**B.TECH. DEGREE COURSE IN**
**COMPUTER SCIENCE & ENGINEERING**

**(2019 Admissions)**

# SCHEME OF EXAMINATIONS & SYLLABUS

**SEMESTER I [Stream B]**

| Code No. | Subject | L Hrs/Wk | T Hrs/Wk | P/D Hrs/ Wk | C | Marks | | Total |
|---|---|---|---|---|---|---|---|---|
| | | | | | | CA | ESE | |
| 19-200-0101B | Calculus | 3 | 1 | 0 | 3 | 40 | 60 | 100 |
| 19-200-0102B | Engineering Physics | 3 | 1 | 0 | 3 | 40 | 60 | 100 |
| 19-200-0103B | Engineering Mechanics | 4 | 1 | 0 | 3 | 40 | 60 | 100 |
| 19-200-0104B | Basic Civil Engineering | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 19-200-0105B | Basic Mechanical Engineering | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 19-200-0106B | Soft Skills Development | 2 | 1 | 0 | 2 | 50 | - | 50 |
| 19-200-0107B | Civil Engineering Workshop | 0 | 0 | 3 | 1 | 25 | 25 | 50 |
| 19-200-0108B | Mechanical Engineering Workshop | 0 | 0 | 3 | 1 | 25 | 25 | 50 |
| 19-200-0109B | Language Lab | 0 | 0 | 1 | 1 | 25 | 25 | 50 |
| 19-200-0110B | NSS/Nature conservation Activities | 0 | 0 | 1 | 0 | - | - | - |
| | **TOTAL** | **18** | **4** | **8** | **20** | | | |

**CA – Continuous Assessment, ESE – End Semester Examination**

**SEMESTER II (STREAM B)**

| Code No. | Subject | L Hrs/Wk | T Hrs/Wk | P/D Hrs/ Wk | C | Marks | | Total |
|---|---|---|---|---|---|---|---|---|
| | | | | | | CA | ESE | |
| 19-200-0201B | Computer Programming | 3 | 1 | 0 | 3 | 40 | 60 | 100 |
| 19-200-0202B | Engineering Chemistry | 3 | 1 | 0 | 3 | 40 | 60 | 100 |
| 19-200-0203B | Engineering Graphics | 2 | 1 | 3 | 3 | 40 | 60 | 100 |
| 19-200-0204B | Basic Electrical Engineering | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 19-200-0205B | Basic Electronics Engineering | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 19-200-0206B | Environmental Studies | 3 | 1 | 0 | 3 | 40 | 60 | 100 |
| 19-200-0207B | Electrical Engineering Workshop | 0 | 0 | 3 | 1 | 25 | 25 | 50 |
| 19-200-0208B | Computer Programming Laboratory | 0 | 0 | 3 | 1 | 25 | 25 | 50 |
| | **TOTAL** | **17** | **4** | **9** | **20** | | | |

**SEMESTER III**

| Code No. | Subject | L Hrs/Wk | T Hrs/Wk | P/D Hrs/Wk | C | Marks | | Total |
|---|---|---|---|---|---|---|---|---|
| | | | | | | CA | SEE | |
| 19-200-0301 | *Linear Algebra and Transform Techniques | 3 | 1 | 0 | 3 | 40 | 60 | 100 |
| 19-202-0302 | Logic Design | 3 | 1 | 0 | 3 | 40 | 60 | 100 |
| 19-202-0303 | **Discrete Computational Structures | 3 | 1 | 0 | 3 | 40 | 60 | 100 |
| 19-202-0304 | Object Oriented Programming | 3 | 1 | 0 | 3 | 40 | 60 | 100 |
| 19-202-0305 | Principles of Programming Languages | 3 | 1 | 0 | 3 | 40 | 60 | 100 |
| 19-202-0306 | Data and Computer Communication | 3 | 1 | 0 | 3 | 40 | 60 | 100 |
| 19-202-0307 | Digital Electronics Laboratory | 0 | 0 | 3 | 1 | 25 | 25 | 50 |
| 19-202-0308 | Object Oriented Programming Laboratory | 0 | 0 | 3 | 1 | 25 | 25 | 50 |
| | **TOTAL** | **18** | **6** | **6** | **20** | | | |

*** Common for CE/CS/EC/EE/IT/ME/SE**
**** Common for CS/IT**

**SEMESTER IV**

| Code No. | Subject | L Hrs/Wk | T Hrs/Wk | P/D Hrs/Wk | C | Marks | | Total |
|---|---|---|---|---|---|---|---|---|
| | | | | | | CA | SEE | |
| 19-200-0401 | *Complex Variables and Partial Differential Equations | 3 | 1 | 0 | 3 | 40 | 60 | 100 |
| 19-202-0402 | Microprocessors | 3 | 1 | 0 | 3 | 40 | 60 | 100 |
| 19-202-0403 | Computer Architecture and Organization | 3 | 1 | 0 | 3 | 40 | 60 | 100 |
| 19-202-0404 | Automata Languages and Computations | 3 | 1 | 0 | 3 | 40 | 60 | 100 |
| 19-202-0405 | Data Structures and Algorithms | 3 | 1 | 0 | 3 | 40 | 60 | 100 |
| 19-202-0406 | Database Management Systems | 3 | 1 | 0 | 3 | 40 | 60 | 100 |
| 19-202-0407 | Database Management Systems Laboratory | 0 | 0 | 3 | 1 | 25 | 25 | 50 |
| 19-202-0408 | Data Structures Laboratory | 0 | 0 | 3 | 1 | 25 | 25 | 50 |
| | **TOTAL** | **18** | **6** | **6** | **20** | | | |

*** Common for CE/CS/EC/EE/IT/ME/SE**

**SEMESTER V**

| Code No. | Subject | L Hrs/Wk | T Hrs/Wk | P/D Hrs/Wk | C | Marks | | Total |
|---|---|---|---|---|---|---|---|---|
| | | | | | | CA | SEE | |
| 19-200-0501 | *Numerical and Statistical Methods | 3 | 1 | 0 | 3 | 40 | 60 | 100 |
| 19-202-0502 | System Programming | 3 | 1 | 0 | 3 | 40 | 60 | 100 |
| 19-202-0503 | Object Oriented Software Engineering | 3 | 1 | 0 | 3 | 40 | 60 | 100 |
| 19-202-0504 | Operating System | 3 | 1 | 0 | 3 | 40 | 60 | 100 |
| 19-202-0505 | Advanced Microprocessors and Microcontrollers | 3 | 1 | 0 | 3 | 40 | 60 | 100 |
| 19-202-0506 | Computer Graphics | 3 | 1 | 0 | 3 | 40 | 60 | 100 |
| 19-202-0507 | Computer Graphics Laboratory | 0 | 0 | 3 | 1 | 25 | 25 | 50 |
| 19-202-0508 | Microprocessors Laboratory | 0 | 0 | 3 | 1 | 25 | 25 | 50 |
| | **TOTAL** | **18** | **6** | **6** | **20** | | | |

*** Common for CE/CS/EC/EE/IT/ME/SE**

**SEMESTER VI**

| Code No. | Subject | L Hrs/Wk | T Hrs/Wk | P/D Hrs/Wk | C | Marks | | Total |
|---|---|---|---|---|---|---|---|---|
| | | | | | | CA | SEE | |
| 19-202-0601 | Computer Networks | 3 | 1 | 0 | 3 | 40 | 60 | 100 |
| 19-202-0602 | *Compiler Construction | 3 | 1 | 0 | 3 | 40 | 60 | 100 |
| 19-202-0603 | Analysis and Design of Algorithms | 3 | 1 | 0 | 3 | 40 | 60 | 100 |
| 19-202-0604 | Data Mining | 3 | 1 | 0 | 3 | 40 | 60 | 100 |
| 19-202-0605 | Artificial Intelligence | 3 | 1 | 0 | 3 | 40 | 60 | 100 |
| 19-202-06** | Professional Elective I | 3 | 1 | 0 | 3 | 40 | 60 | 100 |
| 19-202-0610 | Operating System Laboratory | 0 | 0 | 3 | 1 | 25 | 25 | 50 |
| 19-202-0611 | Mini Project | 0 | 0 | 3 | 1 | 50 | - | 50 |
| | **TOTAL** | **18** | **6** | **6** | **20** | | | |

*** Common for CS/IT**

**<u>19-202-0606 to 0609: PROFESSIONAL ELECTIVE I</u>**

19-202-0606 Web Technologies
19-202-0607 Software Project Management
19-202-0608 Digital Image Processing
19-202-0609 Bioinformatics

**SEMESTER VII**

| Code No. | Subject | L Hrs/Wk | T Hrs/Wk | P/D Hrs/Wk | C | Marks | | Total |
|---|---|---|---|---|---|---|---|---|
| | | | | | | CA | SEE | |
| 19-202-0701 | *Principles of Management | 3 | 1 | 0 | 3 | 40 | 60 | 100 |
| 19-202-0702 | Advanced Computer Networks | 3 | 1 | 0 | 3 | 40 | 60 | 100 |
| 19-202-0703 | Cryptography and Network Security | 3 | 1 | 0 | 3 | 40 | 60 | 100 |
| 19-202-07** | Professional Elective II | 3 | 1 | 0 | 3 | 40 | 60 | 100 |
| 19-202-07** | Open Elective I | 3 | 1 | 0 | 3 | 40 | 60 | 100 |
| 19-202-0712 | Language Processors Laboratory | 0 | 0 | 3 | 1 | 25 | 25 | 50 |
| 19-202-0713 | Networks Laboratory | 0 | 0 | 3 | 1 | 25 | 25 | 50 |
| 19-202-0714 | Entrepreneurship Development | 0 | 0 | 2 | 1 | 50 | - | 50 |
| 19-202-0715 | Project Phase I | 0 | 0 | 1 | 1 | 50 | - | 50 |
| 19-202-0716 | Industrial Internship | 0 | 0 | 1 | 1 | 50 | - | 50 |
| | **TOTAL** | **15** | **5** | **10** | **20** | | | |

*** Common for CS/EC/EE/IT**

**19-202-0704 to 0707:PROFESSIONAL ELECTIVE II**

19-202-0704 Artificial Neural Networks
19-202-0705 Advanced Mobile Communications
19-202-0706 Embedded System Design
19-202-0707 Computer Vision

**19-202-0708 to 0711:OPEN ELECTIVE I**

19-202-0708 Mobile Application Development
19-202-0709 System Modeling and Simulation
19-202-0710 Cyber Law and Ethics
19-202-0711 Business Intelligence and Analytics

**SEMESTER VIII**

| Code No. | Subject | L Hrs/Wk | T Hrs/Wk | P/D Hrs/Wk | C | Marks | | Total |
|---|---|---|---|---|---|---|---|---|
| | | | | | | CA | SEE | |
| 19-202-0801 | Advanced Architecture and Parallel Processing | 3 | 1 | 0 | 3 | 40 | 60 | 100 |
| 19-202-08** | Professional Elective III | 3 | 1 | 0 | 3 | 40 | 60 | 100 |
| 19-202-08** | Professional Elective IV | 3 | 1 | 0 | 3 | 40 | 60 | 100 |
| 19-202-08** | Open Elective II | 3 | 1 | 0 | 3 | 40 | 60 | 100 |
| 19-202-0814 | Seminar | 0 | 0 | 3 | 1 | 50 | - | 50 |
| 19-202-0815 | Project Phase II | 0 | 0 | 11 | 6 | 200 | - | 200 |
| 19-202-0816 | Comprehensive Viva Voce | 0 | 0 | 0 | 1 | - | 50 | 50 |
| | **TOTAL** | **12** | **4** | **14** | **20** | | | |

**19-202-0802 to 0805:PROFESSIONAL ELECTIVE III**

19-202-0802 Big Data Analytics
19-202-0803 Cloud Computing
19-202-0804 Computational Linguistics
19-202-0805 High Performance Computing

**19-202-0806 to 0809:PROFESSIONAL ELECTIVE IV**

19-202-0806 Machine learning
19-202-0807 Agent Based Intelligent System
19-202-0808 Augmented Reality
19-202-0809 Ethical Hacking

**19-202-0810 to 0813:OPEN ELECTIVE II**

19-202-0810 High Performance Embedded Computing
19-202-0811 Cyberspace and Information System Security
19-202-0812 Soft Computing
19-202-0813 Internet of Things

## Evaluation Pattern for Theory and Practical courses

**Theory courses**

Type of Questions for Semester End Examination (SEE)

**PART - A (8 x 4 = 32 marks)**
Question No. I (a) to (h) – Eight short answer questions of 4 marks each with two questions from each of the four modules.

**PART - B (4 x 10 = 40 marks)**
Question nos. II, III with sub sections (a), (b) ---- 10 marks each with option to answer either II or III from Module I.
Question nos. IV, V with sub sections (a), (b) ---- 10 marks each with option to answer either IV or V from Module II.
Question nos. VI, VII with sub sections (a), (b) ---- 10 marks each with option to answer either VI or VII from Module III.
Question nos. VIII, IX with sub sections (a), (b) ---- 10 marks each with option to answer either VIII or IX from Module IV.

***The maximum marks that can be awarded for the Semester End Examination (SEE) will be only 60, even though the questions are for 72 marks.***

**Practical courses**

50% marks is earmarked for Continuous Evaluation, and 50% marks for Semester End Examination. The Semester End Examination to be conducted by a minimum of two examiners – one, not below the rank of an Associate Professor. A candidate shall secure a minimum of 50% marks in the aggregate and 40% minimum in the Semester End Examination for a pass.

## 19-200-0101B/ 12-200-0201A CALCULUS

**Course Outcomes**:
On completion of this course the student will be able to:

1. Recall the methods of differentiation and integration.
2. Solve ordinary differential equations and linear differential equations of higher orders with constant coefficient and apply them in engineering problems
3. Estimate the maxima and minima of multi variable functions.
4. Evaluate area as double integrals and volume as triple integrals in engineering applications.
5. Illustrate the application and physical meaning of gradient, divergence and curl.

**Module I**
**Ordinary differential equations**:
First order differential equations - exact differential equations, Bernoulli's equations--Methods of solution and Simple applications.
Linear differential equations of higher orders with constant co-efficient-Methods of solution of these equations. Cauchy's linear differential equations. Simultaneous linear differential equations- Simple applications of linear differential equations in engineering problems – Electrical Circuits, Mechanical Systems.

**Module II**
**Partial differentiation**: Partial differentiation-Concept of partial derivative - Chain rule-Total derivative- Euler's theorem for homogeneous functions, Differentials and their applications in errors and approximations, Jacobians - Maxima minima of functions of two variables(Proof of the result not required)-Simple applications.
**Co-ordinate systems:** Rectangular co-ordinates-Polar co-ordinates-In plane and in Space-Cylindrical polar co-ordinates-Spherical polar co-ordinates.

**Module III**
**Integral calculus**:
Application of definite integrals: Area, Volume, Arc length, Surface area.
Multiple integral: Evaluation of double integrals-Change of order of integration. Evaluation of triple integrals-Change of Variables in integrals.
Applications of multiple integrals. Plane Area, Surface area &Volumes of solids

**Module IV**
**Vector calculus**: scalar and vector point functions, gradient and directional derivative of a scalr point function, divergence and curl of vector point functions, their physical meaning. Evaluation of line integral, surface integral, and volume integrals, Gauss's divergence theorem, Stoke's theorem (No proofs), conservative force fields, scalar potential.
**References**:


1. Sastry, S.S. Engineering mathematics: Vol1. (Fourth edition).PHI Learning, New Delhi. (2008).
2. Erwin Kreyzig. Advanced engineering mathematics (Tenth edition). John Wiley& Sons, Hoboken, NJ.(2011)
3. Veerarajan, T. Engineering mathematics.(third edition). Tata McGraw Hill Publishers, New delhi. (2011)
4. Grewal, B.S. Higher engineering mathematics. (Forty third Edition). Khanna Publishers, New Delhi. (2013).

## 19-200-0102B/ 19-200-0202A ENGINEERING PHYSICS

**Course Outcomes:**

On completion of this course the student will be able to:

1. Interpret modern devices and technologies based on lasers and optical fibres.
2. Explain the basic principles of crystal physics and applications of liquid crystals.
3. Summarise the characteristics and applications of nano materials and superconducting materials
4. Explain the factors affecting the acoustics of buildings and application of ultrasonics in non-destructive testing.

**Module I**

**Laser-introduction**—properties-interaction of radiation with matter-absorption-spontaneous and stimulated emission-principle of laser--Einstein coefficients-conditions for getting laser- population inversion- metastable state- pumpimg-Basic components of a laser-Different types of lasers- construction,working and applications of Ruby laser-Neodymium YAG laser- He-Ne laser- semiconductor laser-Applications of laser in medicine, industry, science and communication. **Holography**-basic principle-Comparison with ordinary photography-Recording and reconstruction of holograms -applications.

**Fibre optics** - Basic structure of an optical fibre - propagation of light in an optical fibre- classifications-step-index fibre and graded index fibre- single mode and multimode- Numerical aperture of a step-index fibre, graded index fibre---acceptance angle and acceptance cone-modes of propagation- Attenuation in optic fibres-fibre losses-material loss,scattering loss,absorption loss,leaky modes- dispersion in optical fibres- Applications.

**Module II**

**Crystallography** – Space lattice- Basis- Unit cell- Unit cell parameters- Crystal systems-Bravais lattices-Three cubic lattices-sc, bcc, and fcc- Number of atoms per unit cell- Co-ordination number- Atomic radius-Packing factor- Relation between density and crystal lattice constants- Lattice planes and Miller indices-Separation between lattice planes in sc-Bragg’s law- Bragg’s x-ray spectrometer- Crystal structure analysis.

**Liquid crystals**- Liquid crystals, display systems-merits and demerits- Metallic glasses-Types of metallic glasses (Metal-metalloid glasses, Metal-metal glasses) – Properties of metallic glasses (Structural, electrical,magnetic and chemical properties). Shape memory alloys- Shape memory effect, pseudo elasticity

**Module III**

**Introduction to nanoscale science and technology**- nanostructures-classifications-nanoring, nanorod,nanoparticle,nanoshells,fullerence- surface occupancy-quantum confinement effect- Properties of nanoparticles- optical, electrical, magnetic and mechanical properties -nanocomposites- metallic nanocomposites and polymer nanocomposites-Applications of nanotechnology.

**Superconductivity**-Introduction--transition temperature-Meissner effect-effect of current-entropy-specific heat-isotope effect-penetration depth-.Types of superconductors-type 1 and type 2- cooper pair-BCS theory-(briefly)-AC Josephsons effect- DC Jospehsons effect- Flux quantisation-Squid-High temperature superconductors-Applications of super conductivity.

**Module IV**

**Quantum mechanics**-Introduction- quantum theory-black body radiation and Photoelectric effect (brief ideas only)-matter waves- de broglie wavelength-wave packet-uncertainty principle-wave function -Physical intrepretation -Time dependent Schrodinger equation for a free particle- Time independent schrodinger equation-Particle in a Box (one dimensional) –Energy eigen values and wave functions.

**Ultrasonics**-production of ultrasonics -piezo electric effect-Magnetostriction effect-properties of ultrasonics- ultrasonic diffractometer and determination of velocity of ultrasonics in a liquid-Application of ultrasonics in non-destructive testing - Accoustics of building-reverberation- Absorption Coefficient- Sabines formula for reverberation time ( no derivation)-Accoustic intensity- loudness-decibel-phon-conditions for good acoustics(Qualitative study).

**References:**

1. S. Mani Naidu, A Text book of Engineering Physics, Pearson.(2010)

2. A.S. Vasudeva, Modern Engineering Physics, S. Chand & Co.(2013)

3. Prabir K. Vasu and Hrishikesh Dhasmana, Engineering Physics, Ane books Pvt. Ltd.(2010)

4. S.O. Pillai and Sivakami, Applied Physics, New Age International (P) Ltd., Second Edition. (2008)

5. G.S. Raghuvanshi, Engineering Physics, Prentice Hall of India.(2008)

## 19-200-0103B/ 19-200-0203A ENGINEERING MECHANICS

**Course Outcomes**: On completion of this course, a student will be able to

1. Understand the principles of mechanics (statics and dynamics), the concept of free body diagrams and resolution of forces.
2. Apply the principles of mechanics, concept of free body diagrams and resolution of forces and equations of equilibrium or motion to given engineering or physical applications.
3. Analyse given engineering or physical applications and calculate the required parameters like forces, moments, various motion parameters like, displacement, velocity, acceleration, etc.
4. Ascertain the physical and mathematical meaning of quantities, like centroid, moment of inertia and their applications in engineering and locate centroid and calculate the moment of inertia or second moment of area of typical sections used in engineering.

**Module I**

**Introduction to Mechanics**: Definition and classification of mechanics – rigid body (statics and dynamics) and deformable body mechanics.

**Forces and Force systems**: Force and its characteristics, Principles of statics – concept of resultant and equilibrant, Composition and resolution of forces, force systems.

**Coplanar Concurrent force system**: Equilibrium of two, three and more than three forces, Moment of a force, Varignon's theorem of moments, Equations of equilibrium, Friction and its effects on bodies, Engineering applications.

**Coplanar Parallel force System**: Two parallel forces, General case of parallel forces in a plane, Centre of parallel forces, Centre of gravity, Centre of mass, Centroids of curves, areas and volumes – regular and composite, Pappus's theorems, Equilibrium of distributed forces in a plane, Applications of the concept of centroid in engineering practice.

**Module II**

**Moment of Inertia**: Concept of moment of inertia and second moment of area, Moment of inertia of regular and composite solids, Second moment of area of regular and irregular surfaces, Polar moment of inertia / second moment of area, Product of inertia, Principal moments of inertia and principal axes, Applications of the concepts in engineering practice.

**Coplanar non-concurrent force system and Analysis of Plane trusses and frames**: Resultant of a general case of force system in a plane, Equilibrium equations, Concept of load carrying mechanism in trusses and frames – internal (axial) forces, two force and multi force members, Analysis of plane trusses by Method of joints and Method of sections, Analysis of Plane frames by Method of members.

**Module III**

**Principle of virtual work**: Concept of virtual work and the principle of virtual work, Applications in engineering, Equilibrium of ideal systems, Stable and unstable equilibrium.

**Introduction to Dynamics**: Definitions, Units, Divisions – Kinematics, Kinetics.

**Rectilinear translation**: Kinematics of rectilinear motion – displacement, velocity, acceleration, Kinetics – Differential equations of motion, D'Alembert's principle in rectilinear translation and its applications, Motion of a particle due to a constant force, Motion of a

particle due to a force proportional to displacement – Simple harmonic motion, Momentum and impulse, Work and energy, Conservation of energy, Collision of two bodies – direct central impact.

**Module IV**

**Curvilinear translation:** Kinematics of curvilinear translation – components of displacement, velocity and acceleration, normal and tangential acceleration, Kinetics – Differential equations of motion, Motion of a projectile – projection on horizontal and inclined surfaces, D'Alembert's principle in curvilinear motion and its applications, Moment of momentum, Work and energy in curvilinear motion.

**Rotation of a rigid body**: Kinematics of rotation – angular displacement, velocity and acceleration, RPM, Relations of kinematic parameters of linear and angular motions, Kinetics – Differential equations of motion of a rigid body rotating about a fixed axis, Rotation under the action of a constant moment, Rotation proportional to angular displacement – Compound pendulum, D'Alemberts principle in rotation, Resultant inertia force in rotation, Principle of angular momentum in rotation, Energy equation for rotating bodies.

**References**


1. Timoshenko and Young. Engineering mechanics. McGraw Hill Book Company, Singapore. (1956)
2. Beer, F. P. and Johnston, E. R. Mechanics for engineers (Vol. 1: Statics and Vol.2: Dynamics). Tata McGraw Hill, New Delhi.(2004).
3. Merriam, H. L. and Kraige, L. G. (2003). Engineering mechanics (Vol. 1: Statics and Vol.2: Dynamics*)*. John Wiley and Sons, Somerset, N.J.(2003)
4. Hibbeller, R.C. Engineering mechanics. Vol. 1: Statics, Vol. 2: Dynamics. (Twelfth edition). Pearson Education Asia Pvt. Ltd., New Delhi.
5. Rajasekaran,S. and Sankarasubramanian,.G. Fundamentals of engineering mechanics. (Third edition). Vikas Publishing House Pvt. Ltd., New Delhi.(2010)

## 19-200-0104B/19-200-0204A BASIC CIVIL ENGINEERING

**Course outcomes**

At the end of the course students will be able to

1. Summarize the types, uses and properties of various building materials
2. Explain the different components of building and types of foundations
3. Illustrate the fundamental aspects of civil engineering
4. Discuss about the surveying techniques and to solve problems related with levelling
5. Recognize the various modern services emerging in the field of civil engineering
6. Prepare site plan based up on the Kerala Municipality Building Rule

**Module I**

**Engineering Materials:** Cement - varieties and grade of cement and their uses. Cement mortar- Steel- types of steel for reinforcement bars, steel structural sections. Brick- varieties and strength, tests on bricks.

Aggregates- types & requirements. Concrete- grades of concrete as per IS code, water cement ratio, workability, mixing, batching, placing, compaction and curing.

**Module II**

**Construction** : Components of a building-Foundation- types of foundations- isolated footing, combined footing, raft, pile & well foundations- Foundation for Machinery

Super structure: Brick masonry, English bond and Flemish bond, Stone masonry-Ashlar masonry- Rubble masonry. Roofing- Steel trusses, roofing for industrial buildings

**Module III**

**Surveying:** Basic Principles of surveying, instruments, methods and measurements- linear measurements- reconnaissance, selection of survey stations.

Leveling: Leveling instruments, different types, temporary adjustments, reduced level of point, booking of field notes, and reduction of levels by height of collimation method.

Introduction to Total Station.

