft realtime operating systems, and fault tolerant systems.

**Unit-III (11 Hrs)**

Arm Programming Instructions Instruction Set: Data processing instructions, Addressing modes, Load Store Instructions, PSR (Program Status Register) Instructions, Conditional Instructions, Interrupt Instructions

**Unit-IV (12 Hrs)**

C Programming Integrated Development Environment (IDE) for C/C++ Programming, C/C++ Programs using Function Calls, Pointers, Structures, Integers &Floating Point Arithmetic, Assembly Code using Instruction Scheduling, Register Allocation, Conditional Execution & Loops

**Recommended Books:**

**1.** Andrew N. Sloss, Dominic Symes, Chris Wright, John Rayfield, ―ARM System Developer‟s Guide Designing and Optimizing System Software‖, Elsevier 2008.
**2.** Brooks, Cole, ―Embedded Microcontroller Systems, Real Time Interfacing‖, Thomson Learning 1999
**3.** Steve Furber, ―ARM system on Chip Architecture‖, Addision Wesley
**4.** Trevor Martin, ―The Insider's Guide to The Philips ARM7 - Based Microcontrollers, An Engineer's Introduction To The LPC2100 Series‖ Hitex Ltd.

# 7th SEMESTER

## ADVANCED MACHINE LEARNING

**Subject Code: BCSED2-711** **L T P C** **Duration: 45 Hrs.**
**3 0 0 3**

**Course Objective:**
To introduce advanced concepts and methods of machine learning and to develop an understanding of the role of machine learning in massive scale automation. To design and implement various machine learning algorithms in a range of real-world applications.

**Course Outcomes:** After completion of course, students would be able to:
1. Understand advanced concepts and methods of machine learning and to develop an understanding of the role of machine learning in massive scale automation.
2. Apply various machine learning algorithms in a range of real-world applications.
3. Integrate and apply their expertise to produce solutions for real-world problems.
4. Interpret and Analyze results with reasoning using different ML techniques

### Unit I (13 Hrs)

**Artificial Neural Network**
Introduction to ANN, Perceptron, Cost Function, Gradient Checking, multi-layer perceptron and back propagation algorithm that is used to help learn parameters for a neural network, Random Initialization

### UNIT II (12 Hrs)

**Bayesian Learning and Decision Trees**
Probability theory and Bayes rule, Naive Bayes learning algorithm, Bayes nets.
Representing concepts as decision trees, Recursive induction of decision trees, best splitting attribute: entropy and information gain. Searching for simple trees and computational complexity, Over fitting, noisy data, and pruning.

### UNIT III (15 Hrs)

**Reinforcement Learning**
Reinforcement earning through feedback network, function approximation.

### UNIT IV (15 Hrs)

**Ensemble Methods**
Bagging, boosting, stacking and learning with ensembles. Random Forest

**Text Books/Suggested References:**
1. Tom Mitchell, Machine Learning, McGraw Hill, 1997.
2. Jeeva Jose, Introduction to Machine Learning, Khanna Book Publishing 2020.
3. Rajiv Chopra, Machine Learning, Khanna Book Publishing 2021
4. Ethem Apaydin, Introduction to Machine Learning, 2e. The MIT Press, 2010.
5. Kevin P. Murphy, Machine Learning: a Probabilistic Perspective, The MIT Press, 2012.
6. https://www.coursera.org/learn/bayesian-methods-in-machine-learning?specialization=aml

## SOFT COMPUTING

**Subject Code: BCSED2-712** **L T P C** **Duration: 45 Hrs.**
**3 0 0 3**

**COURSE OBJECTIVE:**

1. To introduce soft computing concepts and techniques and foster their abilities in designing appropriate technique for a given scenario.
2. To implement soft computing based solutions for real-world problems.

**COURSE OUTCOMES**:

1. Identify and describe soft computing techniques and their roles in building intelligent machines
2. To have knowledge of neural networks-I
3. To have knowledge of neural networks-II.
4. To learn the concepts of genetic algorithms.

**UNIT-I (12 Hrs.)**

**Introduction to Soft Computing and Neural Networks:** Introduction to soft computing, soft computing constituents, difference between soft computing and hard computing, Applications of Soft Computing.

**Fuzzy Logic:** Basic Concepts, Fuzzy Sets and Operations, Properties of Fuzzy Sets, Fuzzy Relations, Membership Functions, Fuzzy Rules and Fuzzy Reasoning, Fuzzy Inference Systems, Defuzzification methods, Industrial applications.

**UNIT-II (10 Hrs.)**

**Neural Networks-I**: (Introduction & Architecture): Biological Neuron, Machine Learning Using Neural Network, Artificial Neuron and its model, activation functions, Supervised, unsupervised and reinforcement Learning, feed forward networks and feedback networks, learning rules – Hebbian, Delta, Perceptron learning and Windrow-Hoff, winner-take-all.

