COCHIN UNIVERSITY OF SCIENCE AND TECHNOLOGY

B.TECH. DEGREE COURSE
IN
COMPUTER SCIENCE AND ENGINEERING

(2019 Admissions)

SCHEME OF EXAMINATIONS & SYLLABUS
(I-VIII SEMESTERS)
# B.TECH. DEGREE COURSE IN
# COMPUTER SCIENCE AND ENGINEERING

## Scheme of Examinations (2019 Admissions)

### SEMESTER I

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CA – Continuous Assessment, SEE – Semester End Examination

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

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

**19-202-0506 to 0509: PROFESSIONAL ELECTIVE I**
19-202-0506(IE) Web Technologies
19-202-0507 Machine Learning
19-202-0508 Embedded System Design
19-202-0509 Bioinformatics

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* Common for CS/IT

**19-202-0606 to 0609: PROFESSIONAL ELECTIVE II**
19-202-0606(IE) Neural Networks and Deep Learning
19-202-0607 Software Project Management
19-202-0608 Digital Image Processing
19-202-0609 Ethical Hacking
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* Common for CS/EC/EE/IT

**PROFESSIONAL ELECTIVE III**
- 19-202-0704(IE) Mobile Computing Technology
- 19-202-0705 Internet of Things and Applications
- 19-202-0706 Biometric Technologies
- 19-202-0707 Computer Vision

*** Common for CS/IT

**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

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**19-202-0802 to 0805:PROFESSIONAL ELECTIVE IV**
19-202-0802 Big Data Analytics
19-202-0803 Augmented Reality
19-202-0804 Computational Linguistics
19-202-0805 Recommender Systems

**19-202-0806 to 0809:PROFESSIONAL ELECTIVE V**
19-202-0806 Cloud Computing
19-202-0807 Agent Based Intelligent System
19-202-0808 Blockchain
19-202-0809 Advanced Compiler Design and Optimization

**19-202-0810 to 0814: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
19-200-0814 Constitutional Law

**Industry based Electives**
Industry based Electives are offered in 5th, 6th and 7th Semesters and are listed among the Professional Electives with notation (IE) along with the subject code. A student should opt for at least one Industry based elective during the B.Tech. programme.

**Open Electives**
Open Electives are offered in 7th and 8th Semesters. A student should opt for at least one Open Elective offered by any Division other than their branch of study.

**Industrial Internship**
Industrial Internship of a minimum duration of 2 weeks must be completed after 4th Semester and before commencement of 7th Semester. The evaluation of internship will be conducted along with Project Phase I.

**Evaluation Pattern for Theory and Practical courses**

**Theory courses**
Type of Questions for Semester End Examination (SEE)

**PART - A (8 x 3 = 24 marks)**
Question No. I (a) to (h) – Eight short answer questions of 3 marks each with two questions from each of the four modules.

**PART - B (4 x 12 = 48 marks)**
Question nos. II, III with sub sections (a), (b)------------------------12 marks each with option to answer either II or III from Module I.

Question nos. IV, V with sub sections (a), (b)------------------------12 marks each with option to answer either IV or V from Module II.
Question nos. VI, VII with sub sections (a), (b)------------------12 marks each with option to answer either VI or VII from Module III.

Question nos. VIII, IX with sub sections (a), (b)------------------12 marks each with option to answer either VIII or IX from Module IV.

**Maximum marks that can be awarded for the Semester End Examination (SEE) will be only 60, eventhough the questions are for 72 marks.**

**Practical courses**

50% marks is earmarked for Continuous Assessment and 50% marks for Semester End Examination. The Semester End Examination is to be conducted by a minimum of two examiners including one not below the rank of an Associate Professor.

**Pass Requirements**

A candidate has to obtain a minimum of 50% marks for Continuous Assessment and Semester End Examination put together with a minimum of 40% marks in the Semester End Examination for a pass in the theory and laboratory courses.

In the case of theory / laboratory / other courses having only continuous assessment, a candidate has to obtain a minimum of 50% marks in Continuous Assessment for a pass.
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.

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.
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 scalar 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:
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
Holography—basic principle—Comparison with ordinary photography—Recording and reconstruction of holograms—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.
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.

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—Applications of nanotechnology.

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.
Ultrasonics—production of ultrasonics—piezo electric effect—Magnetostriiction effect—properties of ultrasonics—Application of ultrasonics in non-destructive testing—Acoustics of building—reverberation—Absorption Coefficient—Sabines formula for reverberation time (no derivation)—Acoustic intensity—loudness—decibel—phon—conditions for good acoustics(Qualitative study).