**Module IV**

**Site planning and Building Rules**-Selection of site-Site plan preparation for buildings-Kerala Municipal Building Rules prevailing, general provisions regarding site and building requirements-Coverage and Floor Area Ratio-Basic concepts of Intelligent Buildings and Green Buildings

Roads- Classification of Rural and urban Roads.

Sources of Water - Water Supply-Quality of Water.

**References:**

1. Chudley, R., Construction Technology, Vol. I to IV, Longman Group, England (2011).
2. Chudley, R. and Greeno, R., Building Construction Handbook, Addison Wesley, Longman Group, England (1998)
3. Mamlouk, M. S., and Zaniewski, J. P., Materials for Civil and Construction Engineering, Pearson Publishers (2011)
4.McKay, W. B. and McKay, J. K., Building Construction, Vol. 1 to 4, Pearson India Education Services.(2013)
5. Rangwala,S.C and Dalal,K.B.,Building Construction, Charotar Publishing House (2017).
6. Kerala Municipal Building Rules (latest revision)

## 19-200-0105B/19-200-0205A BASIC MECHANICAL ENGINEERING

**Course Outcomes:**

On completion of this course the student will be able to:

1. Understand basics of thermodynamics and working of steam turbines
2. Understand basics of internal combustion engines, refrigeration and air conditioning
3. Gain knowledge on the working of hydraulic turbines and centrifugal pumps
4. Identify manufacturing methods encountered in engineering practice and understand mechanism of power transmission

**Module I**

**Thermodynamics**: Thermodynamics systems – open, closed and isolated systems, equilibrium state of a system, property and state, process, cycle, Zeroth law of thermodynamics- concept of temperature, temperature scales. First law – internal energy, enthalpy, work and heat, Different processes (isobaric, isochoric, isothermal, adiabatic and polytropic processes). Second law – Kelvin-plank and Claussius statements and their equivalence, Carnot Cycle (Elementary problems only).

Thermodynamic properties of Steam, Steam Generator. Different types of boilers, boiler mountings and accessories. Formation of steam at constant pressure, working of steam turbines, compounding of turbines.

**Module II**

**Internal Combustion Engines**: Air standard cycles – Otto and Diesel cycles, working of two stroke and four stroke Petrol and Diesel engines, Carburetted and MPFI engines, fuel pump, fuel injector, ignition system, cooling system, lubricating system.

**Refrigeration & Air-conditioning**: Introduction to refrigeration and air -conditioning, Rating of refrigeration machines, Coefficient of performance, Simple refrigeration vapour compression cycle (Elementary problems only), Summer and winter air conditioning.

**Module III**

**Hydraulic Turbines & Pumps**: Introduction, Classification, Construction details and working of Pelton Wheel, Francis and Kaplan turbines, Specific speed (Definition and significance only), Classification of water pumps, working of centrifugal pumps and reciprocating pumps (Theory of working principles only)

**Power plants:** Hydro-electric power plants, Thermal power plants, Nuclear power plants, Diesel power plants, Wind mills, solar energy (Working principles using schematic representations only)

**Module IV**

**Introduction to Manufacturing Systems**: Welding- different types of welding, resistance welding, arc welding, gas welding, Brazing and soldering, Different welding defects. Casting- different casting processes, sand casting, casting defects, Rolling- hot rolling and cold rolling, two high, three high , cluster rolling mills, wire drawing, forging, extrusion, Heat treatment of steel, elementary ideas of annealing, hardening, normalizing, surface hardening.

**Power Transmission Methods and Devices**: Introduction to Power transmission, Belt, Rope, Chain and Gear drive. Length of belt open and crossed. Ratio of belt tensions (Elementary

problems only). Different types of gears (Elementary ideas only). Types and functioning of clutches.

**References**


1. Nag, P.K. Engineering thermodynamics. (Fifth Edition). McGraw Hill Education (India) Pvt. Ltd, New Delhi.(2013).
2. Gill, J.H. Smith Jr. and Ziurys, E.J. Fundamentals of internal combustion engines, Oxford & IBH, New Delhi.(1959)
3. Stoecker, W. F. Refrigeration and air conditioning. Tata McGraw Hill, New Delhi.(1980).
4. JagadishLal. Hydraulic machines. Metropolitan Book co, New Delhi.(1994)
5. Raghavan, V. Material science and engineering, Prentice Hall of India, New Delhi.(2004)
6. Rajendar Singh.Introduction to basic manufacturing processes and workshop technology, New Age International, New Delhi. (2006).

## 19-200-0106B/19-200-0206A SOFT SKILLS DEVELOPMENT

**Course Outcomes:**

On completion of this course the student will be able to:

1. Speak English at the formal and informal levels and use it for daily conversation, presentation, group discussion and debate.
2. Read, comprehend and answer questions based on literary, scientific and technological texts
3. Develop self-motivation, raised aspiration, belief in one's own abilities and commitment to achieving one's goal
4. Demonstrate emotional maturity and emotional health.

**Module I**

Role and importance of verbal communication, Everyday active vocabulary, Common words used in transitions, enhancing vocabulary, affixes and changes in pronunciation and grammatical functions, words often confused in pronunciation and usage. Passage comprehension- skimming, scanning techniques, note making, note taking and summarizing. Deciphering meaning from contexts. Two types of meaning- literal and contextual. Constructive criticism of speeches and explanations.

**Module II**

Fundamental grammar, Simple structures, passivizing the active sentences, reported speech, the judicious use of tenses and moods of verbs, forming questions and conversion from questions to statements and vice versa, forming open –ended and close- ended questions. Words and style used for formal and informal communication. Practice converting informal language to formal, the diction and the style of writing. Dealing with the nuances of ambiguous constructions in language. Learning authoritative writing skills, polite writing and good netiquette. Writing for internships and scholarships.

**Module III**

Kinesics, Proxemics, Haptics, and other areas of non-verbal communication, fighting communication barriers, positive grooming and activities on the same.

Different types of interviews, and presentation - oral, poster, ppt. Organizing ideas for group discussions, the difference between GD and debates.

Effective listening and seeking to understand others' perspectives.

Non-violent negotiation and persuasion, communicating across age groups, cultures or identity groups

**Module IV**

Developing positive self: Understanding oneself, A realistic awareness of oneself and one's abilities, strengths and potential, Self-esteem, Self-efficacy, steps for improvement.

Intra-personal skills – Self-control, emotional regulation and self-discipline, conscientiousness, dutifulness, reliability, truthfulness, honesty and trustworthiness. Goal orientation and initiative. Time management – prioritising work.

Interpersonal skills – cross cultural competence and valuing diversity of perspectives, respecting and expressing concern for others. Empathy and ability to notice the effect of one's actions on others, tolerance for disagreement, conflict management and resolution. Critical thinking and evaluation.

**References:**


1. Duck, Steve and David T. Macmahan. Communication in Everyday Life. 3rd Ed. Sage, (2017).
2. Gamble, Kawl Teri and Michael W. Gamble. The Public Speaking Playbook. Sage, (2015).
3. Raman, Meenakshi and Sangeetha Sharma. Technical Communication: Principles and Practice, Oxford University Press, (2015).
4. Coleman, D. Emotional intelligence: Why it can matter more than IQ, Bantam Books, New York (2006).
5. Devadas Menon. Stop sleep walking through life, Yogi Impressions Books Pvt. Ltd, Mumbai (2012).
6. Barun K Mitra. Personality Development and Softskills, Oxford University Press (2012).


**ASSESSMENT**

1. 'Soft Skills Development' is a practical and activity oriented course which has continuous assessment for 50 marks based on class room interaction, activities, and assignments. The activities may include 'Just a Minute' (JAM) sessions, group discussion, role play, debate, and extempore speech.

The weightages for the different components shall be as follows:

Class room interaction – 10 marks
Activities – 30 marks
Assignments (mainly from Modules I and II) – 10 marks

2. End semester examination is not envisaged.

3. A student should secure a minimum of 50% marks in continuous assessment for a pass in the course.

## 19-200-0107B/19-200-0207A CIVIL ENGINEERING WORKSHOP

**Course Outcomes:**
On completion of this course the student will be able to:

1. Identify simple plumbing and sanitary fittings and state its use
2. Identify the various methods used in building construction.
3. Construct brick walls using English Bond and Flemish Bond
4. Set out a building as per a given building plan using surveying instruments
5. Compute the various quantities of materials required for a building

Plumbing:
Introduction to simple plumbing and sanitary fittings.

Building Materials:
Familiarization of building materials and their testing.

Masonry:
Construction of English bond and Flemish bond – wall junction – one brick – one and a half brick –and two brick thick

Surveying:
Surveying and levelling instruments
Setting out of building (single room only) as per the given building plan using surveying instruments
Compute the area and/or volume of various features of a building/structure such as door and window size, number of bricks required to construct a wall of a building, diameter of bars used in windows etc. (to create an awareness of measurements and units)
Demonstration of Total Station

Assignment: *Students shall collect the list of various building materials used for the construction of a building including their market rate.*

## 19-200-0108B/19-200-0208AMECHANICAL ENGINEERING WORKSHOP

**Course Outcomes:**

On completion of this course the student will be able to:

1. Identify and use tools, and make different types of joints used in carpentry, fitting, and sheet metal shop.
2. Compare basic fabrication techniques of different types of welding.

Preliminary exercises for beginners in all the following shops. Specific models may be designed by the teachers.

1) Fitting Shop.
2) Sheet Metal Shop
3) Foundry Shop
4) Welding Shop
5) Carpentry Shop

## 19-200-0109B/19-200-0209A LANGUAGE LAB

**Course Outcomes:**

On completion of this course the student will be able to:

1. Test pronunciation skills through stress on word accent, intonation, and rhythm.
2. Use English language effectively for writing business letters, resume, minutes of meeting and reports.
3. Use English language effectively to face interviews, group discussions, and public speaking.

Following course content is prescribed for the **Language Laboratory** sessions:

1. Introduction to the Sounds of English- Vowels, Diphthongs & Consonants.
2. Introduction to Stress and Intonation.
3. Preparing business letters
4. Preparing a resume
5. Conducting a meeting and writing the minutes
6. Writing a report
7. Situational Dialogues / Role Play.
8. Oral Presentations- Prepared and Extempore.
9. 'Just A Minute' Sessions (JAM).
10. Describing Objects / Situations / People.
11. Debate
12. Group discussion

## 19-200-0110B/19-200-0210A NSS/NATURE CONSERVATION ACTIVITIES

### NATIONAL SERVICE SCHEME (NSS)

**Course Outcomes:**

On completion of this course the student will be able to:

1. Recognise the community in which they work
2. Utilise their knowledge in finding practical solution to individual and community problems

A student enrolling as member of NSS will have to complete 10 hours of training / social service.

### NATURE CONSERVATION ACTIVITIES

**Course Outcomes:**

On completion of this course the student will be able to:

1. Practice and spread the message of sustainable life styles
2. Understand the importance of green plants in mitigating global environmental problems
3. Identify suitable waste management practices for the local community

A student enrolling as member of the Nature Conservation Club will have to complete 10 hours of campus cleaning and greening activities.

## 19-200-0101A/19-200-0201B COMPUTER PROGRAMMING

**Course Outcomes:**

On completion of this course the student will be able to:

1. Identify main components of a computer system and explain its working.
2. Develop flowchart and algorithms for computational problems.
3. Write the syntax of various constructs of C language.
4. Build efficient programs by choosing appropriate decision making statements, loops and data structures.
5. Illustrate simple search and sort algorithms.
6. Demonstrate how to perform I/O operations in files for solving real world problems.
7. Design modular programs using functions for larger problems.

**Module I**

Basics of Computer and Information Technology:

Digital Computer System (CPU, Memory, I/O devices)- Working of a digital computer-Hardware and Software : Definition - Categories of Software, Application of Computers.

Problem Solving Methodology:

Problem statement, Analysis, Design a solution, Implement/Coding the solution, Test the solution, Design tools (Algorithm, Flow-chart, Pseudo-code)- Develop algorithms for simple problems.

Programming Languages:

Types of programming languages-Compiler–Interpreter-Linker–Loader–Execution of program.

**Module II**

Basics of C:

Character set-Identifier- Keywords- Constants –Data Types- Variables and declaration –Operators and Expressions – Operator precedence and associativity – Expression Evaluation (Simple Examples) - Input and output functions – Simple computational problems involving the above constructs.

Control Statements:

Selection, Conditional operator, Iteration (for, while, do-while), Branching (switch, break, continue, goto), Nesting of control statements- Problems using control statements.

**Module III**

Arrays and Strings:

1D and 2D arrays –Searching (Linear and Binary) - Sorting (Bubble, Selection) – Matrix manipulation programs – Strings and basic operations on strings – Strings functions -Programs on string manipulation.

Functions:

Definition – Calling – Declaration – Parameter Passing (by value and by reference) – Recursion – Programs based on functions.

User defined data types:

Structure – Union - Enumerated data type - Programs involving structure and union.

**Module IV**

Pointers:

Declaration, Initialization – Operations on pointers- Pointers and arrays – Pointers and Structures-Command line arguments-Dynamic memory allocation — Programs involving the above concepts.

Files:

File concept – File pointer – File handling operations (open, close, read, write etc) on sequential and

random access files. Programs on file manipulations using fgetc(), fgets(),fseek().

**References:**


1. Pradip Dey and Manas Ghosh, Computer Fundamentals and Programming, Second Edition, Oxford University Press, (2013).
2. Byron Gottfried, Programming with C, Second edition, Tata McGraw-Hill, (2006).
3. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Second Edition, Pearson Education, (2001).
4. R.G. Dromey, How to solve it by Computer, Pearson Education, (2008).
5. Kanetkar Y, Let Us C, BPB Publications, (2007).

## 19-200-0102A/19-200-0202B ENGINEERING CHEMISTRY

**Course Outcomes:**

On completion of this course the student will be able to:

1. Interpret the basic principles and concepts of quantum mechanics
2. account for how spectroscopic methods can be used to determine molecular structures, with focus on the identification of characteristic groups in polyatomic molecules
3. Apply the laws of thermodynamics to engineering systems.
4. Explain the chemistry of a few important engineering materials and their industrial applications.

**Module I**

**Quantum Chemistry**: Schrodinger equation. Derivation from classical wave equation. Operator form of the equation. Application of Schrodinger equation to 1-D box solutions. Significance of wave functions, probability and energy. Application of 1-D box solutions to conjugated molecules.

Forms of hydrogen atom wave functions and the plots of these functions to explore their spatial variations.

Energy level diagrams of diatomic molecules, Pi-molecular orbitals of butadiene, and benzene and aromaticity.

**Module II**

**Spectroscopy:** Principles of spectroscopy and selection rules. Electronic spectroscopy. Fluorescence and its applications in medicine.

Vibrational and rotational spectroscopy of diatomic molecules. Applications.

Nuclear magnetic resonance and magnetic resonance imaging.

Surface characterisation techniques. Diffraction and scattering.

**Module III**

**Chemical Thermodynamics**: Fundamentals. First law of thermodynamics. Molecular interpretation of internal energy, enthalpy and entropy. Heat of reaction. Kirchoff's equations. Dependence on pressure and temperature. Gibbs-Helmholtz equation. Free energy changes and equilibrium constant. Chemical potential and fugacity. Thermodynamics of biochemical reactions.

**Phase Rule**: Terms involved in phase rule and examples, Application of phase rule to one component water system, Application of phase rule to two-component systems. (Simple eutectic systems).

**Module IV**

**Engineering materials**:

Polymers- Classifications- Mechanism of polymerisation (Addition, free radical, cationic, anionic and coordination polymerisation)- Thermoplastics and thermosetting plastics- Compounding of plastics-Moulding techniques of plastics (Compression, Injection, Transfer and Extrusion moulding)-Preparation, properties and uses of PVC, PVA, PET, Nylon- Silicon polymers- Biodegradable plastics. Elastomers- structure of natural rubber- vulcanisation- synthetic rubbers (Buna-S, Butyl rubber and Neoprene).

Lubricants- Introduction-Mechanism of lubrication- solid and liquid lubricants- Properties of lubricants-Viscosity index- flash and fire point- cloud and pour point- aniline value.
Refractories: Classification – Properties of refractories.
Cement- Manufacture of Portland cement- Theory of setting and hardening of cement.

**References:**


1. B. H. Mahan and R. J. Meyers University Chemistry, 4th Edition, Pearson publishers. (2009).
2. Peter W. Atkins, Julio de Paula, and James Keele. Physical Chemistry, 11th Edition, Oxford publishers. (2018).
3. M. J. Sienko and R. A. Plane. Chemistry: Principles and Applications, 3rd Edition, McGraw-Hill publishers.(1980).
4. C. N. Banwell. Fundamentals of Molecular Spectroscopy, 5th Edition, McGraw-Hill publishers.(2013).
5. B.L. Tembe, M.S. Krishnan and Kamaluddin. Engineering Chemistry (NPTEL Web Course)
6. Shashi Chawla. A Text book of Engineering Chemistry. Dhanpat Rai & Co, New Delhi.(2013).

## 19-200-0103A/19-200-0203B ENGINEERING GRAPHICS

**Course Outcomes:**

On completion of this course, the students will be able to:

1. Prepare drawings as per Indian standards
2. Produce orthographic projection of straight lines and planes.
3. Draw orthographic projection of solids.
4. Understand development of surface of different geometric shapes
5. Construct isometric scale, isometric projections and views.

**Module I**

**Introduction to engineering graphics**. Drawing instruments and their use. Familiarisation with current Indian Standard Code of Practice for general engineering drawing.

Scales- plain scale, Vernier scale, diagonal scale.

Conic sections- Construction of ellipse, parabola, hyperbola - construction of cycloid, involute, Archimedian spiral and logarithmic spiral- drawing tangents and normal to these curves.

**Module II**

**Introduction to orthographic projections**- plane of projection- principles of first angle and third angle projections, projection of points in different quadrants.

Orthographic projection of straight lines parallel to one plane and inclined to the other plane- straight lines inclined to both the planes- true length and inclination of lines with reference planes- traces of lines.

Projection of plane laminae of geometrical shapes in oblique positions.

**Module III**

**Projection of polyhedra and solids of revolution**- frustum, projection of solids with axis parallel to one plane and parallel or perpendicular to other plane- projection of solids with axis inclined to both the planes- projection of solids on auxiliary planes.

Section of solids by planes inclined to horizontal or vertical planes- true shape of sections.

**Module IV**

**Development of surface** of cubes, prisms, cylinders, pyramids and cones

**Intersection of surfaces**- methods of determining lines of intersection - intersection of prism in prism and cylinder in cylinder.

**Module V**

**Introduction to isometric projection**- isometric scales, isometric views- isometric projections of prisms, pyramids, cylinders, cones and spheres.

**Introduction to perspective projections**: visual ray method and vanishing point method- perspective of circles- perspective views of prisms and pyramids.

**References:**


1. John, K.C. Engineering graphics. PHI Learning, New Delhi.(2013)
2. Bhat, N.D. Elementary engineering drawing. (Forty ninth edition). Charotar Publishing House, Anand.(2010)
3. Gill P.S. Geometric drawing. B.D Kataria &Sons, Ludhiana.(2012)


**<u>Type of questions for End Semester Examination</u>**

Two questions of 12 marks each from all the five modules. Answer one question from each module. (5x12 = 60 marks)

## 19-200-0104A/19-200-0204B BASIC ELECTRICAL ENGINEERING

**Course Outcomes:**

On completion of this course the student will be able to:

1. Analyse and solve electric circuits
2. Understand the principles of electromagnetic induction and identify meters for measuring electrical quantities
3. Recognise the basic elements and phases in AC circuits
4. Identify the type of electrical machine for a given application

**Module I**

**Basic principles of Electric circuits**: Review of Ohm's law - Definition of Resistance, Current, Voltage and Power - Series and Parallel circuits- Constant voltage source and Constant current source.

**Network Theorems**: Kirchhoff's laws- Network analysis by Maxwell's circulation currents - Superposition theorem -Thevenin's theorem - Norton's theorem - simple illustrative problems on network theorems.

**Review of electrostatics** - Coulomb's Law- Electric field strength and electric flux density, Capacitance.

**Module II**

**Review of electromagnetic induction** -Faraday's Law- Lenz's Law - Mutually induced emf. Magnetic circuits - Magnetic field of a coil - Ampere turns calculation - Magnetic flux - Flux density - Field strength.

**Measuring instruments**: Working principle of galvanometer, Ammeter, Voltmeter, Watt meter & Energy Meter (elementary concepts).

**Module III**

**AC Fundamentals:** Sinusoidal Alternating Waveforms - Sinusoidal AC Voltage characteristics and definitions — General representation of voltage or current – Phase Relations – Average value – Effective (Root mean square) value.

**The Basic Elements and Phasors:** Response of basic R, L and C elements to a sinusoidal voltage or current –Phasor diagrams, Frequency response of the basic elements – Average power and power factor – Complex representation of vectors (Rectangular & polar forms)

**Series and Parallel ac Circuits:** Series & parallel impedances and admittances, Analysis of RL, RC & RLC circuits, Resonance in series and parallel circuits- Variation of impedance and admittance in series and parallel resonant circuits. Power in ac circuits: active, reactive & apparent power.

**Introduction to 3 phase Systems:** Star& Delta connection, Power in three phase circuits

**Module IV**

**Electrical Machines**: Principle of operation, Types and applications of DC machines, Transformers and Induction Machines. (Only an elementary qualitative treatment is envisaged.)

**Elementary Concepts of Generation, Transmission, and Distribution:** Conventional sources of electrical energy: Hydro, Thermal, Nuclear and Diesel power station, Non-conventional Sources: Solar energy, wind energy & energy from oceans, Various levels of power transmission, introduction to primary and secondary distribution

**References:**


1. Robert L. Boylestad. Introductory circuit analysis. (Twelfth edition). Pearson Education, New Delhi. (2012)
2. Cotton, H. Electrical technology. (Seventh edition). CBS Publishers and Distributors, New Delhi. (2005)
3. Leonard S. Bobrow. Fundamentals of electrical engineering. Oxford University Press, New Delhi.(1996).
4. Rajendra Prasad. Fundamentals of electrical engineering. (Second edition). PHI Learning, New Delhi.(2009)
5. Edward Hughes. Electrical technology. Addison Wesley Longman, Boston. (1995).

## 19-200-0105A/19-200-0205B BASIC ELECTRONICS ENGINEERING

**Course Outcomes:**

On successful completion of this course the student will be able to:

1. Develop an understanding of the behaviour of semiconductor junctions, diodes and BJTs
2. Familiarize with the applications of Diodes in rectification and regulation
3. Relate the role of BJTs in amplification and switching
4. Identify various measuring instruments and their functions
5. Gain knowledge on the fabrication of semiconductor devices and ICs

**Module I:**

**Basic Semiconductor and PN Junction Theory:** Atomic Theory, Conduction in Solids, Conductors, Semiconductors and Insulators, n-Type and p-Type semiconductors, Semiconductor conductivity
The p-n Junction, Biased Junctions. Junction Currents and Voltages

**Module II:**

**Semiconductor Diodes and Applications**: PN Junction Diode, Characteristics and parameters, Diode Approximations, DC Load Line Analysis, Temperature Effects, Diode AC Models, Diode Specifications, Diode Testing, Zener Diodes
Half wave rectification, Full wave rectification, RC and LC Filters, Shunt Voltage Regulators, Power supply - performance and Testing
Optoelectronic Devices-LED, LCD, Seven segment displays

**Module III:**

**Bipolar Junction Transistors and Electronic measuring instruments:** BJT Operation, BJT voltages and currents, BJT Amplification and Switching, Common Base, Common Emitter and Common Collector Characteristics, Transistor Testing
Electronic measuring instruments – Power Supply, Function Generator, CRO, Multimeter.

**Module IV:**

**Fabrication of Semiconductor Devices and ICs:** Processing of Semiconductor materials, Diode Fabrication and Packaging, Transistor construction and Performance, Transistor Fabrication, Integrated Circuits, IC components and circuits, Transistor and IC packaging, Transistor Data sheets, Power measurement in dB

**References:**

1. David A Bell, Electronic Devices and Circuits Oxford Higher Education, 5th Edition, (2017).

2. NN Bhargava, DC Kulshreshtha, SC Gupta, Basic Electronics and Linear circuits, Tata McGrawHill Publishing Company, 2nd Edition, (2013).

## 19-200-0106A/19-200-0206B ENVIRONMENTAL STUDIES

**Course Outcomes:**

On completion of this course the student will be able to:

1. Identify the natural resources and suitable methods for conservation and sustainable development
2. Realise the importance of eco system and biodiversity for maintaining ecological balance
3. Identify environmental pollutants and abatement mechanisms
4. Understand environmental problems arising due to developmental activities and population growth

**Module I**

Multidisciplinary nature of environmental studies. Definition, scope and importance, need for public awareness.

Natural Resources: Renewable and non-renewable resources: Natural resources and associated problems. Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people.

Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.

Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies.

Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.

Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources. Case studies.

Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification. Role of an individual in conservation of natural resources. Equitable use of resources for sustainable lifestyles.

**Module II**

**Ecosystems**: Concept of an ecosystem. Structure and function of an ecosystem. Producers, consumers and decomposers. Energy flow in the ecosystem. Ecological succession. Food chains, food webs and ecological pyramids. Introduction, types, characteristic features, structure and function of the following ecosystems: - Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

**Biodiversity and its conservation**: Introduction – Definition: genetic, species and ecosystem diversity. Biogeographical classification of India. Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values. Biodiversity at global, National and local levels. Inida as a mega-diversity nation. Hot-sports of biodiversity. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts. Endangered and endemic species of India. Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

**Module III**

**Environmental Pollution**: Definition. Cause, effects and control measures of: - a. Air pollution b. Water pollution c. Soil pollution d. Marine pollution e. Noise pollution f. Thermal pollution g. Nuclear hazards. Solid waste Management: Causes, effects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution. Pollution case studies.