**UNIT-III (12 Hrs.)**

**Neural Networks-II**: Supervised learning- Perceptron learning, single layer/multilayer perceptron, linear separability, hidden layers, back propagation algorithm, Radial Basis Function network; Unsupervised learning - Kohonen, SOM, k-means clustering, Adaptive Resonance Theory (ART), Application of neural networks.

**UNIT-IV (11 Hrs.)**

**Genetic Algorithms**: Concept of Introduction to Genetic Algorithms (GA), GA operators: Encoding, Crossover, Selection, Mutation, Fitness function, population, Simple GA (SGA), other types of GA, Applications of GA.

**Recommended Books**:

1. Jyh: Shing Roger Jang, Chuen:Tsai Sun, EijiMizutani, „Neuro: Fuzzy and Soft Computing17‟, Prentice-Hall of India, 2003.
2. George J. Klir and Bo Yuan, „Fuzzy Sets and Fuzzy Logic: Theory and Applications 17‟, Prentice Hall, 1995.
3. MATLAB Toolkit Manual

## PARALLEL PROCESSING

**Subject Code: BCSED2-713** **L T P C** **Duration: 45 Hrs.**
**3 0 0 3**

**COURSE OBJECTIVE:**

Students will have skills in RISC as well as CISC architectures and can design or analyses different problems associated with this domain.

**COURSE OUTCOMES:**

1. Design and analyze the parallel algorithms for real world problems and implement them on available parallel computer systems.
2. To implement basic communication operations.
3. To implement various threads.
4. To learn different sorting algorithms.

**Unit-I (12 Hrs.)**

**Introduction:** Implicit parallelism, Limitations of memory system performance, control structure, communication model, physical organization, and communication costs of parallel platforms, Routing mechanisms for interconnection networks, Mapping techniques.

**Parallel algorithm design:** Preliminaries, decomposition techniques, tasks and interactions, mapping techniques for load balancing, methods for reducing interaction overheads, parallel algorithm models.

**UNIT- II (11 Hrs.)**

**Basic communication operations:** Meaning of all-to-all, all-reduce, scatter, gather, circular shift and splitting routing messages in parts.

**Analytical modeling of parallel programs:** sources of overhead, performance metrics, the effect of granularity on performance, scalability of parallel systems, minimum execution time, minimum cost-optimal execution time, asymptotic analysis of parallel programs.

**UNIT III (11 Hrs.)**

**Programming using message passing paradigm:** Principles, building blocks, MPI, Topologies and embedding, Overlapping communication and computation, collective communication operations, Groups and communicators

**Programming shared address space platforms:** Threads, POSIX threads, Synchronization primitives, attributes of threads, mutex and condition variables, Composite synchronization constructs, Open MP Threading Building blocks; An Overview of Memory Allocators, An overview of Intel Threading building blocks.

**UNIT IV (11 Hrs.)**

**Dense Matrix Algorithms:** matrix vector multiplication, matrix-matrix multiplication, solving system of linear equations.

**Sorting:** Sorting networks, Bubble sort, Quick sort, Bucket sort and other sorting algorithms Graph algorithms: Minimum spanning tree, single source shortest paths, all-pairs shortest paths, Transitive closure, connected components, algorithms for sparse graphs.

**Recommended Books**

1. Ananth Grama, Anshul Gupta, George Karypis, Vipin Kumar: Introduction to Parallel Computing, Second Edition Pearson Education – 2007
2. Michael J. Quinn (2004), Parallel Programming in C with MPI and Open MP McGraw-Hill International Editions, Computer Science Series.

## AD-HOC & SENSOR NETWORKS

**Subject Code: BCSED2-714** **L T P C** **Duration: 45 Hrs.**
**3 0 0 3**

**COURSE OBJECTIVE:**

This course will help to learn the concepts of ad-hoc and sensor networks.

**COURSE OUTCOMES:**

1. To be able to learn wireless technologies.
2. To be able to learn different protocols for ad-hoc networks.
3. To learn different routing algorithms used for ad-hoc networks.
4. To learn how to synchronize network nodes.

**COURSE CONTENTS:**

**UNIT I (12 Hrs)**

**Introduction:** Elements of Ad hoc Wireless Networks, Issues in Ad hoc wireless networks, Example commercial applications of Ad hoc networking. Cellular architecture, co-channel interference, frequency reuse, capacity increase by cell splitting, handoff, types of handoffs, Mobile IP, Cellular IP.

Introduction to Wireless sensor networks, Single-sink single-hop WSN, Single-sink multi- hop WSN, Multi-sink multi-hop WSN, Advantages of ad-hoc/sensor networks, Node and Network Architectures of WSN.

**UNIT-II (12 Hrs)**

**MAC protocols for Ad hoc Networks**: Design issues, Classifications, Contention based protocols, MACAW, FAMA, BTMA, DBTMA, MACABI, Real-Time MAC protocol, Multichannel protocols, Power aware MAC

**MAC protocols in WSN:** Scheduled protocols, LEACH IEEE 802.15.4 MAC protocol, Guo protocol, TRAMA protocol, Contention-based protocols, Zhong protocol, DMAC protocol, PAMAS protocol, SMAC protocol.

**UNIT-III (09 Hrs)**

**Routing protocols in Ad hoc Networks:** Design issues, Table-driven protocols - DSDV, WRP, CGSR, On-Demand protocols - DSR, AODV, TORA, LAR, ABR, Zone Routing Protocol, ZRP, ZHLS, Power Aware Routing protocols.

**UNIT-IV (12 Hrs)**

**Routing protocols in WSN:** Issues in designing routing protocols, Classification of routing protocols, Flat routing, Flooding and gossiping, SPIN protocol, PEGASIS protocol, TEEN protocol, MECN protocol, SPAN protocol, Location-based routing protocols, GAF protocol, GEAR protocol,

**Introduction to Technologies for WSNs:** ZigBee technology, Ultrawide bandwidth technology, Bluetooth technology, Comparison among technologies.

**RECOMMENDED BOOKS:**

1. Roberto Verdone, Davide Dardari, Gianluca Mazzini and Andrea Conti, “Wireless Sensor and Actuator Networks: Technologies, Analysis and Design”, Academic Press, 2008.
2. Miguel A. Labrador and Pedro M. Wightman, “Topology Control in Wireless Sensor Networks-with a companion simulation tool for teaching and research”, Springer Science, 2009.

3. Edgar H. Callaway, "Wireless Sensor Networks: Architectures and Protocols", CRC Press, 2004.
4. Xian-Yang Li, "Wireless Ad Hoc and Sensor Networks: Theory and Applications", Cambridge University Press 2008.
5. Feng Zhao and Leonidas J. Guibas, "Wireless Sensor Networks: An Information Processing Approach", Morgan Kaufmann Publishers, 2008.
6. C. Siva Ram Murthy and B. S. Manoj, Ad Hoc Wireless Networks: Architectures and Protocols", Pearson Education, 2007.
7. C.K. Toh, Ad Hoc Mobile Wireless Networks: Protocols and Systems", Pearson Education, 2007.

## BIOINFORMATICS

**Subject Code: BCSED2-721** **L T P C** **Duration: 45 Hrs.**
**3 0 0 3**

**COURSE OBJECTIVE:**

The main objective of this course is to make student able to understand the basic concepts of bioinformatics and also give knowledge about the algorithms used in bioinformatics.

**COURSE OUTCOMES:**

1. To learn basic concepts of bioinformatics.
2. To learn different motif models.
3. To learn the concept of genomics.
4. To analyse DNA data.

**COURSE CONTENTS:**

**UNIT- I (12 Hrs.)**

**Introduction:** Sequence similarity, homology, and alignment.

**Pairwise alignment:** scoring model, dynamic programming algorithms, heuristic alignment,and pairwise alignment using Hidden Markov Models.

**UNIT – II (12 Hrs.)**

**Multiple alignment:** scoring model, local alignment gapped and ungapped globalalignment.

**Motif finding:** motif models, finding occurrence of known sites, discovering new sites.

**UNIT – III (09 Hrs.)**

**Genomics and Structural Genomics**: Genes, genomes, Gene cloning, mapping and DNA sequencing.

**UNIT – IV (12 Hrs.)**

**Analysis of DNA microarray data**: using hierarchical clustering, model-based clustering, expectation-maximization clustering, Bayesian model selection.

**RECOMMENDED BOOKS:**

1. Matthias Dehmer, Frank Emmert-Streib, Analysis of Microarray Data: A Network-Based Approach.
2. JinXiong, Essential Bioinformatics.
3. Teresa Attwood, David Parry-Smith, Introduction to Bioinformatics.
4. Pierre Baldi, G. Wesley Hatfield, DNA Microarrays and Gene Expression: From Experiments to Data Analysis and Modelling.

## IMAGE PROCESSING

**Subject Code: BCSED2-722** **L T P C** **Duration: 45 Hrs.**
**3 0 0 3**

**COURSE OBJECTIVE:**

This course will help to understand the different techniques used for image processing.

**COURSE OUTCOMES:**

1. To give introduction of image processing.
2. To understand image enhancement.
3. To have knowledge of image Compression Redundancy models
4. To have knowledge of Image Segmentation.

**Unit-I (14 Hrs.)**

**Digital Image Fundamentals**: Simple image model, sampling and quantization, imaging geometry, digital geometry, different types of digital images, image formation, Elements of Storage, Relationships between pixels-neighbours of pixel, application of image Processing. **Bilevel Image Processing**: Digital distance, distance transform, medial axis transform, component labeling, thinning, morphological processing, extension to grey scale morphology.