References:
Course Outcomes:
On completion of this course the 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
**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:**

Course outcomes:
On completion of this course the student 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 on the Kerala Municipality Building Rule

Module I
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
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:
6. Kerala Municipal Building Rules (latest revision)
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 Clausius 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, Carbureted 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:
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. Higher order thinking and evaluation, information-seeking, research, and independent learning, synthesis, creativity, problem analysis and problem solving. Decision making, Self-reflection and learning from experience.

Module IV

References:

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. Semester End Examination is not envisaged.

3. A student should secure a minimum of 50% marks in continuous assessment for a pass in the course.
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.
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
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.
9. ‘Just A Minute’ Sessions (JAM).
10. Describing Objects / Situations / People.
11. Debate
12. Group discussion
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.
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:
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:
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

Module III

Module IV
Engineering materials:

References:
5. B.L. Tembe, M.S. Krishnan and Kamaluddin. Engineering Chemistry (NPTEL Web Course)
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
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:

Type of questions for Semester End Examination
Two questions of 12 marks each from Module I with option to answer any one. (1 x 12 = 12)
Two questions of 15 marks each from Module II, Module III, Module IV and Module V with option to answer any one question from each module. (4 x 15 = 60).
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
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:
New Delhi. (2012)
Delhi. (2005)
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

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:

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)

Module III
Disaster management: floods, earthquake, cyclone and landslides.
Module IV


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:

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.
10. Soldering practice.
11. Familiarisation of CRO.
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.
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:**
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

Module III

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:
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

Module III

Module IV

References:
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

Module II

Module III

Module IV

References:
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

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

Module IV

References:
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

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

Module III

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:
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

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

Module IV

References:
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
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).
3. Transfer characteristics and specifications of TTL gates

References:
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:
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:
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 peripheral 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

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:
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

References:
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

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

References:
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

Module II

Module III

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:

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

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

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:
Course Outcomes:
On completion of this course the student will be able to:
1. More aware of themselves and their surroundings (family, society, nature).
2. More responsible in life in handling problems with sustainable solutions
4. Having better critical ability and would also become sensitive to their commitment towards what they have understood (human values, human relationship and human society).
5. Apply what they have learnt to their real life.

Module I: Course Introduction - Need, Basic Guidelines, Content and Process for Value Education
Purpose and motivation for the course, recapitulation from Universal Human Values-I
Self-Exploration –what is it? - Its content and process; ‘Natural Acceptance’ and experiential Validation - as the process for self-exploration
Continuous Happiness and Prosperity- A look at basic Human Aspirations
Right understanding, Relationship and Physical Facility- the basic requirements for fulfilment of aspirations of every human being with their correct priority
Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario
Method to fulfil the above human aspirations: understanding and living in harmony at various levels.

Include practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking

Module II: Understanding Harmony in the Human Being - Harmony in Myself!
Understanding human being as a co-existence of the sentient ‘I’ and the material ‘Body’
Understanding the needs of Self (‘I’) and ‘Body’ - happiness and physical facility
Understanding the Body as an instrument of ‘I’ (I being the doer, seer and enjoyer)
Understanding the characteristics and activities of ‘I’ and harmony in ‘I’
Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail
Programs to ensure Sanyam and Health.

Include practice sessions to discuss the role others have played in making material goods available to me. Identifying from one’s own life. Differentiate between prosperity and accumulation. Discuss program for ensuring health vs dealing with disease

Module III: Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship
Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship
Understanding the meaning of Trust; Difference between intention and competence
Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship
Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals
Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family.

Include practice sessions to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students’ lives

Module IV: Understanding Harmony in the Nature and Existence - Whole existence as Coexistence

Understanding the harmony in the Nature
Interconnectedness and mutual fulfilment among the four orders of nature- recyclability
and selfregulation in nature
Understanding Existence as Co-existence of mutually interacting units in all-pervasive space
Holistic perception of harmony at all levels of existence.

Include practice sessions to discuss human being as cause of imbalance in nature (film “Home” can be used), pollution, depletion of resources and role of technology etc.