**Diaster management**: floods, earthquake, cyclone and landslides.
**Environmental legislation**: Environment Protection Act. Air (Prevention and Control of Pollution) Act. Water (Prevention and control of Pollution) Act. Wildlife Protection Act. Forest Conservation Act. Issues involved in enforcement of environmental legislation.

**Module IV**
**Environmental ethics**: Issues and possible solutions. Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies. Wasteland reclamation. Consumerism and waste products.
**Social Issues and the Environment**: From Unsustainable to Sustainable development. Urban problems related to energy. Water conservation, rain water harvesting, watershed management. Resettlement and rehabilitation of people; its problems and concerns. Case Studies. Public awareness.
**Human Population and the Environment**: Population growth, variation among nations. Population explosion – Family Welfare Programme. Environment and human health. Human Rights. Value Education. HIV/AIDS. Women and Child Welfare. Role of Information Technology in Environment and human health. Case Studies.
Field work: Visit to a local area to document environmental assets river/ forest/grassland/hill/mountains. Visit to a local polluted site-Urban/Rural/Industrial/Agricultural. Study of common plants, insects, birds. Study of simple ecosystems-pond, river, hill slopes, etc.

**References:**


1. Rajagopalan, R. Environmental studies: From crisis to cure. Oxford University Press, New Delhi. (2005).
2. Erach Bharucha. Textbook of environmental studies and ethics. Universities Press (India), Hyderabad. (2005).
3. Jayashree A. Parikh. Balsaraf, V.M. and Dwivedi, P.B. Environmental studies. Ane Books Pvt. Ltd, New Delhi. (2010)
4. Anindita Basak. Environmental studies, Pearson, New Delhi. (2009).
5. Misra, S.P. (2011). Essential environmental studies. (Third edition). Ane Books Pvt. Ltd., New Delhi. (2011).
6. Benny Joseph. Environmental science & engineering, Tata McGraw Hill Education Pvt. Ltd., New Delhi. (2010).

## 19-200-0107A/19-200-0207B ELECTRICAL ENGINEERING WORKSHOP

**Course Outcomes:**

On completion of this course the student will be able to:

1. Apply basic electrical engineering knowledge for house wiring practice

**Experiments:**

1. One lamp controlled by one switch
2. Series and parallel connections of lamps.
3. Stair case wiring.
4. Hospital Wiring.
5. Godown wiring.
6. Fluorescent lamp.
7. Connection of plug socket.
8. Different kinds of joints.
9. Winding of transformers.
10. Soldering practice.
11. Familiarisation of CRO.
12. Single Phase Distribution Board Wiring.

## 19-200-0108A/19-200-0208B COMPUTER PROGRAMMING LABORATORY

**Course Outcomes:**
On completion of this course the student will be able to:

1. Solve problems efficiently by choosing loops and decision making statements in C programming.
2. Implement different operations on arrays.
3. Solve problems using functions and recursion.
4. Design and implement C programs using the concepts of structure, pointers and files.

**Cycle I**
**Application Packages:**
Text Editor
1. To create a word document like an advertisement.
Spread Sheet
2. To create a spread sheet to analyse the marks of the students of a class and also to create appropriate charts.
Presentation Software
3. To create a presentation for the department using Power Point.
**C Programming Basics:**
4. To write a program to calculate and display areas of rectangle and triangle.
**Decision Making:**
5. To write a program for electricity bill preparation.
6. To write a program to find the roots of a quadratic equation.
7. To write a simple menu driven calculator program using switch statement.
8. To write a program to find the sum of digits of a given number.

**Cycle II**
**Looping:**
9. To write a program to print all the prime numbers of a given range.
10. To write a program to print the sine and cosine series.
11. To write a program to print Pascal's triangle.
**Arrays:**
12. To write a program to print the sum and average of elements in an array.
13. To write a program to sort the given numbers using bubble sort.
14. To write a program to perform Matrix addition and matrix multiplication.
**String:**
15. To write a program to perform string manipulation functions like string concatenations, comparison, find the length and string copy without using library functions.
16. To write a program to arrange names in alphabetical order.
**Cycle III**
**Functions:**
17. To write a C program to calculate the mean, variance and standard deviation using functions.
18. To write a C program to perform sequential and binary search using functions.
**Recursion:**
19. To write a program to print the Fibonacci series using recursive function.
20. To write a program to print the factorial of the given number using recursive function.

**Structure:**

21. To print the mark sheet of n students using structures.

**Pointers:**

22. To write a program using pointers to access the elements of an array and count the number of occurrences of the given number in the array.

**Files:**

23. To write a program to count the number of characters,lines in a file.

**References:**


1. Pradip Dey and Manas Ghosh, Computer Fundamentals and Programming in C, Second Edition, Oxford University Press, (2013).
2. Smarajit Ghosh, All of C, PHI Learning Pvt. Ltd, (2009).
3. Byron Gottfried, Programming with C, 2 nd edition, Tata McGraw-Hill, (2006).
4. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Second Edition, Pearson Education, (2001).
5. Sukhendu Dey, Debobrata Dutta, Complete Knowledge in C, Narosa PublishingHouse, New Delhi, (2009).

## 19-200-0301 LINEAR ALGEBRA AND TRANSFORM TECHNIQUES

***Course Outcomes:***

*On completion of this course the student will be able to:*

1. *Solve linear system of equations and to determine Eigen values and vectors of a matrix.*
2. *Understand the concept of vector space and sub space.*
3. *Determine Fourier series expansion of functions and transform.*
4. *Solve linear differential equation and integral equation using Laplace transform.*

**Module I**

Linear Algebra 1:Rank of a matrix, solution of linear system of equations- existence, uniqueness, general form-Eigen values and Eigen vectors- properties of Eigen values - Diagonalization of a matrix- Cayley Hamilton theorem (without proof) Verification-Finding inverse and power of a matrix using it-Quadratic form-orthogonal reduction of quadratic form to Canonical form.

**Module II**

Linear Algebra 2: Vector space-subspace-Linear dependence and independence-Spanning of a subspace- Basis and Dimension. Inner product- Inner product spaces - Orthogonal and Orthonormal basis –Gram- Schmidt Orthogonalization process. Linear Transformation.

**Module III**

Fourier Analysis: Periodic function, Fourier series, Functions of arbitrary period, Even and odd functions, Half Range Expansion, Harmonic analysis, Complex Fourier Series, Fourier Integrals, Fourier Cosine and Sine Transform, Fourier Transform.

**Module IV**

Laplace Transforms: Gamma functions and Beta function-Definition and properties, Laplace transforms. Inverse Laplace Transform, Shifting theorem, Transform of Derivative and Integrals, Solution of differential equation and integral equation using Laplace transform, Convolution, Unit step function, Second Shifting theorem, Laplace transform of periodic function.

**References:**


1. Erwin Kreyzig, Advanced Engineering Mathematics, 10th Edition, Wiley, 2011.
2. Grewal, B. S., Higher Engineering Mathematics, 43th Edition, Khanna Publishers, 2013.
3. Hsiung, C.Y. and Mao, G.Y.- Linear Algebra, WorldScientfic.
4. Hoffman, K. and Kunze, R., Linear Algebra, Prentice Hall of India ,New Delhi 1971
5. Venkataraman, M. K., Linear Algebra, The National Co., 1999.

## 19-202-0302 LOGIC DESIGN

***Course Outcomes:***

*On completion of this course the student will be able to:*

1. *Understand about the basic number systems and the conversion between them.*
2. *Manipulate boolean expressions and simplify them.*
3. *Design combinational circuits for any given problem.*
4. *Design sequential circuits, flip-flops etc.*
5. *Design circuits like counters, registers etc.*
6. *Familiarize with the basic principles of memory, design of memory etc.*
7. *Gain knowledge about the basics of integrated circuits.*

**Module I**

Introduction : Digital System - Binary Numbers - Base conversions - Octal and Hexadecimal numbers - compliments - operations of compliments - Signed binary numbers - Binary codes - Binary storage and Registers - Binary Logic. Boolean algebra and logic gates: Axiomatic definition of boolean algebra - Basic theorems and properties - Boolean functions - Canonical and standard forms - Logic operations- Introduction to Digital Logic gates. Gate level minimisation: Karnaugh map - two, three, four and five variable maps - Product of Sums and Sum of Products simplification - Don't care conditions - NAND and NOR implementation - Exclusive OR function - Quine McCluskey Technique for simplification.

**Module II**

Combinational Logic : Combinational Circuits - Analysis procedure - Design procedure - Binary adder-subtractor - Fast adders - Decimal adder - Binary multiplier - Magnitude comparator - Decoders - Encoders - Multiplexers and demultiplexers. Synchronous sequential circuits: Sequential circuits - Storage elements: Latches and Flip-Flops - Analysis of clocked sequential circuits - State reduction and assignment - Design procedure.

**Module III**

Registers and Counters: Registers - Shift Registers - Ripple counters - Synchronous counters - Counter with unused states - Ring counter - Johnson counter.Asynchronous Sequential circuits: Analysis procedure - Circuits with Latches – Hazards.

**Module IV**

Memory and Programmable Logic: Random Access Memory - Memory decoding – Error detection and correction - Read Only Memory - Programmable Logic Array - Programmable Array Logic - Sequential programmable devices. Digital Integrated circuit: IC digital logic families - Characteristics: Fan out - Power dissipation - Propagation delay - Noise Margin. RTL and DTL circuits - Transistor Transistor Logic - Emitter coupled Logic - CMOS Logic - CMOS transmission gate circuit.

**References:**


1. M.Morris Mano , Michael D.Ciletti, Digital Design, Fifth edition, Pearson Education, 2013, ISBN-13: 978-0-13-277420-8.
2. Yarbrough, Digital Logic-Applications And Design ,Thomson Learning, ISBN:981-240 062-1.
3. Thomas L. Floyd, Digital Fundamentals, Eleventh edition, Pearson Education , 2017,ISBN-13**:** 978-9332584600.
4. Herbert Taub, Donald Schilling, Digital Integrated Electronics, Mcgraw Hill Education, ISBN:978-00-702-6508-0.
5. M.Morris Mano, Digital Logic and Computer Design, 1/e, Pearson Education, ISBN: 978-81-775-8409-7.

## 19-202-0303 DISCRETE COMPUTATIONAL STRUCTURES

***Course Outcomes:***

*On completion of this course the student will be able to:*

1. *Use logical notation to define and reason mathematically about the fundamental data types and structures used in computer algorithms.*
2. *Summarise mathematical notations and concepts in discrete mathematics that is essential for computing.*
3. *Construct proofs using direct proof, proof by contraposition, proof by contradiction and proof by resolution and by mathematical induction.*
4. *Familiarise mathematical reasoning and proof strategies.*
5. *Identify and Apply the counting principle.*
6. *Apply graph theory to solve real world problems.*
7. *Interpret the conceptual background needed to identify structures of algebraic nature, and discover, prove and use properties about them.*

**Module I**

Mathematical Logic: Propositions, Connectives, Equivalences of Proposition, Algebra of Propositions, Quantifiers, Proofs: Direct - Contraposition - Contradiction - Resolution - Mathematical Induction, Sets, Relations: properties - Representation - Composition of Relations - Equivalence Relation, Functions: Types - Composition of Functions.

**Module II**

Algorithms: Introduction - The Growth of Functions - Complexity of Algorithms, Recursive algorithms, Counting techniques: Counting Principle - The Pigeonhole Principle, Recurrence relations - Order of Recurrence Relation - Linear Recurrence Relation with Constant Coefficients - Linear Homogeneous Recurrence Relation with Constant Coefficients.

**Module III**

Graphs: Definition and terminology, Representation of graphs, Multigraphs, Bipartite graphs, Planar graphs, Isomorphism and Homomorphism of graphs, Euler and Hamiltonian paths and graphs, Fleury's Algorithm, Shortest path in weighted graphs-Dijkstra's Algorithm Trees: Introduction to trees - Binary Tree - Tree Traversal, Expression Trees - Spanning Trees - Minimum Spanning Tree - Kruskal's Algorithm.

**Module IV**

Algebraic Structures: Semigroups and Monoids, groups, subgroups, homomorphisms, Isomorphism, Rings, Field. Posets, Hasse Diagrams, Lattice: Bounded Lattice - Sublattices - Isomorphic Lattices - Distributive Lattice.

**References:**


1. Veerarajan, T., Discrete Mathematics with Graph Theory and Combinatorics, McGraw-Hill Education ISBN-13**:** 978-0070616783.
2. Rosen, K.H., Discrete Mathematics and its Applications, McGraw-Hill, 7 th Edition, 2011.
3. Ralph P. Grimaldi, Discrete and Combinatorial Mathematics: An applied introduction, Pearson Education Limited, 2014 ISBN 10 : 1-292-02279-5.
4. Satinder Bal Gupta, Discrete Mathematics and Structures, University science Press (Laxmi Publications (P) Ltd.) ISBN : 978 – 81 – 318 – 0452 – 0, 5 th Edition.

## 19-202-0304 OBJECT ORIENTED PROGRAMMING

***Course Outcomes:***

*On completion of this course the student will be able to:*

1. *Find the basics of OOPS and relate object oriented approach for design software.*
2. *Demonstrate the adaptness of various object oriented concepts in developing solutions to problems.*
3. *Design and implement efficient programs for a given problem by incorporating features such as encapsulation, abstraction, inheritance etc.*
4. *Analyse the polymorphic behaviour of objects both in run time and compile time.*
5. *Choose between the different inheritance structures according to the problem and practice reusability.*
6. *Experiment with generic programming and exception handling capability of C++.*
7. *Learn the features and usage of file handling statements in C++.*

**Module I**

Procedure oriented programming - Object oriented programming paradigm – Basic concepts of object oriented programming - Benefits of OOP – console I/O operations – formatted and unformatted – managing output with manipulators. Functions in C++ -call and return by reference – inline functions - default arguments – const arguments – function overloading – friend functions.

**Module II**

Classes and objects – Specifying a class – Defining member functions – Memory allocation for objects – Static data members – Static member functions – Arrays of objects – const member functions – Constructors and Destructors – Constructors- default, parameterised, with default arguments. copy constructor – destructors –operator overloading – overloading unary operators - overloading binary operators - overloading binary operators using friends – manipulation of strings using operators – Type conversions – basic to class, class to basic, class to class.

**Module III**

Inheritance – Defining derived classes- Single inheritance - Multilevel inheritance - multiple inheritance – Hierarchical inheritance - Hybrid inheritance – virtual base classes – Abstract classes – Constructors in derived classes –pointers - pointers to objects - this pointer – pointers to derived classes – virtual functions – pure virtual functions.

**Module IV**

Working with files – classes for fstream operations- opening and closing of file – detecting end of file – file modes – file pointers and manipulators – sequential input and output operations – random access – Templates – Exception handling – Manipulating strings.

**References:**


1. Balagurusamy, E., Object Oriented Programming with C++, 6th Edition, Tata McGraw Hill, ISBN: 978-1-25-902993-6.
2. Robert Lafore, Object Oriented Programming in Turbo C++, 4th Edition, Galgotia, ISBN-13: 978-0672323089.
3. Ashok N. Kamthane, Object oriented programming with ANSI & Turbo C++, 2/ E , Pearson Publications, ISBN: 9788131703830.
4. Ravichandran, D., Programming with C++, E/3, Tata McGraw Hill,ISBN: 9780070681897, 0070681899
5. Bjarne Stroustrup, The C++ Programming Language, 4th Edition, Addison Wesley. ISBN-13: 978-0321563842.
6. Herbert Schildt, The Complete Reference to C++ Language,Fourth Edition,Tata McGraw-Hill Education India ,ISBN: 9780070532465.

## 19-202-0305 PRINCIPLES OF PROGRAMMING LANGUAGES

***Course Outcomes:***

*On completion of this course the student will be able to:*

1. *Summarize the evaluation criteria for programming languages.*
2. *Familiarise notations to describe syntax and semantics of programming languages.*
3. *Compare different programming paradigms – imperative, object oriented, functional and logical programming and choose the appropriate one for problem solving.*
4. *Analyze and explain behavior of imperative languages using concepts like binding, scope and lifetime, referencing environment, subprograms and parameter passing mechanisms.*
5. *Explain the concepts of object oriented, functional and logic programming for solving problems.*
6. *Explain the design issues involved in various constructs of programming languages.*

**Module I**

Programming domains, Language Evaluation Programming paradigms - Imperative programming, Functional programming, Object oriented programming, Logic programming. Formal methods of describing syntax and semantics - Backus Naur Form, Attribute grammars. Describing semantics - Denotational semantics.

**Module II**

Data types, Names, Variables, Bindings, Scope and lifetime, Referencing Environments-Named Constants-Variable Initialization-Subprograms-Parameter Passing – Coroutines.

**Module III**

Data abstraction and encapsulation. Polymorphism and inheritance.Features of object-oriented languages - Smalltalk, C++ and Java. Design and implementation issues. Exception handling.

**Module IV**

Functional programming languages - Lambda calculus - Introduction to pure LISP. Application of functional programming languages. Logic programming languages - a brief introduction to predicate calculus – Horn clauses - Logic programming. Introduction to Prolog. Applications of Logic programming.

**References:**


1. Robert W. Sebesta, Concepts of Programming Languages, 10th Edition, Addison Wesley.
2. Ravi Sethi, Programming Languages - concepts and constructs, 2nd Edition, Addison Wesley.
3. Michael L. Scott, Programming Language Pragmatics – 3rd Edition, Morgan Kaufmann.
4. Kenneth C. Louden, Programming Languages : Principles and Practices, 3rd Edition, Thomson Learning.
5. Terence W. Pratt, Programming Languages, 4th Edition, Prentice Hall.
6. Bjarne Stroustrup, Design and Evolution of C++, Addison Wesley.

## 19-202-0306 DATA AND COMPUTER COMMUNICATION

***Course Outcomes:***

*On completion of this course the student will be able to:*

1. *Explain and calculate digital transmission over different types of communication media.*
2. *Describe the principles of access control to shared media and carry out performance calculations.*
3. *Solve issues in networking by referring to problem solving steps through relevant information by choosing suitable techniques.*
4. *Explain the role of protocols in networking.*
5. *Analyse the services and features of various communication devices.*

**Module I**

Introduction to Data Communications and Computer Networks, The Internet, Protocols and Standards, Network Models, Layered Tasks, The OSI Model, Layers in the OSI Model, Addressing. Data and Signals: Analog and Digital, Periodic Analog Signals, Digital Signals, Noise, Transmission impairments, Data Rate Limits - Nyquist's and Shannon's capacity equations, Performance, Digital Transmission: Digital data over Digital channel, Analog data over Digital channel, Analog Transmission: Analog data over Analog channel, Digital data over Analog channel.

**Module II**

Bandwidth utilization: Multiplexing and Spreading, Multiplexing, Spread Spectrum, Transmission Media: Guided Media, Unguided Media: Wireless, Switching, Circuit - Switched Networks, Datagram Networks, Virtual - Circuit Networks, Structure of a Switch, Using Telephone and Cable Networks for Data Transmission, Telephone Networks, Dial-up Modems and modem standards, Digital Subscriber Line - different DSL technologies, Cable TV Networks, Cable TV for Data Transfer.

**Module III**

Error Detection and Correction: Block Coding, Linear Block Codes, Hamming distance, Cyclic Codes,Checksum – CRC - capabilities of CRC, FEC: Hamming code, constant ratio code, convolutional code-Threshold decoding,Sequential decoding,Viterbi decoding. Error and flow control methods: ARQ implementations - Stop and wait, Go-back-n, Selective repeat-Link utilisation and efficiency of ARQ methods. Data Compression: Simple coding schemes, Frequency based coding - Huffman coding, Relative encoding, Run length encoding, LZW compression - Image and video compression standards.

**Module IV**

Network Topologies - Mesh, Star, Tree, Ring, Bus, Hybrid. Connecting devices: Passive hubs, Repeaters, Active hubs, Bridges, Two layer and Three layer switches, Routers, Gateway. IEEE Ethernet Standards, Standard Ethernet, Changes in the Standard, Fast Ethernet, Gigabit Ethernet,10 Gigabit ethernet - IEEE 802.11, Bluetooth.

**References:**


1. Behrouz A. Forouzan, Data Communication and Networking, 5th Edition, McGraw Hill, 2012.ISBN: 978-0073376226.
2. Andrew S. Tanenbaum and David J. Wetherall,Computer Networks, 5th edition,, Prentice Hall, 2011, ISBN-13 978-0-13-212695-3.
3. William Stallings, Data and Computer Communication, 10th Edition, Pearson education, 2006.978-0133506488.
4. Fred Halsal, Data Communication Computer Network and Open Systems, 4th Edition, Pearson education, 2005.
5. William Stalling, Wireless Communication and Networks, 2nd Edition, Pearson Education, 2004ISBN: 978-0-13-191835-1.
6. William A. Shay, Understanding Data Communication & Networks, 2nd Edition, Thomson Learning, 2003, ISBN: 978-0-53-420244-6.

## 19-202-0307 DIGITAL ELECTRONICS LABORATORY

***Course Outcomes:***

*On completion of this course the student will be able to:*

1. *Gain good knowledge about the concepts of digital electronics.*
2. *Apply these concepts in practical cases.*
3. *Design and analyse various combinational circuits using basic gates.*
4. *Implement sequential circuits like flip-flops, registers, counters etc.*
5. *Develop teamwork skills.*

**Cycle-I**

1. Study of standard logic gates and universal gates.
2. Arithmetic circuits
   i. Adders &subtractors using standard logic & universal gates.
   ii.Study of 7483 & binary addition & subtraction using 1's & 2's complement.
   iii. BCD adder using 7483.
3. Code converters with mode control, Parity generator/ checkers.
4. Study of MUX, DEMUX, decoder & encoder circuits & their IC's.

**Cycle-II**

1. Flip flops: RS, JK, T, D, master-slave JK flip flops using universal gates.
2. Counters
   i. Asynchronous UP, DOWN, UP/DOWN counter using JK Flip flops
   ii.Design and realization of sequence generators.
   iii.Study of IC counters 7490, 7492, 7493 and 74193.
3. Study of shift registers and design of Johnson and Ring counter using it.

**Cycle-III**

1. Study of seven segment display & decoder driver (7447).
2. Astable and nonstable multi-vibrators using TTL gates.
3. Transfer characteristics and specifications of TTL gates

**References:**


1. Morris Mano, M., Michael D. Ciletti, Digital Design, 4th Edition, Pearson Education, 2009, ISBN:978-81-317-1450-8.
2. Herbert Taub, Donald Schilling, Digital Integrated Electronics, McGraw Hill Education, ISBN: 978-00-702-6508-0.
3. Thomas L. Floyd, Digital Fundamentals, 10th Edition, Pearson Education, 2011, ISBN: 978-81-317-3448-3.
4. Yarbrough, Digital Logic - Applications And Design, Thomson Learning, ISBN: 981-240-062-1.
5. Morris Mano, M., Digital Logic and Computer Design, 1st Edition, Pearson Education, ISBN: 978-81-775-8409-7.
6. Anand Kumar, A., Fundamentals of Digital Circuits, PHI Learning, 2nd Edition, 2010, ISBN: 978-81-203-3679-7.

## 19-202-0308 OBJECT ORIENTED PROGRAMMING LABORATORY

***Course Outcomes:***

*On completion of this course the student will be able to:*

1. *Familiarise with the language environment.*
2. *Develop object oriented programming style and compare that with structured style of programming.*
3. *Plan and decide appropriate oops features for the problems in hand.*
4. *Create a complete class definition with constructors and methods and to instantiate it.*
5. *Design efficient programs by incorporating oops features like operator overloading, virtual functions, different ways of inheritance structures etc.*
6. *Develop programs that can read and write data to and from secondary storage.*

**Cycle-I**

1. Programs to differentiate between struct and class.
2. Programs to implement data abstraction, data encapsulation and information hiding.
3. Programs to demonstrate parameter passing techniques.

**Cycle-II**

1. Programs to implement different Inheritance structures - Single, multiple, multilevel, and hierarchical.
2. Programs to implement Operator overloading and function overloading.
3. Programs to implement virtual functions and dynamic binding.

**Cycle-III**

1. Programs to implement Pointers and arrays.
2. Programs to implement Files.

**References:**


1. Balagurusamy, E., Object Oriented Programming with C++, 6th Edition, Tata McGraw Hill., ISBN: 978-1-25-902993-6.
2. Robert Lafore, Object Oriented Programming in Turbo C++, 4th Edition, Galgotia, ISBN-13: 978-0672323089.
3. Bjarne Stroustrup, The C++ Programming Language, 4th Edition, Addison Wesley. ISBN-13: 978-0321563842.

## 19-200-0401 COMPLEX VARIABLES AND PARTIAL DIFFERENTIAL EQUATIONS

***Course Outcomes:***

*On completion of this course the student will be able to:*

1. *Transform a region to another region using conformal mapping.*
2. *Evaluate real integrals using residue theorem.*
3. *Formation and solution of partial differential equation.*
4. *Determine solution of partial differential equation for vibrating string and heat conduction.*

**Module I**

Analytic function- Cauchy-Riemann equation (Cartesian and polar)-Harmonic function-construction of analytic function given real or imaginary parts- Conformal mapping of standard elementary function and bilinear transformation.

**Module II**

Cauchy's integral theorem, Cauchy's integral formula and for derivatives-Taylor's and Laurent's expansion (without proof) - Singularities-Residues-Cauchy's Residues theorem- Contour integration involving unit circle.

**Module III**

Formation of partial differential equation eliminating arbitrary constants and function—Solution of first order equation-four standard types- Lagrange's equation—Linear homogeneous partial differential equation with constant coefficient.

**Module IV**

One dimensional wave equation, D'Alembert's solution and one dimensional heat flow equation - solution by the method of separation of variables - application of Fourier series solution. Solution of Laplace's equation over a rectangular region by the method of separation of variables.