**Unit-II (12 Hrs.)**

**Image Enhancement:** Point processing, spatial filtering, frequency domain methods, multi-spectral image enhancement, image restoration.

**Color Image Processing:** Color representation, laws of color matching, chromaticitydiagram, color enhancement, color image segmentation, color edge detection.

**Unit-III (09 Hrs.)**

Image Compression Redundancy models, error free compression, Lossy compression, Image compression standards.

**Unit-IV (10 Hrs.)**

Image Segmentation Detection of Discontinuity, Edge detection, Boundary detection, Thresholding, Regional oriented segmentation, use of motion in segmentation.

**RECOMMENDED BOOKS:**

1. Digital Image Processing - by Rafact Gonzalez and Richard E. Woods, Pearson Education Society.
2. Digital Image Processing - by Keenneth R Castleman, Pearson Education Society.
3. A. K. Jain, ―Fundamental of Digital Image Processing‖, PHI

## CRYPTOGRAPHY & NETWORK SECURITY

**Subject Code: BCSED2-723** **L T P C** **Duration: 45 Hrs.**
**3 0 0 3**

**COURSE OBJECTIVE:**

The main objective of this course is to make student able to understand the basic concepts, services, threats and principles in network security, various security services and mechanisms in the network protocol stack.

**COURSE OUTCOMES:**

1. To understand security trends.
2. To implement various cryptographic algorithms.
3. To implement public key cryptography.
4. To implement IP Security.

**COURSE CONTENTS:**

**UNIT-I (12 Hrs.)**

Security trends, Attacks and services, Classical crypto systems, Different types of ciphers, LFSR sequences, Basic Number theory, Congruence, Chinese Remainder theorem, Modular exponentiation, Fermat and Euler's theorem, Legendre and Jacobi symbols, Finite fields, continued fractions.

**UNIT-II (09 Hrs.)**

Simple DES, Differential crypto analysis, DES – Modes of operation, Triple DES, AES, RC4, RSA, Attacks – Primality test – factoring.

**UNIT-III (12 Hrs.)**

Discrete Logarithms, Computing discrete logs, Diffie-Hellman key exchange, El Gamal Public key cryptosystems, Hash functions, Secure Hash, Birthday attacks, MD5, Digital signatures, RSA, ElGamal DSA.

**UNIT-IV (12 Hrs.)**

Authentication applications – Kerberos, X.509, PKI – Electronic Mail security – PGP, S/MIME – IP security – Web Security – SSL, TLS, SET. Intruders, Malicious software, viruses and related threats, Firewalls, Security Standards.

**RECOMMENDED BOOKS:**

1. Wade Trappe, Lawrence C Washington, „Introduction to Cryptography with CodingTheory", 2nd Edn., Pearson, **2007**.
2. William Stallings, „Cryptography and Network Security Principles and Practices", 4th Edn., Pearson/PHI, **2006**.
3. W. Mao, „Modern Cryptography – Theory and Practice", 2nd Edn., Pearson Education, **2007**.
4. Charles P. Pfleeger, Shari Lawrence Pfleeger, „Security in Computing", 3rd Edn., Prentice Hall of India, **2006**.
5. Behrouz Forouzan, „Cryptography & Network Security", 2nd Edn., McGraw-Hill, **2011.**

## OPTIMIZATION TECHNIQUES IN MACHINE LEARNING

**Subject Code: BCSED2-724** **L T P C** **Duration: 45 Hrs.**
**3 0 0 3**

**Course Objective:**
The students will be able to understand and analyze how to deal with changing data. They will also be able to identify and interpret potential unintended effects in your project. They will understand and define procedures to operationalize and maintain your applied machine learning model.

**Course Outcomes:** After completion of course, students would be able to:
1. Understand and analyze how to deal with changing data.
2. Understand and interpret potential unintended effects in their project.
3. Understand and define procedures to operationalize and maintain the applied machine learning model.
4. Understand how to optimize the use of Machine Learning in real-life problems.

**Unit 1: Introduction (12 Hrs.)**
What is optimization, Formulation of LPP, Solution of LPP: Simplex method, Basic Calculus for optimization: Limits and multivariate functions, Derivatives and linear approximations: Single variate functions and multivariate functions.

**Unit 2: Machine Learning Strategy (09 Hrs.)**
ML readiness, Risk mitigation, Experimental mindset, Build/buy/partner, setting up a team, Understanding and communicating change.

**Unit 3: Responsible Machine Learning (12 Hrs.)**
AI for good and all, Positive feedback loops and negative feedback loops, Metric design and observing behaviours, Secondary effects of optimization, Regulatory concerns.

**Unit 4: Machine Learning in production and planning (12 Hrs.)**
Integrating info systems, users break things, time and space complexity in production, when to retain the model? Logging ML model versioning, Knowledge transfer, Reporting performance to stakeholders.

**Care and feeding of your machine learning model**: MLPL Recap, Post deployment challenges, QUAM monitoring and logging, QUAM Testing, QUAM maintenance, QUAM updating, Separating Data stack from Production, Dashboard Essentials and Metrics monitoring.

**Text Books/Suggested References:**
1. Jeeva Jose, Introduction to Machine Learning, Khanna Book Publishing 2020.
2. Rajiv Chopra, Machine Learning, Khanna Book Publishing 2021
3. Optimization for Machine Learning, Suvrit Sra, Sebastian Nowozin and Stephen J. Wright,MIT Press, 2011.
4. Optimization in Machine Learning and Applications, Suresh Chandra Satapathy, Anand J.Kulkarni, Springer, 2019.
5. Algorithms for Optimization by Mykel J. Kochenderfer and Tim A. Wheeler, MIT Press,2019.
6. Accelerated Optimization for Machine Learning: First-Order Algorithms by Cong Fang,Huan Li, and Zhouchen Lin, Springer, 2020.
7. https://www.coursera.org/learn/optimize-machine-learning-model-performance

## ENVIRONMENTAL SCIENCES

**Subject Code: BMNCC0-002** **L T P C** **Duration: 30 Hrs.**
**2 0 0 0**

### COURSE OBJECTIVES:

1. To identify global environmental problems arising due to various engineering/industrial and technological activities and the science behind these problems.
2. To identify the major pollutants and abatement devices for environmental management and sustainable development.
3. To estimate the current world population scenario and calculating the economic growth, energy requirement, demand and also their related problems and plausible solutions.

### COURSE OUTCOMES:

1. Students are able to identify global environmental problems arising due to various engineering/industrial and technological activities and the science behind these problems.
2. Students are able to classify the major pollutants and abatement devices for environmental management and sustainable development.
3. Students can evaluate the current world population scenario and calculating the economic growth, energy requirement, demand and also their related problems and plausible solutions.

### UNIT-I

1. The Multidisciplinary Nature of Environmental Studies:
   Definition, scope and importance, Need for public awareness.
2. **Natural Resources**
   Renewable and Non-renewable Resources: Natural resources and associated problems.

(a) Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forests and tribal people.
(b) Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.
(c) Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies.
(d) Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.
(e) Energy resources: Growing energy needs, renewable and non-renewable energy sources,use of alternate energy sources, case studies.

### UNIT-II

**Environmental Pollution**: Definition

(a) Causes, effects and control measures of:
   i) Air pollution
   ii) Water pollution
   iii) Soil pollution
   iv) Marine pollution
   v) Noise pollution
   vi) Thermal pollution
   vii) Nuclear pollution

(b) **Solid Waste Management**: Causes, effects and control measures of urban and industrial wastes.
(c) Role of an individual in prevention of pollution.
(d) Pollution Case Studies.
(e) Disaster management: floods, earthquake, cyclone and landslides.

**UNIT-III**

Social Issues and the Environment
(a) From unsustainable to sustainable development
(b) Urban problems and related to energy
(c) Water conservation, rain water harvesting, Watershed Management
(d) Resettlement and rehabilitation of people; its problems and concerns, Case studies.
(e) Environmental ethics: Issues and possible solutions
(f) Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, Case studies.
(g) Issues involved in enforcement of environmental legislation

**UNIT-IV**

Human Population and the Environment
(a) Population growth, variation among nations
(b) Population explosion – Family Welfare Programmes
(c) Environment and human health
(d) Human Rights
(e) Value Education
(f) Women and Child Welfare
(g) Role of Information Technology in Environment and Human Health
(h) Case Studies.

**Environmental Science related activities:**

We as human being are not an entity separate from the environment around us rather we are a constituent seamlessly integrated and co-exist with the environment around US. We are notan entity so separate from the environment that we can think of mastering and controlling it rather we must understand that each and every action of ours reflects on the environment and vice versa. Ancient wisdom drawn from Vedas about environment and its sustenance reflects these ethoses. There is a direct application of this wisdom even in modern times. Idea of an activity based course on environment protection is to sensitize the students on the above issues through following two types of activities.

**(a) Awareness Activities**:
i) Small group meetings about water management, promotion of recycle use, generation of less waste, avoiding electricity waste.
ii) Slogan making event
iii) Poster making event
iv) Cycle rally
v) Lectures from experts.

**(b) Actual Activities**:
i) Plantation

ii) Gifting a tree to see its full growth
iii) Cleanliness drive
iv) Drive for segregation of waste
v) To live some big environmentalist for a week or so to understand his work
vi) To work in kitchen garden for mess
vii) To know about the different varieties of plants
viii) Shutting down the fans and ACs of the campus for an hour or so

**Recommended Books**

1. Agarwal, K. C. 2001 Environment Biology, Nidi Publ. Ltd. Bikaner.
2. Jadhav, H & Bhosale, V.M. 1995. Environment Protection and Laws. Himalaya Pub House, Delhi 284p.
3. Rao M. N. & Datta A.K. 1987. Waste Water Treatment. Oxford & IBH Publ. Co. Pvt. Ltd. 345 p.
4. Principle of Environment Science by Cunninghan, W.P.
5. Essentials of Environment Science by Joseph.

## CONSTITUTION OF INDIA

**Subject Code: BMNCC0-001** **L T P C**
**2 0 0 0**

**COURSE OBJECTIVE:**

The student will be able to learn different perspectives of constitution of India.

**COURSE OUTCOMES:**

1. To learn the meaning and historical perspective of law.
2. To have deep knowledge of fundamental rights.
3. To learn different policies implemented by Constitution of India.
4. To learn Article 19 and 21.

**COURSE CONTENTS:**

1. Meaning of the constitution law constitutionalism.
2. Historical perspective of the Constitution of India.
3. Salient features and characteristics of the Constitution of India.
4. Scheme of the fundamental rights.
5. The scheme of fundamental duties and its legal status.
6. The Directive principles of State Policy – Its importance and implementation.
7. Federal structure and distribution of legislative and financial powers between the Union and states.
8. Parliamentary form of Government of India- The Constitution powers and status of the President of India.
9. Amendment of Constitutional Powers and Procedure.
10. The historical perspectives of constitutional amendments in India.
11. Emergency Provisions: National Emergency, President Rule, financial emergency.
12. Local Self Government- Constitutional Scheme in India.
13. Scheme of Fundamental Right to Equality.
14. Scheme of the Fundamental Right to certain Freedom under Article 19
15. Scope of the Right to Life and Personal Liberty under Article 21

## ESSENCE OF INDIAN KNOWLEDGE TRADITION

**Subject Code: BMNCC0-006** **L T P C**
**2 0 0 0**

**COURSE OBJECTIVE:**

The course is introduced

1. To get a knowledge in Indian Philosophical Foundations.
2. To Know Indian Languages and Literature and the fine arts in India & Their Philosophy.
3. To explore the Science and Scientists of Medieval and Modern India

**COURSE OUTCOMES:**

After successful completion of the course the students will be able to

1. Understand philosophy of Indian culture.
2. Distinguish the Indian languages and literature among difference traditions.
3. Learn the philosophy of ancient, medieval and modern India.
4. Acquire the information about the fine arts in India.
5. Know the contribution of scientists of different eras.
6. The essence of Yogic Science for Inclusiveness of society.

**COURSE CONTENTS:**

**UNIT – I**

**Introduction to Indian Philosophy:** Basics of Indian Philosophy, culture, civilization, culture and heritage, general characteristics of culture, importance of culture in human literature, Indian culture, Ancient Indian, Medieval India, Modern India.

**Indian Philosophy & Literature:** Vedas Upanishads, schools of Vedanta, and other religion Philosophical Literature. Philosophical Ideas the role of Sanskrit, significance of scriptures to current society, Indian Philosophies, literature of south India.

**UNIT – II**

**Religion and Philosophy**: Religion and Philosophy in ancient India, Religion and Philosophy in Medieval India, Religious Reform Movements in Modern India (selected movements only)

**UNIT – III**

**Indian Fine Arts & Its Philosophy (Art, Technology & Engineering):** Indian Painting, Indian handicrafts, Music, divisions of Indian classic music, modern Indian music, Dance and Drama, Indian Architecture (ancient, medieval and modern), Science and Technology in Indian, development of science in ancient, medieval and modern Indian.

**UNIT – IV**

**Education System in India:** Education in ancient, medieval and modern India, aims of education, subjects, languages, Science and Scientists of Ancient India, Scientists of

Medieval India, Scientists of Modern India. The role Gurukulas in Education System, Valuebased Education.

**RECOMMENDED BOOKS:**

1. Kapil Kapoor, "Text and Interpretation: The India Tradition"", ISBN: 81246033375, 2005
2. "Science in Samskrit", Samskrita Bharti Publisher, ISBN-13:978-8187276333,2007
3. NCERT, "Position paper on Arts, Music, Dance and Theatre"", ISBN 81-7450-494-X, 2006

4. S. Narain, “Examination in Ancient India”, Arya Book Depot, 1993
5. Satya Prakash, “Founders of Sciences in Ancient India”, Vijay Kumar Publisher, 1989
6. M.Hiriyanna, “Essentials of Indian Philosophy”, Motilal Banarsidass Publishers, ISBN-13: 978- 8120810990,2014
7. Chatterjee. S & Dutta “An Introduction to Indian Philosophy”.

# 8th SEMESTER

## ENTERPRISE RESOURCE PLANNING

**Subject Code: BCSED2-811** **L T P C** **Duration: 45 Hrs.**
**3 0 0 3**

**COURSE OBJECTIVE:**

The course has all the required contents that are necessary for a graduate to understand the different strategies of an organization.

**COURSE OUTCOMES:**

1. To understand the concepts of ERP and its related technologies.
2. To understand the implementation of ERP in an organization.
3. To have a deep understanding of different business modules of an organization.
4. To have a basic understanding of applications of ERP and various ERP software‟s.

**COURSE CONTENTS:**

**UNIT-I (12 Hrs)**

**ERP AND TECHNOLOGY:** Introduction, Related Technologies, Business Intelligence, E-Commerce and E-Business, Business Process Reengineering, Data Warehousing, Data Mining, OLAP, Product life Cycle management, SCM, CRM

**UNIT II (12 Hrs)**

**ERP IMPLEMENTATION:** Implementation Challenges, Strategies, Life Cycle, Methodologies Package selection, Project Teams, Vendors and Consultants, Data Migration, Project management

**UNIT-III (12 Hrs)**

**ERP IN ACTION & BUSINESS MODULES:** Operation and Maintenance, Business Modules, Finance, Manufacturing, Human Resources, Plant maintenance, Materials Management, Quality management, Marketing, Sales, Distribution and service.

**UNIT-IV (09 Hrs)**

**ERP Application:** Enterprise Application Integration, ERP II, Total quality management
**ERP CASE STUDY:** SAP AG, JD Edwards.

**RECOMMENDED BOOKS:**

1. Alexis Leon, „ERP DEMYSTIFIED‟, 2nd Edn., Tata McGraw Hill, **2008**.
2. Mary Sumner, „Enterprise Resource Planning‟, Pearson Education, **2007**.
3. Jim Mazzullo, „SAP R/3 for Everyone‟, 2nd Edn., Pearson, **2007**.
4. Jose Antonio Fernandz, „The SAP R /3 Handbook‟, Tata McGraw Hill, **2000**.
5. Biao Fu, „SAP BW: A Step-by-Step Guide‟, 1st Edn., Pearson Education, **2003**.

## INTERNET OF THINGS

**Subject Code: BCSED2-812** **L T P C** **Duration: 45 Hrs.**
**3 0 0 3**

**COURSE OBJECTIVE:**

The purpose of this course is to impart knowledge on IoT Architecture and various protocols, study their implementations

**COURSE OUTCOMES:**

1. To Understand the Architectural Overview of IoT
2. To Understand Raspberry.
3. To Understand the various IoT Protocols ( Data link, Network)
4. To understand sensor applications.

**COURSE CONTENTS:**

**UNIT I (12 hours)**

**OVERVIEW**: Introduction to IOT, how does it work? Difference between Embedded device and IoT device, Properties of IoT device, IoT Ecosystem, IoT Decision Framework, IoT Solution Architecture Models, Major IoT Boards in Market, Privacy issues in IOT

**UNIT II (11 hours)**

Setting Up Raspberry Pi/Arduino to Create Solutions Explore Raspberry Pi, setting up Raspberry Pi, showing working of Raspberry Pi using Secure Shell (SSH) Client and Team Viewer, Understand Sensing actions, Understand Actuators and Micro electromechanical Systems (MEMS).

**UNIT III (12 hours)**

**IOT DATA LINK LAYER & NETWORK LAYER PROTOCOLS:** Communication Protocols used in IoT Types of wireless communication, Major wireless Short-range communication devices, properties, comparison of these devices (Bluetooth, Wireless Fidelity(WiFi), ZigBee, Low-power Wireless Personal Area Network(6LoWPAN)), Major wireless Long-range communication devices, properties, comparison of these devices (Cellular IoT, Low-Power Wide-Area Network(LPWAN))

**UNIT IV (10 hours)**

**Sensors Applications of various sensors**: Google Maps, Waze, WhatsApp, Ola Positioning sensors: encoders and accelerometers, Image sensors: cameras Global positioning sensors: Global Positioning System (GPS), Global Navigation Satellite System (GLONASS), Indian Regional Navigation Satellite System (IRNSS).

**RECOMMENDED BOOKS:**

1. Vijay Madisetti and Arshdeep Bahga, “Internet of Things (A Hands-onApproach)”, 1 st Edition, VPT, 2014.
2. Peter Waher, “Learning Internet of Things”, PACKT publishing, BIRMINGHAM – MUMBAI
3. Bernd Scholz-Reiter, Florian Michahelles, “Architecting the Internet of Things”,ISBN 978-3-642-19156-5 e-ISBN 978-3-642-19157-2, Springer
4. Daniel Minoli, “Building the Internet of Things with IPv6 and MIPv6: The EvolvingWorld of M2M Communications”, ISBN: 978-1-118-47347-4, Willy Publications.

## CLOUD COMPUTING

**Subject Code: BCSED2-813** **L T P C** **Duration: 45 Hrs.**
**3 0 0 3**

**COURSE OBJECTIVE:**

1. To understand what is cloud storage, characteristics of cloud computing,
2. To know about cloud computing services and cloud hosting, cloud data storage and deployment models.
3. To learn cloud computing companies and cloud service providers, cloud infrastructure.
4. To learn advantages of cloud computing and issues with cloud computing.

**COURSE OUTCOMES:**

1. To learn basic terms used in cloud computing and its benefits.
2. To learn architecture of Hadoop.
3. To implement cloud security.
4. To manage services provided by cloud.

**COURSE CONTENTS:**

**UNIT-I (12 Hrs.)**

**Cloud Computing Fundamentals:** Introduction to Cloud Computing, private, public and hybrid cloud. Cloud types: IaaS, PaaS, SaaS. Benefits and challenges of cloud computing, public vs private clouds, Role of virtualization in enabling the cloud; Benefits and challenges to Cloud architecture.

**UNIT-II (12 Hrs.)**

Hadoop - Apache Hadoop Architecture, Hadoop YARN, Comparison of Traditional system & Hadoop Ecosystem, Installation steps of Hadoop (1.x), Moving Data in and out of Hadoop, need for Record Reader and Record writer, understanding inputs and outputs file format of Map Reduce.

**UNIT-III (10 Hrs.)**

Cloud Security and Trust Management, Open Source Clouds -Baadal, Open Stack, CloudStack

**UNIT-IV (11 Hrs.)**

**Cloud Applications, Cloud Services 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, computing infrastructures available for implementing cloud based services.

**RECOMMENDED BOOKS:**

1. Chris Eaton, Dirk deroos et al., „Understanding Big data", 1st Edn., McGraw Hill, **2015**.
2. Tom White, „HADOOP: The definitive Guide", 4th Edn., O Reilly, **2015**.
3. Gautam Shroff, „Enterprise Cloud Computing Technology Architecture Applications", 1st Edn., Cambridge University Press, **2010**.
4. Toby Velte, Anthony Velte, Robert Elsenpeter, „Cloud Computing, A Practical Approach",1st Edn., McGraw Hill Education, **2009**.
5. Thomas Erl, ' Big Data Fundamentals', 1st Edn., Pearson Education, **2016**
6. Srinivasan, ' Cloud Computing', 1st Edn,, Pearson Education, **2016.**

## SOFTWARE PROJECT MANAGEMENT

**Subject Code: BCSED2-814** **L T P C** **Duration: 45 Hrs.**
**3 0 0 3**

**COURSE OBJECTIVE:**

It gives an in depth knowledge of software project management and project planning. It also covers the Step Wise framework in project planning

**COURSE OUTCOMES:**

1. Apply the basics of Software Project Management in order to manage and deliver qualified product and plan the activities within time schedules with CPM and PERT Analysis.
2. For managing the quality of product and managing the risk involved
3. Managing team and measuring and tracking the planning
4. To learn Configuration management and project monitoring and control

**UNIT-I (12 Hrs.)**

**Project Planning**: Characteristics of a software project, Software scope and feasibility,resources, the SPM plan.

**Software Project Estimation**: Size/scope estimation, Decomposition techniques, WBS. Effort estimation: Sizing, Function point, LOC, FP vs LOC. Schedule estimation: GANTT Charts, Activity networks, PERT/CPM networks. Cost estimation: Models: COCOMO-I,COCOMO-II.

**UNIT-II (12 Hrs.)**

**Quality Planning**: Quality control, Quality assurance, Formal Technical Reviews, The SQAPlan, ISO and CMM standards.

**Risk Management**: Reactive vs proactive Risk strategies, Risk projection, Risk Refinement, Risk Monitoring, Monitoring and management, RMMM plan.

**UNIT-III (12 Hrs.)**

**Measurement and Tracking Planning**: Earned Value Analysis.

**Team Management**: Team structures: hierarchical, Egoless, chief programmer, mixed; Team software Process; Resource levelling, Building a team: Skill sets.

**UNIT-IV (09 Hrs.)**

**Configuration Management:** Baselines, Configurable items, SCM repository, SCM process, version control change control, configuration audit**.**

**Project Monitoring and Control**: Audits and Reviews.

**RECOMMENDED BOOKS:**

**1.** Bob Hughes and Mike Cotterell, „Software Project Management", 5th Edn., Tata McGrawHill, **2009.**
**2.** Roger Pressman, „A Practitioner"s Guide to Software Engineering", 8th Edn., Tata McGraw Hill, **2014.**
**3.** Head First PMP: A Brain Friendly Guide to Passing the Project Management Professional Exam", **2013.**