Module V: Implications of the above Holistic Understanding of Harmony on Professional Ethics

Natural acceptance of human values, Definitiveness of Ethical Human Conduct
Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order
Competence in professional ethics: a. Ability to utilize the professional competence for augmenting
universal human order b. Ability to identify the scope and characteristics of people friendly and
eco-friendly production systems, c. Ability to identify and develop appropriate technologies and
management patterns for above production systems.

Case studies of typical holistic technologies, management models and production systems
Strategy for transition from the present state to Universal Human Order: a. At the level of individual:
as socially and ecologically responsible engineers, technologists and managers b. At the level of
society: as mutually enriching institutions and organizations Sum up.

Include practice exercises and case studies to discuss the conduct as an engineer or scientist etc.

References:
1. R R Gaur, R Asthana, G P Bagaria, Human Values and Professional Ethics, 2nd revised
   edition, Excel Books, New Delhi, 2019
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:
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
1. Simple programming exercises in Java.
2. Implementation in Java for Stacks – various applications.
3. Implementation in Java for Queues-Linear and circular.

Cycle-II
1. Implementation in Java for Searching and Sorting.

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

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

References:
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

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:
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

Module II

Module III

Module IV

References:
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

Module III

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

References:
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

Module II

Module III

Module IV

References:
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 8051 microcontroller.
4. Explain the basic architecture and features of PIC microcontrollers.
5. Develop microcontroller programs.
6. Familiarize basics of interfacing.

Module I

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

Module IV

References:
1. Intel x86 processors programmer's reference manuals.
5. PIC: 18F2420, 16F84A data sheet ,by Microchip.
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 Open GL 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:
19-202-0511 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 8085 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:
19-202-0506(IE) 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

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
JavaScript : 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 Components, Handling Dynamic HTML with Ajax. AJAX Database, Working of AJAX with PHP, Ajax PHP Database Form, AJAX PHP MySQL query.

References:
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

Module II

Module III

Module IV

References:
**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**


**References:**

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--Bioinformatics 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

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:
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

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 - Router architectures. IP Multicast Addresses. ARP Protocol.
Datagram encapsulation and Fragmentation, Reassembly and fragmentation, Routing algorithm- LS and DV, Routing in the Internet, BGP.

Module IV
Data link layer services, Multiple Access Protocols. Switching, VLANs, MPLS, Data centre networking, Software defined networking

References:
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

Module II

Module III

Module IV

References:
5. Alan Holub, Compiler Design in C, PHI.
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.
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.

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).

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.

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.

References:

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

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 use cases

References:
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

Module II

Module III

Module IV

References:

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 Linux kernel, demonstrate using insmod, lsmod and rmmod commands.
5. Developing device drivers.
6. Creating Linux distributions from debian source.

References:
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.

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) End-Semester 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.
Course Outcomes:
On completion of this course the student will be able to:
1. Identify the basic concepts of deep learning
2. Analyse the deep learning architectures which are appropriate for various types of learning tasks in different domains
3. Illustrate use of TensorFlow libraries to implement deep neural networks
4. Apply TensorFlow in NLP applications.

Module I
Feedforward Networks: Multilayer Perceptron, Gradient Descent, Backpropagation.

Module II
Convolutional Neural Networks: Architectures, convolution / pooling layers.
Recurrent Neural Networks: Back propagation through time, Bidirectional RNNs, Long Short Term Memory, Gated Recurrent Units, Bidirectional LSTMs.

Module III
TensorFlow: Introduction, tensors, tensor properties, basic tensor methods.

Module IV
Applications of Deep Learning to NLP: Introduction, working with bag of words, Implementing TF-IDF, Working with skip-gram embeddings, CBOW embeddings, making predictions with word2vec, using doc2vec for sentiment analysis.

References:
3. Aurelien Geron, Hands-on Machine Learning with Scikit-Learn, Keras, and TensorFlow, O’Reilly Media, 2019
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

Module II

Module III

Module IV

References:
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

Module II

Module III

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

References:
19-202-0609 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

Module II

Module III

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:
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:
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

Module II

Module III

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:
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

Module II

Module III

Module IV

References:
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:
5. John R Levine, Tony Mason and Doug Brown, Lex & YAcc, Oreilly, 2nd edition
6. web reference: Lex and Yacc Tutorial by Tom Niemann
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
1. Program to test error detection and correction codes.
2. Program to test various data compression algorithms.
3. Program to test public key and symmetric key cryptography method.
4. Program to test various message digest algorithms.

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

References:
2. Douglas E. Comer, Hands-on Networking with Internet Technologies, Pearson Education.
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.