**References:**


1.Erwin Kreyzig Advanced Engineering Mathematics, 10th Edition,Wiley, 2011.

2.Grewal, B.S., Higher Engineering Mathematics, 43rd Edition, Khanna Publishers, 2013.

## 19-202-0402 MICROPROCESSORS

***Course Outcomes:***

*On completion of this course the student will be able to:*

1. *Describe the architecture & organization of 8085 & 8086 Microprocessor.*
2. *Understand and classify the instruction set of 8085/8086 microprocessor and distinguish the use of different instructions and apply it in assembly language programming.*
3. *Relate the addressing modes used in the instructions.*
4. *Realize the Interfacing of memory & various I/O devices with 8085/8086 microprocessor.*
5. *Familiarise the architecture and operation of Programmable Interface Devices and realize the programming & interfacing of it with 8085 microprocessor.*
6. *Interface various pheripheral IC's with Intel 8085/8086 microprocessor for its various applications.*

**Module I**

Introduction to 8 bit microprocessor: Internal architecture of Intel 8085 microprocessor: Block diagram, Registers, Internal Bus Organization, Functional details of pins, Control signals, External Address / Data bus multiplexing, Demultiplexing.

**Module II**

8085 instruction set: Instructions, Classifications, Addressing modes, Programming examples, Instruction Timing, I/ O mapped I/ O, and memory mapped I/ O techniques. Interrupts of the 8085 Microprocessor.

**Module III**

Introduction to 8086 - 8086 Architecture - Addressing Modes - Instruction Set and Programming, Assembler Directives. 8086 hardware design: minimum mode and maximum mode configurations, Bus structure, bus buffering, latching, system bus timing with diagram, Interrupt of 8086 Microprocessor.

**Module IV**

I/O and memory interfacing using 8085 and 8086:Memory interfacing and I/O interfacing with 8085 and 8086 – Parallel communication interface (8255) –Timer (8253 / 8254) – Keyboard / Display controller (8279) – Interrupt controller (8259) – DMA controller (8257).

**References:**


1. Ramesh S. Gaonkar , Microprocessor – Architecture, Programming and Applications with the 8085 Penram International Publisher, 6th Edition 2013.
2. Nilesh B. Bahadure, Microprocessors - The 8086/8088, 80186/80286, 80386/80486 and the Pentium Family. 2010, PHI Learning, ISBN-978-81-203-3943-2.
3. Douglas V. Hall,Microprocessors and Interfacing, Tata McGraw Hill publications, 2nd Edition, 2012.
4. Yu-Cheng Liu, Glenn A. Gibson, Microcomputer Systems: The 8086/8088 Family : Architecture, Programming, and Design, Prentice-Hall, ISBN:9780135818510.
5. Kenneth Ayala, The 8086 Microprocessor: programming and interfacing the PC, Thomson Learning.
6. Barry B. Brey, The INTEL Microprocessors – 8086 / 8088, 80186 / 80188, 80286, 80386, 80486 Pentium and Pentium pro processor, Pentium II, Pentium III and Pentium IV - Architecture, Programming and interfacing, PHI , 8th Edition, ISBN 0-13-502645-8.

## 19-202-0403 COMPUTER ARCHITECTURE AND ORGANIZATION

***Course Outcomes:***

*On completion of this course the student will be able to:*

1. *Acquire knowledge about structure, functions and characteristics of computer systems.*
2. *Identify the addressing modes used in instructions.*
3. *Determine the set of control signals generated and their timing sequence, given an instruction.*
4. *Demonstrate how addition, multiplication and division operations are implemented inside a computer system.*
5. *Explain each level of memory hierarchy.*
6. *Show how cache mapping affect the location of the data and the replacement policies.*
7. *Map a virtual address to physical address.*
8. *Identify and compare different methods for computer I/O.*

**Module I**

Basic structure of computers – Functional units – Basic operational concepts – Historical Perspective. - Instruction set architecture- Memory locations and addresses-Instructions & instruction sequencing - Addressing modes – Assembly language – Basic Input Output operations - Stacks, Subroutines- RISC and CISC styles.

**Module II**

Processing Unit – Some fundamental concepts – Instruction Execution - Hardware components- Register file, ALU, Data path-Instruction fetch and execution steps-control signals-Hardwired control - CISC style processors-Interconnect using buses, microprogrammed control.

Computer arithmetic - design of fast adders -multiplication of unsigned numbers-multiplication of signed numbers - Booth's algorithm - Fast multiplication - bit pair recoding of multipliers, carry save addition of summands-integer division - floating point numbers and operations.

**Module III**

Memory organization - Semiconductor RAM memories - internal organization of memory chips - Static and Dynamic memories - cache memories - mapping functions - replacement algorithms - performance considerations- virtual memory - address translations - Secondary storage.

**Module IV**

Input-output organization - Accessing I/O devices-program controlled I/O-interrupts – Enabling & Disabling interrupts - handling multiple devices - device identification - vectored interrupts - interrupt nesting – Simultaneous requests.

Bus structures–Synchronous and asynchronous - Arbitration - I/O interface circuits – parallel and serial interfaces-Interconnection standards.

**References:**


1. Carl Hamacher, Naraig Manjikian, Safwat G. Zaky, Zvonko G. Vranesic, Computer Organization and Embedded Systems ,6th Edition,McGraw Hill Education (India) Private Limited. ISBN: 9780071089005.
2. Pal Chaudhury, P., Computer Organization and Design, 3rd Edition, PHI Learning, New Delhi, 2009, ISBN: 978-81-203-3511-0.
3. John P. Hayes, Computer Organization and Architecture, 4th Edition, McGraw Hill, 2003, ISBN-13: 978-0072320886.
4. Kai Hwang & Faye A. Briggs, Computer Architecture and Parallel Processing, 1st Edition, McGraw Hill Education, 2012, ISBN-13:9781259029141.
5. David A. Patterson and John L. Hennessy, Computer Organization and Design, The Hardware / Software Interface, 5th Edition, Morgan Kaufmann, 2013, ISBN: 978-0-12-407726-3.

## 19-202-0404 AUTOMATA LANGUAGES AND COMPUTATIONS

***Course Outcomes:***

*On completion of this course the student will be able to:*

1. *Design a minimized Deterministic Finite Automata.*
2. *Analyse and generate regular expressions for any structure.*
3. *Demonstrate that a given language is regular or not.*
4. *Design new context free grammar.*
5. *Design Push Down Automata for any context free grammar.*
6. *Analyse and design turing machines for any problem.*

**Module I**

Finite state systems: NFA, DFA, Definitions. Equivalence of NFA and DFA, NFA to DFA conversion,NFA with epsilon transitions, Elimination of epsilon transitions, Minimization of Finite Automata, Finite Automata with output. Designing Moore and Mealy machines.

**Module II**

Regular Expressions: Definitions, Equivalence of regular expression and finite automata, Conversion between regular expression and DFA, Arden's Theorem, Pumping Lemma of regular languages and its application, closure properties of Regular sets, Applications of regular expressions: Expressions in UNIX, lexical analysis.

Regular grammars: equivalence of regular grammar and FA, converting regular grammar to Finite Automata, Converting Finite Automata to regular grammar.

**Module III**

Context Free grammars (CFG): Definition, Derivations, parse trees, ambiguity, Simplification of CFG, Conversion to Normal Forms: Chomsky, Greibach. Pumping lemma for Context free languages, application of pumping lemma, Closure Properties of CFL, decision algorithms for CFL.

Pushdown Automata: Definition, Design examples, Equivalence of acceptance by final state and empty stack, Equivalence of PDA and CFG.

**Module IV**

Turing machine (TM ): Model of TM, Design examples, Techniques for construction of TM: storage in the state, multiple tracks ,subroutines, multi-tape . Church's Thesis, Universal TM Recursive and recursively enumerable languages, halting problem of TM, Decidable and Undecidable problems. Problem reduction. Introduction to Linear Bound Automata and Context Sensitive Grammars, Chomsky Hierarchy.

**References:**


1. Hopcroft J. E., Motwani,R. and Ullman J. D., Introduction to Automata Theory, Languages, and Computation, 3rd Edition, ISBN : 978-03-214-5536-9.
2. Padma Reddy, A.M., Finite Automata and Formal Languages, 1st Edition, Pearson Education,ISBN 978-81-317-6047-5.
3. Mishra, K.L.P. and Chandrasekaran, N., Theory of Computer Science, Automata , Languages and Computation, 3 rd Edition, PHI, 2014, ISBN 978-81-203-2968-3.
4. lPeter Linz, An Introduction to Formal Languages and Automata, 4th Edition, Narosa Publishing Co., ISBN 978-81-7319-781-9
5. Sivadandam, S. N., Janaki Meena, M., Theory of Computation, I. K. International Publishing House, 1 st Edition, ISBN 978-93-80026-20-6.
6. John.C. Martin, Introduction to Languages and the theory of computation, 3rd Edition, Tata McGraw Hill, ISBN 978-0-07-066048-9.

## 19-202-0405 DATA STRUCTURES AND ALGORITHMS

***Course Outcomes:***

*On completion of this course the student will be able to:*

1. *Explain the important features of data structures like arrays, linked lists, trees and graphs.*
2. *Define advanced data structures such as balanced search trees, hash tables, spatial data structures etc.*
3. *Create the different data structures to solve a problem.*
4. *Describe and compare the performance of various sorting algorithms like quicksort, mergesort and heapsort.*
5. *Describe algorithms on trees and graphs such as traversals, shortest path and minimum spanning tree.*
6. *Design a data structure and algorithm for maximum efficiency.*

**Module I**

Introduction to Data structures - Arrays & sparse matrices - representation, Searching - linear, binary – Sorting – selection, bubble, insertion, quick, merge, heap - Hash tables – Hashing functions -Associative arrays.

**Module II**

Linked lists – singly, doubly and circular lists, Application of linked lists – Polynomial manipulation, stacks – Implementation of stacks using arrays and lists – Typical problems – Conversion of infix to postfix – Evaluation of postfix expression . Queues and Deques – implementation., priority queues.

**Module III**

Trees, Definition and mathematical properties. Representation – sequential, lists - Binary trees – Binary tree traversals – pre-order, in-order & post-order, Expression trees. Threaded binary trees. Binary Search trees. AVL trees-tries-Spatial data structures- k-d tree.

**Module IV**

Graphs – Graph representation using adjacency matrices and lists – Graph traversals – DFS, BFS -shortest path – Dijkstra’s algorithm, Minimum spanning tree – Kruskal Algorithm, Prims algorithm – Tree based indexing, B trees and B+ trees.

**References:**


1. Robert Lafore, Data structures and algorithms in JAVA, 2nd Edition, Pearson, ISBN: 978-8131718124.
2. Adam Drozdek, Data Structures and Algorithms in Java, Thomson Publications, 2nd Edition , ISBN-13: 9780534492526.
3. Aaron M. Tanenbaum, Moshe J. Augenstein, Yedidyah Langsam, Data Structures using Java, Pearson Education, 2003, ISBN 13: 9780130477217.
4. Ellis Horowitz, SartajSahni, Dinesh P. Mehta, Fundamentals of Data Structures in C++, Silicon Press, 2007.
5. Jean Paul Tremblay and Paul G Sorenson, An introduction to Data Structures with Applications,McGraw-Hill, Singapore, 1984.
6. Clifford A. Shaffer, Data structures and Algorithm analysis in Java, Dover Publications, 2012, ISBN 97804864858127.

# 19-202-0406 DATABASE MANAGEMENT SYSTEMS

***Course Outcomes:***

*On completion of this course the student will be able to:*

1. *Outline the characteristics and features of database systems.*
2. *Represent the components and relations through an ER diagram and convert that to relational model.*
3. *Familiarise with the storage structures, accessing methods and indexing techniques.*
4. *Formulate relational algebra queries according to user requirements.*
5. *Formulate efficient SQL query and refine it with procedures, cursors etc.*
6. *Improve the database design by applying normalisation techniques.*
7. *Familiarise with an SQL interface of a multi-user relational DBMS package to create, secure, populate, maintain and query a database.*
8. *Discover the basic issues of transactions and concurrency control of them.*

**Module I**

Introduction: Characteristics of the Database approach – Data models, schemas and instances – DBMS architecture – Data independence – Database languages and interfaces – Database administrator – Data modeling using Entity - Relationship (ER), Entity sets, attributes and keys - Relationships, Relationship types, roles and structural constraints - Weak Entity types - Enhanced Entity - Relationship (EER) and object modeling. Sub classes, super classes and inheritance - Specialization and generalization.

**Module II**

Record storage and file organizations: Placing file records on disks – Fixed length and variable length records- Spanned Vs Unspanned records - Heap files, Sorted files. Hashing Techniques-Internal,External. Indexed structures for files – single level ordered index, multi- level indexes.

**Module III**

The Relational model:Concepts-Relational model constraints – The Relational Algebra. Functional Dependencies – Basic definition – Trivial and Nontrivial dependencies – First, Second and Third normal forms – Boyce - codd normal form. SQL – Commands – Group By & Order By – Cursor – Procedure & Function – Trigger – View-Introduction to SQL variants-PL/SQL, XML query language-Introduction to query optimization.

**Module IV**

Transaction Management - Concurrency Control - Lost Updates - Uncommitted Data - Inconsistent Retrievals - The Scheduler - Concurrency Control with Locking Methods – Concurrency Control with Time Stamping - Concurrency Control with Optimistic Methods - Database Recovery Management. Introduction to object oriented databases, Active databases.

**References:**


1. Elmasri and Navathe, Fundamentals of Database Systems, 5th Edition, Addison - Wesley, 2011.
2. Peter Rob Carlos Coronel, Database Systems , Design, Implementation & Management,5th Edition, Thomson Course Technology.
3. Silberschatz, A., Korth, H.F. and Sudarshan, S., Database System Concepts, 4th Edition, Tata McGraw Hill, 2002.
4. Thomas Connoly, Carolyn Begg, Database Systems, 3rd Edition, Pearson Education.
5. Date, C.J., An Introduction to Database Systems, Addison –Wesley.
6. Margaret H. Dunham, Data Mining - Introductory and advanced topics, Pearson Education, 2003.

## 19-202-0407 DATABASE MANAGEMENT SYSTEMS LABORATORY

***Course Outcomes:***

*On completion of this course the student will be able to:*

1. *Design and manipulate database tables using MySQL queries.*
2. *Apply set operations on database tables.*
3. *Design and develop applications using PHP-MySQL.*
4. *Design procedures and functions to manipulate database tables.*
5. *Implement Triggers and cursors.*

**Cycle-I**

Implementation of DDL and DML queries and set operations.

**Cycle- II**

Implementation of views, Procedures and Functions.

**Cycle-III**

Implementation of Triggers and Cursors.

**Cycle-IV**

Develop web applications using PHP-MySQL.

**References:**


1. Seyed, M. M. et.al, Learning MySQL: Get a handle on your data, O'Reillypublishers.
2. Robin Nixon, Learning PHP, MySQL and JavaScript, 5th Edition,O'Reillypublishers.
3. Peter Rob ,Carlos Coronel, Database Systems , Design, Implementation &Management, 8th Edition, Thomson CourseTechnology.
4. Elmasri and Navathe,Fundamentals ofDatabase Systems,7thEdition,Pearson Education, 2015.

## 19-202-0408 DATA STRUCTURES LABORATORY

***Course Outcomes:***

*On completion of this course the student will be able to:*

1. *Write the syntax of Java language constructs.*
2. *Write a Java program.*
3. *Implement data structures like arrays,stacks, queues, linked lists, trees and graphs.*
4. *Implement various sorting algorithms like quicksort, mergesort and heapsort.*
5. *Design a data structure and algorithm for a problem for maximum efficiency.*

**Cycle-I**

- Simple programming exercises in Java.
- Implementation in Java for Stacks – various applications.
- Implementation in Java for Queues-Linear and circular.

**Cycle- II**

- Implementation in Java for Searching and Sorting.

**Cycle-III**

- Implementation in Java for Linked Lists- Singly linked and doubly linked.
- Implementation in Java for Trees –Binary search tree and threaded binary trees.

**Cycle-IV**

- Implementation in Java programming language for Graphs- Traversals, Minimum spanning trees.

**References:**


1. Robert Lafore, Data structures and algorithms in JAVA-Second edition, Pearson, ISBN: 978-8131718124.
2. Herbert Schildt, Java The complete reference, 10th edition, Mc Grawhill, 2017, ISBN**:** 9789387432291.
3. Balaguruswamy, Programming with JAVA, a primer, 4th Edition, Tata McGraw-Hill, ISBN:978- 0070141698.

## 19-200-0501 NUMERICAL AND STATISTICAL METHODS

***Course Outcomes:***

*On completion of this course the student will be able to:*

1. *Solve algebraic and transcendental equations by numerical methods.*
2. *Perform numerical differentiation and integration.*
3. *Find the mean and variance of a probability distribution including the binomial distribution.*
4. *Use statistical tests in testing hypotheses on data.*

**Module I**

Numerical solution of algebraic and transcendental equation by - Regula-Falsi method, Newton Raphson's method. Gauss Seidal iteration method to solve a system of equations and convergence (without proof) Newton's forward and backward interpolation formula. Lagrange interpolation, Newton's divided difference and central differences.

**Module II**

Numerical differentiation at the tabulated points with forward, backward and central diffrences. Numerical integration with trapezoidal rule, Simpson's 1/3 rule, Simpson's 3/8 rule. Taylor series method. Euler method, Modified Euler method, Runge–Kutta method of second and fourth order for solving 1st order ordinary differential equation.

**Module III**

Random variable (discrete and continuous) Expectation-mean and variance of probability distribution. Binomial, Poisson and Normal distribution and Fitting of this Distribution to the given data. Curve fitting- fitting of straight line, parabola, exponential.

**Module IV**

Population and Sample-Sampling Distribution (of mean and variance) Testing of Hypothesis-level of significance, Z-test statistic, Chi square test for variance, for goodness of fit and F-test .

**References:**


1.Erwin Kreyzig, Advanced Engineering Mathematics, 10th Edition, Wiley, 2011.

2.Grewal, B.S, Higher Engineering Mathematics, 43rd Edition, Khanna Publishers, 2013.

3.Kandaswamy, P., Thilagavathy,K., Gunavathy,K., Numerical methods, S Chand & Co.

4.Richard A. Johnson. Irvin Miller and John E. Freund. Probability and statistics for engineers, 8th Edition, Pearson, 2010.

## 19-202-0502 SYSTEM PROGRAMMING

***Course Outcomes:***

*On completion of this course the student will be able to:*

1. *Familiarise the basics of system programs like assemblers, macro processors, linkers, loaders and operating systems.*
2. *Design, analyze and implement one pass, two or multi pass assembler.*
3. *Design and implement macro processors, linkers and loaders.*
4. *Compare different types of operating systems.*

**Module I**

Assemblers: Overview of the assembly process- Machine dependent assembler features-Machine independent assembler features - Design of two pass assembler - single pass assembler.

**Module II**

Linker and Loader :Basic Loader functions - Design of absolute loader, Simple bootstrap Loader, Machine dependent loader features- Relocation, Program Linking, Algorithm and data structures of two pass Linking Loader, Overview of linkage editing - linking loader - Dynamic linking - Design of the linkage editor.

**Module III**

Basic Macro Processor Functions - Macro Definitions and Expansion, Macro Processor Algorithm and Data Structures, Machine- Independent Macro Processor Features - Concatenation of Macro Parameters, Generation of Unique Labels, Conditional Macro Expansion, Keyword Macro Parameters, Macro Processor Design Options - Recursive Macro Expansion, General-Purpose Macro Processors, Design of a Macro assembler.

**Module IV**

Operating Systems - Basic Operating Systems functions -Types of Operating Systems- User Interface -Runtime Environment. Operating Systems Design Options -Hierarchical Structures -Virtual Machines- Multiprocessor Operating Systems - Distributed Operating Systems - Object Oriented Operating Systems.

**References:**


1. Leland L. Beck,System Software-An Introduction to System Programming, 3rd Edition,Addison Wesley.
2. John J. Donovan, Systems Programming, McGraw Hill, 2009.
3. D.M. Dhamdhere, Systems Programming and Operating Systems, Second Revised Edition, Tata McGraw Hill.
4. J Nithyashri, System Software, Second Edition, Tata McGraw Hill.
5. Srimanta Pal ,System Programming,OXFORD Publication.
6. John R. Levine,Linkers & Loaders – Harcourt India Pvt. Ltd., Morgan Kaufmann Publishers, 2000.

## 19-202-0503 OBJECT ORIENTED SOFTWARE ENGINEERING

***Course Outcomes:***

*On completion of this course the student will be able to:*

1. *Compare and classify various software process / life cycle models.*
2. *Analyze structured vs object oriented modeling.*
3. *Illustrate various techniques in software quality assurance.*
4. *Analyze various principles of software project management.*
5. *Compare and classify the new trends in life cycle models in industry.*
6. *Analyze and make use of any one testing tool used in the industry.*

**Module I**

Software Life Cycle - Waterfall model – Prototyping – Spiral model - Agile development - pros and cons of each model.Requirements Analysis - SRS – Introduction to Structured analysis and design techniques - Introduction to Object oriented analysis and design techniques.

**Module II**

Software Design: Design Heuristics – Cohesion and Coupling. Concepts of user interface design - Architectural design - Use case analysis - Introduction to UML diagrams - case studies - ATM system design using object oriented analysis techniques. Emerging trends in software engineering:Introduction to Rational unified process, Service oriented architecture(SOA).

**Module III**

Introduction to Software Quality Management - SQA-SQM-SCM-Software Testing - Objectives of testing– Black Box and white box testing – Test Plan - Unit testing – Integration testing – System testing – Test reporting-Testing object oriented programs - Quality standards ISO and CMM - Software quality metrics. Familiarisation with testing tools.

**Module IV**

Software Project Management - Brief study of various phases of Project Management – Planning – Organizing – Staffing – Directing and Controlling-Case studies and activities.

Software Project Cost Estimation – COCOMO model – Software Project Scheduling - Work Breakdown Structure - CASE tools-Life cycle, classification and different types.

**References:**


1. Roger S. Pressman, Software Engineering – 6th illustrated edition, McGraw Hill,2005.
2. Booch et.al, The UML Reference Manual- Pearson Education, 2005.
3. Jacobs et.al, Object Oriented Software Engineering: A Use case driven approach, Pearson Education, 7th edition, 2009.
4. Frank Tsui, Managing Software Projects - Illustrated Edition, Jones and Barlett learning,2011.
5. David Gustafson, Software Engineering-, 1st Edition, Schaum's outline series, 2002.
6. Richard Thayer et.al, Software Engineering Project Management – 2nd Illustrated Edition, IEEE Computer Society, 2006.

# 19-202-0504 OPERATING SYSTEM

***Course Outcomes:***

*On completion of this course the student will be able to:*

1. *Familiarize with the basic concepts of operating systems.*
2. *Implement various process scheduling algorithms.*
3. *Design programs to avoid the synchronization problems.*
4. *Gain knowledge about memory management and virtual memory concepts.*
5. *Analyze various security and protection mechanisms in file system implementation.*
6. *Illustrate the problems related with deadlocks and deadlock handling.*
7. *Compare different types of operating systems.*

**Module I**

Introduction to Operating Systems. Operating system concepts – System calls – Operating System Structure.Processes - Interprocess Communication – Race Conditions - Critical Sections – Mutual Exclusion - Busy Waiting - Sleep And Wakeup -Semaphores - Monitors - Message Passing. Process Scheduling – First come First Served - Shortest Job First - Priority scheduling - Round Robin Scheduling - Multiple queues scheduling – Guaranteed scheduling - Two- level scheduling.

**Module II**

Memory management. Multiprogramming and memory usage - Swapping - multiprogramming with fixed and variable partitions - Memory management with bitmaps, linked lists, Buddy system - Allocation of swap space. Virtual memory - paging and page tables, Associative memory - Inverted page tables. Page replacement algorithms – Segmentation.

**Module III**

File systems and Input/output. Files - Directories - File system implementation - Security and Protection mechanisms.Principles of I/O hardware - I/O devices - Device controllers - DMA. Principles of I/O software - Interrupt handlers - Device drivers - Disk scheduling - Clocks and terminals. I/O Buffering - RAID- Disk Cache.

**Module IV**

Deadlocks - Conditions for deadlock. Deadlock detection and recovery. Deadlock avoidance - resource trajectories - safe and unsafe states – Banker’s algorithms. Deadlock prevention. Two phase locking – Non-resource deadlocks - Starvation.Case Study: UNIX / LINUX operating system.

**References:**


1. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, “Operating Systems Concepts”, Tenth Edition, John Wiley & Sons, 2018, ISBN:978-1-118-06333-0.
2. Andrew S Tanenbaum, Herbert Bos “Modern Operating Systems” , Fourth Edition, Pearson Education India, 2016. ISBN 978-9332575776.
3. William Stallings, “Operating Systems Internals and Design Principles”, Seventh Edition, Pearson Education, 2018. ISBN 978-9352866717.
4. Garry Nutt, Nabendu Chaki, Sarmistha Neogy, “Operating Systems”, Third Edition, Pearson Education.
5. D.M.Dhamdhere, “Operating Systems”, 2nd Edition, Tata McGraw Hill, 2011.
6. Achyut S Godbole, Atul Kahate, “Operating Systems”, 3rd Edition, Tata McGraw Hill, 2011.

## 19-202-0505 ADVANCED MICROPROCESSORS AND MICROCONTROLLERS

***Course Outcomes:***

*On completion of this course the student will be able to:*

1. *Familiarize 32bit, 64bit and multi core architectures.*
2. *Compare the features of various microprocessors.*
3. *Learn the architecture and programming with 8O51 microcontroller.*
4. *Explain the basic architecture and features of PIC microcontrollers.*
5. *Develop microcontroller programs.*
6. *Familiarize basics of interfacing.*

**Module I**

Intel 80386 Microprocessor: Architecture - Registers – Descriptors - Real Mode - Protected mode - Virtual 8086 mode - Paging and Segmentation - Comparison with 80486 Microprocessor. Pentium class of processors: RISC and CISC architectures - Superscalar Architecture - MMX technology – SSE – Pipelining - Branch Prediction techniques – FPU - Comparative study of features of Pentium-II, Pentium-III and Pentium-IV processors.

**Module II**

Intel 64 bit processors-:Overview of 64 bit processor execution environment – Memory organization – IA-32 memory models – Memory organization in 64 bit mode – Extended physical addressing in protected mode - Basic program execution registers – Operand addressing. Multicore Architectures: Concepts – Power reduction techniques in processors – Comparison of Intel Skylake,Goldmont and Ice Lake microarchitectures

**Module III**

8051 microcontroller: Architecture - pin configuration - addressing modes - instruction set – programming - timers – counters - Programming - interrupts- communication interfaces - interfacing with DAC, ADC,stepper motor.

**Module IV**

PIC micro controllers: PIC family - PIC16F84A: Features - architecture – data memory organization – RAM - Program memory - ROM – instruction types and addressing modes- instruction cycle -ports - Introduction to programming PIC microcontrollers using MPLAB.

**References:**


1. Intel x86 processors programmer's reference manuals.
2. Lyla B. Das, The x86 Microprocessors: 8086 to Pentium, Multi cores, Atom and the 8051 Microcontroller, 2/e, Pearson Education. ISBN-13**:** 978-9332536821.
3. Barry B. Brey, The Intel Microprocessors: 8086/8088, 80186/80188, 80286, 80386, 80486, Pentium, Pentium Pro Processor, Pentium II, Pentium III, Pentium 4, and Core2 with 64-bit Extensions : Architecture, Programming, and Interfacing, Pearson Education India, ISBN:9788131726228.
4. Tim Wilmshurst, Designing Embedded Systems with PIC Microcontrollers, Newnes Publisher, ISBN:9780080961842.
5. PIC: 18F2420, 16F84A data sheet ,by Microchip.
6. Intel® 64 and IA-32 Architectures Software Developer's Manual: Vol. 1.

# 19-202-0506 COMPUTER GRAPHICS

***Course Outcomes:***

*On completion of this course the student will be able to:*

1. *Explain the organisation of an interactive computer graphics system.*
2. *Generate 2D and 3D geometrical objects.*
3. *Explain the important transformations on graphical objects.*
4. *Fill a region given boundary and clip lines and polygons against a rectangular boundary.*
5. *Describe the different types of curves and generate curves.*
6. *Apply the operations like projections and rendering for 3D picture generation.*
7. *Design graphical objects.*
8. *Design interactive graphics systems and animation systems.*

**Module I**

Graphic hardware: Raster scan and random scan displays, color CRTs, Hard copy output devices,interactive input devices, Output primitives –points and lines. Line drawing algorithms – dda-Bresenham, parametric and nonparametric forms of circle and ellipse, midpoint algorithms for circle and ellipse, polygon filling algorithms – boundary fill, flood fill and scan line fill, Filling arcs – pattern filling- Attributes of output primitives - Antialiasing. Graphical user interface - Logical classification of input devices.

**Module II**

Two dimensional transformations: Representation of points - Transformations and matrices -transformation of points- Transformations of lines – Rotation - Reflection- Scaling - Combined transformations - Homogeneous coordinates. Viewing transformations: Viewing pipeline, window to viewport transformation. Clipping: Interior and exterior clipping-Point clipping- Line clipping – Cohen Sutherland - Liang Barsky- Sutherland Hodgeman Polygon clipping- Curve clipping - Text clipping. Curves: Curve representation- Geometric and Parametric Continuity – Natural Cubic Splines – Hermite spline - Bezier curves - B-spline curves.

**Module III**

Polygon meshes, Quadric surfaces, sweep representations, Bezier surfaces, B-spline surfaces. Three Dimensional Transformations: Three dimensional scaling, shearing, rotation, reflection, translations - Rotation about arbitrary axis Parallel to coordinate axis- Rotation about arbitrary axis in space. Projections: Orthographic projections – Oblique projections-perspective projections and Vanishing points. Visible surfaces: classification of visible surface detection algorithms, Back Face detection method - Depth buffer method(z-Buffer algorithm)- A-Buffer method-Screen subdivision method-Painter's algorithm - Scan line algorithms- octree hidden surface elimination.

**Module IV**

Rendering: Illumination models-diffuse reflection – specular reflection-Determining surface normal and reflection vector- Polygon rendering – Gouraud shading- Phong Shading -Ray tracing- Texture mapping. Color models: Color- Chromacity - Tristimulus theory of color – RGB color system -CMY color system -HSV color system. Modeling techniques and fractals: Surfaces and hierarchical modeling- Hierarchical modeling with structures – Fractals. Animation: Computer assisted animation – Real-Time animation techniques.

**References:**


1. Donald Hearn, Pauline Baker, M., Computer Graphics with OpenGL, 3 rd Edition, Pearson Education,2004, ISBN:978-0-13-015390-6.
2. David F. Rogers, Procedural Elements for Computer Graphics, 2nd Edition, Tata McGraw Hill, 2001, ISBN-13:978-0-07-047371-3, ISBN-10:0-07-047371-4.
3. James D. Foley et.al., Introduction to Computer Graphics, Addison Wesley Publishing Company, 1994, ISBN : 0-201-60921-5.
4. David F. Rogers, Mathematical Elements for Computer Graphics, 2nd Edition, Tata McGraw-Hill,2001,ISBN-13:978-0-07-048677-5,ISBN-10:0-07-048677-8.
5. James D. Foley, Andries Van Dam, Steven K. Feiner, John F. Hughes, Computer Graphics Principles.

## 19-202-0507 COMPUTER GRAPHICS LABORATORY

***Course Outcomes:***

*On completion of this course the student will be able to:*

1. *Understand and explain the mathematical and theoretical principles of computer graphics and openGL.*
2. *Familiarize generation and transformations for 2D geometrical objects, filling and clipping operations.*
3. *Design algorithms for different geometric shapes line, circle and ellipse.*
4. *Implement various algorithms to scan, convert the basic geometrical primitives, transformations, Area filling, clipping.*
5. *Understand the practical implementation of modeling, rendering, viewing of objects in 2D, 3D etc. and describe the importance of viewing and projections.*

*Note: All programs should be done using python with openGL libraries.*

**Cycle-I**

Introduction: Study of graphical input devices and display devices and different display standards.Study of OpenGL libraries and programming techniques using python.

Implementation of algorithms for drawing 2D Primitives .

1) Line – DDA,Bresenham's
2) Circle- Bresenham's, Midpoint
3) Ellipse – Midpoint

**Cycle- II**

2D Filling Algorithms

1) Seed filling algorithms (recursive and non-recursive methods)
    a) Flood fill
    b) Boundary fill
2) Scanline filling

    filling a given polygon using the scan line polygon fill algorithm.

2D Geometric Transformations:

1) Translation
2) Rotation
3) Scaling
4) Reflection
5) Sheer
6) Window to Viewport
7) Composite Transformations.

**Cycle-III**

2D Clipping Algorithms

1) Line clipping ( Cohen Sutherland, Cyrus–Beck)
2) Polygon clipping (Sutherland–Hodgman, Weiler–Atherton)

3D Transformations:

1) Translation
2) Rotation
3) Scaling

3D Projections – Orthographic and Perspective.

**Cycle-IV**

1) Programs for generating Splines.
    a) Interpolation curves.
    b) B-Spline
    c) Bezier Spline
2) Generating fractal images
3) 3D rendering
4) Simple animation programs using python animation libraries.

**References:**


1. Donald Hearn, Pauline Baker, M., Computer Graphics with OpenGL, 3rd Edition, Pearson Education,2004, ISBN:978-0-13-015390-6.
2. Dave Shreiner, Bill The Khronos OpenGL ARB Working Group, OpenGL Programming Guide: The Official Guide to Learning OpenGL, Versions 3.0 and 3.1, Pearson Education, 2009.ISBN: 9780321669278.
3. David F. Rogers, Procedural Elements for Computer Graphics, 2nd Edition, Tata McGraw- Hill, 2001,ISBN- 13:978-0-07-047371-3, ISBN-10:0-07-047371-4.
4. David F. Rogers,Mathematical elements for computer graphics',McGraw Hill Education; 2nd edition ,2017.ISBN: 978-0070486775.
5. PyopenGL libraries and documents , http://pyopengl.sourceforge.net/.
6. Python Tutorial, http://soe.cusat.ac.in/tutorials/python/.

## 19-202-0508 MICROPROCESSORS LABORATORY

***Course Outcomes:***

*On completion of this course the student will be able to:*

1. *Perform the given set of operations like 8 bit addition, subtraction, multiplication and division.*
2. *Perform code conversion, counters using 8085 microprocessor.*
3. *Perform basic arithmetic, logical and system related operations using 8086 microprocessor.*
4. *Perform peripherals and interfacing experiments using 8085 and 8086 Microprocessors.*

**Cycle-I**

1. Assembly language programming to explore instruction set of 8O85 using the microprocessor kit -Basic Programming
   -Sorting
   -Code Conversion
   -Counters

**Cycle- II**

1. Design and implementation of basic interface circuits (Any two)
   -Interfacing 8085 with 8255
   -Interfacing 8085 with 8279
   -Stepper motor
   -ADC/DAC
   -Hex keyboard
   -LCD

**Cycle-III**

1. x86 Assembly language programming using TASM/MASM/NASM.
   -Familiarise assembler directives, addressing modes and memory models.
   -Interrupts and functions.
   -Arithmetic operation using keyboard inputs and display on the screen (Signed and Unsigned)
   -Programs on array manipulation using Indirect, indexed and based indexed addressing modes.
   -Programs using keyboard interrupts - manipulate key functions.
   -Programs using display interrupts - managing texts and drawings.
   -Programs using disk interrupts - formatting, partitioning, file management.
   -Programs using interrupts to read and set system parameters-date, time, resolution,BIOS etc.
   -Programs to test Memory resident programs.

**Cycle-IV**

1. Interfacing with 8051/PIC ( Any two)
   - DAC,ADC, stepper motor, hex keyboard, LCD displays, LED
2. Familiarising computer hardware components, assembling and troubleshooting.

**References:**


1. 8080/8085 Assembly Language Programming Manual, Intel Corporation.
2. Barry B. Brey, The 8085A Microprocessor: Software Programming, and Architecture, Prentice Hall, ISBN:9780130908049.
3. Ytha Y. Yu, Charles Marut, Assembly Language Programming and Organization of the IBM PC,McGraw-Hill, ISBN:9780071128964.
4. Sivarama P. Dandamudi, Guide to Assembly Language Programming in Linux, Springer,ISBN:10: 0-387-26171-0.
5. Jeff Duntemann, Assembly Language Step-by-Step: Programming with DOS and Linux, 2nd dition, John Wiley & Sons, ISBN:0471375233.
6. Lyla B. Das, The x86 Microprocessors:8086 to Pentium, Multi cores, Atom and the 8051 Microcontroller, 2nd Edition, Pearson Education, ISBN-13**:** 978-933253682.

## 19-202-0601 COMPUTER NETWORKS

***Course Outcomes:***

*On completion of this course the student will be able to:*

1. *Familiarize with fundamental underlying principles of computer networking.*
2. *Explain the details and functionality of layered network architecture.*
3. *Apply mathematical foundations to solve computational problems in computer networking.*
4. *Acquire knowledge in ethical, legal, security and social issues related to computer networking.*

**Module I**

TCP/IP Protocol stack - Application Layer: Application layer Protocols: - WWW and HTTP, FTP, DNS, SMTP, SNMP, RPC, P2P File sharing, Domain Name System (DNS).TCP/IP and Socket Programming.

**Module II**

Transport layer: Transport Layer Services, Relationship with Network Layer, Relationship with Application Layer, Multiplexing and Demultiplexing, UDP, TCP: Header, Segment Structure, Services, Connection establishment and termination, Flow control and window size advertising, TCP timeout and retransmission, Congestion Control, TCP Fairness.

**Module III**

Network Layer: Network layer Services, Datagram and Virtual circuit services, IP datagram format and Types of Services, The Original Classful Addressing Scheme Dotted Decimal Notation - Subnet and Classless Extensions - IP Multicast Addresses. ARP: Resolution Through Direct Mapping - Resolution Through Dynamic Binding - ARP Protocol Format- ARP Implementation . RARP.

Datagram encapsulation and Fragmentation, Reassembly and fragmentation Routing : Link state routing, distance vector routing, hierarchical routing, multicast routing.

**Module IV**

Data link layer services: Elementary Data link layer protocols, sliding window protocols, HDLC, Multiple access protocols, TDM, FDM, CDM Random access protocols: ALOHA, CSMA, CSMA/CD, CSMA/CA. Circuit and Packet Switching, Virtual Circuits. High speed Networks and Network programming: Physical Layer services, ISDN, BISDN, Frame relay, Fast Ethernet and Gigabit Ethernet. Properties of an Ethernet - interoperability & collision domains – Ethernet Hardware Addresses - Ethernet Frame Format - Extending An Ethernet With Bridges - Switched Ethernet -VLAN.

**References:**


1. James F. Kurose and Keith W. Ross, Computer Networking – A Top-Down Approach 7 th Edition, Pearson Education, 2016, ISBN: 978-1292153599.
2. Douglas E. Comer, Computer Networks and Internet, 6th Edition, Pearson Education, 2018, ISBN: 978-9352869152.
3. Behrouz A. Fourouzan, Firouz Mosharraf, Computer Networks - A Top Down Approach,Tata McGraw Hill, 2017, ISBN: 13978-1-25-900156-7.
4. Andrew S. Tanenbaum and David J. Wetherall, Computer Networks, 5th Edition, Pearson education, 2013, ISBN: 978- 9332518742.

## 19-202-0602 COMPILER CONSTRUCTION

***Course Outcomes:***

*On completion of this course the student will be able to:*

1. *Summarize the functionality of each phase involved in compilation process.*
2. *Develop scanner and parser using lex and yacc tools.*
3. *Design top down parsers including recursive descent parser and non-recursive predictive parser for CFGs.*
4. *Design bottom up parsers including shift reduce, operator precedence and LR parsers (SLR, CLR and LALR).*
5. *Explain Syntax directed translation using S-attributed definition and L-attributed definition.*
6. *Familiarize specification for a type checker and run time environment.*
7. *Comprehend different representations of intermediate code.*
8. *Describe various code optimization techniques to improve the performance of a program and learn code generation techniques.*

**Module I**

Compiler: Introduction – Analysis of the source program – phases of a compiler – Lexical analysis – Role of the lexical analyser – Input Buffering -- Specification of tokens – Recognition of tokens – Lexical analyser generators.

**Module II**

Syntax Analysis – Role of the parser – Context free grammars – Top-down parsing – Bottom-up parsing –Operator precedence parsing – LR parsers (SLR, Canonical LR, LALR) – Parser generators.

**Module III**

Syntax-directed translation – Syntax-directed definitions – S-attributed definitions –L-attributed definition – Top-down and bottom-up translation – Type checking – Type systems – Specification of a type checker. Run time environment – Source language issues – Storage organization – Storage allocation strategies – Access to nonlocal names – Symbol tables.

**Module IV**

Intermediate code generation – Intermediate languages – Declarations – Assignment Statement – Boolean Expression – Procedure calls - Code optimization – Introduction – Sources of optimization – Introduction to data flow analysis. Code generator – Issues in the design of a code generator, the target machine, A simple code generator.

**References:**


1. Alfred V. Aho, Ravi Sethi & Jeffrey D. Ullman, Compilers Principles, Techniques & Tools, Pearson.
2. Kenneth C. Louden, Compiler Construction: Principles and Practice, Thomson Learning, India.
3. Keith D. Cooper & Linda Torczon, Engineering a Compiler, 2nd Edition, Elsevier, New Delhi.
4. Muchnick, S.S., Harcourt Asra, Advanced Compiler Design implementation, Morgan Kaufman.
5. Alan Holub, Compiler Design in C, PHI.

## 19-202-0603 ANALYSIS AND DESIGN OF ALGORITHMS

***Course Outcomes:***

*On completion of this course the student will be able to:*

1. *Analyse a given algorithm and express its worst, best and average time and space complexities in asymptotic notations.*
2. *Solve recurrence equations using Substitution Method, Changing Variables, Recursion Tree and Masters Theorem.*
3. *Understand the dynamic programming paradigm and its algorithmic design solutions.*
4. *Familiarise optimization problems using Greedy Method.*
5. *Design efficient algorithms using Backtracking and Branch and Bound Techniques for solving problems.*
6. *Familiarize some approximation algorithms and the benefit of using them.*
7. *Classify computational problems into P, NP, NP-Hard and NP-Complete complexity classes.*

**Module I**

Introduction to algorithm analysis-Time and Space Complexity-Classifying functions by their asymptotic growth rate-Best, Worst and Average case complexities-Complexity Calculation of simple algorithms (sequential and iterative algorithms).

Recurrence Equations-Analyse Recursive algorithms, Solution of recurrence equations-Substitution Method, Changing Variables, Recursion Tree, Masters Theorem-divide and conquer and decrease and conquer. Introduction to design techniques-Divide and conquer-Decrease and Conquer-Dynamic Programming-Greedy Programming-Backtracking.

**Module II**

Analysis of searching Algorithms and Sorting Algorithms-Linear Search and Binary Search.

Sorting- In Place and Stable Sorting-Insertion Sort, Bubble Sort, Quick Sort, Merge Sort and Heap Sort - Comparison of sorting Algorithms.

Analysis of complex Data Structures-Binomial Heap, Fibonacci Heap, AVL Tree and Red Black Tree. Amortized Analysis.

**Module III**

Graph Algorithms- DFS and BFS Traversal-Complexity. Greedy Strategy-Spanning Tree, Minimum spanning Tree- Prim's and Kruskal Algorithm-Complexity.

Dynamic Programming- The optimality Principle-optimal Matrix chain multiplication, Transitive Closure, Bellman ford algorithm for all pair shortest path in a graph. Backtracking- The N queens Problem.

**Module IV**

Introduction to Complexity Theory- Tractable and Intractable Problems-P and NP, Polynomial Reductions, NP-Hard and NP Complete Complexity Classes.NP Complete Problems- Bin Packing, Graph Colouring, Travelling salesman problem.

Approximation Algorithms, Algorithm for parallel Computers-PRAM models and simple PRAM algorithms.

**References:**


1. Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, Computer Algorithms,Universities Press, 2007.
2. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, Introduction to Algorithms, MIT Press, 2009.
3. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, The Design and Analysis of Computer Algorithms, Pearson Education, 1999.
4. Anany Levitin, Introduction to the Design and Analysis of Algorithms, Pearson, 3rd Edition, 2011.
5. Gilles Brassard, Paul Bratley, Fundamentals of Algorithmics, Pearson Education, 1995.
6. Richard E. Neapolitan, Kumarss Naimipour, Foundations of Algorithms using C++ Psuedocode, Second Edition, 1997.

## 19-202-0604 DATA MINING

***Course Outcomes:***

*On completion of this course the student will be able to:*

1. *Analyse various types of data, its collection and cleaning.*
2. *Illustrate and analyse various applications of data mining.*
3. *Analyse and compare various classification models in data mining.*
4. *Understand developments in big data technologies.*
5. *Familiarize the concepts of machine learning using R/Python.*
6. *Analyse and make use of deep learning using R/Python.*

**Module I**

Data Mining-Purpose-Various phases of data mining - supervised vs. unsupervised - learning - Data Warehouses - OLAP - Multidimensional databases - Data Pre-processing-Case studies in data pre-processing-Different applications of data mining.

**Module II**

Association Rules mining-Apriori algorithm-Examples-Improvements for apriori algorithm-Classification concepts, mathematical notions and case studies-Decision trees, Neural networks, Naïve Bayes classifier, KNN, Support vector machines.

**Module III**

Cluster Analysis-K-Means algorithm-Example and suggestions for improvements- A Categorization of Major Clustering Methods, Partitioning Methods, Hierarchical Methods, Density-Based Methods (DBSCAN), Time series mining, Graph Mining-Case studies-Introduction to rough sets-Mathematical Notions.

**Module IV**

Introduction to cloud computing-Services from a cloud- Big Data-definition-data bases for the big data platform-Introduction to Hadoop its architecture and ecosystem. MapReduce-basic concepts-Introduction to Spark-Deep learning-Concepts-CNN and RNN- Typical usecase.

**References:**


1. Jiawei Han and Micheline Kamber, Data Mining: Concepts and Techniques – 3rd Edition, Elsevier, 2011.
2. Richard Royger, Data mining – 1st Edition, CRC Press, 2nd Edition, 2017.
3. Tom White, Hadoop: The definitive guide, 3rd edition, OReilly Publishers, 2012.
4. Karau. H. et.al, Learning Spark: lightning-fast big data analysis, OReilly Publishers, 2015 hadoop, tom white.
5. Ian H.Witten et.al, Data Mining: Practical Machine Learning Tools and Techniques, Morgan Kofman publishers. 4th edition, 2016.
6. Ian Good fellow et.al, Deep learning, First edition, MIT Press, 2016.

## 19-202-0605 ARTIFICIAL INTELLIGENCE

***Course Outcomes:***

*On completion of this course the student will be able to:*

1. *Explain the characteristics of software agents and java framework for implementing agents.*
2. *Describe important search techniques and their suitable problem domains.*
3. *Define knowledge representation and deduction methods.*
4. *Describe the important phases in natural language processing.*
5. *Apply the AI principles and techniques to solve problems.*
6. *Analyse the problems and suggest a suitable problem solving method.*

**Module I**

Software agents – agent characteristics, agent topology, and agent oriented programming, Java implementation of intelligent agents. AI domains-Problem Characteristics - Problem spaces- search: DFS, BFS - Production systems- Swarm intelligence- genetic algorithm.

**Module II**

Heuristic search techniques: Generate and Test - Hill climbing -Best first - A* algorithm. Problem reduction –AO*algorithm, constraint satisfaction - Means Ends analysis. Game playing: Minimax – Alpha-betacut-off.

**Module III**

Logic and Deduction: Introduction to symbolic logic - Propositional logic - Well Formed Formula- Predicate Logic - predicates variables and constants - First order logic, Quantifiers- Forward and backward chaining-Resolution by refutation- Unification- Goal trees.

**Module IV**

Representing Knowledge: Procedural versus Declarative. Reasoning under uncertainty: Non Monotonic reasoning –support lists and dependency directed backtracking - Statistical reasoning: Bayes theorem. Bayesian networks. Fuzzy Logic, Semantic Nets, Frames, Conceptual Dependency, Scripts, CYC. Natural Language Processing. Learning: Types of learning.

**References:**


1. Elaine Rich and Kevin Knight, Artificial Intelligence, Tata McGraw-Hill, Third Edition, ISBN: 13:978-0-07-008770-5, 2010.
2. Jeffrey M. Bradshaw, Software Agents, AAAI Press/ The MIT Press (1997) (Module 1), ISBN: 0-262-52234-9.
3. Dan W. Patterson, Introduction to Artificial Intelligence and Expert Systems, Prentice Hall India Ltd., 2009, ISBN: 81-203-0777-1 (modules 2,3,4).
4. Stuart Russell and Peter Norvig, Artificial Intelligence – A Modern Approach. 3rd Edition, Prentice Hall, 2009.
5. Padhy, N.P., Artificial intelligence and intelligent systems, 2010, 0-19-567154-6.
6. Jurafsky D., Martin J.H., Speech and natural language processing, Second Edition, Prentice Hall, 2008, ISBN 10: 0131873210.

# 19-202-0610 OPERATING SYSTEM LABORATORY

***Course Outcomes:***

*On completion of this course the student will be able to:*

1. *Develop shell scripts.*
2. *Implement scheduling algorithms.*
3. *Write programs using system calls.*
4. *Write programs to implement inter process communication.*
5. *Write system level programs.*

**Cycle-I**

1. Study of different system calls.
2. Programs using the system calls of linux operating system- fork,exec,getpid,exit,wait,close,stat,opendir,readdir.
3. Programs using the I/O system calls of Linux operating system.
4. Programs to simulate Linux commands like ls,grep etc

**Cycle- II**

1. Programs to study and analyse various scheduling policies.
2. Programs to study uses of semaphore.
3. Programs to implement page replacement algorithms.

**Cycle-III**

1. Programs to implement IPC using shared memory, pipes, and message queue.
2. Linux shell programming.
3. Kernel programming--Linux Kernel configuration, compilation and rebooting from the newly compiled kernel.
4. Kernel space programming: Implement and add a loadable kernel module to Linuxkernel, demonstrate using insmod, lsmod and rmmod commands.
5. Developing device drivers.
6. Creating Linux distributions from debian source.

**References:**


1. Richard Stevens, W., UNIX Network Programming: Interprocess communications, Volume 2,Second Edition, Prentice Hall, ISBN: 9780130810816.
2. Peter Jay Salzman, Michael Burian, Ori Pomerantz, The Linux Kernel ModuleProgramming Guide. http://www.tldp.org/LDP/lkmpg/2.6/lkmpg.pdf.
3. Robert Love, Linux Kernel Development, 3rd Edition Addison-Wesley Professional, ISBN: 978- 0672329463.
4. Mark G. Sobell, Practical Guide to Linux Commands, Editors, and Shell Programming, 3rd Edition, Prentice Hall, ISBN-13: 978-033085044.

## 19-202-0611 MINI PROJECT

***Course Outcomes:***

*On completion of this course the student will be able to:*

1. *Identify project topic of current relevance.*
2. *Explain software development cycle with emphasis on different processes - requirements, design and implementation phases.*
3. *Develop confidence at having conceptualized, designed and implemented a working, medium sized project.*
4. *Learn how to work as a team and to do a working project on time with each student taking responsibility for their part in the project.*
5. *Familiarise document and report preparation.*

The students are expected to develop an application in the field of embedded system / mobile application / any other current relevant topic. They have to do a proper system study and prepare SRS and design documents.

Each batch comprising of 3 to 5 students. Each student shall submit a project report at the end of the semester. The project report should contain the design and engineering documentation and test results. Product has to be demonstrated for its full design specifications. Innovative design concepts, reliability considerations and aesthetics / ergonomic aspects taken care of in the project shall be given due weight.

Guidelines for evaluation:

| | |
|---|---|
| i) Attendance and Regularity | 5 |
| ii) Work knowledge and Involvement | 15 |
| iii) Semester end presentation & Oral examination | 10 |
| iv) Level of completion and demonstration of functionality/specifications | 10 |
| v) Project Report | 10 |
| Total | 50 marks |

Note: External projects and R&D projects need not be encouraged at this level. Points (i) & (ii) to be evaluated by the project guide & coordinator and the rest by the final evaluation team comprising of 3 teachers including the project guide.

## 19-202-0606 WEB TECHNOLOGIES

***Course Outcomes:***

*On completion of this course the student will be able to:*

1. *Write programs in PHP language for server side scripting.*
2. *Understand XML and processing of XML Data with Java.*
3. *Develop server side programming using JSP.*
4. *Use client side scripting using Javascript.*
5. *Use AJAX with PHP and Mysql.*

**Module I**

Introduction to PHP: Variables, data types, numbers, date, arrays, strings. Operators, Expressions, Control structures, Functions, Handling POST and GET methods, Connecting to database (MySQL or Postgres), executing queries and handling results, managing sessions and cookies, PHP file handling: open, read, write and closing files. Working with Images.PHP errors and exception handling. Security Considerations in PHP. Object Oriented Programming with PHP.

**Module II**

Introduction of XML- Features of XML, Anatomy of XML document, The XML Declaration, Defining XML tags, their attributes and values, Document Type Definition, XML Schemas, Document Object Model, XHTML Parsing XML Data. XMLHttpRequest- Introduction, XMLHttpRequest, The XMLHttpRequest Object, Events for the XMLHttpRequest Object, Request Object for XMLHttpRequest, Response Object for XMLHttpRequest.

**Module III**

JavaServer Pages (JSP): Introduction, JSP Processing, Declarations, Directives, Expressions, Code Snippets, implicit objects, Using Beans in JSP Pages, Using Cookies and session for session tracking, connecting to database in JSP.Error and exception handling in JSP.

**Module IV**

Java Script : Client side scripting with JavaScript , variables, functions, conditions, event handlers ,loops and repetition, Pop up boxes, Form validation, Advance JavaScript: Javascript and objects, JavaScript own objects, the DOM and web browser environment.AJAX: Introduction, AJAX Introduction, AJAX Components, Handling Dynamic HTML with Ajax. AJAX Database, Working of AJAX with PHP, Ajax PHP Database Form, AJAX PHP MySQL query.

**References:**


1. Kogent Learning Solutions Inc. Web Technologies, HTML, JAVASCRIPT, PHP, JAVA, JSP, ASP.NET, XML AND AJAX Black Book.Dreamtech Press**,**Wiley India Pvt.Ltd.,2009. ISBH: 978-8177229974.
2. Uttam Kumar Roy, Web Technologies, Oxford University Press.2010. ISBN: 978-0198066224.
3. Alan Forbes,The Joy of PHP: A Beginner's Guide to Programming Interactive Web Applications with PHP and MySQL,CreateSpace Independent Publishing Platform, 2012. ISBN: 978-1522792147.
4. Hans Bergsten, JavaServer Pages, 3rd Edition,O'Reilly Media ,2009. ISBN: 978-0596005634.
5. David Flanagan,JavaScript:The Definitive Guide, 6th edition, O'Reilly Media,ISBN:978-059680552.

## 19-202-0607 SOFTWARE PROJECT MANAGEMENT

***Course Outcomes:***

*On completion of this course the student will be able to:*

1. *Gain knowledge on the issues and challenges to be faced while managing a software project.*
2. *Familiarise with various project scheduling techniques, project control and monitoring.*
3. *Identify factors that influence the performance of team members in a project environment.*
4. *Explain the role of continuous training, improve team working and select appropriate leadership styles.*

**Module I**

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

**Module II**

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

Risk Management – Nature Of Risk – Types Of Risk – Managing Risk – Hazard Identification – Hazard Analysis – Risk Planning And Control.

**Module III**

Monitoring And Control: Creating Framework – Collecting the Data – Visualizing Progress – Cost Monitoring – Earned Value – Prioritizing Monitoring – Getting Project Back To Target – Change control –Managing contracts – Introduction – Types of Contract – Stages in Contract Placement – Typical Terms of a Contract – Contract Management – Acceptance.

**Module IV**

Managing People and Organizing Teams: Introduction – Understanding Behavior – Organizational Behaviour: A Background – Selecting the Right Person For The Job – Instruction in the Best Methods –Motivation – The Oldman – Hackman Job Characteristics Model – Working in Groups – Becoming a Team –Decision Making – Leadership – Organizational Structures – Stress – Health and Safety – Case Studies.

**References:**


1. Jalote, software Project Management in Practice, First edition, Pearson Education, ISBN: 978-7-30-210682-1.
2. Bob Hughes, Mike cotterell, Software Project Management, Third Edition, Tata McGrawHill, ISBN: 978-0-07-070653-8.
3. Ramesh, Gopalaswamy, Managing Global Projects, First edition, Tata McGraw Hill, ISBN:978-0-07-059897-3.
4. Royce, Software Project Management, 1st Edition, Pearson Education, ISBN: 978-0-2-0130958-4.

## 19-202-0608 DIGITAL IMAGE PROCESSING

***Course Outcomes:***

*On completion of this course the student will be able to:*

1. *Outline the basics of image processing.*
2. *Interpret image enhancement techniques.*
3. *Illustrate image restoration and segmentation techniques.*
4. *Infer image compression techniques.*
5. *Identify current technologies and applications of image processing.*

**Module I**

Introduction-Digital image representation, Fundamental steps in image processing, Components of image processing system. Digital image fundamentals- Sampling and quantization, relationship between pixels. Image transforms-2D DFT, DCT, Walsh-Hadamard transform, Haar Transform, Wavelet Transform.

**Module II**

Image enhancement-Spatial domain methods-Basic Gray Level Transformations, Histogram Processing. Basics of Spatial Filtering-Smoothing, Sharpening. Frequency Domain Methods-low pass filters, high pass filters, homomorphic filters.

**Module III**

Image restoration- Degradation model, Inverse filtering, Wiener filter, constrained least squares filtering. Morphological Image Processing-Dilation and Erosion, Opening and Closing. Fundamentals of color image processing-Color models-RGB, CMY, CMYK, and HSI. Pseudocolor Image Processing- Intensity slicing, gray level to color transformation.

**Module IV**

Image Segmentation-Detection of Discontinuities, edge linking and boundary detection, thresholding, region based segmentation, use of motion in segmentation.

Image compression-Error-free Compression-variable length coding, LZW coding, bit plane coding, lossless predictive coding, Lossy compression-lossy predictive coding, transform coding, wavelet coding, Image compression standards.

**References:**


1. Rafael C., Gonzalez & Woods R.E., Digital Image Processing, 3rd edition, Pearson Education, 2008.
2. Anil K Jain, Fundamentals of Digital Image Processing, Prentice Hall India, 2010.
3. William K Pratt, Digital Image Processing, 4th Edition, John Wiley and Sons, 2007.
4. Ioannis Pittas, Digital Image Processing Algorithms and Applications, John Wiley, 2000.

## 19-202-0609 BIOINFORMATICS

***Course Outcomes:***

*On completion of this course the student will be able to:*

1. *Demonstrate different biological databases and tools.*
2. *Apply algorithms for searching the biological databases.*
3. *Categorize sequence alignment methods.*
4. *Implement phylogenetic tree construction algorithms.*
5. *Predict gene and protein secondary structure.*
6. *Analyse genomic sequence.*

**Module I**

Introduction to Bioinformatics and computational biology-Nature and scope of Bioinformatics--Bio informatics tools and databases-Biological Databases - Major biological databases and its classification, sequence and structure file formats, Biological data types.

**Module II**

Sequence Analysis-Sequence Alignment-Types of sequence alignment -Global, local- Pair wise alignment - Multiple sequence alignment- Application of multiple alignments- Tools for Multiple Sequence Alignment-Methods of Sequence Alignment- Dot matrix, Dynamic programming algorithm, Word method alignment, Progressive Methods- BLAST, PSI BLAST.

**Module III**

Phylogeny - Phylogenetic Trees-Tree Topologies-Distance matrix methods, Character based methods. Solving UPGMA, NJ and small parsimony problems. Methods of evaluating phylogenetic methods-bootstrapping, jackknifing.

**Module IV**

Macromolecular Structure Analysis -Gene prediction, Gene prediction approaches, Conserved domain analysis, Protein visualization, Prediction of protein secondary structure, Tertiary structure prediction-stereo chemical properties.

**References:**


1. CynthiaGibas, PerJambeck, Developing Bioinformatics Computer Skills O'Reilly MediaInc a 2001.
2. David Edwards, Jason Eric Stajich, David Hansen, Bioinformatics Tools and Applications, Springer, 2009.
3. S C Rastogi, N Mendiratta and P Rastogi, " Bioinformatics: Methods and Applications" , ISBN : 978-81-203-4785-4, PHI Learning Private Limited, 2015.
4. David W Mount, Bioinformatics: Sequence and genome analysis, Cold spring harbor laboratory press, 2nd Edition, 2004.
5. Attwood, T.K., Parry, D.J., Smith, Introduction to Bioinformatics, Pearson Education, 2005.
6. Stan Tsai C., Bio macro molecules: Introduction to Structure, Function and Informatics, John Wiley & Sons, 2007.

## 19-202-0701 PRINCIPLES OF MANAGEMENT

***Course Outcomes:***

*On completion of this course the student will be able to:*

1. *Understand the basic principles underlying in the management of organizations.*
2. *Get exposure in all industrial management functions .*
3. *Get knowledge to analyse the financial accounts and ratios .*
4. *Understand the principles of economics and IPR aspects.*

**Module I**

Basic concept of Management: Introduction, definitions of managements, characteristics of management, levels of management, management skills, Scientific management - Contributions of Gilbreth and Gantt.

Functions of Management: Planning, forecasting, organizing, staffing, directing, motivating, controlling, co-coordinating, communicating, decision making.

Organization: Introduction, definition of organization, elements of organization, process of organization, principles of organization, formal and informal organization, organization structure, types of organization structure.

Forms of Business Organization: Concept of ownership organization, types of ownership, Individual ownership, partnership, joint stock company, private and limited company, co-operative organizations, state ownership, public corporation

**Module II**

Production planning and control: Objectives and functions.

Production management: Structure, objectives, productivity index, modern productivity improvement techniques.

Inventory Management: Functions, classifications of inventory, basic inventory models, inventory costs, Economic order quantity (EOQ). Materials Requirement Planning – Objectives, Functions and methods.

Project Management: Functions, Characteristics, Feasibility studies, Project network analysis – PERT/CPM.

**Module III**

Human Resource Management: Introduction, definition, objectives, characteristics, functions, principles and organization of HR management, Recruitment, selection process and training methods, Wages and incentives, Job evaluation and merit rating, Industrial accidents-causes and related issues

Marketing Management: Introduction, Functions and objectives, Marketing environment and Information, Market segmentation, Distribution channels, Consumer and Industrial markets, Consumer behaviour, Pricing methods, Sales promotion and Advertisement. Market research: Objectives and methods.

**Module IV**

Financial Management: Basic functions, Capital-classifications, Sources of funds, Financial accounts-types, basic concepts and importance, Financial ratios and its significance, Types of budgets and budgetary controls, Overheads, Standard costing, Marginal costing.

Economics: Principles of economics, problem of scarcity, demand, supply, utility, time value of money, inflation and deflation, Consumer Demand Curve.

IPR Aspects: General introduction to IPR, eligibility for patent, patent information and prior art search, procedure for filing patent application, rights of patent owner and duration, ownership of patent and commercialization.

**References:**


1. Fraidoon Mazda, Engineering Management, Addison-Wesley, (1997).
2. Koontz and O'Donnell, Essentials of Management, Mc Graw Hill, (1978).
3. Kotler P., Marketing Management, Prentice Hall, (2011).
4. Prasanna Chandra, Finance Management, Tata Mc Graw Hill, (2008).
5. Monks, J. G., Operations Management, Mc Graw Hill, (1982).
6. Production and Operations Management,PHI(2010).

## 19-202-0702 ADVANCED COMPUTER NETWORKS

***Course Outcomes:***

*On completion of this course the student will be able to:*

1. *Interpret internetworking approaches and issues.*
2. *Explain routing and management protocols.*
3. *Categorize technologies used in wireless transmission.*
4. *Identify latest technologies used in telecommunication systems.*

**Module I**

Multimedia Networking-Multimedia Networking Applications,Streaming stored Video, Voice over IP, Protocols for Real-time conversational applications, Network Support for Multimedia- Scheduling Mechanisms, Diffserv.

**Module II**

Internet Routing: Routing Between Peers (BGP)-Routing Within An Autonomous System (RIP, OSPF).Internet Multicasting : Ethernet Multicast- IP Multicast- IGMP-DVMRP-PIM. Understanding Router Components: Ports-Queueing- Scheduling-shaping-policing-marking. QoS in IP networkk. IPv6: Frame formats-Comparison with IPv4. Introduction to ICMP,DHCP and NAT. Network Management: SNMP and RMON models.

**Module III**

Wireless transmission: Frequencies for radio transmission-Signals-Antennas-Signal propagation-Multiplexing-Modulation-Spread spectrum-Cellular systems. Medium access control: SDMA-FDMA-TDMA-CDMA-Comparison of S/T/F/CDMA.

**Module IV**

Mobile Comminication System: GSM,:-System Architecture, Radio Interface, Protocols, Addressing-Call management and Handover. GPRS and UMTS networks. HSDPA and HSPA Protocols.- LTE and Advanced LTE Standards – VoLTE .Wireless LAN(WiFi): Infrared vs radio transmission-Infrastructure and ad-hoc network-IEEE 802.11a,b,g, 802.15 and 802.16 protocol standards – Bluetooth - Principle of WiMax . Mobile IP.

**References:**


1. Douglas E.Comer, Internetworking With TCP/IP Volume 1: Principles Protocols, and Architecture, 5/e ,Prentice Hall,2006. (Module I and II), ISBN:978-8-12-031053-7
2. Martin Sauter,From GSM to LTE-Advanced Pro and 5G: An Introduction to Mobile Networks and Mobile Broadband, 3rd Edition,Wiley, ISBN**:** 978-1119346869
3. Schiller, Mobile Communication, 2/e , Addison Wesley, 2005 (Module III and IV) ISBN:978-0321123817
4. Youlu Zheng and Shakil Akhtar, Networks for Computer Scientist and Engineers, Oxford University Press,2006
5. James.F.Kurose & Keith W.Ross , Computer Networking –A Top Down approach featuring Internet, 3/e, Pearson Education,2005.
6. Douglas E.Comer, Computer Network and Internets, 2/e, Person education ,2003.

## 19-202-0703 CRYPTOGRAPHY AND NETWORK SECURITY

***Course Outcomes:***

*On completion of this course the student will be able to:*

1. *Identify security issues in the network and provide data security over the network.*
2. *Familiarise cryptographic algorithms, hash codes and digital signatures.*
3. *Examine the issues and structure of authentication service and electronic mail security.*
4. *Familiarise with network security protocols used to protect against threats in the network.*
5. *Familiarise methods for authentication, access control, intrusion detection and prevention.*

**Module I**

Introduction- Security problem in computing, Security in networks. Elementary cryptography-Introduction-Substitution,Transposition,Hill Ciphers and Affine Ciphers.Review of number Theory-Modular arithmetic.

**Module II**

Encryption Algorithms- Symmetric key encryption - DES- The Feistel cipher structure. The avalanche effect. Modes of operations of DES algorithm. AES-S-boxes.

**Module III**

Public Key Encryption- RSA Cryptosystem. Primality testing-Miller-Rabin Algorithm.Key Management-Diffie- Hellman- Cryptosystem-ElGamal Scheme Elliptical Curve Cryptography and Elliptic curves over Finite Fields. Hash Algorithms- SHA 1 and SHA-512 MAC-HMAC.

**Module IV**

Authentication protocols, Authentication applications-Kerberos,X.509,Digital Signature, Secure e-mail, SSL,IP Security - Intruders -Malicious Software,Firewalls.

**References:**


1. Cryptography and Network Security – Principles and Practice: William Stallings, Pearson Education, 6th Edition.
2. Cryptography and Network Security: Atul Kahate, Mc Graw Hill, 3rd Edition.
3. Cryptography and Network Security: C K Shyamala, N Harini, Dr T R Padmanabhan, Wiley India, 1st Edition.
4. Cryptography and Network Security : Forouzan Mukhopadhyay, Mc Graw Hill, 3rd Edition.
5. Introduction to Network Security: Neal Krawetz, CENGAGE Learning.
6. Principles of Computer Security: WM. Arthur Conklin, Greg White, TMH.

## 19-202-0712 LANGUAGE PROCESSORS LABORATORY

***Course Outcomes:***

*On completion of this course the student will be able to:*

1. *Design assemblers and macro processors .*
2. *Design deterministic finite automata for any language.*
3. *Implement lexical analyser.*
4. *Implement YACC programs for any context free grammar.*
5. *Design any top-down or bottom-up parsing algorithm.*

**Cycle-I**

Implementation Two Pass Assemblers,Macro Processors and Deterministic Finite Automata.

**Cycle- II**

Implementation of LEX programs.

**Cycle-III**

Implementation of YACC programs.

**Cycle-IV**

Implementation of parsing algorithms.

**References:**


1. Hopcroft J. E., Motwani,R. and Ullman J. D., Introduction to Automata Theory, Languages, and Computation, 3rd Edition, ISBN : 978-03-214-5536-9.
2. Padma Reddy, A.M., Finite Automata and Formal Languages,1stEdition,Pearson , Education ISBN 978-81-317-6047-5.
3. Mishra, K.L.P. and Chandrasekaran, N., Theory of Computer Science, Automata, Languages and Computation, 3rd Edition, PHI, 2014, ISBN 978-81-203-2968-3.
4. Peter Linz, An Introduction to Formal Languages and Automata, 4th Edition, Narosa Publishing Co., ISBN 978-81-7319-781-9.

## 19-202-0713 NETWORKS LABORATORY

***Course Outcomes:***

*On completion of this course the student will be able to:*

1. *Familiarise network components and structured cabling.*
2. *Write programs for various communication algorithms.*
3. *Familiarise configuration of various servers and firewalls.*
4. *Do simulations of various network protocols using network simulator such as ns3.*
5. *Design of communication system using embedded boards.*

**Cycle-I**

1. Familiarizing computer network components--a)Cables b)Connector c)Switches and Hub d) Router e) Network Cards etc.
2. Structured cabling, Creating VLAN using switches and routers, Experiments on subnetting and supernetting.
3. Socket programming--Implement TCP and UDP in UNIX domain, Single chatting program, Multi Chat program using Multithread, Applet chatting.

**Cycle- II**

4. Program to test error detection and correction codes.
5. Program to test various data compression algorithms.
6. Program to test public key and symmetric key cryptography method.
7. Program to test various message digest algorithms.

**Cycle - lll**

8. Simulations of CSMA / CD , Aloha and Slotted Aloha protocols.
9. Simulations to test ARP and RARP.
10. Simulation to test CSMA/CA.
11. Simulations to test congestion and flow control methods in TCP and UDP.
12. Simulations to test various routing protocols.
13. Programs using pcap libraries to packet capture and analysis.
14. Install and configure various servers- file server, ssh server, web server, database server etc.
15. ACL, firewall and use of "iptables".
16. Design of communication system using GSM, 3G,GPS and RFID modules using Raspberry-pi,Arduino or Edison Board .

**References:**


1. Richard Stevens,W., Unix network programming ,The Sockets Networking API,Vol.1,3rd edition, Addison-Wesley Professional ISBN:9780131411555.
2. Douglas E. Comer, Hands-on Networking with Internet Technologies, Pearson Education.
3. Todd Lammle, CCNA: Cisco Certified Network Associate Study Guide,John Wiley and Sons, ISBN:9780470410486.
4. Emad Aboelela, Network Simulation Experiments Manual, The Morgan Kaufmann Series in Networking, Elsevier. ISBN:9780123852113.
5. Jack L. Burbank, An Introduction to Network Simulator 3(ns3), Wiley-Blackwell. ISBN: 978111815899.

## 19-202-0714 ENTREPRENEURSHIP DEVELOPMENT

***Course Outcomes:***

*On completion of this course the student will be able to:*

*1. Develop awareness about the importance of entrepreneurship opportunities available in the society.*

*2. Get acquainted with the challenges faced by the entrepreneur.*

**Excercises**

1. To study the types of entrepreneurs and the factors affecting entrepreneurial growth.
2. To make an assessment of the major motives influencing an entrepreneur.
3. To make an overview of the various stress management techniques.
4. How to identify and select a good business opportunity?
5. Preparation of a techno economic feasibility report for a given project.
6. Preparation of a preliminary project report for a given project.
7. To identify the various sources of finance and management of working capital.
8. Carry out the costing and break even analysis of a proposed project.
9. Preparation of a PERT / CPM chart for the various activities involved in a project.
10. To make a study of the various causes and consequences of sickness in small business and identify corrective measures.

**References:**


1. Roy Rajeev, Entrepreneurship, Second edition, Oxford Latest Edition, 2011.
2. Gordon, E., & Natarajan, K., Entrepreneurship Development, Fourth edition, Himalaya, 2007.
3. Coulter, Entrepreneurship in Action, Second edition, PHI, 2008.
4. Jain, P.C., Handbook for New Entrepreneur, Oxford University Press, 2003.
5. Khanka, S.S., Entrepreneurial Development, Fifth edition, S. Chand and Co, 2013.


Note: There will only be continuous evaluation for this course. The evaluation will be based on the performance of the student in the exercises given above. A minimum of 50% marks is required for a pass.

## 19-202-0715 PROJECT PHASE I

***Course Outcomes:***

*On completion of this course the student will be able to:*

1. *Conduct literature survey in a relevant area of course of study and finally identify and concentrate on a particular problem.*
2. *Formulate a project proposal including the analysis and design phases through extensive study of literature and / or discussion with learned resource persons in academy or industry.*
3. *Generate a proper execution plan for the project work to be carried out in PhaseII through deliberations.*
4. *Improve presentation skills.*

The project work shall commence in the seventh semester shall be completed by the end of eighth semester. Students are expected to identify a suitable project and complete the analysis and design phases by the end of seventh semester. For those students who are doing real life projects in the industry should also have both an external guide in the industry and an internal guide in the department. The internal guides are responsible for the continuous evaluation. Each batch comprising of 3 to 5 students shall identify a project related to the curriculum of study.

At the end of the semester, each student shall submit a project synopsis comprising of the following.

• Application and feasibility of the project
• Complete and detailed design specifications
• Block level design documentation
• Detailed design documentation including algorithms/circuits
• Project implementation action plan using standard presentation tools

Guidelines for evaluation:

| | | |
|---|---|---|
| i. | Attendance and Regularity | 10 |
| ii. | Quality and adequacy of design documentation | 10 |
| iii. | Concepts and completeness of design | 10 |
| iv. | Theoretical knowledge and individual involvement | 10 |
| v. | Quality and contents of project synopsis | 10 |
| | | Total: 50 Marks |

Note: Points (i)-(ii) to be evaluated by the respective project guides and project coordinator Based on continuous evaluation. (iii)-(v) to be evaluated by the final evaluation team comprising of 3 Internal examiners including the project guide.

## 19-202-0716 INDUSTRIAL INTERNSHIP

***Course Outcomes:***

*On completion of this course the student will be able to:*

1. *Acquire insights into tasks and problems which are usually not experienced in an academic environment.*
2. *Get an exposure to real-world professional activities, which will help them to gain better understanding of their academic curriculum contents.*
3. *Work with various groups of professionals, managers, technicians, etc.*
4. *Polish their engineering skills by applying knowledge in trouble shooting, software development, software maintenance, etc.*
5. *Build relations with academic institutions and industry that will help mutual cooperation in long-term.*
6. *Appreciate their social and ethical responsibilities.*

Every Student shall undergo a summer internship programme of minimum two weeks duration in an IT industry /Public Sector Organization during the May-June vacation before the commencement of the VII semester and submit a report on their work. The evaluation shall be conducted based on presentation and report.

## 19-202-0704 ARTIFICIAL NEURAL NETWORKS

***Course Outcomes:***

*On completion of this course the student will be able to:*

1. *Analyse the working of the human brain.*
2. *Design a artificial network to mimic some functionality of the human brain.*
3. *Design neural networks for classification problems.*
4. *Design network structures suitable for a given type of problem.*
5. *Implement systems to recognize various patterns, images, sound, characters etc.*

**Module I**

Introduction to neural networks. Artificial neural networks. Biological neural networks- Comparison, Basic building blocks of ANN. Activation functions. McCulloch-Pitts Neuron Model, Hebb net. Learning Rules- Hebbian Learning Rules, Perceptron, Delta, Competitive,. Perceptron networks- single layer, multilayer –algorithm.

**Module II**

Feedback Networks, Discrete Hopfield nets,. Feed Forward Networks: Back Propagation Networks, Learning Rule, Architecture, training algorithm. Counter Propagation Network: Full CPN, Forward only CPN, architecture, training phases.

**Module III**

Self Organizing feature maps: Kohonen SOM, Learning Vector Quantization, Max net, Mexican Hat, Hamming net. Associative memory networks, Algorithms for pattern association Hetero associative networks, Auto associative memory networks ,Bidirectional associative memory networks.

**Module IV**

Special networks: Simulated Annealing, Boltzmann machine,Cauchy machine, Support Vector Machine Classifiers. Application of Neural networks In Image Processing and classification. Introduction to Fuzzy systems, Operations of fuzzy logic, fuzzy sets, Membership functions, Fuzzy techniques, Neuro fuzzy systems.

**References:**


1. Dr. Sivanandam, S.N., Introduction to neural networks using MATLAB 6.0, Tata McGrawHill New Delhi.,2012 , ISBN 978-0-07-059112-7.
2. Laurene Fausett, Fundamentals of neural networks, Prentice Hall, New Jersey, 2007. ISBN 81- 317-0053-4.
3. James A. Freeman, David M. Skapura, Neural Networks Algorithms,Applications and Programming Techniques, Addison-Wesley, 2003 ISBN 81-7808-108-3.

## 19-202-0705 ADVANCED MOBILE COMMUNICATIONS

***Course Outcomes:***

*On completion of this course the student will be able to:*

1. *Understand various generation of mobile technologies.*
2. *Analyze the latest trends in mobile communication.*
3. *Identify the research areas in 4G and 5G.*
4. *Understand core concepts used in various generations of mobi*le communications.

**Module I**

Overview & Classification of Mobile Communication Systems. Mobile Communication Channel. Modeling of Propagation Loss. Diversity reception. Cellular System Concepts. Ways of increasing system capacity. First Generation Cellular Telephony.

**Module II**

GSM Cellular Telephony. GSM Architecture. Radio Transmission Parameters of GSM. GSM Logical Channels. GSM Burst Structures. Call setup Procedures & Handover in GSM System. Data Transmission in GSM. HSCSD, GPRS, EDGE. CDMA in Mobile Communication Systems. Spreading Sequences. Basic Transmitter & Receiver Schemes in CDMA Systems. RAKE Receiver. Multi Carrier CDMA. IS- 95 System. Digital Cordless Telephony .Wireless Local Loops.

**Module III**

Third Generation Mobile Communication Systems. IMT 2000. Concepts of UMTS. UTRA FDD Mode, UTRA TDD Mode.WCDMA. CDMA 2000. Application of Smart Antennas in Cellular Applicable to batch upto admitted in Aug 2011 Telephony. Satellite Mobile Communication Systems. Iridium, GlobalStar, ICO Systems.

**Module IV**

Fourth Generation Mobile Communication Systems. Forerunner versions : 3GPP Long Term Evolution (LTE) , Mobile WiMAX (IEEE 802.16e) , TD-LTE for China market. IMT-2000 compliant 4G standards : LTE Advanced, IEEE 802.16m or Wireless MAN-Advanced . 5G : Research Constraints, Small cells, SON (self–organizing networks), future of 5G, internet and other related technologies.

**References:**


1. Hazyszt of Wesolowski, Mobile Communication Systems, Wiley.
2. Theodore S. Rappaport, Wireless Communications Principles & Practice, Pearson Education, Jochen Schiller, Mobile Communications, Pearson Education.
3. Raj Pandya, Mobile & Personal Communication Systems And Service, PHI.
4. Martin Sauter, 3G, 4G and Beyond: Bringing Networks, Devices and the Web Together.
5. Dr. AnwarM.Mousa, Perspective of Fifth Generation Mobile Communications University of Palestine, Gaza- Palestine.

## 19-202-0706 EMBEDDED SYSTEM DESIGN

***Course Outcomes:***

*On completion of this course the student will be able to:*

1. *Demonstrate the architecture of Embedded Systems.*
2. *Summarize the characteristic of Embedded Systems.*
3. *Illustrate the features of Embedded Operating Systems.*
4. *Apply the concepts of scheduling algorithms to solve scheduling problems in Embedded Systems.*
5. *Demonstrate the design procedure and analysis of Embedded Systems.*
6. *Develop solutions to simple computation problems using ARM instructions.*

**Module I**

Concepts of control system: Definitions-open loop system-closed loop system, Embedded computing--characteristics of embedded computing applications-challenges in embedded computing system design -embedded system design process. Instruction set--ARM processor-ARM Processor and Memory Organizations-Data Operations.

**Module II**

CPU- Programming input and output-supervisor mode-exceptions and trap-co-processors-CPU performance-CPU power consumption. Computing platforms- basic computing platforms-Platform hardware components-Platform software components-The CPU bus-Bus organization and protocol-DMA-System Bus Configuration

**Module III**

Program Design and analysis-components for embedded programs-models of program-Assembly, linking and loading-Compilation techniques-compiler optimizations. Software performance optimization -program validation and testing.

**Module IV**

Processes and OS-multiple tasks and multiple processes-Multirate systems-Preemption real-time OS-priority based scheduling-Rate montonic scheduling-Earliest deadline first scheduling-Interprocess communication mechanisms.Network and multiprocessors-categories of multiprocessors-MPSoCs and shared memory multiprocessors.

**References:**


1. MarilynWolf,ComputersasComponents,4th Edition,MorganKaufmann Publishers.
2. Raj Kamal, Embedded System, Architecture programming and Design, 3rd Edition.
3. Vahid, Embedded System Design: A Unified Hardware/Software Introduction, John Wiley &Sons.ISBN:9788126508372.
4. Jack Ganssle The Art of Designing Embedded Systems, Second Edition ,Newnes, ISBN:9780080568799.
5. Tammy Noergaard, Embedded Systems Architecture, Newnes,ISBN:978-81-8147-997-6.
6. Arun Ghosh,IntroductionToControlSystems,2nd Edition, PHILearningPvt.Ltd.,ISBN-13:9788120348202.

## 19-202-0707 COMPUTER VISION

***Course Outcomes:***

*On completion of this course the student will be able to:*

1. *Familiarise both theoretical and practical aspects of computing with images.*
2. *Describe the foundation of image formation, measurement and analysis.*
3. *Implement common methods for robust image matching and alignment.*
4. *Understand the geometric relationships between 2D images and the 3D world.*
5. *Gain exposure to object and scene recognition and categorization from image.*
6. *Develop the practical skills necessary to build computer vision applications.*

**Module I**

Image formation and Image model-Components of a vision system-Cameras-Radiometry-Light in space-Light in surface- sources, shadows and shading, Color-Human color perception-Representation of color- A model for image color-Surface color from image color. Early vision-Linear Filters and Convolution-Shift variant Linear system- Spatial Frequency and Fourier Transforms-Sampling and Aliasing-Filters as Templates-Normalized correlation and finding patterns-Edge detection-Texture Representation, Analysis and Application.Recognition Methodology: Conditioning, Labeling, Grouping, Extracting.

**Module II**

Multiple images-The Geometry of multiple views-Stereopsis-Affine structure from motion- Elements of Affine Geometry-Affine structure and motion from two images-Affine structure and motion from multiple images-From Affine to Euclidean images. Matching Morphological Image Processing: Introduction, Dilation, Erosion, Opening, Closing, Hit-or-Miss transformation, Morphological algorithm operations on binary images, Morphological algorithm operations on gray-scale images, Thinning, Thickening, Region growing, region shrinking.

**Module III**

Binary Machine Vision: Thresholding, Segmentation, Connected component labeling, Hierarchical segmentation, Spatial clustering, Split & merge, Rule-based Segmentation, Motion-based segmentation. Area Extraction: Concepts, Data-structures, Edge, Line-Linking, Hough transform, Line fitting, Curve fitting (Least-square fitting). Middle level vision-Segmentation by clustering-Shot Boundary Detection and Background Subtraction-Image segmentation by clustering pixels-Segmentation by Graph-Theoretic clustering- Segmentation by fitting a model-The Hough Transform-Fitting lines-Fitting curves- Fitting as a probabilistic inference problem-Robustness-Segmentation and fitting using probabilistic methods.

**Module IV**

High level vision-:Geometric methods-Model based vision-Obtaining hypothesis by pose consistency, pose clustering and using Invariants- Verification-smooth surface and their outlines-Aspect graphs-Range data-Range Data segmentation- Range image Registration and model acquisition-Object Recognition.Shape correspondence and shape matching Principal component analysis Shape priors for recognition.

**References:**


1. Computer vision – A modern Approach , David A forsyth & Jean ponce , Prentice Hall ,2002.
2. Computer vision and Applications , Bernd Jahne and Horst HauBecker Academic press ,2000.
3. Robert Haralick and Linda Shapiro, "Computer and Robot Vision", Vol I, II, AddisonWesley, 1993.
4. Milan Sonka,Vaclav Hlavac, Roger Boyle, "Image Processing, Analysis, and Machine Vision" Thomson Learning.
5. Computer Vision:Algorithms and Applications by Richard Szliski.
6. Ma, Soatto, Kosecka and Sastry (MaSKS) An Invitation to 3D Vision.

## 19-202-0708 MOBILE APPLICATION DEVELOPMENT

***Course Outcomes:***

*On completion of this course the student will be able to:*

1. *Outline the architectures and infrastructure used in Mobile application development.*
2. *Identify user interface and client applications.*
3. *Evaluate the security issues involved in Mobile application development.*
4. *Design and develop android and iOS applications.*

**Module I**

Introduction-Mobility,Developing Mobile Applications.Mobile application architectures-Client-Server,Client, Server, Connection-types,synchronization,architectural patterns, design tenets. Mobile Infrastructure-Mobile Device Types, Mobile Device Components, Connection Methods.

**Module II**

Mobile client user interface-User interface, Application content, User experience, best practices for developing user interface. Mobile Client Applications- Thin client, Fat Client, Web page hosting,best practices. Client-Server data transfer-HTTP and HTML, WAP and WML, Synchronization software, RDA and Merge Replication, SOAP and WEB services,Message Queues, TCP/IP

**Module III**

Mobilizing Existing Application Architectures-Evolution of Enterprise Architectures, Anatomy of Enterprise Web Architecture, Considerations. Security- Mobilized Enterprise Web Architecture,User to Mobile client security issues,Mobile client security issues,client-server communication security issues,existing web architectures and back-end systems security issues.

**Module IV**

Developing android app-Using eclipse for android development,android navigation and interface design,persistent data in android,lists in android,maps and locations in android, access to hardware and sensors in android.Developing iOS app- Using Xcode for iOS development,iOS navigation and interface design,persistent data, tables,maps and locations, access to hardware and sensors in Ios

**References:**


1. Valentino Lee, Heather Schneider and Robbie Schell, Mobile Applications: Architecture, Design and Development, Prentice Hall, 2004.
2. Jakob Iversen and Michael Eierman,Learning Mobile App Development,A hands-on Guide to building apps with iOS and android, Addison-wesley,2014.
3. Dawn Griffiths, Head First Android Development, O'Reilly Media, Inc, 2015.
4. Jeff McWherter, Scott Gowell, “Professional Mobile Application Development” ,Wiley India Private Limited

## 19-202-0709 SYSTEM MODELLING AND SIMULATION

***Course Outcomes:***

*On completion of this course the student will be able to:*

1. *Summarize the various simulation and modeling tools used.*
2. *Interpret how different modelings are done mathematically.*
3. *Outline how and when to collect simulation data for modeling.*
4. *Acquire knowledge in advancements in computer based simulation scenarios.*

**Module I**

Introduction to simulation: Introduction – Simulation Terminologies – Advantages and Disadvantages of simulation-Application areas – Model Classification – Types of Simulation – Steps in a Simulation study – Concepts in Discrete Event Simulation – Simulation Examples

**Module II**

Mathematical Models: Statistical Models – Concepts – Discrete Distribution – continuous Distribution – Poisson Process – Empirical Distributions – Queueing Models – Characteristics – Notation – Queueing Systems – Markovian Models – Properties of random numbers – Generation of Pseudo Random numbers– Techniques of generating random numbers – Testing random number generators - Generating Random – Variates – Inverse Transform technique – Acceptance – Rejection technique – Composition & Convolution Method.

**Module III**

Analysis Of Simulation Data: Input Modeling – Data collection – Assessing sample independence – Hypothesizing distribution family with data – Parameter Estimation – Goodness-of-fit tests – Selecting input models in absence of data – Output analysis for a Single system – Terminating Simulations – Steady state simulations. Verification and validation: Model Building – Verification of Simulation Models – Calibration and Validation of Models – Validation of Model Assumptions – Validating Input – Output Transformations.

**Module IV**

Simulation of Computer Systems and Case Studies:Simulation Tools – Model Input – High level computer system simulation – CPU – Memory Simulation – Comparison of systems via simulation – simulation Programming techniques – Development of Simulation models.

**References:**


1. Jerry Banks and John Carson, Discrete Event System Simulation, 4th Edition, PHI, 2005.
2. Geoffrey Gordon,System Simulation,2nd Edition, PHI, 2006,ISBN 978-81- 203-014005.
3. Frank L.Severance, System Modeling and Simulation, Wiley, 2001.
4. Averill M. Law and David Kelton, W.,Simulation Modeling and Analysis, 3rd Edition, McGraw Hill, 2006.
5. Jerry Banks, Handbook of Simulation: Principles, Methodology, Advances, Applications and Practice Wiley, 1998.
6. Jerry Banks, Carson, J.S., Barry L. Nelson, David, M. N., Shahabudeen, P.Discrete - Event System Simulation, Pearson 4th Edition.

## 19-202-0710 CYBER LAW AND ETHICS

***Course Outcomes:***

*On completion of this course the student will be able to:*

1. *Explain the different forms of IPR's and related rules and regulations and the laws applicable to computer and software related contracts.*
2. *Identify different forms of Cyber crimes and the Indian and International laws to combat Cyber crimes and facilitate e-commerce.*
3. *Reason out different situations of ethics faced in the cyber world.*
4. *Analyse the ethical issues in computer society.*

**Module I**

Intellectual property rights, computer software copyrights, copyright in databases and electronic publishing, trade secrets, patent laws, trademarks, industrial designs, international implications of IPR Computer contracts, liability for defective hardware and software, Contract for writing software, Licence agreements, Website development contracts, Electronic contracts and torts, Liability of ISP's.

**Module II**

Computer crime, computer frauds, hacking, unauthorized modification of information, piracy, cyber harassment. cyberstalking, cyber defamation. Domain names and cybersquatting.

**Module III**

Cyber law in India ,IT Act 2000- Objectives, Provisions under IT Act, Authentication of electronic records, Digital signature,Offences under the IT Act 2000: sections 65 to 74, Case studies, Positive aspects and grey areas of the IT Act.Protection of IPR in Cyber space in India: copyright, patents; IPR's needing protection.

**Module IV**

International organizations to regulate e-commerce and cyber crimes, COE convention on cyber crimes.Ethical issues in computer security, Case studies.

**References:**


1. D. Bainbridge, Introduction to Information Technology Law, 6/e, Pearson Education, 2007.
2. Harish Chander, Cyber Laws and IT Protection, PHI Learning Private Limited, 2012.
3. P. Duggal, Cyber law: the Indian Perspective, Saakshar Law Publications, Delhi, 2005.
4. C. P. Fleeger and S. L. Fleeger, Security in Computing, 3/e, Pearson Education, 2003.

## 19-202-0711 BUSINESS INTELLIGENCE AND ANALYTICS

***Course Outcomes:***

*On completion of this course the student will be able to:*

1. *Explain the basic concepts and need of Business Intelligence and Analytics.*
2. *Explain how Business Intelligence and Analytics works.*
3. *Explain EPLC and what is expected of Business Intelligence and Analytics*
4. *Relate data mining and business intelligence.*
5. *Make use of existing data for prediction in Certain, Uncertain and risky situations.*
6. *Summarize the Role of Big Data and Big Data analytics.*
7. *Summarize recent and emerging trends in this area.*
8. *Apply various modeling techniques and propose an appropriate technique.*

**Module I**

Introduction to Business Intelligence, Business Modeling and Analytics, History and Evolution, Data, information, knowledge and intelligence. Enterprise Performance Life Cycle (EPLC).Decision making: key issues, frameworks for computerized decision support: Classical Framework, Decision Support Systems, Business Intelligence, Business Analytics; Phases of decision making and assisting foundations and technologies.

**Module II**

Importance and Role of : Data Warehousing, Visualization and Visual Analytics. Data mining: Concepts, Process and Methods. Using Artificial Neural Network and Support Vector Machines: Learning Process and Prediction. Mathematical models for decision support. Case studies.

**Module III**

Certainty, Uncertainty and Risk; Decision Tables and Decision Trees; Heuristic Search, Simulation and Genetic Algorithms; Knowledge Management. Understanding Big Data and Big Data analytics. Familiarize tools and technologies enabling for Big Data analytics. Role of Data Scientist. Case studies.

**Module IV**

Analytics by mining/analysis of : Text, Web, Sentiment, Speech, Social Networks,Geospatial and location based data. Advanced Applications and emerging trends. Potential of Cloud Computing.
Ethical and Legal issues with data collection and analytics.

**References:**


1. Ethem Alpaydin, Introduction to Machine Learning, MIT Press, Second Edition.
2. C. M. Bishop, Pattern recognition and Machine Learning, Springer 2007.
3. M. Mitchell, Machine Learning. Publisher, McGraw Hill, Edition 1997.
4. P. Harrington, Machine learning in action, Manning Publications Co,2012.
5. Stephen Marsland, Machine Learning: An Algorithmic Perspective, CRC Press, Second Edition.
6. Trevor Hastie, Robert Tibshirani, Jerome Friedman, “The Elements of Statistical Learning – Data Mining, Inference, and Prediction”, Springer, Second Edition.

## 19-202-0801 ADVANCED ARCHITECTURE AND PARALLEL PROCESSING

***Course Outcomes:***

*On completion of this course the student will be able to:*

1. *Summarize multiprocessors and multicomputer.*
2. *Utilize message passing mechanisms.*
3. *Outline memory hierarchy and caching mechanisms.*
4. *Elaborate pipelining and parallel programming.*

**Module I**

Parallel computer models-state of computing, multiprocessors and multicomputer, multivector and SIMD computers, PRAM and VLSI models, architectural development tracks. Program and Network Properties-Conditions of Parallelism, Program Partitioning and Scheduling, Program Flow Mechanism, System Interconnect Architectures. Principles of Scalable Performance-Performance Metrics and Measures, Parallel Processing Applications, Speedup Performance Laws, Scalability Analysis and Approaches.

**Module II**

Processors and Memory Hierarchy-Advanced Processor Technology, Superscalar and Vector Processors, Memory hierarchy technology, virtual memory technology. Bus, Cache and Shared Memory-Bus Systems, Cache Memory Organizations, Shared-Memory Organizations, Sequential and Weak Consistency Models.

**Module III**

Pipelining and Superscalar Techniques-Linear Pipeline Processors, Nonlinear Pipeline Processors, Instruction Pipeline design, Arithmetic Pipeline Design. Multiprocessor and Multicomputer-Multiprocessor System Interconnects, Cache Coherence and Synchronization Mechanisms, Message Passing Mechanisms. Vector Processing Principles.

**Module IV**

Parallel Programming- Parallel Programming Models, Parallel Languages and Compilers. Instruction Level parallelism- Design issues, model of typical processor, compiler-directed instruction level parallelism, operand forwarding, Tomsula's algorithm, branch prediction, thread level parallelism.

**References:**


1. Kai Hwang, Naresh Jotwani, Advanced Computer Architecture Parallelism, Scalability, Programmability, 3rd edition, McGraw-Hill Education,2011
2. Dezso Sima, Terence Fountain, Peter Karasuk, Advanced Computer Architecture-A design space approach, Pearson Education,2012
3. Sajjan G Shiva, Advanced Computer Architecture, CRC Taylor & Francis,2006.
4. David E Culler, Jaswinder Pal Singh, Anoop Gupta, Parallel Computer Architecture, Elsevier.
5. Hwang and Briggs,Computer Architecture and Parallel Processing,McGraw Hill.

## 19-202-0814 SEMINAR

***Course Outcomes:***

*On completion of this course the student will be able to:*

1. *Identify and familiarize with some of the good publications and journals in his/her field of study.*
2. *Acquaint with preparation of independent reports, name them based on a central theme and write abstracts, main body, conclusions and references.*
3. *Familiarize the effective use of tools for presentation and generate confidence in presenting a report before an audience.*
4. *Develop skills like time management, leadership quality and rapport with an audience.*

Students shall individually prepare and submit a seminar report on a topic of current relevance related to the field of Computers either hardware or software. The reference shall include standard journals, conference proceedings, reputed magazines and textbooks, technical reports and URLs.

The references shall be incorporated in the report following IEEE standards reflecting the state-of-the-art in the topic selected. Each student shall present a seminar for about 30 minutes duration on the selected topic. The report and presentation shall be evaluated by a team of internal experts comprising of 3 teachers based on style of presentation, technical content, adequacy of references, depth of knowledge and overall quality of the seminar report.

## 19-202-0815 PROJECT PHASE II

***Course Outcomes:***

*On completion of this course the student will be able to:*

1. *Apply required theory and experiments on the problem related to industry / research identified in Phase-I and solve it.*
2. *Realize various steps involved in conducting a project work, like literature survey, methodology adopted (field study / survey / experiments / numerical work), analysis of data to arrive at final results and conclusions.*
3. *Familiarize proper report writing with all of its major components with proper style of writing and preparation of distinct abstract and conclusions.*
4. *Conceive the benefits of working as a team and the wonderful results which could evolve through team-work.*
5. *Present and defend self-prepared report, verified by the project guide before a peer audience.*

The project work commencing from the seventh semester shall be completed and the project report shall be submitted by each student by the end of eighth semester. There shall be an internal examination of the project that includes a presentation, demonstration and oral examination of the project work.

Each batch of students shall develop the project designed during the seventh semester. The implementation phase shall proceed as follows:

A detailed algorithm level implementation, test data selection, validation, analysis of outputs and Necessary trial run shall be done.

Integration of hardware and software, if applicable, shall be carried out.

A detailed project report in the prescribed format shall be submitted at the end of the semester. All test results and relevant design and engineering documentation shall be included in the report. The work shall be reviewed and evaluated periodically

A committee consisting of the Project Coordinator (appointed by the Head of the Department / Division), project guide and at least one senior faculty member will carry out the assessment based on at least one Interim review and a final review just before the submission of the project report.

The final evaluation of the project shall be done by a team of minimum 3 internal examiners including the Project guide and shall include the following

Presentation of the work

Oral Examination

Demonstration of the project against design specifications

Quality and content of the project report

Guidelines for evaluation:

| | |
|---|---|
| (i) Regularity and progress of work | 40 |
| (ii) Work knowledge and Involvement | 40 |
| (iii) Semester end presentation and oral examination | 40 |
| (iv) Level of completion and demonstration of functionality/specifications | 40 |
| (v) Project Report – Presentation style and content | 40 |
| Total | 200 marks |

Note: Points (i) and (ii) to be evaluated by the respective project guide and the project coordinator based on continuous evaluation. (iii)-(v) to be evaluated by the final evaluation team.

## 19-202-0816 COMPREHENSIVE VIVA VOCE

***Course Outcomes:***

*On completion of this course the student will be able to:*

1. *Summarize all the subjects covered during the course.*
2. *Build good knowledge of theory and practice.*
3. *Develop oral communication skills and positive attitude.*
4. *Face technical interviews with confidence.*

Each student is required to appear for a viva-voce examination at the end of the complete course work. The examination panel shall comprise of Head of the Department / Division or his / her nominee and one senior faculty of the Department / Division and an external expert. The examination panel should be appointed by the University. The examiners shall evaluate the students in terms of their conceptual grasp of the course of study and practical/analysis skills in the field.

## 19-202-0802 BIG DATA ANALYTICS

***Course Outcomes:***

*On completion of this course the student will be able to:*

1. *Familiarize with the big data concepts and terminologies.*
2. *Compare and classify the cloud platforms and its services.*
3. *Familiarize the various components in Hadoop and MapReduce programming model.*
4. *Compare and analyse Apache with Hadoop.*
5. *Familiarize frequent use cases of big data in industry.*
6. *Analyse how existing machine learning applications can be scaled to big data domain.*

**Module I**

Data mining concepts, Applications of data mining, Stages of data mining-types of data mining applications -Data pre-processing- - data normalization, data transformation- data reduction-Web mining and text mining- case studies.

**Module II**

Introduction to cloud computing: Differences between cloud, cluster and grid. Cloud computing fundamentals, public vs. private clouds, Types of cloud services-PaaS, SaaS, IaaS, Examples for each service. Role of virtualization in enabling the cloud, Application Development: Service creation environments to develop cloud based applications. Development environments for service development: Amazon, Azure, Google App-Social network analysis-Tools and applications-Examples.

**Module III**

Introduction to Big Data: MapReduce Basics: Functional Programming Roots, Mappers and Reducers,The Execution Framework, Partitioners and Combiners, The Distributed File System, Hadoop Cluster Architecture, A word count example with MapReduce.

MapReduce Algorithm Design: Local Aggregation, Combiners and In-Mapper Combining, Algorithmic Correctness with Local Aggregation, Pairs and Stripes, Computing Relative Frequencies, Secondary Sorting, Relational Joins

**Module IV**

Big Data and Hadoop: Introduction to Hadoop Distributed File System, Hadoop ecosystem, MapReduce Implementation with Hadoop, Big Data Management Tools: PIG: Pig's Data Model, HIVE: Hive Architecture, HIVEQL, HBASE: MapReduce Integration, ZooKeeper, SQOOP. Introduction to Spark and its architecture. Comparison of Hadoop with spark. Different databases for big data platform: Cassendra, Neo4j

Case studies: Algorithms for Mining massive datasets for various kinds of research problems and projects for e-Governance.

**References:**


1. Jimmy Lin and Chris Dyer, Morgan & Claypool, Data-Intensive Text Processing with Map Reduce, Synthesis Lectures, 2010.
2. Anthony T. Velte, Toby J. Velte, Elsenpeter, R., Cloud Computing a practical approach, Tata McGraw-HILL, 2010.
3. kJiawei Han & Micheline Kamber, Morgan Kaufmann, Data Mining – Concepts and Techniques -Publishers, Elsevier,2nd Edition, 2006
4. Ian H.Witten, Frank, E., Hall, M.A., Data mining-Practical machine learning tools and techniques,Third edition, Elsevier Publications.
5. Margaret H. Dunham and Sridhar, S., Data Mining: Introductory and Advanced Topics , First edition,Pearson Education.
6. Karau, H. et.al, Learning Spark: lightning-fast big data analysis , OReilly Publishers.

## 19-202-0803 CLOUD COMPUTING

***Course Outcomes:***

*On completion of this course the student will be able to:*

1. *Identify benefits and challenges of cloud computing and services.*
2. *Explain structure of cloud architecture.*
3. *Illustrate cloud virtualization concepts.*
4. *Discuss the challenges in cloud security.*
5. *Analyze different cloud services.*

**Module I**

Cloud Computing: History of Cloud Computing - Cloud Computing definition, private, public and hybrid cloud. Cloud types : IaaS, PaaS, SaaS - Cloud Architecture - Cloud Storage - Why Cloud Computing Matters - Advantages of Cloud Computing - Benefits and challenges of cloud computing, public vs private clouds, role of virtualization in enabling the cloud - Disadvantages of Cloud Computing - Business Agility: Benefits and challenges to Cloud architecture. Application availability, performance, security and disaster recovery - Companies in the Cloud Today - Cloud Services - Next generation Cloud Applications.

**Module II**

Basics of Virtualization - Types of Virtualization - Implementation Levels of Virtualization -Virtualization Structures - Tools and Mechanisms - Virtualization of CPU, Memory, I/O Devices - Virtual Clusters and Resource management – Virtualization for Data-center Automation.

**Module III**

Architectural Design of Compute and Storage Clouds – Layered Cloud Architecture Development - Design Challenges - Inter Cloud Resource Management - Resource Provisioning and Platform Deployment - Global Exchange of Cloud Resources. Security Overview - Cloud Security Challenges and Risks - Software-as-a-Service Security - Risk Management - Security Monitoring - Security Architecture Design - Data Security - Application Security - Virtual Machine Security – Identity Management and Access Control -Autonomic Security.

**Module IV**

Web-Based Application - Pros and Cons of Cloud Service Development - Types of Cloud Service Development - Software as a Service - Platform as a Service - Web Services - On-Demand Computing - Discovering Cloud Services Development Services and Tools - Amazon EC2 - Google App Engine , Windows Azure. Programming Support - Google App Engine, Amazon AWS, Windows Azure - Cloud Software Environments - Eucalyptus, Opennebula, OpenStack, Aneka, CloudSim.

**References:**


1. Kai Hwang, Geoffrey C. Fox, Jack G. Dongarra, Distributed and Cloud Computing, From Parallel Processing to the Internet of Things, Morgan Kaufmann Publishers, 2012.
2. John W. Rittinghouse and James F. Ransome, Cloud Computing: Implementation, Management,and Security, CRC Press, 2010.
3. Toby Velte, Anthony Velte, Robert Elsenpeter, Cloud Computing, A Practical Approach, TMH,2009.
4. Kumar Saurabh, Cloud Computing – insights into New-Era Infrastructure,Wiley India,2011.
5. George Reese, Cloud Application Architectures: Building Applications and Infrastructure in the Cloud O'Reilly.
6. James E. Smith, Ravi Nair, Virtual Machines: Versatile Platforms for Systems and Processes ,Elsevier/Morgan Kaufmann, 2005.

## 19-202-0804 COMPUTATIONAL LINGUISTICS

***Course Outcomes:***

*On completion of this course the student will be able to:*

1. *Identify the theoretical foundation of natural language processing in linguistics and formal language theory.*
2. *Explain the elements and applications of parts of speech tagging and parsing.*
3. *Explain the elements of semantic analysis.*
4. *Compare rule based and statistical algorithms used in NLP.*
5. *Discuss the limitations and capabilities of current natural language processing technologies.*

**Module I**

Words- Regular Expressions and Finite Automata-Morphology and Finite State Transducers-Probabilistic Models of Pronunciation and Spelling -N grams, HMMs and speech recognition, computational phonology and Text to speech.

**Module II**

Syntax- Word Classes and Part-of-Speech Tagging and chunking-HMM Taggers- probabilistic Context Free Grammars for English Syntax-Parsing with Context Free Grammars- lexicalized and probabilistic parsing- Features and Unification-Language and Complexity.

**Module III**

Semantics-Representing Meaning-canonical forms- FOPC-ambiguity resolution-scoping phenomena -Semantic Analysis-syntax driven semantic analysis-Lexical Semantics-Word Sense Disambiguation and Information Retrieval.

**Module IV**

Pragmatics- Discourse-Reference Resolution -Text Coherence -Dialog and Conversational Agents-Dialogue acts-dialogue structure, natural language generation, Statistical alignment and machine translation-clustering- text categorization.

**References:**


1. Daniel Jurafsky and James Martin, Speech and Language Processing, 2nd Edition, PH, 2008.
2. James Pustejovsky, Amber Stubbs, Natural language annotation for machine learning, O'Reilly, 2012.
3. Alexander Clark and Chris Fox, The Handbook of Computational linguistics and natural language processing, Wiley-Blackwell, 2012.
4. Grant S Ingersoll, Thomas Morton, Andrew L Farris, Taming Text, Manning Publications, 2013 Christopher D. Manning and Hin Rich Schutze, Foundations of statistical natural language processing, 1st Edition, MIT press, 1999.

## 19-202-0805 HIGH PERFORMANCE COMPUTING

***Course Outcomes:***

*On completion of this course the student will be able to;*

1. *Design a powerful and cost effective computer system.*
2. *Provide the basic concepts of parallel processing on high performance computers*
3. *Analyse the various paradigms of high performance computing and their potential for performance and programmability.*
4. *Explain different parallel processing architectures.*

**Module I**

Introduction to parallel processing-Trends towards parallel processing-Parallelism in uniprocessor-parallel computer structures-Architecture classification schemes,Amdahl's law,Indian contribution to parallel processing.

**Module II**

Principles of pipelining and vector processing-Linear pipelining-Classification of pipeline processors-General pipelines-Instruction and Arithmetic pipelines–Design of Pipelined instruction unit-Principles of Designing Pipeline Processors-Instruction prefetch and branch handling -Data Buffering and Busing Structure-Internal forwarding and register tagging-Hazard detection and Resolution, Dynamic pipelines and Reconfigurability.

**Module III**

Array processors -SIMD array processors-Interconnection networks-Static vs dynamic networks-mesh connected networks-Cube interconnection networks-Parallel algorithms for array processors-SIMD matrix multiplication -Parallel sorting on array processors-Associative array processing-Memory organization.

**Module IV**

Multiprocessor architectures and Programming-Loosely coupled and Tightly coupled multiprocessors-Interconnection networks-Language features to exploit parallelism-Interprocess communication mechanism-Process synchronisation mechanisms,synchronization with semaphores.

**References:**


1. Computer Architecture &Parallel Processing-Kai Hwang &FayeA.Briggs, McGraw Hill.
2. Computer architecture A quantitative approach-John L Hennessy and David A.Patterson-Elsevier,Fourth Edition.
3. Elements of Parallel computing-V. Rajaraman-PHI.
4. Parellel Processing for Super Computers & AI Kai Hwange & Douglas Degneot Mc Graw Hill.
5. HIgh Performance Computer Architecture-Harold S. Stone, Addison Wesley.
6. Advanced Computing-Vijay P.Bhatkar, Asok V.Joshi,Arirban Basu, Asok K.Sharma.

## 19-202-0806 MACHINE LEARNING

***Course Outcomes:***

*On completion of this course the student will be able to:*

1. *Explain various learning approaches and concepts of supervised learning.*
2. *Compare the different dimensionality reduction techniques.*
3. *Make use of theoretical foundations of decision trees to identify best split and Bayesian classifier.*
4. *Make use of clustering algorithms.*
5. *Identification of classifier models for typical machine learning applications.*
6. *Combine algorithms and analyze different algorithms.*

**Module I**

Introduction to machine learning: importance, identification of Problems, data sets, Types of Learning, application examples. Supervised Learning: Learning a Class, Vapnik-Chervonenkis(VC) Dimension, Probably Approximately Correct(PAC) Learning, Learning multiple Classes, Regression, Model Selection and Generalization. Bayesian Decision Theory; Parametric Methods: Maximum Likelihood Estimation, Bias and Variance, The Bayes' Estimator.

**Module II**

Dimensionality reduction: Subset Selection, Principal Components Analysis, Factor Analysis, Multidimensional Scaling, Linear Discriminant Analysis. Unsupervised Learning: Clustering, Mixture Densities, k-Means Clustering, Expectation-Maximization Algorithm, Mixtures of Latent Variable Models, Supervised Learning after Clustering, Hierarchical Clustering, Choosing the Number of Clusters.

**Module III**

Nonparametric Methods: Nonparametric Density Estimation, Generalization to Multivariate Data, Nonparametric Classification, Condensed Nearest Neighbor, Nonparametric regression. Decision Trees: Univariate Trees, Pruning, Rule Extraction from Trees, Learning Rules from Data, Multivariate Trees. Kernel Machines: SVM, Optimal Separating Hyperplane, Soft Margin Hyperplane, ν-SVM, Kernel Trick, Vectorial Kernels, Defining Kernels.

**Module IV**

Graphical models: Discrete Markov Processes and Hidden Markov models, example graphical models. Reinforcement Learning : model based and temporal difference learning. Combining multiple Learners: Ensembles, model combination schemes, Voting, Bagging, Boosting. Neural Networks: Perceptrons, Training, Learning boolean functions, Back Propagation, Multilayer Perceptrons, Deep Neural Networks. Competitive Learning, Radial Basis Function.

Design and Analysis of Machine Learning Experiments, Structural risk minimization.

**References:**


1. Ethem Alpaydin, Introduction to Machine Learning, MIT Press, Second Edition .
2. C. M. Bishop, Pattern recognition and Machine Learning, Springer 2007.
3. M. Mitchell, Machine Learning. Publisher, McGraw Hill, Edition 1997.
4. P. Harrington, Machine learning in action, Manning Publications Co,2012.
5. Stephen Marsland, Machine Learning: An Algorithmic Perspective, CRC Press, Second Edition.

## 19-202-0807 AGENT BASED INTELLIGENT SYSTEM

***Course Outcomes:***

*On completion of this course the student will be able to:*

1. *Define the algorithmic foundation of agents and multi agent systems.*
2. *Explain theoretical foundations of agent based system.*
3. *Apply Bayesian networks for probabilistic reasoning.*
4. *Create logical agents to do inference using first order logic.*

**Module I**

Introduction: Definitions – Foundations – History – Intelligent Agents – Problem Solving –Searching – Heuristics – Constraint satisfaction Problems – Game Playing. Knowledge representation and reasoning: Logical agents – First order logic – First Order Inference – Unification – Chaining – Resolution Strategies – Knowledge Representation – Objects – Actions – Events.

**Module II**

Planning Agents: Planning Problem – State Space Search – Partial Order Planning _Graphs – No deterministic Domains – Conditional Planning – continuous Planning – Multiagent Planning.

**Module III**

Agents And Uncertainty: Acting under uncertainty – Probability Notation – Bayes Rule and use – Bayesian Networks – Other approaches – Time and Uncertainty – Temporal Models – Utility Theory – Decision Network – Complex Decisions.

**Module IV**

Higher Level Agents: Knowledge in Learning – Relevance information –Statistical Learning Methods – Reinforcement Learning – Communication – Formal Grammar – Augmented Grammars- Future of AI.

**References:**


1. Stuart Russell and Peter Norvig, Artificial Intelligence – A Modern Approach. 3rd Edition, Prentice Hall, 2009.
2. Michael Wooldridge, An Introduction to Multi Agent System, 2nd Edition, John Wiley,. ISBN: 978-0-470-51946-2.
3. Winston, Patrick Henry, Artificial intelligence, Addison Wesley ,2008.

## 19-202-0808 AUGMENTED REALITY

***Course Outcomes:***

*On completion of this course the student will be able to:*

1. *Define alternative 3D compositing techniques using computer vision.*
2. *Extend knowledge in 3D vision.*
3. *Develop applications in interactive interfaces most notably augmented reality interfaces on mobile devices.*
4. *Develop skills in the design and development of interactive augmented reality games.*

**Module I**

Introduction of Virtual Reality:Fundamental Concept and Components of Virtual Reality-Primary Features and Present Development on Virtual Reality.

Multiple Modals of Input and Output Interface in Virtual Reality:Input-Tracker, Sensor,Digital Glove, Movement Capture, Video-based Input, 3D Menus & 3D Scanner etc. Output-Visual /Auditory / Haptic Devices.

**Module II**

Visual Computation in Virtual Reality:Fundamentals of Computer Graphics. Software and Hardware Technology on Stereoscopic Display. Advanced Techniques in CG: Management of Large Scale Environments & Real Time Rendering

Environment Modeling in Virtual Reality:Geometric Modeling, Behavior Simulation,Physically Based Simulation.Interactive Techniques in Virtual Reality:Body Track, Hand Gesture, 3D Manus, Object Grasp.

**Module III**

Introduction of Augmented Reality (AR):System Structure of Augmented Reality. Key Technology in AR.Development Tools and Frameworks in Virtual Reality:Frameworks of Software Development Tools in VR. X3D Standard; Vega, MultiGen, Virtools etc.

**Module IV**

Application of VR in Digital Entertainment :VR Technology in Film & TV Production.VR Technology in Physical Exercises and Games. Demonstration of Digital Entertainment by VR.

**References:**


1. Virtual Reality Technology(2nd Ed.)–Grigore C. Burdea & Philippe Coiffet.John Wiley & Sons, Inc. 2003.
2. Sherman, William R. and Alan B. Craig. Understanding Virtual Reality – Interface,Application, and Design, Morgan Kaufmann,2002.
3. Fei GAO. Design and Development of Virtual Reality Application System, Tsinghua Press, March 2012.
4. Julie Carmigniani and Borko Furht.Handbook of Augmented Reality, DOI10.1007/978-1-4614-0064-6 1.

## 19-202-0809 ETHICAL HACKING

***Course Outcomes:***

*On completion of this course the student will be able to:*

1. *Outline the vulnerabilities in a system or network.*
2. *Analyze and critically evaluate techniques used to break into an insecure web application and identify relevant countermeasures.*
3. *Demonstrate a critical evaluation of an advanced security topic with an independent project.*
4. *Critically evaluate the potential counter measures to advanced hacking techniques.*
5. *Explain computer forensic fundamentals.*

**Module I**

Ethical Hacking−Overview-Hacker types-Threats and attacks ,Vulnerabilities, Phases of hacking-Reconnaissance-Scanning-Maintaining Access with Backdoors and Rootkits-Clearing traces. System Hacking-Hacking Windows-Hacking UNIX-Remote connectivity and VoIP Hacking. Software Hacking-Hacking code-Web Hacking-Hacking the Internet User.

**Module II**

Password Hacking-Dictionary attack-Hybrid Dictionary attack-Brute force attack-Rainbow tables. A study on various attacks– Input validation attacks – SQL injection attacks – Buffer overflow attacks - Privacy attacks.

**Module III**

TCP / IP – IP Spoofing, port scanning, DNS Spoofing. Dos attacks – SYN attacks, Smurf attacks, UDP flooding, DDOS – Models. Batch File Programming.

**Module IV**

Overview of computer forensics technology: computer forensics services-Data seizure-Data duplication and preservation-Data recovery-Document searches-Media conversion-Expert witness services-Computer evidence service options-Other miscellaneous services.

**References:**


1. Hacking Exposed: Network Security Secrets & Solutions, Stuart McClure, Joel Scambray and George Kurtz, McGraw-Hill, 2005.
2. Patrick Engebretson, The Basics of Hacking and Penetration Testing, Elsevier, 2013.
3. Network intrusion alert: an ethical hacking guide to intrusion detection, Ankit Fadia, Manu Zacharia, Thomson Course Technology PTR, 2007.
4. Ethical Hacking, Thomas Mathew, OSB Publisher, 2003.
5. Network Security and Ethical Hacking, Rajat Khare, Luniver Press, 2006.
6. John R. Vacca, Computer Forensics: Computer Crime Scene Investigation, 2nd Edition.

## 19-202-0810 HIGH PERFORMANCE EMBEDDED COMPUTING

***Course Outcomes:***

*On completion of this course the student will be able to:*

1. *Analyze how to improve the quality of the programs on high performance embedded computer systems.*
2. *Identify the basic architectural techniques and analyze performance and energy consumption for both hardware and software.*
3. *Outline the characteristics of HPEC.*
4. *List the parallel processing methods in embedded systems.*
5. *Define the program optimization and performance analysis.*

**Module I**

The Landscape of HPEC- Example applications, Design Methodologies-Embedded Systems Design Flows-Standards-Based Design Methodologies-Models of Computation-Parallelism and Communication , CE Architectures.

**Module II**

Evaluating Processors- RISC DSP Processors, Parallel Execution Mechanisms-Superscalar SIMD and Vector Processors, Variable-Performance CPU Architectures, CPU Simulation Automated CPU Design, Code Generation and Back-End Compilation, Memory-Oriented Optimizations, Program Performance Analysis- Models of Computation and Programming.

**Module III**

Multiprocessor Architectures, Multiprocessor Design Techniques, Multiprocessor Architectures, Processing Elements, Interconnection Networks, Physically Distributed Systems and Networks, Multiprocessor Design Methodologies and Algorithms.

**Module IV**

Multiprocessor Software - RT Multiprocessor Operating Systems, Services and Middleware for Embedded Multiprocessors, Hardware and Software Co-design-Performance Analysis, Hardware/Software Co-synthesis Algorithms, Hardware/Software Co-simulation.

**References:**


1. Marilyn Wolf, High-Performance Embedded Computing, Second Edition, Morgan Kaufmann Publishers, ISBN: 9780124105119, 0124105114.
2. Wayne Wolf, High-Performance Embedded Computing Architectures, Applications, and Methodologies, 1st Edition, Morgan Kaufmann Publishers, ISBN 13: 978-0-12-369485-0.
3. Larry L. Peterson, Computer Networks - A System Approach 5th Edition Morgan Kaufmann Publishers, ISBN: 9789380501932.
4. Joseph .A. Fisher, Paolo Faraboschi, Cliff Young, Embedded Computing:A VLIW Approach to Architecture, Compilers and Tools, Elsevier, ISBN: 9780080477541.
5. Bruce Powel Douglass, Real-Time UML: Developing Efficient Objects for Embedded Systems, Reading MA: Addison-Wesley Longman, 1998, ISBN: 9780849371974.
6. D.R. Martinez ,High Performance Embedded Computing Handbook A Systems Perspective 1st Edition, Crc Press.

## 19-202-0811 CYBERSPACE AND INFORMATION SYSTEM SECURITY

***Course Outcomes:***

*On completion of this course the student will be able to:*

1. *Explain the need of security in cyberspace.*
2. *Explain the components of Information System and challenges in Information System Security.*
3. *Explain why controls are necessary in Information systems.*
4. *Explain methods of controlling Information systems.*
5. *Explain how controls are introduced in Information systems.*
6. *Choose the required controls to ensure security of an Information system.*
7. *Summarize immediate steps to be taken in the event of a cybercrime .*

**Module I**

Computer, Network, History of Network, Types of network, Internet, www, IP Address, E-mail working, Servers, DNS Servers, Service providers, e-commerce.Cyberspace, Cyber crime, Cyber Security, importance of Cyber Laws: National and International. Data, Information, Knowledge, Information Security, need, History and evolution of Information Security, Critical Concepts of Information Security. Information System, Components of the Information System; Balancing Information Security and Access.

**Module II**

Need of Security: Vulnerabilities, Threats, Attacks, Risks. SecSDLC. Supporting Tools and Technology: Cryptology, Cipher methods, Symmetric and Asymmetric algorithms, Cryptanalysis, Cryptographic Tools, Protocols supporting security, Attacks on cryptosystems. Firewalls, Intrusion Detection and Prevention Systems, Honeypots , honeynets, padded cell systems, scanning and analysis tools.

**Module III**

Risk Management: Overview, Identification, Assessment, Control Strategies. Planning: Practises, Procedure, Guideline, Standards, Policy, Information Security Blueprint, Importance of Education, Training and awareness programs, Continuity Strategies.

**Module IV**

Implementing Security Controls: Information Security Project Management, technical and non-technical aspects. Positioning and staffing security function, Employment policies and practises, considerations for non-employees.

Maintenance: Maintenance models. Digital Forensics: Evidence Collection and seizure, Duplication and preservation of evidence.

**References:**


1. Information Technology Amended Act, 2008, Ministry of Law and Justice, Government of India.
2. M. E. Whitman and H. J. Mattord, “Principles of Information Security,” 4th Edition.
3. Ron Weber, Information system Audit and Control, Pearson Education.
4. John R Vacca, Computer Forensics: Computer Crime Scene Investigation, 2nd Edition.

## 19-202-0812 SOFT COMPUTING

***Course Outcomes:***

*On completion of this course the student will be able to:*

1. *Classify the different soft computing techniques and their applications.*
2. *Define Artificial neural network and its applications.*
3. *Analyze various neural network architectures.*
4. *Demonstrate the concept of genetic algorithm and its applications.*

**Module I**

Introduction to Soft Computing Soft- computing versus Hard computing-Characteristics of Soft computing, Some applications of Soft computing techniques. Artificial neural networks - biological neurons, Basic models of artificial neural networks – Connections, Learning, Activation Functions, McCulloch and Pitts Neuron.

**Module II**

Fuzzy logic, fuzzy sets - properties - operations on fuzzy sets, fuzzy relations - operations on fuzzy relations Fuzzy membership functions,Operations on Fuzzy sets Fuzzy logic controller design.Some applications of Fuzzy logic.

**Module III**

Fuzzy membership functions, fuzzification, Methods of membership value assignments – intuition – inference – rank ordering, Lambda – cuts for fuzzy sets, Defuzzification methods.

Truth values and Tables in Fuzzy Logic, Fuzzy propositions, Formation of fuzzy rules - Decomposition of rules – Aggregation of rules, multi-objective optimization problems (MOOPs) and issues of solving them. Multi-Objective Evolutionary Algorithm (MOEA).

**Module IV**

Introduction to genetic algorithm, Basic GA framework and different GA architectures- operators in genetic algorithm - coding - selection - crossover – mutation, Stopping condition for genetic algorithm flow, Genetic-neuro hybrid systems, solving single-objective optimization problems using Gas.

**References:**


1. Timothy J. Ross, Fuzzy Logic with engineering applications , John Wiley & Sons, 2016.
2. S. N. Sivanandam and S. N.Deepa, Principles of soft computing – John Wiley & Sons, 2007.
3. Simon Haykin, Neural Network- A Comprehensive Foundation- Prentice Hall International, Inc.1998
4. R. Eberhart and Y. Shi, Computational Intelligence: Concepts to Implementation, Morgan Kaufman/Elsevier, 2007.
5. Driankov D., Hellendoorn H. and Reinfrank M., An Introduction to Fuzzy Control-Narosa Pub., 2001.
6. Melanie Mitchell, An Introduction to Genetic Algorithms, MIT Press, 2000.

## 19-202-0813 INTERNET OF THINGS

***Course Outcomes:***

*On completion of this course the student will be able to:*

1. *Familiarise IoT and its components.*
2. *Familiarise programming the microcontroller for IoT.*
3. *Get a deep insight to market perspective of IoT.*
4. *Learn data and knowledge management and use of Devices in IoT Technology.*

**Module I**

Introduction to Internet of Things: Introduction – Definition - phases – Foundations – Policy -Challenges and Issues – identification - security –privacy.Components in internet of things: Control Units-Sensors -Communication modules - Power Sources -Communication Technologies - RFID - Bluetooth –Zigbee – Wifi – RF links - Mobile Internet - Wired Communication.

**Module II**

Programming the Microcontroller for IoT: Basics of Sensors and actuators - examples and working principles of sensors and actuators - Cloud computing and lOT - Arduino/Equivalent Microcontroller platform- Setting up the board - Programming for lOT- Reading from Sensors; Communication: Connecting microcontroller with mobile devices – communication through Bluetooth and USB - connection with the internet using wifi / Ethernet.

**Module III**

Fundamental Concepts of Agility and Autonomy -Enabling Autonomy and Agility by the Internet of Things -23 Technical Requirements for Satisfying the New Demands in Production - The Evolution from the RFID-based EPC Network to an Agent based Internet of Things - Agents for the Behavior of Objects.

**Module IV**

Business Models for the Internet of Things: The Meaning of DiY in the Network Society - Sensor-actuator technologies and Middleware as a basis for a DiY Service Creation Framework - Device Integration - Middleware Technologies Needed for a DiY Internet of Things - Semantic Interoperability as a Requirement for DiY Creation –Ontology - Value Creation in the Internet of Things - Application of Ontology Engineering in the Internet of Things - Semantic Web-Ontology - The Internet of Things in Context of EURIDICE Business Impact.

**References:**


1. Charalampos Doukas, Building Internet of Things with the Arduino, Create space, April 2002.
2. Dieter Uckelmann et.al, “Architecting the Internet of Things”, Springer, 2011.
3. Luigi Atzor et.al, The Internet of Things: A survey, Journal on Networks, Elsevier.