Exercises

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:


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 Phase II 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 an industrial internship programme of minimum two weeks duration in an IT industry / Public Sector Organization / Institutes funded by the government of India after 4th Semester and before the commencement of 7th semester and submit a report on their work. Evaluation shall be done along with Project Phase I based on their presentation and report.
Course Outcomes:
On completion of this course the student will be able to:
   1. Learn the basics of mobile communications and evolution of different generations of cellular networks
   2. Understand the different architectures of mobile computing and their applications
   3. Analyze the working of mobile IP, mobile web services and mobile data management
   4. Learn about wireless security in WLAN and mobile networks

Module I

Module II
Emerging wireless networks: MANET, Wireless sensor networks-OFDM and Flash OFDM
Mobile computing architecture: Wireless LANs, WAP, Wireless Personal Area Network, Pervasive computing, Mobile Devices, cards and sensors, Mobile computing applications

Module III
Mobile IP, wireless web-Web services and mobile web services- Wireless middleware-wireless gateway and mobile application servers, Mobile database management, Smart Client, DataStore, Application.

Module IV
Wireless security-WLAN security-cellular wireless network security-Mobile ad-hoc network security-Internet security protocols: VPNs and IPSec-Wireless middleware security-SSL for wireless web security-WAP security and WTLS.

References:
Course Outcomes:
On completion of this course the student will be able to:
1. Familiarize IoT and its components
2. Learn data and knowledge management and use of devices in IoT technology
3. Distinguish different communication models and protocols
4. Design IoT applications for different domains
5. Implement basic IoT applications

Module I
Introduction to IoT- History and evolution- Architecture of an IoT ecosystem-Components for designing IoT application. Building the Internet of Things: Device Proliferation and connection, Making things work together, IoT for building Intelligent Applications. Understanding of -Smart devices, Network connections, IP addresses, RF technology, Data, Intelligent applications, Big data.

Module II

Module III
Overview of Raspberry Pi 3-Important features of Raspberry Pi 3-Setting up Raspberry Pi-Setting of headless Raspberry Pi. Overview of Linux OS, CLI. Setting up Raspbian as an IoT gateway, Interfacing with sensors and actuators using GPIO pins, Interfacing with camera on Rpi.

Module IV
Building python-based programs to communicate to cloud server using various application Protocols. Develop a complete python based IoT application, Python program to interface with Arduino using serial libraries, Rpi as a device.

References:
1. Michael Miller, The Internet of Things: How Smart TVs, Smart Cars, Smart Homes, and Smart Cities are Changing the World, First Edition.
3. Tim Dox, Dr.Steven Lawrence Fernandes, Barberry pi 3 cookbook for python programmers, Thid Edition.
Course Outcomes:
On completion of this course the student will be able to:
1. Explain the need and different types of biometric systems
2. Describe the characteristics and deployment of systems using physical biometric systems
3. Describe the characteristics and deployment of systems using behavioural biometric systems
4. Describe the characteristics and deployment of different biometric interfaces.
5. Analyse different applications and suggest the suitable biometric system for a given application.

Module I

Module II

Module III
Behavioural Biometrics: Handprint biometrics - Signature and handwriting technology - Technical description – Classification - Comprehensive packet logging - Keyboard or keystroke dynamics - Voice, Data acquisition, Feature extraction - Characteristics, Strength, Weakness, Deployment. Gait recognition, Gesture recognition, Video face, Mapping the body technology. Multi Biometrics and Multi Factor biometrics - Two factor authentication with password - Tickets and tokens

Module IV

References:
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

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

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:
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

Module II

Module III

Module IV
Developing android app-Using eclipse for android development, android navigation and interface design, persistent data 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:
4. Jeff McWherter, Scott Gowell, “Professional Mobile Application Development”, Wiley India Private Limited
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

Module II

Module III

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

References:
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

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

References:
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**

**Module II**

**Module III**

**Module IV**

**References:**
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

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

References:
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.
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) End semester 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
**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.
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

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

References:
3. kJiawei Han & Micheline Kamber, Morgan Kaufmann, Data Mining – Concepts and Techniques -Publishers, Elsevier,2nd Edition, 2006
19-202-0803 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

Module II

Module III

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:
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

Module III

Module IV
Pragmatics- Discourse-Reference Resolution -Text Coherence -Dialog and Conversational Agents-

References:
3. Alexander Clark and Chris Fox, The Handbook of Computational linguistics and natural
Course Outcomes:
On completion of this course the student will be able to:
1. Familiarize with recommender systems and their applications
2. Analyze the different approaches towards recommendation
3. Evaluate the effectiveness of recommender system
4. Design recommender system

Module I
Linear Algebra notation: Matrix addition, Multiplication, transposition, and inverses; covariance matrices.
Introduction: Recommender Systems Function, Applications of recommendation systems, Issues with recommender system

Module II
Attacks on collaborative recommender systems: Attack dimensions, Attack types, Countermeasures, Privacy aspects – distributed collaborative filtering

Module III

Module IV
Social Tagging Recommenders Systems- Folksonomy, The Traditional Recommender Systems Paradigm, BibSonomy as Study Case, Tag Acquisition
Trust and Recommendations- Introduction, Computational Trust, Trust-Enhanced Recommender Systems

References:
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

Module II

Module III

Module IV

References:

5. George Reese, Cloud Application Architectures: Building Applications and Infrastructure in the Cloud O'Reilly.
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

Module II

Module III

Module IV

Future of AI.

References:
Course Outcomes:
On completion of this course the student will be able to:
1. Understand how block chain systems work
2. Familiarize the functional / operational aspects of cryptocurrency ecosystem
3. Design, build and deploy smart contract and distributed applications
4. Identify a use case for a blockchain application

Module I
Introduction – Distributed system – Blockchain and Bitcoin – Types of blockchains – Consensus
Decentralization – Decentralization using blockchain – Methods of decentralization – Routes to
decentralization – Blockchain and full ecosystem decentralization – Decentralized organizations –
platforms

Module II
Introduction – Bit coin – Digital Keys and addresses – Transactions – Blockchain – Mining –
alternative coins – alternatives to proof of work – Various stake types – Bitcoin limitations – Smart
contracts

Module III
Ethereum – Introduction – Ethereum network – Components of Ethereum ecosystem – EVM –
Development tools and Frame woks – Remix – Truffle – Solidity language

Module IV
Hyperledger – Reference architecture Requirements and design goals of hyper ledger fabric –
Distributed ledger – proof of Elapsed Time – Transaction families – Attacks on blockchain –
Applications on block challenges

References:
1. Imran Bashin, Mastering Block chain, 2<sup>nd</sup> edition, 2018 packt publishing
2. Aravind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and steven Goldfeder,
Bitcoin and crypto currency Technologies: A comprehensive Introduction, Princeton
University Press
Course Outcomes:
On completion of this course the student will be able to:
1. Identify the requirements of each phase of compiler in detail.
2. Understand Data flow and Control flow analysis in compiler design.
3. Analyze optimization techniques to obtain high performance
4. Learn code generation algorithms

Module I

Module II

Module III
Static Single Assignment Form (SSA): SSA Construction – Optimizations on SSA Form. Register Allocation – Graph Colouring Algorithm.

Module IV

References:
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

Module II

Module III

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:
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

Module II

Module III

Module IV

References:
1. Information Technology Amended Act, 2008, Ministry of Law and Justice, Government of India.
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

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

Module IV

References:
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

Module II
Programming the Microcontroller for IoT: Basics of Sensors and actuators - examples and working principles of sensors and actuators - Arduino/Equivalent Microcontroller platform- Setting up the board - Programming for IOT- 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 - The Evolution from the RFID-based EPC Network to an Agent based Internet of Things - Agents for the Behavior of Objects.

Module IV

References:
1. Charalampos Doukas, Building Internet of Things with the Arduino, Create space, April 2002.
19-200-0814 CONSTITUTIONAL LAW

Course Outcomes:
On completion of this course the student will be able to:
1. Configure the preamble and fundamental rights.
2. Actuate the governance and functioning of constitutional functionaries.
3. Describe the functions of legislative bodies.
4. Decipher the judiciary system and its role in governance.

Module I
Introduction: Constitution Law – Constitutional Assembly Debates – Constitution of India – Basic Features of Indian Constitution – Preamble – Structure and Content of Indian Constitution

Module II

Module III

Module IV
Constitutional Organs: Legislative Organs – Parliament – Lok Sabha, Rajya Sabha - State Legislatures - Executive Organs - President, Vice President, Council of Ministers - Judicial Organs – Supreme Court and High Courts – Other Constitutional Bodies – Election Commission - Comptroller and Auditor General of India, etc.

References: