Department of Chemistry
PSO's and CO's
FYBSc
Paper – I
SEM-I
P.S.O's

1. Learner understand chemical thermodynamics, chemical calculations, atomic structure and periodic table and periodicity.
2. Learner understand the basics of organic chemistry, classification and nomenclature of organic compounds, bonding and shapes of organic compounds, and fundamentals of organic reaction mechanism

C.O's

1. The learner is made to understand the concept of thermodynamics.
2. The learner is made to understand and use the terms internal energy and enthalpy.
3. The learner is made to understand ways of expressing the concentration of solutions and its interconversions.
4. The learner is made to understand the structure of atom, structure of H-atom and atomic spectrum of H-atom.
5. The learner is made to understand effective nuclear charge and classification of periodic table.
6. The learner is made to understand the nomenclature and Hybridization of organic compounds
7. The learner is made to understand bond fission, electrophiles and nucleophiles.
8. The learner is made to understand chemistry of reactive intermediates and types of organic reactions.

SEM-II
P.S.O's

1. Learner understands gaseous state, chemical equilibria and thermodynamic parameter, concept of qualitative analysis.
2. Learner understands the concept of acid base theories and concept of aliphatic hydrocarbons.

C.O's

1. The learner is made to understand the gas laws kinetic theory of gases.
2. The learner is made to understand the thermal equilibrium.
3. The learner is made to understand the second law of Thermodynamics and concept of entropy and spontaneity.
4. The learner is made to understand the concept of qualitative analysis and its classification.
5. The learner is made to understand the concept of acids and bases along with its advantages and limitations.
6. The learner is made to understand the acid-base concept.
7. The learner is made to understand the classification, mechanism of elimination and addition reactions.
8. The learner is made to understand the hydroxylation, 1,2 and 1,4- addition Diels-Alder reaction and reactions of alkynes.

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Paper – II

SEM-I

P.S.O's

1. Learner understands order of reactions and Liquid state.
2. Learner understands the comparative chemistry of main group elements and concept of Stereochemistry-I

C.O's

1. To make the learner understand the kinetics of first and second order reactions.
2. To make the learner understand the properties of liquid i.e. surface tension, viscosity and refractive index and liquid crystals
3. To make the learner understand the classification and properties of Main group elements.
4. To make the learner understand some important compounds like $NaHCO_3$, NaCl etc., oxides of S and oxyacids and N w.r.t. environmental aspects.
5. To make the learner understand the Projection formulae, Geometrical isomerism, Syn/Anti, E/Z notations.
6. To make the learner understand the concept of Chirality, enantiomers and distereoisomers, D/L and R/S designations.
7. To make the learner understand the conformational analysis of alkanes

SEM-II

P.S.O's

1. Learner understands the concept of Chemical equilibria and Molecular spectroscopy.
2. Learner understands the concept of solid state chemistry, Chemical bonding and reactivity and oxidation-reduction chemistry.
3. Learner understands the concept of stereochemistry-II and Aromaticity.

C.O's

1. To make the learner understand the types of electrolyte, Degree of Ionization and factors affecting degree of ionisation, Ionization constant and ionic product of water.
2. To make the learner understand the Ionization of weak acid / bases, pH scale, common ion effect, Dissociation constant of mono, di, and triprotic acid, Buffers its action and Henderson's equation for acid/base.
3. To make the learner understand the electromagnetic radiation and its interaction with matter, types of transitions.
4. To make the learner understand the types of solid and different laws of crystallography.
5. To make the learner understand the types of chemical bonds and VSEPR theory.
6. To make the learner understand the Oxidation and reduction concepts, latimer and Frost diagrams, applications of Redox Chemistry.
7. To make the learner understand the types of strains and conformations in cycloalkanes.
8. To make the learner understand orientation effect and substituent in aromatic compounds

SYBSc

Semester I

P.S.O's

1. To make the learner understand the concept of thermodynamics and electro- chemistry.
2. To make the learner understand the concept of chemical bonding.
3. To make the learner understand the reactions and reactivity of halogenated hydrocarbons and alcohols, phenols and epoxide.
4. To make the learner understand the role of chemical kinetics and different types of reaction and thermodynamics of ideal solution.
5. To make the learner understand the chemistry of some specific elements of 'P'- block
6. To make the learner understand carbonyl compounds.
7. To make the learner understand analytical chemistry and statistical treatment of analytical data.

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8. To make the learner understand classical method of analysis.
9. To make the learner understand instrumental method of analysis.

C.O.'s Paper-I

1. To make the learner understand free energy functions.
2. To make the learner understand the concept of thermodynamics of open system.
3. To make the student study the concept of fugacity and activity
4. To make the learner understand vant hoff's isochore
5. To make the student understand conductivity equivalent conductivity & molar conductivity
6. To study Kohlrausch law of independent migration of ion.
7. To study the applications of conductance measurement
8. To make the student understand concept of transference number and its experimental determination.
9. To make the students understand the concept of non directional bonding
10. To make student learn the directional bonding by valence bond theory.
11. To make the students understand the role of hybridisation in polyatomic molecules.
12. To make the students understand the formation of molecules such as CH_4,NH_3,H_2O Involving SP^3 hybridisation.
13. To make the students understand molecular orbital theory (LCAO-MO approach),Wave mechanical treatment for molecular orbitals,concept of bond order.
14. To make the students understand nucleophilic substitution reaction of alkyl halide
15. To make the learner understand reactivity of aryl halide.
16. To make the students understand the preparation,reactions of organomagnesium and organolithium compounds.
17. To make the learner understand preparation and reactions of alcohols,phenols and epoxides.

C.O.'s PAPER- II

1. To make the student understand types of complex reaction.
2. To understand the effect of temperature on reaction rate.
3. To make the student understand various theories of reaction rates e.g. collision theory activated complex theory.
4. To make the learner understand the thermodynamics of ideal solutions and Rault's Law.
5. To make the students understand The concept of partial miscibility of liquids with respect to phenol-water triethanolamine-water and water nicotine system.
6. To understand the concept of immiscibility of liquids.
7. To make the learner understand Nernst Distribution law and its application.
8. To make the learner understand chemistry of Boron with respect to electron deficient compounds (BH_3, BF_3, BCl_3), Preparation of diborane and tetraborane, synthesis of Borax.
9. To make the learner understand chemistry of Silicon & Germanium.
10. To make the students understand electrochemistry of Nitrogen family.
11. To make the learner understand nomenclature of carbonyl compounds.
12. General reaction mechanism of nucleophilic reaction.
13. To make the students know reaction of various reagent on carbonyl compounds ($NaHSO_3$, HCN, RMgX, Phenylhydrazine, 2,4 dinitrophenyl hydrazine, $LiAlH_4$ & $NaBH_4$)
14. To make the Student understand Benzoin condensation, Knoevengal condensation, Claisen Schimidt and Cannizaro reaction.
15. To make the Student Understand mechanism of acid and base catalysed enolisation.
16. To make the Student Understands the concept of active methylene group.

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C.O's PAPER III

1. To make the Student Understand role of analytical chemistry.
2. To make the Student Understand significance of sampling in analytical chemistry
3. To make the student understand concept of errors, precision and accuracy and correction of determinate errors.
4. To make the student understand titrimetric methods i.e. neutralization titration, redox titration, precipitation and complexometric titration.
5. To make the student understand calculation in titrimetry:- Normality, Molarity, Formality and their calculation.
6. To make the student understand concept of pH and neutralization.
7. To make the student understand concept of end point and equivalence point in neutralization reaction.
8. To make the student understand various methods of end point determination, use of indicator, change in potential, change in conductance.
9. To make the student understand how to construct various titration curve.
10. To make the student understand concept of gravimetry with respect to types, steps and application.

Semester IV

P.S.O's

1. To make the student understand concept of electrochemistry, and phases in equilibrium.
2. To make the student understand the chemistry of transition metals and co-ordination chemistry.
3. To study chemistry of carboxylic acid and their derivatives and sulphonic acid.
4. To give an idea to the learner about solid state and catalysis.
5. To give an idea to the learner about the ions in aqueous medium.
6. To make the student understand amines, diazonium salts and heterocyclic compound.
7. To give the learner the idea of methods of separation.
8. To make the learner understand instrumental methods of analysis.
9. To make the students understand how to analyze analytical data.

C.O's PAPER-I

1. To make the learner understand Nernst equation and it's importance.
2. To make the learner understand thermodynamics of reversible cell.
3. To make the learner understand concentration cells with transference and without transference.
4. To make the learner understand how to determine pH using hydrogen electrode.
5. To make the learner learn phase rule and how to derive Clausius Clayperon equation and its importance.
6. To make the learner understand phase diagrams of one components system and two component systems.
7. To make the student aware of position of transition metals in the periodic table.
8. To make the student understand extra stability cases d^0, d^5 and d^{10}.
9. To make the learner understand the colour and the magnetic property of d-block elements.
10. To make the learner understand chemistry of Titanium and Vanadium.
11. To make the student understand nomenclature of co-ordination compound, types of ligands and formation of co-ordination compound.
12. To make the learner understand theories of co-ordination compounds. Werner theory, EAN rule and 18 electron rule.
13. To make the learner understand the nature of Metal-ligand bond.

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14. To make the learner understand application of co-ordination compounds.
15. To make the learner understand the nomenclature, structure and physical properties of carboxylic acids.
16. To give the learner idea of preparation of carboxylic acid and reaction of carboxylic acid with mechanism.
17. To make the learner understand Claisen condensation and Diekmann condensation.

C.O's PAPER-II

1. To make the students understand laws of crystallography.
2. To make the students understand characteristics of Simple cube, Face centre cube and Body centered cube.
3. To make the learner understand use of X-rays in study of crystal structure.
4. To make the students understand catalysis, catalytic activity , catalysis poisoning.
5. To make the students understand mechanism and kinetics of acid-base catalysed reaction.
6. To make the learner understand the effect of particle size and efficiency of nano-particle as catalyst.
7. To make the students understand hydration of cations.
8. To make the students understand Latimer equation.
9. To make the students understand classification of cations on basis of acidity.
10. To make the students understand hydration of anions.
11. To make the learner understand physical properties of concentrated Oxo-acid like sulphuric acid, nitric acid and phosphoric acid.
12. To make the learner understand uses and environmental aspect of these acids.
13. To make the learner understand nomenclature,reactivity and methods of preparation of amines.
14. To make the learner understand various reactions of amines e.g. Hoffman's elimination, electrophilic substitution in aromatic amine.
15. To make the learner understand preparation reactions of Dizonium salt.
16. To make the learner understand classification, nomenclature of five membered and six membered heterocyclic ring.
17. To make the learner understand synthesis of Furan, Pyrole, Thiophene and Pyridine.
18. To make the learner understand Vilsmeir Haack reaction, Friedal craft reaction, Diel's Alder reaction.
19. To make the learner understand concept of basicity of pyridine.

C.O's PAPER-III

1. To make the learner understand various methods of separation precipitation, centrifugation, distillation, electrophoresis, ion exchange.
2. To make the learner understand Nernst distribution law and distribution constant.
3. To make the learner understand single steps extraction, multiple steps extraction.
4. To make the learner understand batch extraction and continuous extraction.
5. To make the learner understand concepts of chromatography, paper chromatography, thin layer chromatography.
6. To make the learner understand the principle and instrumentation of potentiometry.
7. To give the learner an idea of reference electrode and indicator electrode and their use in neutralization reaction.
8. To make the learner understand principle and instrumentation of conductometry.
9. To make the learner understand application of neutralization titrimetry.
10. Advantage and limitation of conductometric titration.
11. To make the learner understand Indeterminate error.
12. To make the learner understand central tendencies and dispersing tendency.

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13. To explain the learner the Gaussian distribution curve.
14. To make the learner understand confidence limit and confidence interval.
15. To make the learner understand the criteria for rejection of doubtful result.
16. To make the learner understand Null hypothesis and F-test.
17. To make student understand graphical representation of data and obtaining best fitting straight line. Method of averages and methods of least square.

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TYBSc
Paper I
P. S. Os.

1. To understand the basic principles of physical chemistry and its applications in various branches of chemical sciences.

Semester V
C.Os.

1. The learner understands the molecular motions and its uses in structure elucidation.
2. The learner understands electrochemical cell, its classification, ion specific electrodes.
3. Learner will understand Galvanic cell and Debye Huckel Limiting law.
4. Learner will understand the principles of Chemical Thermdynamics.
5. Learner is explained the use of thermodynamics in solutions.
6. Learner understands relative lowering of vapour pressure, elevation of boiling point and depression in freezing point.
7. Learners will understand Osmosis and Van't Hoff law.
8. To make learners understand Gibb's phase rule and its applications.
9. Learner is explained principles of surface chemistry and its uses in solid phase catalysis.
10. Learner understands chemistry of colloids and its use as surfactants.

Semester VI
CO's

1. To learn Unimolecular theory and Activated complex theory for chemical kinetics.
2. To understand principles of Polymer Chemistry.
3. To understand basic principles of Nuclear Magnetic Resonance Spectroscopy.
4. To learn the application of electrochemistry and renewable energy resources.
5. To understand the principles and applications of Nuclear Chemistry.
6. To learn basic principles of Quantum Chemistry.
7. To understand principles and techniques of Crystalline State.

Paper - II
P. S. Os.

1. To understand the basic principles of Inorganic chemistry.

Semester V

1 To make student understand terms used in solid state chemistry.
2 To make student understand different types of packing in solids.
3 To make student understand defects in solid.
4 To make student understand discovery of superconductivity.
5 To make student understand superconductivity.
6 To make student understand types of superconductivity.
7 To make student aware of the application of superconductor.
8 To make student understand position of lanthanons and actinons.
9 To make student understand lanthanon contraction.
10 To make student understand oxidation states.
11 To make student understand magnetic and spectral properties.
12 To make student understand extraction and separation of lanthanons by solvent exaction process.
13 To make student aware the application of lanthanons.
14 To make student understand comparison between lanthanons and actinons.
15 To make student understand chemistry of uranium.
16 To learn properties and application of uranium.

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17 To understand molecular orbital diagram with respect to polyatomic molecule.
18 To understand molecular symmetry with respect to their point group symmetry operation and elements.
19 To explain metallic bonding their properties conductors, insulators and semiconductor and also understand n-type and p-type semiconductor.
20 To understand the concept of point group with illustration using different point group C_3V, C_2V, D_3h.
21 To understand the importance of symmetry in chemistry
22 To understand the classification of solvents.
23 To understand the importance of nonaqueous solvents.
24 To understand of liquid NH_3 ,N_2O_4 as non aqueous solvents with respect to acid base reaction, redox reaction, complex formation pptation reaction.
25 To understand interhalogen compounds and their boning and structure. e.g. ClF, BrF_3, BrF_5, IF_7 etc.
26 To understand pseudo halogen and their types.
27 To impart knowledge of structure, Xenon compounds.
28 To understand general characteristic of zero group elements.
29 To understand with suitable example like XeF_2, $XeOF_2$.
30 To explain similarities and difference pseudo halogens and halogens XeF_6, XeO_2F_2.

Semester VI

1 To make student understand theories of metal- ligand bond.
2 To make student understand crystal field effect.
3 To learn splitting of d-orbitals in octahedral, tetrahedral, square planar complexes.
4 To make student understand Jahn –Tellar effect.
5 To make student understand crystal field splitting parameter Δo.
6 To study calculations based on CFSE.
7 To make student understand properties.
8 To make student understand limitations of CFT and evidences of covalent bonding in metal complexes.
9 To study molecular orbital theory.
10 To learn origin of electronic spectra.
11 To study types of electronic spectra.
12 To make students understand microstates and terms.
13 To make students understand p2 and d2 configuration.
14 To make students understand Orgel diagrams.
15 To make students understand selection rule.
16 To study thermodynamic and kinetic stability.
17 To study stepwise and overall stability constant.
18 To study factors affecting thermodynamic stability.
19 To study types of reaction.
20 To study labile and inert complex.
21 To learn ligand substitution reactions.
22 To understand organ metallic compounds of main group metal with respect to ionic, sigma-bond, electron deficient compound.
23 To explain general synthetic methods with respect to metal-metal, metallation, methylene-insertion reaction.
24 To understand chemical reaction of organ metallic compounds with respect to oxygen and halogen, alkylation, arylation, reaction, protonic reagent, complex formation.
25 To understand ferrocene compounds with respect to their synthesis, structure and bonding.
26 To understand catalysis with their catalytic cycles.

27 To understand coupling reaction with respect to Heck and Suzuki reactions.
28 To explain general characteristic of homogeneous and heterogeneous.
29 To understand Nanomaterials with respect to their form of nano materials like nano films, nano layers, nano tubes, nano wires and nano particles.
30 To impart knowledge of nano material like nano wires, rods, nano particles and their dimensions.
31 To understand chemical methods of synthesis with colloidal method and sol-gel methods.
32 To understand application of nano material in different fields
33 To understand bio-inorganic and medicinal chemistry with respect their enzymes , coenzymes.
34 To understand biological role in catalyses, peroxidase.
35 To understand Metal complexes in medicine.
36 To explain inorganic radio pharmaceuticals.
37 To understand with suitable example- Cr_{50} , Co_{57}, Au-198

Paper III

Semester V

PSO's: Learner understands Stereochemistry of Organic compounds and organic reactions along with applications of Organometallic Chemistry and Synthetic Organic Chemistry.

CO's:

1. Learners are made to understand mechanism of elimination reactions, NGP reactions, esterification and ester hydrolysis.
2. Learner understands mechanism of rearrangements.
3. Learner made to understand concept of molecular chirality and strains in cycloalkanes.
4. Learn stereoselective and stereospecific reactions with mechanism.
5. Learner gets knowledge about names of allenes, spiranes, biphenyls and understands the applications of organometallic compounds.
6. Learner gets basic information of retrosynthesis.
7. Learner understands green methods of Organic synthesis so they aware to save environment.

Semester VI

PSO's:

1. Learner understands Heterocyclic Chemistry and importance of catalyst and reagents in Organic Chemistry.
2. Learns importance of Spectoscopy and Bio-molecules and Natural products.

CO's:

1. Learner made to understand the synthesis of heterocyclic compounds, its reactivity and reactions.
2. Learner understands selectivity and applications of catalysts and reagents.
3. Learner understand the importance of Biomolecules, their structures and reactions.
4. Learner made to understand basics of U.V., I.R, NMR spectroscopy and Mass spectrometry and its applications in structure determination of Organic compounds.
5. Learner gets knowledge about Classification and importance of Natural products.
6. Learner understands classification, Synthesis and applications of Polymers.

P. S. Os.

1. To understand the concept & working of instruments and methods used to separate, identify, and quantify matter.

Semester-V

Cos of Paper –IV

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1. The learner will able to understand the acceptable practices for the analysis and consisten interpretation of data obtained from chemical and other analysis.
2. Students are enables to learn samplings, types of sampling, samplings of gases, liquids, solid etc.
3. The technique that enable students, Separation of samples by chromatographic techniques lik paper, Thin layer, HPLC & HPTLC and their applications in chemical separation.
4. The students will understand the optical instrumental methods like FES and AAS fluorescence, Phosphorescence, Turbidimetry and Nephelometry their applications in atomi & molecular analysis.
5. Learner is explained the principles of redox titration, detection of end point and concept o UV- Visible spectroscopy and its applications.

Semester VI

CO's of Paper IV

1. The learner understands the concept& principles of Potentiometric titration, Polarography an Amperometric titration and their applications in chemical analysis.
2. Learner is explained the techniques of food processing, food preservation, types of foo preservation.
3. Learner understands the concept of various type cosmetics like face powder, Deodorants.
4. Learners will understand the theory of Gas chromatography & ion-exchange chromatography.
5. Types of Gas chromatography and their applications in chemical separations.
6. To make learners understand the Thermal Methods of analysis, Thermometric titration, an Neutron activation analysis and their application in chemical analysis.

Applied Component

Sem – V

P.S.O's

1. Learners understand meaning of drug, various routes and dosages of drug's administration an mode of action of drugs.
2. Learners understand the discovery, design and development, metabolism of dru chemotherapeutic agents and use of nano particles in medicinal chemistry.

C.O's

1. Learner is made to understand classification of drugs.
2. Learner is made to understand oral and parenteral routes of drug administration along with it advantages and disadvantages.
3. Learner is provided with a brief introduction of Pharmacodynamic agents.
4. Learner is made to understand the classification of cardiovascular drugs.
5. Learner is made to understand the discovery of lead compounds.
6. Learner is made to understand various chemotherapeutic agents.
7. Learner is made to understand the synthesis and uses of drug intermediate.
8. Learner is made to understand the concept of carbon nano tubes.

SEM-VI

P.S.O's

1. Learner understands the classification of dyes based on constitution and applications and relation between colour and chemical constitution of dyes.

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2. Learner understands optical brightener, organic pigment, unit process and method of dyeing cotton fibers.
3. Learner understands synthesis and uses of dyes and toxicity of dyes.

C.O.'s

1. Learner is made to understand Natural synthetic dyes, historical background and limitations
2. Learner is made to understand classification of dyes based on constitution and application.
3. Learner is made to understand relation between colour and chemical constitution including various theories.
4. Learner is made to understand properties of non-textile and use of dyes.
5. Learner is made to understand the optical brighteners, organic pigments and difference between lakes-tonners and dyes-pigments.
6. Learner is made to understand basic idea of unit process and primary intermediates.
7. Learner is made to understand synthesis and use of specific dyes.
8. Learner is made to understand the ecology and toxicity of dyes.

M.Sc –I Physical Chemistry

P. S. Os.

1. To understand the basic principles of physical chemistry and its applications in various branches of chemical sciences.

Semester I

C.Os. of Paper I

1. The learner understands different forms of Maxwell thermodynamic relation and Joule – Thomson effect.
2. The learner understands the third law of thermodynamics and application to different phase transition.
3. To learn basic principles of Quantum Chemistry and its applications to various system.
4. Learner understands use of operators to the chemical systems such as harmonic oscillator.
5. Learner will understand composite reaction, polymerization reaction and gas phase reaction.
6. Learner will understand basics of electro chemistry,Debye Huckel theory and Debye Huckel Limiting law.
7. Learner will understand the electrolytic conductance,ionic interaction and Debye–Huckel-Onsager equation.
8. Learner is explained different types of batteries.
9. Learner understands basics of biochemistry.

Semester II

CO's

1. To learn fugacity of real gases,Gibbs energy,enthalpy and entropy of mixing.
2. To understand real solutions and Gibbs Duhem Murgules equation.
3. To understand thermodynamics of surfaces,Gibbs and BET isotherm equations.
4. To understand the standard free energy change in biochemical reaction.
5. To understand the use of quantum mechanics to Hydrogen like atoms.
6. Learner understands the application of quantum numbers, orbital shapes and simple conjugated systems such as ethane, butadiene and benzene.
7. To learn elementary reaction in solution and solvent effect on reaction rates.
8. To understand kinetics of reaction catalyzed by enzymes and inhibition of enzyme action.
9. To understand kinetics of reactions in solid state.

10. To understand types of defects and stoichiometry in solids.
11. To understand phase equilibria for two component and three component system.

Paper II

1. To understand the basic principles of Inorganic Chemistry.

Sem-I

CO's

1. To make students understand hybridization and other theories.
2. To make students understand molecular symmetry and group theory.
3. To make students understand structure and preparative methods.
4. To make students understand nanomaterials and its applications.
5. To make students understand IR, NMR and ESR spectroscopic methods.
6. To make students understand orgel and Tanabe – sugano diagrams.
7. To make students understand overall and stepwise method.

Sem-II

1. To make students understand Reaction mechanism in Inorganic chemistry
2. To make students understand organometallic chemistry
3. To make students understand environmental chemistry
4. To make students understand Bioinorganic chemistry

Paper III

Semester I

PSO's: Learner understands Physical Organic Chemistry, Nucleophilic substitution reactions, Aromaticity , Stereochemistry and Oxidation and Reduction reactions.

CO's:

1. Learner made to understand Thermodynamic and kinetic requirements of a reactions.
2. Learner understands the detection and trapping of intermediates, crossover experiments and stereochemical evidence.
3. Learns the mechanisms of aliphatic nucleophilic substitutions and aromatic nucleophilic substitutions.
4. Learners understand Structural, thermochemical, and magnetic criteria for aromaticity and NMR characteristics of aromatic systems.
5. Learners are able to Recognize symmetry elements.
6. Learner made to understand Concept of Chirality with R-S nomenclature, Axial and planar chirality and Prochirality
7. Learns the importance of Oxidation reactions including general mechanism, selectivity, and important applications.
8. Learner made to understand mechanism of reduction, selectivity, and important applications of the reducing reagents.

Semester II

PSO's:

1. Learner understands Chemistry of enolates, Mechanism of Reactions and Rearrangements, Molecular Orbital Theory for Organic Chemistry.
2. Learns the NMR spectroscopy and Mass spectrometry.

CO's:

1. Learner made to understand Generation of carbanion, kinetic and thermodynamic enolate formation.
2. Learner understands alkylation of enolates and reaction of carbon nucleophiles with carbonyl groups.
3. Learners are made to understand mechanism of organic reactions.

4. Learner understands the concerted rearrangements and Cationic rearrangements.
5. Learner made to understand Molecular orbitals, Formation of σ- and π-MOs by using LCAO method.
6. Learns the importance Applications of FMO concepts in Organic reactions, applications of UV and IR spectroscopy
7. Learner understands principles of principle of Proton magnetic resonance spectroscopy and 13C NMR spectroscopy and Mass spectrometry.

Paper - IV

P. S. Os.

To understand the concept & working of instruments and methods used to separate, identify, and quantify matter.

CO's of Sem - I

1. To make student understand analytical perspective and common analytical problems.
2. To make student aware of terms involved.
3. To make student understand instrumental methods and instruments used for analysis.
4. To make student understand errors, types of errors and different quantitative methods of analysis.
5. To make student aware of significance of quality management and problems.
6. To make student aware of basic concepts of safety in laboratories.
7. To make student understand Accrediation of laboratories and good laboratory practices.
8. To make student understand calculations based on chemical principles.
9. To make student understand stichiometry of chemical reactions.
10. To make student aware of calculations of pH and oxidation number.
11. To make student aware of electromagnetic spectrum.
12. To make student understand laser as radiation source.
13. To make student aware of Fourier Transform.
14. To make student understand Beer-Lambert's law.
15. To make student understand dual spectroscopy.
16. To make student understand IR spectroscopy and FTIR.
17. To make student understand principle of diffuse reflectance spectroscopy.
18. To make student understand types of thermal methods.
19. To make student understand TGA and DSC.
20. To make student aware of applications of DSC.
21. To make student aware of automation in chemical analysis.

CO's of Sem - II

1. To make student understand basic concepts in chromatography.
2. To make student understand gas chromatography.
3. To make student understand HPLC.
4. To make student understand X-ray spectroscopy.
5. To make student understand mass spectrometry.
6. To make student understand radioanalytical methods.
7. To make student understandsurface analytical methods.
8. To make student understand SEM, STM, TEM, ESCA.
9. To make student aware of atomic spectroscopy.
10. To make student understand ion selective potentiometry.
11. To make student understand polarography.
12. To make student understand electrogravimetry.
13. To make student understand coulometry.

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M.Sc. Part II
Semester III
Paper I

PSO's: Learner understands Organic reaction mechanisms, Pericyclic reactions, Stereochemistry, Photochemical reactions of Organic compounds.

CO's:

1. Learner made to understand stability and reactions Organic reactive intermediates and NCIP in Organic reactions.
2. Learner understands Role of FMOs in organic reactivity.
3. Learns Classification and importance of Pericyclic reactions such as Cycloaddition reactions, Electrocyclic reactions, Sigmatropic rearrangements.
4. Learners are able to identify point groups based on symmetry elements.
5. Learner understands Conformational analysis of medium rings and Dynamic stereochemistry
6. Learner made to understand Principles of photochemistry.
7. Learns the importance of Photochemical reactions of carbonyl compounds , olefins, arenes.

Paper- II
P.S.O's

1. Learner understands different name reactions with mechanism and applications and the concept of protection-Deprotection and electro-organic chemistry.
2. Learner understands the preparation and reactions of enamines and ylieds and use of different metals in organic synthesis

C.O's

1. The learner is made to understand the various name reactions and multicomponent reactions, Domino/caseade reaction.
2. The learner is made to understand the Protection and Deprotection of functional group, concept of umpolung, electro-organic chemistry.
3. The learner is made to understand the methods of preparation and reaction of enamines and ylieds, comparison of reactivity of enamines and enolates.
4. The learner is made to understand the structures and comparison of reactivity of P, S and N Ylieds.
5. The learner is made to understand the Wittig reaction andWittig Horner reaction and it's application in C-C bond formation.
6. The learner is made to understand the Bamford-Stevens reaction, Julia-Olefination ,Bestmann-Ohira reagent, Barton-Kellogg olefination and Steven's rearrangement.
7. The learner is made to understand the Oxymercuration and Demercuration of alkenes and applications of organoboranes.
8. The learner is made to understand the important features of silicon governing the reactivity of C-Si compounds, iodotrimethylsilane in organic synthesis.

Paper III

PSO's: Learner understands the concepts Heterocyclic Chemistry, Natural products, Advanced spectroscopic techniques.

CO's:

1. Learner made to understand nomenclature, synthesis and reactions of heterocyclic compounds.
2. Learner understands the natural product chemistry of carbohydrate, natural pigments insect pheromones and Alkaloids.
3. Learner understands the natural product chemistry of Multi-step synthesis of natural products, Prostaglandins, Insect growth regulators, and Plant growth regulators.
4. Learner learns the spectroscopic technique like IR, ^{1}HNMR, ^{19}F and ^{31}P NMR.

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5. Learner made to understand the problem solving skill in spectroscopy.

Paper IV

PSO's: Learner understands basics of drug chemistry, biomolecules and its biosynthesis.

CO's:

1. Learner is made to understand various concepts of drug interaction with receptor.
2. Learner learns the importance of drug discovery with and without lead molecule.
3. Learner understands the basic biomolecules such as proteins and nucleic acids.
4. Learners are taught chemical synthesis of nucleic acids.
5. Learner understands the basic chemistry of enzymes and its action.
6. Learner understands biosynthesis of various biologically important molecules through acetate, shikimate and mevalonic pathways.

Semester IV

Paper I

PSO's: Learners are made to understand Physical organic Chemistry, Supramolecular Chemistry and Asymmetric synthesis.

CO's:

1. Learner made to understand Structural effects and reactivity as a Linear free energy relationship in determination of organic reaction mechanism.
2. Learner understands uses and deviations in Hammett equation.
3. Learners are made to understand the principles of molecular associations and organizations as exemplified in biological macromolecules and Synthetic molecular receptors.
4. Learner understands the importance of crown ethers, cryptands, cyclophanes.
5. Learner made to understand Racemisation and resolution, Determination of enantiomer and diastereomer composition.
6. Learns the importance Molecular dissymmetry and chiroptical properties such as ORD, CD.
7. Learner understands principles of asymmetric synthesis and importance of chiral pool in Nature.
8. Learner made to understand methods of asymmetric induction and Asymmetric reactions with mechanism:

Paper- II

P.S.O's

1. Learner understands role of radicals in organic synthesis and designing organic synthesis.
2. Learner understands the newer methods and role of transition /rare earth metals in organic synthesis

C.O's

1. The learner is made to understand the reactivity of electrophile and nucleophile, aliphatic and aromatic C-C bond formation and clevage of C-metal/nonmetal bond to form radical.
2. The learner is made to understand the radical-radical process, hunsdiecker halodecarboxylation and auto-oxidation.
3. The learner is made to understand the convergent and divergent synthesis, functional group interconversion.
4. The learner is made to understand the disconnection approach, retero synthetic analysis and synthesis of some complex molecule.
5. The learner is made to understand the crown ethers, cryptands, micelles cyclodextrins, clay, zeolites and PTC.

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6. The learner is made to understand the PSR, organocatalyst and applications of ultrasound and microwave in organic synthesis
7. The learner is made to understand the 18 e rule and bonding in transition metal complexes, role of Pd in organic synthesis, olefin metathesis.
8. The learner is made to understand the application of transition and rare earth metals in organic synthesis

Paper III

PSO's: Learner understands the concepts heterocyclic Chemistry, Natural products, Advanced spectroscopic techniques.

CO's:

1. Learner made to understand the reactivity, synthesis and general reactions of heterocyclic compounds -pyridines, pyridine-N-oxide, pyridazines, pyrimidines, pyrazines, s-triazines, quinolines, isoquinolines, indoles, purines, oxazines, coumarins.
2. Learners are made to understands the natural product chemistry of Steroids.
3. Learner learns the synthesis of androsterone, testosterone, oestrone, oestriol, Oestradiol, progesterone, cinerolone, jasmolone, allethrolone, exaltone and muscone.
4. Learners are made to understands the natural product chemistry of Vitamins, Antibiotics and Naturally occurring insecticides
5. Learner learns the spectroscopic technique like 13C -NMR spectroscopy, Two-dimensional NMR spectroscopy, ESR and Fluorescence spectroscopy.
6. Learner made to understand the problem solving skill in spectroscopy

Paper IV

PSO's: Learner understands concepts of drug synthesis, biomolecules and green chemistry.

CO's:

1. Learner understands QSAR concept and modern methods of drug design.
2. Learner understands concept of prodrug and soft drug
3. Learner learns synthesis and application of few important drug molecules.
4. Learner understands the basic chemistry of vitamins and its biological role.
5. Learners are taught energy metabolism via synthesis and breakdown of glycogen.
6. Learner understands the role of enzymes in synthesis of commercially important molecules.
7. Learner understands the basic principles of green chemistry and its uses in environment friendly synthesis of various molecules.

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Department of Botany

Program Specific Outcomes

- **Study of Plant Biodiversity with respect to Algae, Fungi, Bryophytes, Pteridophytes,**
- **Gymnosperms and Angiosperms.**
- **Modern Techniques to study Plant Diversity.**
- **Study of forms and functions of plant with respect to cell biology, Plant ecology, Genetics,**
- **Anatomy, Plant physiology and Medicinal Botany.**
- **Study of Current Trends in Plant Sciences.**

Course Outcomes

F.Y.B.Sc.

SEMESTER I

Paper I

- Observe and study General characteristics of Chlorophyta.
- Impart knowledge of Structure, life cycle and systematic position of *Nostoc* and *Spirogyra*.
- Enumerate economic importance of Algae.
- Study General Characteristics of Phycomycetes.
- Impart knowledge of Structure, life cycle and systematic position of *Rhizopus* and *Aspergillus*.
- Enumerate economic importance of Fungi.
- Study mode of nutrition in Fungi.
- Describe General characteristics of Hepataceae.
- Have knowledge of Structure, life cycle and systematic position of *Riccia*.

Paper II

- characterize general structure of cell wall and plasma membrane of plant cell.
- Study of ultra-structure of and functions of Endoplasmic reticulum and Chloroplast.
- Get clarify about energy pyramids and flow of energy in an ecosystem.
- Acquire knowledge of Types of Ecosystems.
- Specify and Explain words phenotype and genotype.
- Study of Mendelian Genetics.
- Elaborate test cross and back cross.
- Explain mechanism of Epistatic and nonepistatic gene interactions.
- Clarify Multiple alleles with suitable examples.

Course Outcomes

SEMESTER II

Paper I

- Make clear about structure, lifecycle, systematic position and alternation of generation of in *Nephrolepis*.
- Throw light upon stellar evolution.
- Describe structure, lifecycle, systematic position and alternation of generation of in *Cycas*.
- Enumerate economic importance of Gymnosperms.
- Have detail knowledge of leaf.
- Analyze and distinguish detail study of inflorescence.
- Compare and study plant families: Malvaceae and Amaryllidaceae.

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Paper II

- Observe and compare simple and complex plant tissues.
- Get clarify about Primary structure of Dicot and Monocot root stem and leaf.
- Inculcate knowledge of epidermal tissue system of plants.
- Understand photosynthesis in detail.
- Learn the concept of primary and secondary metabolites.
- Relate grandma's pouch with respect to plant source, part used, active constituent and medicinal uses of certain plants.

Course Outcomes

S.Y.B.Sc.

SEMESTER III

Paper I

- Observe and study General characteristics of Division Phaeophyta
- Get idea about Structure, Life cycle and Systematic position of ***Sargassum* sp.**
- Learn General account of Class Anthocerotae and Musci.
- To have knowledge about Structure Life cycle & systematic position of ***Anthoceros* and *Funaria*.**
- Understand Plant Systematics Taxonomy in relation to Anatomy, Palynology, Chemical constituents, Embryology, Cytology and Ecology
- Compare and study families such as **Leguminosae, Asteraceae, Amaranthaceae and Palmae.**
- Discuss various preservation methods of plants.
- Learn Microscopy.
- Clarify and demonstrate Chromatography and electrophoresis techniques.

Paper II

- Understand the Ultra Structure and functions Mitochondrion ,Peroxisomes, Glyoxysomes and Ribosomes
- Significance of Cell Division and Differences between Mitosis and Meiosis
- Describe Nucleic Acids.
- Thrown light upon Chromosomal Aberrations.
- Understand the mechanism of Sex determination, Sex linked, Sex influenced, and Sex-limited traits:
- Illustrate Extra Nuclear genetics.
- Understand complete process of DNA Replication.
- Elaborate the Enzymes involved and molecular mechanism of DNA replication in Prokaryotes and Eukaryotes.
- Learning the complete process of Protein Synthesis.

Paper III

- Introduce Pharmacopoeias.
- Thrown light on Monograph from pharmacopoeia.
- Comprehends Secondary metabolites
- Infers Adulterants.
- Outline of types of forest in India.
- Operative types of Forestry.

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- Applications of Fibres and Current trends in Fiber industries.
- Compare Spices and condiments and Commercial market of spices.
- Understand the Aromatherapy.
- Application of Neutraceutical.
- Acquainted with Enzyme Industry.
- Information about Biofuel.

Semester IV

Paper I

- Understand thoroughly General characters of Ascomycetes.
- Interpolation of Structure, life cycle and systematic position of *Erysiphe* and *Xyluria*.
- Comprehends Plant pathology with respect to powdery mildew and late blight of potato.
- Get idea about classification, structure, methods of reproduction, economic importance and ecological significance of lichen.
- Observe and study Salient feature and classification of Psilophyta and Lepidophyta.
- Explain Structure, life cycle and systematic position of *Selaginella*.
- Interpret Paleobotany
- Apprehend structure and systematic position of form genus Rhynia.
- Grasp Salient feature and classification and economic importance of Coniferophyta
- Envisage Structure life cycle and systematic position of *Pinus*.
- Discern Structure and systematic position of the form genus *Cordaites*.

Paper II

- Understand the Normal secondary growth in dicotyledonous stem and root.
- Comment on Growth rings, periderm, lenticels, tyloses, heart wood and sap wood.
- Observe and learn Mechanical tissue system.
- Compare vascular boundless.
- Differentiate between Aerobic and anaerobic respiration.
- Interpretation of photorespiration
- Concept of Photoperiodism.
- Mechanism of Vernalization.
- Compare and study Biogeochemical cycles
- Role of Ecological factors.
- Concept of environmental factors
- Explain soil as an edaphic factor.
- Elaborate Community ecology.

Paper III

- Introduction to horticulture and Branches of Horticulture.
- Observe the different locations of garden.
- Concept of Focal point of garden.
- Study of types of garden.
- Generalize study of National park e.g. Sanjay Gandhi national park.
- Concept of Botanical garden e.g. Veer Mata Jijabai Udyan.
- Comprehend plant Tissue Culture.

- Grasp r-DNA technology.
- Learning Biostatistics: The chi square test and Correlation calculation of coefficient of correlation.
- Interpret Bioinformatics.

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Department of Mathematics

Semester I

Program specific outcomes(PSO's)

PSO1 :Determine Real Number system and its properties and applications with an examples.
PSO2 :Define Sequences, subsequences and types, explain their properties with an examples.
PSO3 :Explain Limits & Continuity with an examples.
PSO4 :Meaning of Integers & divisibility, various properties of divisibility.
PSO5 :Define Functions and Equivalence relation and examples.
PSO6 :Define Polynomials, and various results.

Course outcomes (CO's)

1. What is Real number system and it's properties of R,
2. Derive AM-GM inequality, Cauchy-Schwarz inequality. Define Intervals and neighbourhoods.
3. State and prove, Hausdorff property, Archimedean property and its applications.
4. Define sequence Convergence, Divergent sequence. Limit of a convergent Sequence. Result on sequences.
5 Derive all Algebraic properties of convergent sequences, sandwich theorem,
6 Define subsequence, and its properties. Cauchy's sequence.
7. Explain Domain, codomain and range, injective, surjective, bijective, composite, Inverse of a objective function. Graphs of some standard function.
8. Determine lim f(x) evaluate limit of functions using the $\epsilon-\partial$ definition, uniqueness of limit if it exists, algebra of limits, limit of composite function, sandwich theorem, non-existence of limits.
9. Explain Continuous functions by solving using examples, Sequential continuity,
10. State and prove well-ordering property, Principle of finite induction, Binomial theorem for non-negative exponents, Pascal Triangles.
11. Define Divisibility in integers, and its properties, state division algorithm, g.c.d. l.c.m. of two Integers, and basic properties of g.c.d.
12. Explain Congruence's and its properties define Euler's function. State Euler's, Fermat's, Wilson theorem and its Applications.
13 Define invertible functions, bijective functions are invertible and conversely; examples of functions including constant, identity, projection, inclusion.
14. Explain Binary operation as a function, and their properties, Equivalence relation, classes,
15 Define polynomial over the field F where F = Q, R or C. Algebraic properties.
16. Explain Division algorithm theorem, g. c. d. of polynomials and its Applications, also explain Roots of a polynomial, relation between roots and coefficients,
17. Define multiplicity of a root. State Remainder -Factor theorem, Complex roots of a polynomials
18. Write Explain Fundamental Theorem of Algebra, roots of unity

CREDITS- Three (3) Theory periods of 48 minutes per week per paper over the semester.
One (1) Tutorial period of 48 minutes per week per paper per batch over the semester.

Semester II

Program Specific Outcomes(PSO's)

1 Explain Series and its properties by an examples
2 Define Continuous functions & Differentiation
3 Applications of differentiations.
4 Explain the System of Linear Equations & Matrices
5 Define Vector spaces and its properties.
6 Basis & Linear transformations

Course outcomes (CO's)

1. Define Series of real numbers, examples on convergence, divergent series, and explain the Algebraic properties of convergent series,
2. State and prove, Cauchy criterion, Leibnitz's theorem Test of convergence alternating series
3. Define Absolute, conditional convergence, absolute convergence implies convergence but not conversely, without proof Ratio test & root test and examples.

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4 State Intermediate value theorem Bolzano-Weierstrass theorem and its applications, algebra of differentiable functions. Chain rule.,
5. Define Higher order derivatives, Derivative of inverse functions, Implicit differentiation and state and prove Leibnitz Rule
6. Definition of local maximum and local minimum, necessary condition, stationary points, second derivative test, examples,
7. Define Graphing of functions and examples by using first and second derivatives, concave, Convex functions, points of inflection.
8. State and prove Rolle 's Theorem, L.M.V.T. & C.M.V.T and its applications. Verify the results by exs.
9. Define Monotone increasing and decreasing function, examples, L-hospital rule without proof, Examples of indeterminate forms,
10. Taylor's theorem with Lagrange's form of remainder with proof, Taylor polynomial and applications
11. Define Parametric equation of lines and planes, system of homogeneous and non- homogeneous linear equations, the solution of system of m homogeneous linear equations in n-unknowns by Elimination method.
12. Explain Matrices with real entries; and their properties and types of matrices
13. Solve System of linear equations Gaussian elimination method, Matrix method
14. Definition of a real vector space, Subspace: examples:
15. Explain linear combinations of vectors. linear span of a vector subspace of V; linearly independent/linearly dependent subsets of a vector space
16. Define Basis & dimension of a vector space, maximal linearly independent.
17. State and prove Rank nullity theorem (statement only) and examples.

CREDITS: Three (3) Theory periods of 48 minutes per week per paper over the semester.
One (1) Tutorial period of 48 minutes per week per paper per batch over the semester.

Semester III

Program specific outcomes(PSO's)

PSO1: Explain the Functions of several variables
PSO2: Define Differentiation of various functions and it's properties.
PSO3: Explain Applications of differentiations.
PSO4: Determine Linear transformations and Matrices,
PSO5: Define Determinants and it's elementary properties by an example.
PSO6: Explain Groups, Subgroups and its results.
PSO7: Define various Algorithms used in various examples like sequences, series.
PSO8: Define Graph its various types & The shortest path algorithm
PSO9: Explain Trees & Traversal algorithm

Course outcomes (CO's

1. Define Euclidean inner product, norm function, distance between two points, open ball, open subset, neighborhoods of a point in Rn;
2. Meaning of sequences, limits and continuity of functions, of vector fields in R2-R2, ------Rn-Rn
3. Basic results on limits and continuity of sum, difference, scalar multiples of vector fields, Continuity & components of a vector field. Directional & partial derivatives Mean value theorem, for derivatives of scalar fields.
4. Differentiability of a scalar field at a point of Rn, the total derivative, uniqueness of total derivative of a differentiable function at a point,
5. Explain Gradient of a scalar field, geometric properties of gradient, level sets and tangent planes. Chain rule for scalar fields. Higher order partial derivatives, mixed partial derivatives, sufficient condition for equality of mixed partial derivatives.
6. Solve the examples by using Second order Taylors formula for scalar fields. Differentiability of vector fields, definition of differentiability of a vector field at a point.
7. Define Jacobean matrix, differentiability of a vector field at a point implies continuity. The chain rule for derivative of vector fields (statements only). Mean value inequalities

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8. Hessian matrix, Maxima, minima and saddle points. Second derivative test for extrema of functions of two variables. Method of Lagrange multipliers.
9. Explain Linear transformations, representation of linear maps by matrices and effect under a change of basis Kernel and image of a linear transformation, examples. Rank-Nullity theorem & applications.
10. Define Linear isomorphism's, inverse of a linear isomorphism.
11. Define matrix units, row operations, elementary matrices. Elementary matrices are invertible and an invertible matrix is a product of elementary matrices. Row space and column space of a matrix, row rank and column rank of a matrix, equivalence of the row and the column rank.
12. Solve examples on solutions of non-homogeneous systems of linear equations represented by Ax = b;
13. Explain existence of a solution when rank(A) = rank(A; b); the general solutions of the system is the sum of a particular solution of the system and the solutions of the associated homogeneous system.
14. Explain Determinant D(A1;A2) of order 2 and its properties:
15. Explain Cofactors and minors, adjoint adj(A) of an n _ n-matrix A; A.adj(A) = det(A) invertible matrix
16. Solve the system of linear equations by Cramer's rule.
17. Explain the terms Determinant as area and volume with an examples.
18. Define group, Abelian group, Order of a group, finite groups, infinite groups.
19. Examples of groups including: 1. Z;R;C, Zn under addition.2. Q,R, C_Un under multiplication. Sn (the group of all permutations of f1; 2; _ _ _ ; ng). 4. Klein 4-group.
20. Explain The group of symmetries of a plane figure. The Dihedral group Dn (= the group of symmetries of a regular polygon of n sides in the plane R2 (n=3,4)) under composition.
21. Solve examples on Mm_n(R) (=the group of all m_n-matrices with real entries) under addition of Matrices, and GLn(R)(the group of invertible matrices with real entries) under multiplication of matrices Subgroups.
22. Define Cyclic groups (exs. of Z; Zn; _n)& subgroups. The center Z(G) of a group G as a subgroup of G:
23. Explain Cosets, Lagrange's theorem. Group homeomorphism and isomorphism. Examples and properties. Automorphism of a group and inner automorphisms.
24. Define an algorithm, characteristics of an algorithm, Selection and iterative constructs in pseudocode, simple examples such as (a) Exchanging values of variables, (b) Sum of n given numbers.
25. Searching and sorting algorithms including the following:
    (a) Finding maximum and/or minimum element in a finite sequence of integers,
    (b) The linear search and binary search algorithms of an integer x in a finite sequence of distinct integers (c) Sorting of a finite sequence of integers in ascending order, selection sort.
26. Write an Algorithms on integers: (a) Modular exponent, (b) Euclidean algorithm to find the g.c.d of two non-zero integers.
27. Explain the Complexity of algorithm, Growth of functions, Time complexity, Best case, average case, Worst Case complexity. Using big notation to express the best, average and worst case behavior for sorting and searching algorithms.
28. Determine an algorithm on Recursion, Fibonacci sequence Examples
29. Introduction to graphs: Types ,Graph Terminology: Adjacent vertices, degree of a vertex, isolated vertex, pendant vertex in an undirected graph.
30. Explain Paths, circuits, simple paths, simple circuits in a graph, Connecting paths between vertices (Simple examples), Euler paths and circuits, Hamilton paths and circuits, Diracs Theorem Planar graphs, planar representation of graphs, Eulers formula. Kuratowski Thm.(state only).
31. Write an Algorithms, Shortest path problem: Construction of Eulerian path by Fleury's Algorithm, The shortest path algorithm Dijkstras Floyd's Algorithm to find the length of the shortest path.
32. Define Trees: Forests, binary trees ,Trees as models. Their Properties

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33. Explain The application of Trees Binary Search Trees, Algorithm for locating an item in or adding an item to a Binary Search Tree, Decision Trees Spanning Trees.
34. Explain Prims Algorithm, Kruskals Algorithm

CREDITS- Three (3) Theory periods of 48 minutes per week per paper over the semester.
One (1) Tutorial period of 48 minutes per week per paper per batch over the semester.
One (1) Practical of 3 periods per week per batch over the semester.

Semester IV

Program specific outcomes(PSO's)

PSO1 : Explain Nested Interval theorem & Applications
PSO2 : Define Riemann Integration
PSO3 : Determine In definite and improper Riemann integrals, double integrals
PSO4 : Meaning of First order first degree differential equations solve examples on each type
PSO5 : Explain Second order Linear Differential equations and solve examples.
PSO6 : Determine Linear system of ODEs
PSO7 : Problem solving strategies
PSO8 ;Define Iterations and Conditional statements
PSO9 : Explain Strings

Course outcomes (CO's)

1. Explain Nested Interval theorem in R: Applications of Nested Interval Theorem: Bolzano Weierstrass Theorem: Every bounded sequence of real numbers has a convergent subsequence.
2. Determine Intermediate Value theorem
3. State and prove Heine-Borel theorem:
4. Definition of uniform continuity of a real valued function on a subset of R: Approximation of area;
5. Definition of Riemann integral on a closed and bounded interval; Riemann's Criterion for Riemann integrability.
6. Explain Properties of Riemann integrals:
7. Describe Ist and IInd Fundamental theorem of Calculus.
8. Explain Mean value theorem for integrals. Integration by parts, Change of variable formula.
9. Solve an examples on Improper integrals- type 1 and type 2; Absolute convergence of improper integrals; Comparison
10. Tests; Abels and Dirichlets tests (without proof), functions and their properties;
11. Solve an examples on Double integrals: Definition of double integrals over rectangles, properties, double integrals over a bounded region. Fubini theorem (without proof) - iterated integrals,
12. Define double integrals as volume. Application of double integrals: average value, area, moment, center of mass. Double integral in polar form.
13. Define Differential Equation, Order and Degree of a Differential Equation, types ODE and PDE.
14. Explain Lipschitz function, examples. Existence and Uniqueness Theorem for the differential Solve examples verifying the conditions of existence and uniqueness theorem Existence and Uniqueness Theorem for the solutions of a second order linear ODE:
15. Define Exact Equations: General Solution of Exact equations of first order and first degree, Necessary and sufficient condition for $M\,dx + N\,dy = 0$ to be exact.
16. Non-exact equations. Rules for finding integrating factors (without proof) for non exact equations such
17. Explain Linear and reducible to linear equations, finding solutions of first order differential equations
18. Explain type for applications to orthogonal trajectories, population growth, and finding the current Fibonacci sequence
19. Existence and uniqueness theorems. Homogeneous and non-homogeneous second order linear differentiable equations: The space of solutions of the homogeneous equation as a vector space.
20. Wronskian and linear independence of the solutions. The general solution of homogeneous D.E.
21. The general solution of a non-homogeneous second order equation.

22. Complementary functions and particular integrals. The homogeneous equation which constant coefficient, auxiliary equation. The general solution corresponding to real and distinct roots, real and equal roots and complex roots of the auxiliary equation. Non-homogeneous equations: T
23. Solve the examples on method of undetermined coefficients. The method of variation of parameters.
24. Explain Existence and uniqueness theorems The Wronskian W(t) of two solutions of a homogeneous linear system of ODEs in two variables.
25. Solve the general solution of a homogeneous linear system of ODEs in two variables. Explicit solutions of Homogeneous linear systems with constant coefficients in two variables, examples.
26. Aim of this course: to introduce Programming as a vehicle to test Algorithms & enable the students to write their own Programs.
27. Explain formal definition of problem, Solution, top-down design, breaking a problem into sub problems, overview of the solution to the sub problems by writing step by step
28. Explain Python programming language:
29. Meaning of Elementary Python Graphics such as drawing lines, circles.

CREDITS : Three (3) Theory periods of 48 minutes per week per paper over the semester.
One (1) Tutorial period of 48 minutes per week per paper per batch over the semester.
One (1) Practical of 3 periods per week per batch over the semester.

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DEPARTMENT OF ZOOLOGY

PSOs and COs

F.Y.B.Sc.

SEMESTER – I

P. S. Os.

1. To nurture interest in the students for the subject of Zoology.
2. To create awareness of the basic and modern concepts of Zoology.
3. To orient students about the importance of abiotic and biotic factors of environment and thei conservation.
4. To provide an insight to the basic nutritional and health aspects of human life.
5. To inculcate good laboratory practices in students and to train them about scientific handling o important instruments.
6. To orient learners about rich heritage of Biodiversity of India and make them understan significance of its conservation.
7. Minds of learners would be impulse to think differently and would be encouraged ipso facto t their original crude ideas from the field of biological sciences.

C.Os. of Paper I

1. To take learners through a captivating journey of hoarded wealth of marvelous animal world Curiosity will be ignited in the mind of learners, to know more about the fascinating world o animals which would enhance their interest and love for the subject of Zoology.
2. Learners would appreciate treasure of Biodiversity, its importance and hence would contribut their best for its conservation.
3. To teach learners about innovative and novel work of scientists/philosopher/entrepreneurs in th field of biological sciences.

C.Os. of Paper II

1. To make learners aware of risks involved in handling of different hazardous agents especiall during practical sessions in the laboratory and to train them to avoid mishap.
2. Learners will learn to work safely in the laboratory which will boost their scholastic performanc and economy in use of materials/chemicals during practical sessions.
3. To acquaint learners to the modern developments and concepts of Zoology highlighting thei applications aiming for the benefit of human being.
4. Learners would understand recent advances in the subject and their applications for the betterme of mankind; and that the young minds would be tuned to think out of the box.
5. To provide all learners a complete insight about the structure and train them with operational skill of different instruments required in Zoology.

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F.Y.B.Sc.
SEMESTER-II

P. S. Os.

1. To facilitate the learning of population ecology, its dynamics and regulatory factors important for its sustenance.
2. To impart knowledge of different components of ecosystem and educate about essentials of coexistence of human beings with all other living organisms.
3. Learners would be inspired to choose career options in the field of wild life conservation, research, photography and ecotourism.
4. To make learners understand the importance of balanced diet and essential nutrients of food at different stages of life.
5. To impart knowledge about source, quantum and need for conservation of fast depleting water resource and essentials of maintaining proper sanitation, hygiene and optimizing use of electronic gadgets.
6. To educate learners about causes, symptoms and impact of stress related disorders and infectious diseases.

C. O.s of Paper I

1. Learners will study about nature of animal population, specific factors affecting its growth and its impact on the population of other life form.
2. Learners will grasp the concept of interdependence and interaction of physical, chemical and biological factors in the environment.
3. The students will have better understanding of implications of loss of fauna specifically on human being, erupting spur of desire for conservation of all flora and fauna.
4. To enlighten learners about the current status of wild life conservation in India in the light of guidelines from different relevant governing agencies vis-à-vis with adversity of poaching and biopiracy.

C. O.s of Paper II

1. Healthy dietary habits would be inculcated in the life style of learners.
2. The students will learn to prevent risk of developing health hazards in younger generation due to faulty eating habits.
3. To promote optimum conservation of water, encouragement for maintaining adequate personal hygiene.
4. To teach optimum use of electronic gadgets, avoiding addiction, thus facilitating achievement of the goal of healthy young India in true sense.
5. Learners will be able to promptly recognize stress related problems at initial stages and would be able to adopt relevant solutions.
6. The students would be able to have psychologically strong mind set by promoting positive attitude. The learners would be able to acquire knowledge of cause, symptoms and precautions of infectious diseases.

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S.Y.B.Sc.
SEMESTER – III

P. S. Os.

1. To Introduce the basic terms of genetics.
2. To familiarize the learners with the structure, types and classification of chromosomes.
3. To make the learner understand the structure of nucleic acids and the concept of central dogma of life.
4. To introduce the concepts of physiology of nutrition, excretion and osmoregulation.
5. To introduce the concepts of physiology of respiration and circulation.
6. To introduce the concepts of physiology of control and coordination and locomotion and reproduction.
7. To introduce the learners to the fascinating facts of animal life.
8. Learners will become familiar with the enthralling animal world.
9. To enable the learners to understand the different patterns of animal behavior.
10. To introduce the learner to the science of vermicomposting and dairy.
11. Learner will appreciate and respect domestic pets through proper care.

C. Os. of Paper I

1. To study Mendelian principles of inheritance and other forms pattern of inheritance.
2. Learners would understand and apply the principles of inheritance.
3. Understand the concept of multiple alleles, linkage and crossing over.
4. To introduce the concept of sex determination and its types, sex influenced and sex limited genes.
5. Learners would understand the structure and types of chromosomes.
6. Learners would understand mechanisms of sex determination.
7. Learners would be able to correlate the disorders linked to a particular sex chromosome.
8. To introduce to the learners the classical experiments proving DNA as the genetic material.
9. To familiarize the learner with the concept of gene regulation.
10. Learner would understand the importance of nucleic acids as genetic material.
11. The learners would understand and appreciate the regulation of gene expressions.

C. Os of Paper II

1. To expose the learners to various nutritional apparatus, excretory and osmoregulatory structures in different classes of organisms.
2. Learners would understand the increasing complexity of nutritional, excretory and osmoregulatory physiology in evolutionary hierarchy.
3. Learners would be able to correlate the habit and habitat with nutritional, excretory and osmoregulatory structures.
4. To expose the learners to various respiratory and circulatory structures in different classes of organisms.

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5. Learners would understand the increasing complexity of respiratory and circulatory physiology in evolutionary hierarchy.
6. Learners would be able to correlate the habit and habitat with respiratory and circulatory structures.
7. To expose the learners to various locomotory and reproductive structures in different classes of organisms.
8. Learners would understand the process of control and coordination by nervous and endocrine regulation.
9. Learners would be fascinated by various locomotory structures found in the animal kingdom.
10. Learners would be acquainted with various reproductive strategies present in animals.

C. Os. of Paper III

1. To study the natural history and marvelous world of animals.
2. Learners will appreciate the use of unique abilities of animals in development of technology.
3. To equip learners with a sound knowledge of how animals interact with one another and with their environment.
4. To make the learners aware of the rapid loss of biodiversity and the different methods for its protection.
5. Learners would gain an insight into different types of animal behavior and their role in adaptation.
6. Learner will understand the science of vermicomposting and dairy.
7. To make the learner aware about the care of different pet animals i.e. dogs, cats, fishes etc.

S.Y.B.Sc.
SEMESTER IV

P. S. Os.

1. To acquaint the learner with key concepts of embryology.
2. To acquaint the learners with different aspects of human reproduction.
3. To inculcate scientific temperament in the learner.
4. To study the structural and functional organization of cell.
5. To acquaint the learner with ultrastructure of cell organelles.
6. Learner would appreciate the intricacy of endomembrane system.
7. To give learner insight into the structure of biomolecules, and their role in sustenance of life.
8. To make learners understand the importance of diet and life style in holistic health management.
9. The learner will become cognizant about genetic and neurological disorders as well as genetic counseling, its requisites and significance.
10. To create awareness in learner regarding various critical environmental issues using thought provoking case studies.

C.Os. of Paper I

1. Learner will be able to understand and compare the different pre- embryonic stages.
2. Learner will be able to appreciate the functional aspects of extra embryonic membranes and classify the different types of placentae.

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3. To make them aware of the causes of infertility, techniques to overcome infertility and the concept of birth control.
4. Learners will able to understand human reproductive physiology.
5. Learners will become familiar with advances in ART and related ethical issues.
6. The learner will develop qualities such as critical thinking and analysis.
7. The learner will develop the skills of scientific communication.
8. Learner will understand the ethical aspects of research.

C.Os. of Paper II

1. To study the structural and functional organization of cell with an emphasis on nucleus, plasma membrane and cytoskeleton.
2. Learner would acquire insight of transport mechanisms for the maintenance and composition of cell.
3. To acquaint the learner with ultrastructure of cell organelles.
4. Learner would understand the interlinking of endomembrane system for functioning of cell.
5. The learner will realize the importance of biomolecules and their clinical significance.

C. Os. of Paper III

1. Learners will apply the knowledge of balanced diet to adopt a healthy life style.
2. The goal is to introduce learners the basic concept of genetic disorders, neurological disorders, genetic counseling, its necessity and applications.
3. To equip the learner with the knowledge of causes and effects of pollution and actions required to combat the detrimental effects of pollution.
4. Learner will be able to relate various anthropogenic activities with environmental degradation and its harmful effects on human health.
   Learner will become more sensitive towards the environmental issues.

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Program Specific Outcomes
PSOs of B.Sc. Computer Science

SEMESTER-I

PAPER –I Computer Organization and Design

PSO1	Representation of number system, logic gtaes, Half Adder,Full Adder,Decoder,Multuiplexer,Shift Register.
PSO2	Memory organization,big endian little endian,Instruction set for RISC and CISC Machine language,Assembly Language
PSO3	Components of Processor,Registers,ALU,Control Unit,Accessing I/O Devices.Interrupts and exceptions.

CO1	Explain Multiplexer?
CO2	Explain Half Adder And Ful Adder?
CO3	Explain Memory Organization?
CO4	Explain Assembly Language?
CO5	Explain Components of processer?
CO6	Explain Interrupts

PAPER –II Programming with Python- I

PSO1	Students should be able to understand the concepts of programming before actually starting to write programs.
PSO2	Students should be able to develop logic for Problem Solving.
PSO3	Students should be made familiar about the basic constructs of programming such as data, operations, conditions, loops, functions etc.
PSO4	Students should be able to apply the problem solving skills using syntactically simple language i.e. **Python (version: 3.X or higher)**
PRACT	As per university syllabus.

CO: Course Outcomes

CO1	Reasons for Python as the learner's first programming language.
CO2	Discuss IDLE interpreter (shell) and its documentation. Interactive and script modes of IDLE.
CO3	Explanation of data type, variables, operators.
CO4	Explain input output statements.
CO5	Explain conditional statements.
CO6	Explain Built-in functions.
CO7	Discuss Concept of Dictionaries
CO8	Anonymous functions declaration in python.
CO9	List comprehensions in python.

PAPER –III Free and Open Source Software

Unit	Description
PSO1	Introduction, Methodologies, Social Impact
PSO2	Case studies, Contributing to open source projects.
PSO3	Understanding Open Source Ecosystem.
PRACT	As per university syllabus.

CO: Course Outcomes

CO1	Write the difference between open source software and free software.
CO2	List and explain the principles of Open source.
CO3	Describe the following with diagram:- a) Copyright b) Copyleft

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CO4 Write a short note on Income generation opportunities.
CO5 Explain in detail Internationalisation.
CO6 What is Open Source Government? Explain with its benefits.
CO7 Explain Wikipedia and steps to contribute to Wikipedia.
CO8 Describe Android in detail.
CO9 Explain different programming languages.
CO10 What is LAMP? Explain in detail.

PAPER –IV Database Systems

Unit	Description
PSO1	Introduction to DBMS, Data models, Entity Relationship Model, Relational data model, ER to Table
PSO2	Schema refinement and Normal forms, Relational Algebra, DDL Statements, DML Statements.
PSO3	Functions, Joining Tables, Subqueries , Database Protection, Views, DCL Statements
PRACT	As per university syllabus

CO: Course Outcomes

CO1 Explain Architecture of DBMS.
CO2 What is data independence?
CO3 Explain the types of attributes with example.
CO4 What is functional dependency? Explain it.
CO5 Explain types of joins in DBMS.
CO6 Write a query for creating a table and insert any five records.
CO7 Explain 1NF and 2NF.
CO8 Explain types of constraint.
CO9 Explain aggregate functions
CO10 Explain string functions.
CO11 What are sub queries? Explain it with example.
CO12 What are views inn DBMS.

PAPER –V Discrete Mathematics

Program:

Unit	Description
PSO1	Functions, Relation, Recurrence relations.
PSO2	Counting principles, Permutations and combinations, Languages grammerars and machines.
PSO3	Graphs, Trees.
PRACT	As per university syllabus

CO: Course Outcomes

CO1 What is domain, co-domain and range of function ?
CO2 What are the types of functions?
CO3 Properties of relation,explain in detail .
CO4 How many ways are there to select a 1st, 2nd and 3rd prize winner from 100 different people who have entered a contest ?
CO5 State and explain Pascals identity theorem .
CO6 What is sum rule ?
CO7 Explain pigeon hole principle.
CO8 The godel number of a word w = a5a2a3a1a2 is ----------
CO9 What is graph , explain in detail.
CO10 What is trees?

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PAPER –VI Descriptive Statistics and Introduction to Probability

Program:

Unit	Description
PSO1	Data Presentation, Data Aggregation
PSO2	Moments, Measures of Skewness and Kurtosis, Correlation and Regression
PSO3	Probability definition
PRACT	As per university syllabus

CO: Course Outcomes

CO1	Define independent events.
CO2	Explain the concept of nonsense correlation.
CO3	Define sample space.
CO4	What is qualitative characteristic?
CO5	Write any three properties of good measure of central tendency.
CO6	Explain the procedure for drawing stem-leaf diagram.
CO7	Explain the concept of skewness and state the relation between mean , mode and median.
CO8	Explain the union of two events.

PAPER –VII Soft Skills Development

Unit	Description
PSO1	Soft skill, Hard skill, emotional intelligent, communication today, personality development
PSO2	Academic skill, employment communication, job interview, group discussion
PSO3	Professional skill, ethical value, stress and time management
PRACT	As per university syllabus

CO: Course Outcomes

CO1	What is Positive Thinking?
CO2	Difference between intelligence Quo and Emotional intelligence.
CO3	Write a note on communicating digital world.
CO4	What is Group discussion?
CO5	How to write effective resume?
CO6	Explain Six thinking Hat method.
CO7	What is Capacity building?
CO8	Explain Stress and time management.
CO9	Explain the interview tips.
CO10	Give the importance of Resume.

SEMESTER-II

PAPER –I Programming with C

Program-Programming with C

Unit	Description
PSO1	Structure of C Program, Data:Data types Like :float ,int,char,double and void ,short and long. Variables, Types of Operators ,Iteration:Control Statements for Decision Making.
PSO2	Arrays, Data Input and Output Functions: Character I\O formate:getch(),getche(), getchar(),getc(),gets(). Manipulating Strings, Functions , Recursion.
PSO3	Pointer, Dynamic Memory Allocation:malloc(),calloc(),realloc(),free(). Structure, Unions, File handling.
PRACT	As per university syllabus

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CO: Course Outcomes

CO1	Explain the different features of c and explain them?
CO2	What is the Data Type and write the different data types with syntax .
CO3	What are Operator and Expressions? Write the different types of Operators with example.
CO4	Explain the different types of Array with Example.
CO5	Difference between C String and Python string.
CO6	Write the different types of Control Statement. Explain any two with Example.
CO7	What do you mean by Pointers to function?
CO8	Define Union and write the different between Structure and Union.
CO9	Define:malloc() ,calloc(), realloc() , free() and sizeof operator.
CO10	What is File Handling ?Write the different types of File Handling functions .
CO11	Compare data types in c and Data types in python.

PAPER –II Programming with Python– II

PSO1	Students should be able to understand how to read/write to files using python.
PSO2	Students should be able to catch their own errors that happen during execution of programs.
PSO3	Students should get an introduction to the concept of pattern matching.
PSO4	Students should be made familiar with the concepts of GUI controls and designing GUI applications
PSO5	Students should be able to connect to the database to move the data to/from the application.
PSO6	Students should know how to connect to computers, read from URL and send email.
PRACT	As per university syllabus.

CO: Course Outcomes

CO1	How to read and write files.
CO2	Explain with iterables and iterators.
CO3	Demonstrate exception handling.
CO4	Demonstrate the use of regular expressions.
CO5	Design to show draw shapes & GUI controls.
CO6	How to create server-client and exchange basic information
CO7	How to send email & read contents of URL.

PAPER –III Linux

Unit	Description
PSO1	Introduction, Installation, Linux structure
PSO2	Graphical Desktop, Command Line, Linux Documentation, File Operations
PSO3	Security, Networking, Basic Shell Scripting
PRACT	As per university syllabus.

CO: Course Outcomes

CO1	Describe the architecture of Linux
CO2	Define the following terms: kernel, distribution, bootloader, command line , file system
CO3	What are the booting steps? Explain in detail.
CO4	Describe the file system architecture.
CO5	Explain touch, cp, rm,mv, mkdir, clear commands with example.
CO6	Define command line mode. List various command line mode options.
CO7	What is root? Explain the uses of root.
CO8	Describe any one network protocol.

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CO9 Write the characteristics of good password.
CO10 What is a protocol?Explain the different types of protocols in networking.

PAPER –IV Data Structures

Unit	Description
PSO1	Abstract Data Types, Arrays, Sets and Maps, Algorithm Analysis, Searching and Sorting
PSO2	Linked Structures, Stacks, Queues, Advanced Linked List
PSO3	Recursion, Hash Table, Advanced Sorting, Binary Trees
PRACT	As per university syllabus

CO: Course Outcomes

CO1 What is abstraction? What are the various types of abstraction?
CO2 Explain merging of 2 sorted list.
CO3 How to calculate the running time for an algorithm.
CO4 Write python code for Binary search.
CO5 How to delete a node from doubly linked list?
CO6 Write short note on sparse matrix.
CO7 Write a program to evaluate a postfix.
CO8 Write a program to implement queue using python list
CO9 Write a short note on recursion.
CO10 Write a program to implement quick sort.
CO11 Write a short note on properties of Binary trees.
CO12 Write a program to implement tower of Hanoi.

PAPER –V Calculus

Program:

Unit	Description
PSO1	Derivatives and Its Applications.
PSO2	Integration and Its Applications.
PSO3	Partial Derivatives and its Applications.
PRACT	As per university syllabus

CO: Course Outcomes

CO1 Define continuity of function with example.
CO2 Define derivative of function with example.
CO3 Explain cups in detail.
CO4 Define definite integral.
CO5 Define properties of definite integrals.
CO6 Explain basic methods of integration with examples.
CO7 State the chain rule with suitable examples.
CO8 Write the properties of Gradient of a vector.
CO9 Explain the term from the following.
CO10 Explain the length of a plane curve.

PAPER –VI Statistical Methods and Testing of Hypothesis

Program- Statistical Methods & Testing of Hypothesis

Unit	Description
PSO1	Standard distributions: random variable; discrete, continuous, expectation and variance of a random variable, pmf, pdf, cdf, reliability, Introduction and properties without proof for following distributions; binomial, normal, chi-square, t, F. Examples

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PSO2	Hypothesis testing: one sided, two sided hypothesis, critical region, p-value, tests based on t, Normal and F, confidence intervals. Analysis of variance : one-way, two-way analysis of variance
PSO3	Non-parametric tests: need of non-parametric tests, sign test, Wilicoxon's signed rank test, run test, Kruskal-Walis tests. Post-hoc analysis of one-way analysis of variance : Duncan's test Chi-square test of association
PRACT	As per university syllabus

CO: Course Outcomes

CO1	What is Random variable? Explain Discrete & continuous RV.
CO2	What is Analysis of Variance?
CO3	An urn contains 6 red & 4 white balls. These balls are drawn at random. Obtain the probability distribution of the number of white balls drawn.
CO4	State the properties of hypothesis testing.
CO5	Explain one-way & two way ANOVA?
CO6	Explain Run test with example.
CO7	When to use non-parametric methods?
CO8	Explain the Duncan's Chi-square test.

PAPER –VII Green Technologies

Program:

Unit	Description
PSO1	Green IT overview
PSO2	Green data centres
PSO3	Sustainable information systems and green metrics.
PRACT	As per university syllabus

CO: Course Outcomes

CO1	How IT can help in enhancing environmenta sustainability?
CO2	What are the environmental impacts of IT?
CO3	What are the green strategies?
CO4	What are the layers of infrastructure in data centre?
CO5	How caching helps in disk power management?
CO6	Discuss business drivers of Green IT strategy.
CO7	Explain the hierarchy of sustainability models .
CO8	What is EMIS?
CO9	Explain the major element of value chain.
CO10	Explain capability maturity framework for SICT.

SEMESTER-III

PAPER –I Theory of computation

PSO1	Defining Automata,Finite Automata,Transitions and its properties,Acceptibility by Finite AutomataNon Deterministic Finite state Machine, Mealy and Moore Machines.Defining Grammar,Chomsky Classification of Grammar and Languages.
PSO2	Regular Grammar,Regular Expression,Pumping Lemma and its Application,Context free language,Ambiguity of Grammar,CFG simplification,Pushdown Automata.
PSO3	Linear Bound Automata,Turing Machines.

CO: Course Outcomes

CO1.	Explain Finite Automata?And its properties
CO2	Explain Mealy and Moore machine

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CO3 Explain Ambiguity Grammar?
CO4 Explain Context free language?
CO5 Explain Linear Bound Automata?
CO6 Explain Turing Machine?

PAPER –II Core Java

Unit	Description
PSO1	The Java Language, OOPS, String Manipulations, Packages
PSO2	Exception Handling, Multithreading, I/O Streams, Networking
PSO3	Wrapper Classes, Inner Classes, AWT
PRACT	As per university syllabus

CO: Course Outcomes

CO1 Explain Features of Java.
CO2 What is Constructor? Define its types.
CO3 Explain the concept of Package.
CO4 Write difference Between Method Overloading & Overriding.
CO5 Explain Predefined Exceptions.
CO6 What is Thread? Explain Thread Life Cycle.
CO7 Discuss the importance of network programming.
CO8 Discuss various methods of Socket Class.
CO9 Write a short note on Layout Manager.
CO10 What are Inner Classes? Discuss its types.
CO11 Write short note on Mouse Listener interface.
CO12 Design GUI Application with various AWT components.

PAPER –III Operating System

Unit	Description
PSO1	Operating System Structures, Processes, Threads
PSO2	Process Synchronization, CPU Scheduling, Deadlocks
PSO3	Main Memory, Virtual Memory, Mass-storage structure, File system interface and implementation.
PRACT	As per university syllabus

CO: Course Outcomes

CO1 Explain the various functions of operating System
CO2 Explain the six major categories of System calls.
CO3 Explain the process states in detail.
CO4 Explain the concept of Scheduling Queues
CO5 Write a short note on Priority Scheduling algorithm
CO6 Explain Peterson's solution.
CO7 What are the CPU scheduling algorithm criteria.
CO8 Write a note on resource allocation graph.
CO9 Write a short note on Magnetic disks.
CO10 Explain the Deadlock detection.
CO11 Write a short note on paging.
CO12 Write a short note on two-level directory.

PAPER –IV Database Management SystemsProgram-DBMS

Unit	Description
PSO1	Stored Procedures ,Triggers, Sequences, File Organization and Indexing

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PSO2	Fundamentals of PL/SQL, Overview of PL/SQL Control Structures
PSO3	Transaction Management, DCL Statements, Crash Recovery
PRACT	As per university syllabus

CO: Course Outcomes

CO1	Explain insert, update trigger with an example
CO2	Write a short note on sequence along with an example
CO3	How to create and execute stored procedure
CO4	Difference between function and stored procedure
CO5	Write a short note on loop and exit statement
CO6	Write an block in PL/SQL to explain GOTO statement
CO7	Find out the similarities and differences between loop ... end loop and while statement
CO8	Describe ACID properties for transaction
CO9	Explain two phase commit protocol
CO10	Explain undo and redo phase in Aries algorithm
CO11	What is write-ahead log protocol? Explain with example
CO12	List advantages of PL/SQL.

PAPER –V Combinatorics and Graph Theory

Program :

Unit	Description
PSO1	Introduction to Combinatorics
PSO2	Graph Theory
PSO3	Network Flows
PRACT	As per university syllabus

CO: Course Outcomes

CO1	How combinatorics and graph theory related to each other ?
CO2	State and prove Binomial theorem ?
CO3	Explain multinomial coefficient.
CO4	What is graph?
CO5	What is eulerian and Hamiltonian graph?
CO6	Define chromatic number ?
CO7	Define the pigeon hole principle.
CO8	What are the basic notation and terminology used in network flow?
CO9	Explain flows and cuts.
CO10	What is planar graph ?

PAPER –VI Physical Computing and IoT Programming

PSO1	SoC and Raspberry Pi System on Chip SoC products: FPGA, GPU, APU, Compute Units ,ARM 8 Architecture: SoC on ARM 8. Raspberry Pi: Introduction to Raspberry Pi.
PSO2	Programming Raspberry Pi Raspberry Pi and Linux: About Raspbian, Linux Commands, Programing interfaces, Introduction to Node.js, Python Raspberry Pi Interfaces: UART, GPIO, I2C, SPI,Useful Implementations: Cross Compilation, Pulse Width Modulation, SPI for Camera.
PSO3	Introduction to IoT: What is IoT IoT examples,Simple IoT LED Program. IoT and Protocols IoT Security: HTTP, CoAP, MQTT, XMPP. IoT Service as a Platform: Clayster, Thingsio, SensoIoT, carriots and Node RED.

CO: Course Outcomes

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CO1 Differenciate between CPU and GPU with an example.
CO2 What is compute units? How does it work? Discuss concept of pipelining with example.
CO3 Write a short note on Node.js
CO4 Explain linux commands for file system.
CO5 Write a short note on MQTT protocol and its architecture.
CO6 What are sensors? How they can be incorporated in COAP.
CO7 Write short note on ARM 8.
CO8 Discuss any one Programming interface used with Raspberry Pi

PAPER –VII Skill Enhancement: Web Programming

PSO1 HTML5:Fundamentals elements of HTML,image maps,forms in HTML,links and urls,audio and video tags.CSS:selectors,types of css,working with fonts and background.
PSO2 JAVASCRIPT:Variables,operators,function,timer,objects.XML:adv and disadv of XML,structures, xslt,elements and attributes.
PSO3 AJAX:how ajax works,handling asyn request with ajax.PHP: Variables, operators, function, arrays, cookies,sessions,working with database. JQUERY:fundamentals,selectors, traversing ,manipulators, events,effects.

CO: Course Outcomes

CO1. Write a note onlinks and image mapping.
CO2. List various types of css selectors.
CO3. Write a note on date and math objects in javascript.
CO4. What is XML?Explain its advantages.
CO5. Write a note on variables and operators in PHP.
CO6. Explain effects in jquery.

SEMESTER-IV

PAPER –I Fundamentals of Algorithms

Program:

Unit	Description
PSO1	Introduction to algorithm; Master Theorem
PSO2	Tree algorithms; Graph algorithms; Selection algorithm
PSO3	Algorithms Design Techniques; Greedy algorithm; Dividing and conquer algorithm; Dynamic Programming
PRACT	

CO: Course Outcomes

CO1 Explain big-O notation with example.
CO2 What are the characteristic of algorithm?
CO3 Explain Master Theorem for divide and conquer technique.
CO4 What is tree? Explain properties of binary tree.
CO5 Explain balanced binary search Trees.
CO6 Explain in detail AVL.
CO7 What is divide and conquer strategy?
CO8 Explain Greedy algorithm. Explain Advantages and disadvantages.
CO9 Explain Dynamic programming strategy?
CO10 Write a short note classification by implementation method.

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PAPER –II Advanced JAVA

PSO1	SWING:difference between awt and swing,JButton,JLabel,JTextField,JComboBox and JList. JDBC architecture,types of drivers,statements,resultset,scrollable and updatable resultset.
PSO2	SERVLET:introduction,genericservlet,servlet life cycle,servletconfig.JSP:lifecycle,implicit objects scripting elements,jsp actions.
PSO3	BEANS:introduction and properties.STRUTS:mvc architecture,framework,interceptors,results and result types.JSON:overview,syntax,datatypes,schema,comparison.

CO: Course Outcomes

Questions:

CO1.	Explain JButton, JLabel, JTextField with an example.
CO2.	Explain scrollable and updatable resultset in jdbc.
CO3.	Explain life cycle of servlet.
CO4.	Describe various types of scripting elements.
CO5.	Write a note on beans and its types.
CO6.	What is JSON?

PAPER –III Computer Networks

Program-Computer Networks

Unit	Description
PSO1	Introduction to N/W models, data communication, TCP/IP model, OSI model, Transmission of digital Signal, Transmission Impairment
PSO2	Introduction to Physical layer & Data link layer, Transmission mode, Analog Transmission , Transmission media, ARP, Error detection & correction
PSO3	Introduction to network layer & Transport layer,IPv4, Connectionless &Connection-oriented protocol, TCP, UDP
PRACT	As per university syllabus

CO: Course Outcomes

CO1	What is Data Communication? Explain 5 components of Data Communication.
CO2	Describe TCP/IP protocol suite and each layer functions.
CO3	Explain transmission impairment.
CO4	Explain type of transmission mode.
CO5	Differentiate between Correction & detection.
CO6	Explain type of Transmission media.
CO7	Define UDP services.
CO8	Differentiate between connectionless & connection oriented protocol.
CO9	Explain classful addressing in IPv4.

PAPER –IV Software Engineering

Unit	Description
PSO1	Introduction, Requirement Analysis and System Modeling
PSO2	System Design , Software Measurement and Metrics , Software Project Management, Project Scheduling
PSO3	Risk Management ,Software Quality Assurance , Software Testing

CO: Course Outcomes

CO1	What is software engineering? Explain the generic process model.
CO2	Why to use waterfall model in software engineering ? explain its various phases.

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CO3	Explain evolutionary process model.
CO4	Write down characteristics of SRS.
CO5	Write down the basic principals of Project Scheduling .
CO6	What is SQA? Explain its goals.
CO7	Explain Six sigma.
CO8	Write down Formal Approaches to SQA .
CO9	Write difference between Verification and Validation
CO10	Explain black box testing and white box testing.

PAPER –V Linear Algebra using Python

Program:

Unit	Description
PSO1	Field
PSO2	Matrix; Basis
PSO3	Gaussian elimination; Inner Product; Orthogonalization
PRACT	As per university syllabus

CO: Course Outcomes

CO1	Explain vector and function.
CO2	How to combine vector addition.
CO3	Explain scalar multiplication.
CO4	Explain matrix vector multiplication in terms of dot product.
CO5	What is outer product and inner product?
CO6	Explain coordinate system.
CO7	Explain two greedy algorithms.
CO8	What is factoring integers
CO9	Explain projection orthogonal to multiple vectors.
CO10	What is internet worm?

PAPER –VI .NET Technologies

PSO1	The .NET Framework:.NET Languages, Common Language Runtime, .NET Class Library C# Language Basics: Comments, Variables and Data Types, Variable Operations, Object-Based Manipulation, Conditional Logic, Loops, Methods, Classes, Value Types and Reference Types, Namespaces and Assemblies, Inheritance, Static Members, Casting Objects, Partial ClasseSASP.NET: Creating Websites, Anatomy of a Web Form - Page Directive, Doctype, Writing Code - Code-Behind Class, HTML Server Controls - View State, HTML Control Classes, HTML Control Events, global.asax File, web.config File
PSO2	Web Controls: Web Control Classes, WebControl Base Class, List Controls, Table Controls, Web Control Events , Session State, Configuring Session State, Application State Validation: Validation Controls, Server-Side Validation, Client-Side Validation,Rich Controls: Calendar Control, AdRotator Control, MultiView Control Master Pages
PSO3	ADO.NET: Data Provider Model, Direct Data Access - Creating a Connection, Select Command, DataReader, Disconnected Data Access Data BindingData Controls: GridView, DetailsView, FormView Working with XML: XML Classes – XMLTextWriter, XMLText Reader LINQ: Understanding LINQ, LINQ BasicsASP.NET AJAX: ScriptManage Partial Refreshes, Progress Notification, Timed Refreshes

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CO: Course Outcomes

CO1	What are Variables and Data Types in C#.
CO2	What is Object and Class.
CO3	Explain HTML Server Controls.
CO4	What is Session State and Application State?
CO5	Explain Validation Controls.
CO6	What is ADO.NET?
CO7	Write short note on Select Command, DataReader.
CO8	Explain Data Control GridView.
CO9	What is LINQ?
CO10	Explain ASP.NET AJAX Controls.

PAPER –VII Skill Enhancement: Android Developer Fundamentals

Unit	Description
PSO1	Understand the requirements of Mobile programming environment.
PSO2	Learn about basic methods, tools and techniques for developing Apps
PSO3	Explore and practice App development on Android Platform
PSO4	Develop working prototypes of working systems for various uses in daily lives.
PRACT	As per university syllabus

CO: Course Outcomes

CO1	Install Android Studio and Run Hello World Program.
CO2	Create an android app with Interactive User Interface using Layouts.
CO3	Create an android app that demonstrates working with TextView Elements
CO4	Create an android app that demonstrates Activity Lifecycle and Instance State
CO5	Create an android app that demonstrates the use of Keyboards, Input Controls, Alerts, and Pickers.
CO6	Create an android app that demonstrates the use of an Options Menu.
CO7	Create an android app that demonstrate Screen Navigation Using the App Bar and Tabs.
CO8	Create an android app to Connect to the Internet and use Broadcast Receiver.
CO9	Create an android app to save user data in a database and use of different queries.

SEMESTER-V

PAPER –I Data Communication and Networking

Program- Data Communication and Networking

Unit	Description
PSO1	Introduction to N/W models, Introduction to Physical layer, Digital and Analog transmission
PSO2	Multiplexing and Spectrum Spreading, Transmission media, Switching Introduction to Data link layer, Error detection & correction
PSO3	Introduction to Data link layer, Error detection & correction, Data Link Control & protocol, HDLC & PPP
PSO4	Multiple Access , Wired LAN, Wireless LANs, Connecting devices and Virtual LANs.
PRACT	As per university syllabus

CO: Course Outcomes

CO1	What is Data Communication? Explain 5 components of Data Communication.

CO2	Describe TCP/IP protocol suite and each layer functions.
CO3	Explain type of multiplexer .
CO4	Explain type of Transmission media.
CO5	Differentiate between Correction & detection.
CO6	Explain type of Errors.
CO7	Define type of multiple Access.
CO8	Describe the virtual LANs.

PAPER –II Advanced Java Programming– I

PSO1	SWING I:difference between awt and swing,JButton,JLabel,JTextField,JComboBox and JList, panes,menus,dialog boxes.
PSO2	SWING II:tables and tress,colorchooser,filechooser,threads and communication.EVENT HANDLING :delegation event model,event classes,and listener interfaces.
PSO3	JDBC:architecture,types of drivers,statements,resultset,scrollable and updatable resultset.
PSO4	NETWORKING:overview,working with url,socket programming,introduction to distributed systems, steps involved in running the RMI application.

CO: Course Outcomes

Questions:

CO1	Explain JButton, JLabel, JTextField with an example.
CO2	Write a note on optionpane.
CO3	Explain JColorchooser with an example.
CO4	Write a note on actionevent and mouseevent.
CO5	Explain scrollable and updatable resultset in jdbc.
CO6	Explain types of drivers.
CO7	Write a note on urlconnection class.
CO8	Explain RMI.

PAPER –III Mobile Application Development

Unit	Description
PSO1	Understand the requirements of Mobile programming environment.
PSO2	Learn about basic methods, tools and techniques for developing Apps
PSO3	Explore and practice App development on Android Platform
PSO4	Develop working prototypes of working systems for various uses in daily lives.
PRACT	As per university syllabus

CO: Course Outcomes

CO1	Install Android Studio and Run Hello World Program.
CO2	Create an android app with Interactive User Interface using Layouts.
CO3	Create an android app that demonstrates working with TextView Elements
CO4	Create an android app that demonstrates Activity Lifecycle and Instance State
CO5	Create an android app that demonstrates the use of Keyboards, Input Controls, Alerts, and Pickers.
CO6	Create an android app that demonstrates the use of an Options Menu.
CO7	Create an android app that demonstrate Screen Navigation Using the App Bar and Tabs.
CO8	Create an android app to Connect to the Internet and use Broadcast Receiver.
CO9	Create an android app to save user data in a database and use of different queries.

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PAPER –IV Data Management using PL/SQL-I

Program- Data Management using PL/SQL-I

Unit	Description
PSO1	Fundamentals of PL SQL, SQL Identifiers, Write Executable Statements
PSO2	Conversion Functions, Control Structures, Composite Data Types
PSO3	Exception Handling, Stored Procedures and Functions
PSO4	Explicit Cursors, Collections
PRACT	As per university syllabus

CO: Course Outcomes

CO1	Describe the benefits of PL/SQL.
CO2	Explain the Pl Block & define types of Pl Blocks
CO3	Explain % TYPE attribute with examples.
CO4	Explain conditional control statements from PL./SQL.
CO5	Explain % ROWTYPE attribute with examples.
CO6	What is Exception & define types of exceptions.
CO7	Write difference between procedure & function.
CO8	Explain implicit cursor with example.
CO9	What is Explicit Cursor? Define the steps for cursor declaration.
CO10	Explain Varray?

PAPER –V .Net Technology

PSO1	Overview of .NET Framework, Objectives, Main components of .NET Framework and their overview, Types of Applications .NET Framework Architecture– CLR(Goal of CLR, Cross Language Interoperability & CLS, Assemblies(Assembly overview, Benefits, Contents, Types)
PSO2	Introduction to Programming:- Data Types and Variables, Statements, Methods: Functions and Subroutines. Structured Exception Handling : try, catch, finally blocks, throwing exceptions, Err object, Using masked Textboxes Navigation Controls- Architecture of the Navigation Controls, Menu Control, TreeView ControlValidation Controls – Validations & Validator controls,
PSO3	ADO.NET: Data Provider Model, Direct Data Access - Creating a Connection, Select Command, DataReader, Disconnected Data Access Data Binding: Introduction, Single-Value Data Binding, Repeated-Value Data Binding Data Source Controls – SqlDataSource, Other Data Controls, Working Together with Data Source and Data-bound ControlsMaster Page LINQ -LINQ to Objects, LINQ to ADO.NET Introducing Query Syntax, Standard Query Operators, Using Server Controls with LINQ Queries.
PSO4	Caching : Introduction to Caching Data Web Applications Security-Identity, Authentication, AuthorizationAJAX in ASP.NET –Using ScriptManager, Partial refreshes, UpdatePanel, TriggersWhat is web service, ASP.NET Web services, Creating a simple web service, Consuming Web service.

CO: Course Outcomes

CO1	Explain .NET Frame Work.
CO2	What is CLR?
CO3	What is Variables in C#?
CO4	Explain Switch Case.
CO5	Explain Button Control.
CO6	Explain Summary Validation Control.
CO7	What is Linq? Aggregate Function in Linq.
CO8	Explain Timer Control in AJAX.

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CO9	Write Web service for multiply and divide two numbers.
CO10	Explain types of Security.

SEMESTER-VI

PAPER –I Advanced Networking & Security

Program- Advanced Networking & Security

Unit	Description
PSO1	Network Layer, Network Layer protocol: Internetworking ,IPv4 Protocol packet format,IPv6 Protocol & packet format, Routing Protocols
PSO2	Transport Layer: Process to Process delivery ,UDP,TCP. Control & Quality of Service ,Application Layer: DNS ,Remote Logging,SMTP,FTP,WWW,HTTP.
PSO3	System and Network Security, Malicious Software and Internet Security, Hacking, Firewall and Instruction Detection .
PSO4	Cryptography: Traditional and Modern Symmetric-Key Ciphers, DES and AES . Network Security.

CO: Course Outcomes

CO1	Write the Different types of Network Layer Protocol. Explain any one in brief.
CO2	Explain IPv4 Packet format in brief.
CO3	Explain Process to process delivery with example.
CO4	What is DHCP. Explain the working of DHCP.
CO5	Describe a typical resolution process in DNS.
CO6	Explain UDP and TCP in brief.
CO7	Write in brief about Network Security?
CO8	List and explain in details the Security Attacks?
CO9	What is Firewall in computing. List the limitation of Firewall.
CO10	Explain in detail Viruses and Hacking.
CO11	Write the short note on Cryptography.

PAPER –II Advanced Java Programming – II

PSO1	SERVLET:introduction,servlet life cycle,sharing information,filtering request and responses ,accessing the web context,finalizing a servlet.
PSO2	JSP:introduction,jsp life cycle,ucl,custom tags,transferring control to another web component.
PSO3	EJB:introduction,beans,types of beans,state management, life cycle of various beans
PSO4	WEB SERVICE:Defining client access with interface,remote or local access,method parameters and access,JAX-WS.

CO: Course Outcomes

Questions

CO1.	What is servlet?list all the advantages.
CO2	Write a note on generic servlet.
CO3	What is jsp page?
CO4	Explain implicit objects in jsp.
CO5	Explain various types of beans.
CO6	Explain life cycle of stateful and stateless session beans.
CO7	What is web service?
CO8	Explain local-interface.

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PAPER –III Software Engineering and Testing

Program-Software Engineering

Unit	Description
PSO1	Socio-technical system, Critical system
PSO2	Software Process, Project management, Software requirements
PSO3	Requirement engineering process, System Models, Architectural Design
PSO4	Application architecture, OOD,User Interface design, Rapid software development
PSO5	Component based software engineering, verification & validation, Software testing
PSO6	Quality management, Process Improvement, Security Engineering
PRACT	As per university syllabus

CO: Course Outcomes

CO1	Define Software. give difference between Software & Hardware.
CO2	Explain the types of Software.
CO3	State attribute of software.
CO4	What is requirement Engineering?
CO5	What is Feasibility Study?
CO6	What is need of ERD diagram?
CO7	What is need of Software design in Software engineering?
CO8	State the Interface design issues.
CO9	What is OOD?
CO10	Explain basic concept of OOP.
CO11	What is agility?
CO12	Explain term Quality Assurance.

PAPER –IV Data Management using PL/SQL-II

PSO1	Decomposition, Concurrency Control
PSO2	Enforcing serializability by locks, Crash Recovery
PSO3	Packages, Dynamic SQL
PSO4	Triggers, File Organisation and Indexing
PRACT	As per university syllabus.

CO: Course Outcomes

CO1	Explain the concept of Transaction with an example.
CO2	What are ACID properties? Explain each property
CO3	Describe Two Phase Locking.
CO4	Explain the Deadlock term in detail.
CO5	State the ARIES algorithm.
CO6	Describe the components of Packages.
CO7	State the advantages of Packages.
CO8	Explain cursor variables with an example.
CO9	What is Trigger? Explain with example.
CO10	What is Cluster in File Organization and Indexing

PAPER –V Advanced Web Technology

Program:

Unit	Description
PSO1	XML; Using XSLT with XML.
PSO2	Introduction to Ajax; Asynchronous Data Transfer with XMLHttpRequest; Integrating PHP and AJAX .

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PSO3 Handling XML Data using PHP and AJAX; Retrieving Data from a Database Using PHP and AJAX Consuming Web Services Using AJAX.
PSO4 jQuery
PRACT As per university syllabus

CO: Course Outcomes

CO1 Describe the structure of xml.
CO2 What is CDATA ?
CO3 Explain xsl template element .
CO4 What is AJAX and give simple example.
CO5 Explain the use of XMLHttpRequest .
CO6 What is UDDI ?
CO7 What is jQuery ?
CO8 Write history of jQuery ?
CO9 What is Callback function ?
CO10 What are the jQuery effects?

Project:

Project Documentation

1. Acknowledgement
2. Preliminary Investigation - Organizational Overview, Description of System, Limitations of present system, Proposed system and its adv. [For web project, URL can be mentioned], Feasibility Study, Stakeholders, Technologies used, Gantt Chart
3. System Analysis - Fact Finding Techniques (Questionnaire, Sample Reports, Forms...), Prototypes(if any), Event Table, Use Case Diagram, Scenarios & Use Case Description, ERD, Activity Diagram, Class diagram, Object Diagram, Sequence diagram/Collaboration Diagram, State diagram
4. System Design - Converting ERD to Tables, Design Class diagram[with UI classes, Persistent classes etc...], Component Diagram, Package Diagram, Deployment Diagram
5. System Coding- Menu Tree / Sitemap, List of tables with attributes and constraints, Design Patterns used (if any), Program Descr[Programs /Classes and their responsibilities in brief] with Naming Conventions, Validations, Test Cases, Test Data and Test Results [Write test cases for all important programs], Screen Layouts & Report Layouts, Program Listing[for dummy project]
6. System Implementation / Uploading
7. Future Enhancements 8. References and Bibliography Note – Project documentation will carry 50 marks. They will be distributed as follows –

1. Preliminary Investigation – 10 marks
2. System Analysis – 10 marks
3. System Design – 10 marks
4. System Coding & Implementation – 20 marks

Project Development

1. Faculties should arrange project demos for SY students at the end of the year or just at the beginning of TY. The demos can be of some good students of previous TY batches or it can be a project developed by faculties themselves.
2. SY students should be encouraged to start finding projects in the vacation. Faculties may take one or two introductory sessions for SY students before the vacation which will help students to work on preliminary investigation phase during vacation.
3. It can be Stand Alone, Multi-user or Web Based. Projects can be done in any technology and should have data stored in DBMS.
4. Each student shall do the project individually, though a project with the same topic name could be done by more than one student.

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5. A project guide should be assigned to students. He/she will assign a schedule for each phase of the project and hand it over to students. The guides should oversee the project progress on a weekly/fortnightly basis. The guides should control iteration if any non-linear technique is used for project development. Sample phases can be as follows – Preliminary investigation, System Analysis, System Design, Coding, Implementation, Project Report Submission

6. College can arrange few sessions by experienced industry people on project management/best practices/technologies etc.

7. After the completion of phase/projects, demos can be planned in front of faculties/clients/students.

8. Projects should have at least following: a. Good content management, presentation & meaningful images b. Data Entry with Validations c. Suitable navigation scheme(menus/toolbars/tabs/links etc) d. Record Manipulation(add, update, delete, display, search ,sort) e. Transactions / Sessions /Reports / Feedback/Registration whichever applicable f. Login accounts(Admin & User) with separate functionalities for administrators and users

9. A certificate should be added in the project report which should contain the following information – a The fact that the student has successfully completed the project as per the syllabus and that it forms a par of the requirements for completing the BSc degree in computer science of University of Mumbai. b. The name of the student and the project guide c. The academic year in which the project is done d. Date of submission, e. Signature of the project guide and the head of the department with date along with the department stamp, f. Space for signature of the university examiner and date on which the project is evaluated. 20 marks,→

10. Project should be evaluated by External Examiner as follows (Project Quality 10 marks)→ 20 marks, Student's Presentation →Working of Project

Note:

i. **Evaluating "Project Quality": It involves overall modules included in the project, whether it wa sufficiently large enough, whether validations were done for data entry, variety of reports etc.**
ii. **Evaluating "Working of the Project": It involves error-free execution of the project.**
iii. **Evaluating Student's Presentation: Marks can be given based on the presentation skills of student.**

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Program Specific Outcomes
PSOs of B.Sc. Information Technology
SEMESTER-I

PAPER –I Imperative Programming
B.Sc. Information Technology
PSO: Program Specific outcome
Class:-F.Y.B.Sc.| Information Technology]
Semester:- I
Program-Imperative Programming

Unit	Description
PSO1	History, Fundamentals
PSO2	Operators & Expression, Data Input-Output
PSO3	Conditional statement and Loops , Functions
PSO4	Program Structure, Arrays
PSO5	Pointer, structure & Union
PRACT	As per university syllabus

CO: Course Outcomes

CO1	Explain Features of C-Language.
CO2	List steps of program development life cycle.
CO3	Write an algorithm to find area of Circle.
CO4	What is Keyword?
CO5	Explain Switch statement.
CO6	What is syntax of If statement.
CO7	Explain with example While loop.
CO8	Explain Array.
CO9	What is Pointer?
CO10	Give difference between Structure & Union.

PAPER –II Digital Electronics

PSO1	Analog system, Binary number system, hexadecimal number system, TTY,1`s complement 2`s complement
PSO2	Logic gates,Boolean Theorems,De`Morgan`s Law,Logic gates, Exclusive OR,NOR,Karnaugh maps
PSO3	Adder,BCD Adder,Combinational circuits,comparator
PSO4	Multiplexer,Demnultiplexer,ALU,Encoder,decoder,S-R flip flop,D Flip-Flop,JK Fflip flop,T Flip flop.
PSO5	Asynchronous Counter,Shift Registers ,Ring Counter ,Johnsons Counter.

CO: Course Outcomes

CO1	Convert binary 20 to decimal?
CO2	Explain TTY in detail?
CO3	Explain DE`Morgans Law in Detail?
CO4	Explain Universal Gates?
CO5	Explain Half Adder?
CO6	Explain Comparator?
CO7	Explain Multiplexer?
CO8	Explain S-R Flip Flop?
CO9	Explain Shift Register?

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CO10 Explain Ring Counter?

PAPER –III Operating Systems

Unit	Description
PSO1	Introduction,history,system calls,processes and threads,ipc problems.
PSO2	Memory management,page replacement algorithms,segmentation. File systems:files,directories,CD ROM file system.
PSO3	I/O:principles,power management Deadlocks:resources,deadlock prevention,issues.
PSO4	Vitualization and cloud:history,virtual machines on multicore CPU's,clouds Multiple processor systems:multiprocessors,multicomputers.
PSO5	Case study on linux and android Case study on windows.
PRACT	As per university syllabus

CO: Course Outcomes

CO1	What is operating systems?
CO2	What are process and threads?
CO3	What is paging?
CO4	Explain segmentation.
CO5	Write a note on monitors,keyboards and mouse.
CO6	How to prevent deadlocks?
CO7	What is deadlock?
CO8	Explain virtualization.
CO9	Write a note on distributed systems.
CO10	What is android?

PAPER –IV Discrete Mathematics

Unit	Description
PSO1	Introduction, Set Theory, The Logic of Compound Statements.
PSO2	Quantified Statements, Elementary Number Theory and Methods of Proof.
PSO3	Sequences, Mathematical Induction, and Recursion, Functions.
PSO4	Relations, Graphs and Trees.
PSO5	Counting and Probability.
PRACT	As per university syllabus

CO: Course Outcomes

CO1	Explain Mathematical Model.
CO2	Verify the following using venn diagram i) $A \cup (B \cup C) = (A \cup B) \cup C$ ii) $(A \cup B)' = A' \cup B'$
CO3	Using algebraic proofs prove that . $(A \cup B) - C = (A - C) \cup (B - C)$.
CO4	Prove that the sum of any two rational numbers is rational.
CO5	Explain Quotient- Remainder theorem.
CO6	Prove that for all integers n, n^2-n+3 is odd.
CO7	What is function? Explain the types of function.
CO8	Give an example of Reflexive and Transitive but not Symmetric.
CO9	State and explain pigeonhole principle.
CO10	What are the types of Event?

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PAPER –V Communication Skills

Program-Communication Skills

Unit	Description
PSO1	The Seven Cs of Effective Communication, Understanding Business Communication: Nature and Scope of Communication, Non-Verbal Communication, Cross-cultural.
PSO2	Writing Business Messages and Documents, Developing Oral Communication Skills for Business: Effective Listening, Business Presentations and Public Speaking, Interviews.
PSO3	Developing Oral Communication Skills for Business: Meeting and Conference, Group Discussion ,Team Presentation. Understanding Specific Communication Needs.
PSO4	Understanding Specific Communication Needs: Corporate Communication, Persuasive Strategies in Business Communication , Ethics in Business Communication.
PSO5	Presentation Process, Planning Stage, Adding graphics to your Presentation: Visual Communication ,Impress Stage.
PRACT	As per university syllabus

CO: Course Outcomes

CO1	What is Effective communication?
CO2	Explain the Seven C's of Effective Communication.
CO3	What is the purpose of business correspondence.
CO4	What are the advantages and barriers of effective communication?
CO5	What are the different types of Interviews? Explain any one.
CO6	What are the tips for conducting a successful team Presentation?
CO7	What are benefit of a group discussion ?
CO8	What is IPR and Piracy explain with example ?
CO9	What is AIDA explain in brief ?
CO10	What are the types of Outlines in presentation.?
CO11	What are the Advantage and Disadvantages of brainstorming ?

SEMESTER-II

PAPER –I Object oriented Programming

PSO1	Advantages and DisAdvantages of Procedure Oriented Language,What is Object Oriented Programming, concept of oops, ObjectsnClasses, DataAbstraction, DataEncapsulation, Inheritance ,Polymorphism,Dynamic Binding.
PSO2	Classes and Objects:Class specification, Defining member functions,passing object as an argument,Friend Classes,Pointer to object.Constructors and DestructorsIntroduction ,Default Constructor,Parameterized Constructor,examples of Destructors.
PSO3	Polymorphism:Concept of Function Overloading,overloaded operators,overloading unary and binary operators,overloading comparison operator.Virtual functions:pure virtual functions,static functions,this pointer,abstract classes,virtual destructors.
PSO4	Program development using inheritance:Derived Class declaration,derived class constructor, multiple Inheritance,multilevel inheritance,hybrid inheritance.Exception Handling:Exception Handling Mechanism,concept of Throw & Catchwith example.
PSO5	Templates:Introduction,function Template and example,class template and examples.Working with Files:Introduction,File Operations,various File Modes,File Pointer and their Manipulation.

CO: Course Outcomes

CO1	What is Benefits of oops?
CO2	Define Encaptulation,Object,class,Polymorphism?
CO3	What is Default Constructor and Parameterized Constructor?

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CO4	What is Destructor? with example.
CO5	What is Function Overloading?
CO6	Explain unary operator overloading?
CO7	What is Multiple and Multilevel Inheritance?
CO8	Explain Exception Handling?
CO9	Explain Function Template with example?
CO10	Explain various File operations?

PAPER –II Microprocessor Architecture

Program-Microprocessor Architecture.

Unit	Description
PSO1	Microprocessor, microcomputers and Assembly Language, Microprocessor Architecture and Microcomputers System, 8085 Microprocessor Architecture and Memory Interface.
PSO2	Interfacing of I\O Devices, Introduction to 8085 Assembly Language Programming, Introduction to 8085 Instructions
PSO3	Programming Techniques With Additional Instructions, Arithmetic Instruction Related to Memory, Logic Operations, Counters and Time Delays, Stacks and Sub-Routines.
PSO4	Code Conversion ,BCD Arithmetic, and 16-Bit Data Operations, Software Development System and Assemblers ,Interrupts.
PSO5	The Pentium and Pentium Pro microprocessor, Core 2 and later Microprocessors, SUN SPARC Microprocessor.
PRACT	As per university syllabus

CO: Course Outcomes

CO1	What is Microprocessor? Explain the difference between Microprocessor and Microcomputer.
CO2	Explain the 8085 Microprocessor Architecture and Memory Interface.
CO3	Write the Basic Interfacing Concept.Explain the interfacing Input and output device.
CO4	Write the different types of 8085 Instruction Set .Explain any one in brief .
CO5	Write the different Programming techniques with example.
CO6	What is Debugging Counter and Time –Delay in Microprocessor.
CO7	What is Code- Conversion. Write the BCD –to-Binary Conversion with Example.
CO8	What is Interrupt ?Explain the different types of Interrupt.
CO9	Explain the Pentium and Pentium Pro Microprocessor with Example.
CO10	Explain the SPARC Microprocessor with example.
CO11	Explain Stack and Subroutines With suitable example.

PAPER –III Web Programming

PSO 1	Introduction to Web and Internet,browsers,search engine.applications of internet.HTML5:why html5?creating hyperlinks and anchors,style sheets,css.
PSO 2	HTML5 LAYOUT AND NAVIGATION: Creating navigational aids,creating image maps,creating divisions.HTML5 TABLES AND FORMS:Creating tables,forms,audio and video clip,additional attributes.
PSO3	JAVASCRIPT:introduction,variables,operators,statements,javascript objects,document,events and events handlers.
PSO4	PHP:php syntax,variables,comments,types,control structures,arrays,strings,regular expressions,superglobals arrays.
PSO5	ADVANCED PHP:Integrating web froms and databases,sessions,cookies,string and regular expressions.

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CO: Course Outcomes

CO1	What are the applications of internet?
CO2	Explain types of css.
CO3	Write a note on image mapping.
CO4	What are the tags used to create tables?
CO5	Explain for loop in javascript.
CO6	Write a note on date and math objects.
CO7	How to declare variables in PHP.
CO8	What are superglobals arrays?
CO9	Write a note on sessions.
CO10	How to retrieve values from web form?

PAPER –IV Numerical and Statistical Methods

Unit	Description
PSO1	Mathematical Modeling and Engineering Problem Solving, Approximations and Round-Off Errors, Truncation Errors and the Taylor Series
PSO2	Solutions of Algebraic and Transcendental Equations, Interpolation
PSO3	Solution of simultaneous algebraic equations (linear) using iterative methods, Numerical differentiation and Integration, Numerical solution of 1st and 2nd order differential equations
PSO4	Least-Squares Regression, Linear Programming
PSO5	Random variables, Distributions
PRACT	As per university syllabus

CO: Course Outcomes

CO1 Explain Overflow and Underflow.

CO2 Explain Data Uncertainty with example.

CO3 Solve the following system using Guass seidel method

$10x+y+z=12$

$2x+10y+z=13$

$x+y+5z=7$

CO4 Solve the following system using Guass jordan method

$2x+4y-6z = -8$

$x+3y+z = 10$

$2x-4y-2z = -12$

CO5 Use Runge-Kutta second order and Euler's method to find y when x=0.1 and x=0.2

CO6 Fit a straight line for the following data.

x	0	1	2	3	4
y	1	1.8	3.3	4.5	6.3

CO7 Solve the LPP maximum $Z=2x+5y$

Subject to $x+3y<=9$

$2x+y<=13$

$x, y >=0$

CO8 Find expected value and variance of X, if X denotes the number obtained on the upper most face when fair die is thrown.

CO9 If a random variable X follows a uniform distribution with Var(X) =30 find n and E(X).

CO10 Define Binomial distribution and its mean and variance . A fair coin is tossed 6 times . Find the probability of getting (i) At most two heads (ii) 4 tails.

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PAPER –V Green Computing

Program:

Unit	Description
PSO1	Green IT Overview
PSO2	Green Data Centres
PSO3	Sustainable Information Systems and Green Metrics.
PRACT	As per university syllabus

CO: Course Outcomes

CO1	How It can help in enhancing environment sustainability?
CO2	What are the environmental impacts of IT?
CO3	What are three Rs of green IT?
CO4	What are two layers of infrastructure in data centre?
CO5	What are options of data storage in data centre design?
CO6	How caching helps in disk power management?
CO7	Explain capability maturity framework for SICT.
CO8	Explain the major element of value chain.
CO9	What is EMIS?
CO10	Write a short note on Remanufacturing.

SEMESTER-III

PAPER –I Python Programming

Unit	Description
PSO1	Introduction: The Python Programming Language,Variables and Expressions, Conditional Statements,Looping,Control statements
PSO2	Functions,Strings
PSO3	Lists ,Tuples and Dictionaries ,Files,Exceptions
PSO4	Regular Expressions, Classes and Objects, Multithreaded Programming, Modules
PSO5	Creating the GUI Form and Adding Widgets, Widgets, Layout Management, Look and Feel Customization,Storing Data in Our MySQL Database via Our GUI
PRACT	As per university syllabus

CO: Course Outcomes

CO1	What is Python? List and explain feature of Python.
CO2	Write the steps to install Python and to run Python code
CO3	How function is defined and called in Python?
CO4	Explain various string operations that can be performed using operators in Python.
CO5	What is list? How to create list?
CO6	Explain try...except blocks for exception handling in Python.
CO7	What is regular expression? Explain various patterns of regular expression.
CO8	Explain match() function with suitable example.
CO9	What is multithreaded programming? Explain _thread module with suitable example.
CO10	Explain Checkbutton widget with example.
CO11	Write short note tkMessageBox module
CO12	Explain place geometry manager with example.
CO13	Write short note on cursor object in Python.

PAPER –II Data Structures

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PSO1	Introduction: Data and Information, Data Structure, Classification of Data Structures, Operation on Data Structure ,Algorithm, Asymptotic Analysis and Notations,Array.
PSO2	Linked List :Traversal of Linked List, Memory Allocation and De-allocation,Circular Linked List, Two Way Linked List, Application of Linked List .
PSO3	Stack: Operation on Stack, Application of Stack,infix and postfix operations Recursion. Queue :Operation on Queue, Circular Queue, Priority Queue.
PSO4	Sorting and Searching Techniques ,Tree, Advanced Tree Structure: Red Black Tree, AVL Tree, 2-3 tree,B-Tree.
PSO5	Hashing Techniques ,Graph.
PRACT	As per university syllabus

CO: Course Outcomes

CO1	What is Data Structure? Explain different Categories of Data Structure.
CO2	List and Explain the Different Operation performed on a Data Structure.
CO3	Explain how Memory is Allocated and de-allocated for linked list .
CO4	What is Header Linked list? Explain different Categories of Header Linked list.
CO5	What is Recursion? What are the Disadvantage of Recursion?
CO6	What is Queue? How Queue is represented in Memory ?Write the different types of Queue.
CO7	Draw the Binary tree whose in-order and preorder traversals are : In-order :g d b h e i a f c Pre-order: a b d g e h i c f.
CO8	What is AVL tree? How balancing id done in AVL tree? Explain with Example.
CO9	List graph Traversal technique .Write and Explain the algorithm for any one.
CO10	List different Hashing methods. Explain with example any two of them.
CO11	List Different technique of Open Addressing.Explain any one.

PAPER –III Computer Networks

Program-Computer Networks

Unit	Description
PSO1	Introduction to N/W models, Introduction to Physical layer, Digital and Analog transmission, Transmission Impairment
PSO2	Bandwidth Utilization: Multiplexing and Spectrum Spreading, Transmission media, Introduction to Data link layer, Error detection & correction
PSO3	Data Link Control, Media Access Control, Wireless LANs, Connecting devices and Virtual LANs.
PSO4	Introduction to network layer, Unicast Routing, Next generation IP
PSO5	Introduction to the Transport layer, Standard Client0Server Protocols
PRACT	As per university syllabus

CO: Course Outcomes

CO1	What is Data Communication? Explain 5 components of Data Communication.
CO2	Describe TCP/IP protocol suite and each layer functions.
CO3	Explain transmission impairment.
CO4	Explain type of multiplexer .
CO5	Differentiate between Correction & detection.
CO6	Explain type of Transmission media.
CO7	Define DLC services.
CO8	Describe the virtual LANs.
CO9	Explain classful addressing in IPv4.
CO10	Define HTTP, FTP, WWW.

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PAPER –IV Database Management Systems

PSO1	Introduction to Databases and Transactions,Data Models,Database design,ER diagram & Unified Modeling Language.
PSO2	Relational Database model, Calculus.
PSO3	Constraints, Views & SQL.
PSO4	Transaction Management and Concurrency.
PSO5	PL-SQL
PRACT	As per university syllabus

CO: Course Outcomes

CO1	Difference between File Processing System and DBMS.
CO2	State and explain the diagrams used for modeling in UML.
CO3	What is SQL? Describe the advantages of SQL
CO4	Explain Database System Architecture with the help of a diagram.
CO5	What are the different types of joins in SQL.
CO6	Describe the SET operators in detail.
CO7	Explain the types of Constraints with example.
CO8	State and explain ACID properties in detail.
CO9	Which are the operators used in PL/SQL.
CO10	What is Exception and how is it handled?

PAPER –V Applied Mathematics

PSO1	Matrices, Complex Numbers
PSO2	Equation of the first order and of the first degree, Differential equation of the first order of a degree higher than the first, Coefficients
PSO3	The Laplace Transform, Inverse Laplace Transform
PSO4	Multiple Integrals, Applications of integration
PSO5	Beta and Gamma Functions, Differentiation Under the Integral Sign, Error Functions
PRACT	As per university syllabus

CO: Course Outcomes

CO1	Explain Inverse of a matrix & Properties of matrices.
CO2	Explain Caley Hamilton Theorem.
CO3	Solve following differential equation (x-4xy-2y^2)dx+(y^2-4xy-2x^2)dy=0
CO4	Explain Linear Differential Equations with Constant Coefficients.
CO5	Explain Laplace Transform with example.
CO6	Obtain inverse Laplace Transform of the function (s+1)/s^3(s-3)^2
CO7	Explain double integral with example.
CO8	Explain Beta and Gamma Functions.

SEMESTER-IV

PAPER –I Core Java

Program-Core Java

Unit	Description
PSO1	Introduction:History & features of Java, Data types
PSO2	Control Flow Statements, Iterations, Classes
PSO3	Inheritance, Packages
PSO4	Enumerations,Arrays, Multithreading, Exceptions, Byte streams

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PSO5 Event Handling, Abstract Window Toolkit, Layouts
PRACT As per university syllabus

CO: Course Outcomes

CO1 Explain Features of Java.
CO2 Explain data types from java.
CO3 Explain various control flow statements from java.
CO4 Write difference Between Method Overloading & Overriding.
CO5 Explain the concept of Package.
CO6 What is Thread? Explain Thread Life Cycle.
CO7 Explain Predefined Exceptions.
CO8 Explain console input & output.
CO9 What are Inner Classes? Discuss its types.
CO10 Write short note on Mouse Listener interface.
CO11 Design GUI Application with various AWT components.
CO12 Write a short note on Layout Manager.

PAPER –II Introduction to Embedded Systems

PSO 1 Introduction: Embedded Systems Core of embedded systems. Characteristics and quality attributes of embedded systems
PSO 2 Embedded Systems –Application and Domain Specific: Application specific – washing machine, domain specific - automotive. Embedded Hardware: Peripherals
PSO3 The 8051 Microcontrollers: 8051 Programming in C
PSO4 Designing Embedded System with 8051 Microcontroller
PSO 4 Real Time Operating System (RTOS).Design and Development

CO: Course Outcomes

CO1 What is Embedded Systems and general purpose system?
CO2 Explain Difference between RISC and CISC controllers.
CO3 Write short note on Application specific – washing machine.
CO4 Explain different types of memory.
CO5 Write note on 8051 Microcontroller hardware.
CO6 Which are Data Types supported by C for Embedded System.
CO7 Explain structure of embedded program.
CO8 What is infinite loop?
CO9 Write short note on compiling, linking and debugging.
CO10 Explain EDLC.

PAPER –III Computer Oriented Statistical Techniques

PSO1 Mean, Median, Mode and other measures of Central Tendency, Standard Deviation, Introduction to R.
PSO2 Moments, Skewness and Kurtosis, Elementary Probability Theory, Elementary Sampling Theory.
PSO3 Statistical Estimation Theory, Statistical Decision Theory, Statistics in R
PSO4 Small Sampling Theory, The Chi-Square Test.
PSO5 Curve Fitting and nethod of Least Square, Correlation
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CO: Course Outcomes

CO1	Explain the importance and scope of Statistics.
CO2	Describe the types of Graphic Representation of a frequency distribution.
CO3	What is Skewness? Explain the measures of Skewness.
CO4	Define Kurtosis. For a distribution, the mean is 10, Variance is 16,r1 is +1 & β2. Obtain the first four moment about the origin i.e. zero.
CO5	Explain the concept of Statistical Hypothesis.
CO6	Define the steps in solving testing of Hypothesis problem.
CO7	Explain the applications of Chi-Square Distribution with an Example.
CO8	Describe goodness of Fit Test with an Example.
CO9	Explain the Properties of variance.
CO10	What is Correlation and Regression ? Explain.

PAPER –IV Software Engineering

Program-Software Engineering

Unit	Description
PSO1	Socio-technical system, Critical system
PSO2	Software Process, Project management, Software requirements
PSO3	Requirement engineering process, System Models, Architectural Design
PSO4	Application architecture, OOD,User Interface design, Rapid software development
PSO5	Component based software engineering, verification & validation, Software testing
PSO6	Quality management, Process Improvement, Security Engineering
PRACT	As per university syllabus

CO: Course Outcomes

CO1	Define Software. give difference between Software & Hardware.
CO2	Explain the types of Software.
CO3	State attribute of software.
CO4	What is requirement Engineering?
CO5	What is Feasibility Study?
CO6	What is need of ERD diagram?
CO7	What is need of Software design in Software engineering?
CO8	State the Interface design issues.
CO9	What is OOD?
CO10	Explain basic concept of OOP.
CO11	What is agility?
CO12	Explain term Quality Assurance.

PAPER –V Computer Graphics and Animation

PSO1	Introduction:overview of computer graphics,crt,input devices,graphics displays.scan conversion: digital differential analyzer(dda) algorithm,method of circle drawing,mid point circle algorithm,clipping polygons,cohen sutherland and liang barsky.
PSO2	Two dimensional transformation:transformation and matrices,2d transformation, homogeneous coordinates,rotation,scaling,window to viewport transformations .three dimensional transformations:three dimensional scaling, three dimensional shearing,three dimensional rotation,three dimensional reflection,perspective geometry.
PSO3	Viewing in 3d:stages in 3d view,canonical view volume,examples of 3d viewing,combined transformation matrices for projection and viewing .light: radiometry, transport, equation, photometry.color:colorimetry,colorspaces,chromatic adaption,color

	appearance.
PSO4	Visible surface determination:visible surface algorithms,back face removal,z-buffer algorithm,scan line method,painters algorithm,comparison of methods.plane curves and surfaces:curve representation,parametric curves,parametric representation of circles,parametric representation of an ellipse,parametric representation of parabola,parametric representation of hyperbola,bezier curves,b-spline curves,quadratic surfaces.
PSO 5	Computer animation:principles of animation, key framing, deformations, character animation.image manipulation and storage:what is an image? Digital image file formats,image compression standards--jpeg, image processing, digital image enhancement, histogram equalization, smoothing and image filtering.

CO: Course Outcomes

CO1	Explain CRT(cathode Ray Tube)?
CO2	Explain DDA Algorithm?
CO3	Explain Homogeneous Coordinates in 2D?
CO4	Explain Reflection in 2D Transformation?
CO5	Explain Canonical view Volume?
CO6	Explain color spaces ?
CO7	Explain Painters Algorithm?
CO8	Expalin Parametric curves?
CO9	Explain Key Framing?
CO10	Explain Digital Image File Formats?

SEMESTER-V

PAPER –I Network Security

Program- Network Security

Unit	Description
PSO1	Computer Security, Cryptography
PSO2	Symmetric Key Algorithms and AES
PSO3	Asymmetric Key Algorithms, Digital Signatures and RSA
PSO4	Digital Certificates and Public Key Infrastructure (PKI)
PSO5	Network Security, Firewalls and Virtual Private Networks, Internet Security Protocols
PSO6	User Authentication and Kerberos
PRACT	As per university syllabus

CO: Course Outcomes

CO1	Write the principles of security.
CO2	Explain types of Active attacks.
CO3	What is cryptography & explain encryption & decryption.
CO4	Explain algorithm types & modes.
CO5	Explain steps of DES.
CO6	What is digital signature?
CO7	Explain RSA algorithm.
CO8	Explain Diffie-Hellman Key Exchange Algorithm.
CO9	What is firewall & explain firewall configuration
CO10	Explain SSL protocol.
CO11	Explain PGP.
CO12	Explain authentication token.

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PAPER –II Asp.Net with C#

PSO 1	Introduction to C#, OOPs with C#
PSO 2	Introduction to ASP.NET 4, CSS
PSO3	ASP.NET server controls, Programming ASP.NET web pages
PSO4	Validation Control, State Management, Master Pages, Navigation.
PSO 5	Databases, ASP.NET Security.
PSO 6	LINQ, Ajax, JQuery

CO: Course Outcomes

CO1	Why exception handling is required? Write syntax for user define exception?
CO2	Why exception handling is required? Write syntax for user define exception?
CO3	What is CSS? Give its advantages and disadvantages.
CO4	What is Garbage Collector? How it works?
CO5	Explain CheckBox and RadioButton web server controls in ASP.NET .
CO6	What is the difference between Button and LinkButton web server controls?
CO7	Explain CustomValidator control with suitable example.
CO8	What is the relationship between master page and content page?
CO9	What is DataReader? Explain ExecuteReader, ExecuteNonQuery methods.
CO10	Explain command object in ADO.NET
CO11	What is Ajax? Explain UpdatePanel control with example.
CO12	Explain JQuery expression with example

PAPER –III Software Testing

Program-Software Testing

Unit	Description
PSO1	Fundamental of testing, psychology of testing, Testing Principles
PSO2	Testing throughout the software life cycle, Test levels
PSO3	Static technique, Review Process, Static analysis tools
PSO4	Testing design technique, Experience based testing, Specification based testing
PSO5	Test Management, Risk & testing, Incident Management, Configuration management
PSO6	Tool Support for testing, Effective use of tools
PRACT	As per university syllabus

CO: Course Outcomes

CO1	Define -software testing. Why testing is necessary?
CO2	Explain Testing Principles.
CO3	What is component testing?
CO4	What is Test Comparator?
CO5	Diagrammatically explain Review process.
CO6	What are the success factors of reviews?
CO7	How to calculate Cyclomatic complexity?
CO8	Explain with example Equivalence Partition.
CO9	Explain Risk Management.
CO10	Explain Tool support for design.

PAPER –IV Advanced Java

PSO 1	Delegation event model,awt event handling,event classes,awt components.
PSO 2	Swingcomponents:JButton,JList,JRadioButton,JTextField,JTextArea,JSlider,JMenu.

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	JPopupMenu.
PSO3	Servlet architecture,life cycle,generic servlet classes.
PSO4	JDBC architecture,drivers,statements,prepapredstatements,resultsets,rowsets. JSP:lifecycle,implicit objects,usebeans.
PSO5	JSF:mvc model,lifecycle of java faces. EJB:types of beans,life cycle of beans,stateless and stateful beans.
PSO6	Struts:introduction Hibernate:architecture,interceptors.

CO: Course Outcomes

CO1	What is delegation event model?
CO2	Explain button and textfield in awt with an example.
CO3	Explain JComboBox with an example.
CO4	How to create menu in swing?
CO5	Explain life cycle of servlet.
CO6	Explain various classes of HTTPServlet.
CO7	List various types of statements in JDBC.
CO8	Explain life cycle of jsp.
CO9	Explain various types of beans.
CO10	What are interceptors?

PAPER –V Linux Administration

Unit	Description
PSO1	Introduction , Duties of the system administrator, Booting and shutting down
PSO2	System configuration files , TCP/IP networking , The network file system
PSO3	Connecting to Microsoft network ,Additional network services
PSO4	Internet services , Domain name system
PSO5	Configuring mail services , Configuring ftp services
PSO6	Configuring a web server , System administration

CO: Course Outcomes

CO1	What is Linuxs?
CO2	What are the duties of system administrator?
CO3	What is network interface card (NIC)?
CO4	How to install samba?
CO5	Explain secure services.
CO6	What is domain name system?
CO7	What is mail user agent?
CO8	Explain postfix mail server?
CO9	What is apache?
CO10	What is sendmail?

SEMESTER-VI

PAPER –I Internet Technology
Program-Internet technologies

Unit	Description

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PSO1	Introduction to N/W models, TCP/IP model, OSI model, IPv4 &IPv6 Address & protocol
PSO2	Address Resolution Protocol (ARP),Internet Control Message Protocol Version 4 (ICMPv4),Mobile IP, Unicast Routing Protocols (RIP, OSPF and BGP)
PSO3	Transport Layer, User Datagram Protocol (UDP), Transmission Control Protocol (TCP), Stream Control Transmission Protocol (SCTP)
PSO4	Host Configuration: DHCP, Domain Name System (DNS), Remote Login: TELNET and SSH, File Transfer: FTP and TFTP
PSO5	World Wide Web and HTTP, Electronic Mail: SMTP, POP, IMAP and MIME, Network Management: SNMP, Multimedia
PSO6	Client Server Programming: Concurrent Connection Oriented (TCP) and Connectionless programming(UDP), Iterative connectionless(TCP) and connection oriented servers(UDP.
PRACT	As per university syllabus

CO: Course Outcomes

CO1	Describe TCP/IP protocol suite and each layer functions.
CO2	Explain classful addressing in IPv4.
CO3	Describe ARP in details.
CO4	Explain Mobile IP.
CO5	Define services of UDP.
CO6	Explain TCP protocol.
CO7	Define DNS(Domain Name System).
CO8	Explain services of FTP.
CO9	Which are the protocol use for Electronic Mail.
CO10	Define HTTP, FTP, WWW.
CO11	Differentiate between TCP & UDP.

PAPER –II Project Management

Program-Project Management

Unit	Description
PSO1	Conventional software management, Evolution of software economics
PSO2	Life cycle phases , Artifacts of the process, Model based software architecture
PSO3	Work flow of the process, Checkpoint of the process
PSO4	Project Organization & responsibility, Process Automation
PSO5	Project control & Process instrumentation, Tailoring the process
PSO6	Future Software Project Management
PRACT	As per university syllabus

CO: Course Outcomes

CO1	Explain Boehm Industrial software metrics top 10 list.
CO2	Explain Attributes of good cost estimate.
CO3	Explain Davis Principles of Conventional software engineering.
CO4	Explain Principles of Modern software management.
CO5	Explain two planning guidelines.
CO6	List the seven top level workflows.
CO7	Explain Software change order.

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CO8 What is the role of infrastructure in Process Automation
CO9 Describe seven core metrics of project control.
CO10 List and explain top 10 software management principles.
CO11 Describe the four quality indicators.
CO12 Explain Risk Resolution

PAPER –III Data Warehousing

Program:

Unit	Description
PSO1	Introduction to data warehousing; Data warehousing design consideration and dimensional modeling
PSO2	An Introduction to Oracle warehouse builder; Defining and Importing source data structures
PSO3	Designing the target structure; creating the target structure in OWB
PSO4	Extract, Transform and load basics; Designing and building an ETL mapping
PSO5	ETL Transformation and other operation; Validating, generating, deploying and Executing objects
PSO6	Extra Features, Data warehousing and OLAP
PRACT	As per university syllabus

CO: Course Outcomes

CO1 Explain architecture of Data Warehousing.
CO2 Explain Dimensional Model.
CO3 Explain oracle database module.
CO4 How to configuring the listener.
CO5 What is Multidimensional implementation?
CO6 How to create time dimension with time dimension Wizard.
CO7 Explain ETL?
CO8 Explain mapping and operator in OWB.
CO9 What validating in mapping?
CO10 Explain the value of multidimensional data.

PAPER –IV IPR and Cyber Laws

Program- IPR and Cyber Laws

Unit	Description
PSO1	Intellectual Property
PSO2	Information Technology Related Intellectual Property Rights
PSO3	Patents
PSO4	Enforcement of Intellectual Property Rights, Licensing
PSO5	Cyber Law, Digital Contracts , Intellectual Property Issues in Cyber Space, Rights of Netizens and E-Governance
PSO6	Information Technology Act 2000
PRACT	As per university syllabus

CO: Course Outcomes

CO1 What is IP? Explain types of IP.
CO2 Explain Unfair Competition.
CO3 Explain WIPO?
CO4 Explain TRIPs?
CO5 Explain Defences in case of patent Infringement.

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CO6 Explain protection of Goodwill.
CO7 Explain Civil remedies.
CO8 Explain Criminal remedies.
CO9 Explain role & function of Certifying authority.
CO10 Explain E-Governance.
CO11 Explain various types of punishments for cyber crimes from IT act.

PAPER –V Project
Project Assessment
INSTRUCTIONS TO EXAMINERS

1) Kindly go through the "Instructions to Candidates" as well as "Instructions to the Head of the Institution".
2) Please be present 20 minutes before the commencement of the examination.
3) Confirm that the students' projects for the day are loaded in their respective subdirectories on the machines reserved for project presentations.
4) Before the start of the examination, brief the candidates about the mode of conduct of examination. Take pains to put them at ease.
5) The expert faculty will guide the candidates to the proper place. Check whether the relevant documentation is deposited at its designated place before the candidate goes to the machine.
6) The External and Internal Examiner will jointly evaluate the project report(100 Marks), presentatio and viva-voce(100 marks) of 200 as per the following guidelines.

PROJECT REPORT Question Description Marks
Q. 1 Documentation and Content Presentation 50
Q. 2 Problem Definition, Solutions Provided, Charts, Diagrams, Planning and Methodology, etc 50
Total marks obtained to be filled in PROJ column of BS6VXXX.DBF 100

VIVA VOCE Question Description Marks
Q. 1 Presentation Skills 25
Q. 2 Viva – voce 25
Q. 3 Project Quality / User Presentation / Innovative Technologies 25
Q. 4 Working and Functionality Testing 25
Total marks obtained to be filled in VIVA column of BS6VXXX.DBF 100

7) A project must be original, of real life value, and should not have been copied from existing materia from any source. Certificate to this effect must be provided with the project, duly countersigned by the head or In-charge of the department of computer science. A student must obtain at least 40% marks in project evaluation and viva-voce to qualify
8) A candidate is asked to present the project and give demo of the same. There may be some cases wh live demo may not be possible in such cases evaluation may be through viva and presentation. The reasoning for such incidence is to be noted and critically examined.
9) Each student is to be evaluated individually.
10) Each student should have his/her own copy of the complete, certified documentation.
11) Examiner may cut the candidate short if s/he arrives at his/her marks.
12) The candidate should be given three opportunities to explain the point.
13) Marks may be deducted if any of the part of the project is not working properly, if there are no pro validations, if it is a dummy project or the documentation is poor.
14) The copy of the project Document with certificate from the HOD/In-charge is must to appear for t examination.
15) The examiner should put his signature with date at the bottom of the certificate bearing the HOD's signature when you complete the evaluation.
16) The examiners for the batch will share the work equally and will be paid accordingly.

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17) The Marksheet should be sealed daily and kept in the custody of Lab Supervisor. Kindly submit the sealed envelope containing mark-sheets duly filled and signed along with the attendance reports of the center to the UNIVERSITY OF MUMBAI, KALINA .

Project Assessment

Instructions to the Head of the Institution and Head of the Department/Coordinator

1) The center should provide ONE lab supervisor, TWO experts, and ONE lab attendant for each session for the project assessment. The University shall provide ONE EXTERNAL EXAMINER and ONE INTERNAL EXAMINER (appointed by University) for each session for the duration of the PROJECT ASSESSMENT.

2) There will be 32 or less candidates at the center on any day. In any given session there will be maximum 16 candidates. Each student will be assessed for about 15 minutes including viva-voce.

3) Every student will have the project assessment examination and viva on the same day. There will be two sessions per day. Morning Session I : 09.00 am to 01.00 pm. Afternoon Session II : 01.30 pm to 05.30 pm. The EXTERNAL EXAMINER and INTERNAL EXAMINER shall jointly assign the marks for THE PROJECT ASSESSMENT for which they are appointed.

4) The number of machines required for project Assessment : 15

- One (or more) separate machine(s) should be provided for demonstrating the project, with all the programs and data pre-loaded on them.
- The projects should be loaded and kept ready on the machine(s) before the project assessment commences for the candidate.
- An overhead projector or LCD projector may be provided if desired. Use of projector is optional.

5. PROJECT ASSESSMENT will be strictly done as per the timetable given by the University. In case of any problem, the Lab Supervisor should immediately contact the University and the Chairman.

6. As far as possible the project should be done individually. Note that if a project has been done in a group (for any reason whatsoever), every candidate must have a complete, but a separate copy of the certified project report.

7. During the project assessment and viva, only the candidate external and internal examiner should be present and nobody else should be allowed to enter the laboratory.

8. If the examiner does not report for the examination, the matter should be conveyed to the Chairman / University immediately and alternative arrangement may be made to continue with the examination as per schedule.

9. Each candidate will be given a time of 15 minutes (maximum) for the presentation/demonstration and viva-voce.

10. The copy of the project Document with certificate from the Head of Department / In-charge is must to appear for the examination.

Project Assessment

Instructions to Candidates

1) Every candidate will have the project assessment examination and the viva on the same day as per the timetable. In a day, there will be two sessions. The timings are Morning Session I : 09.00 am to 01.00 pm. Afternoon Session II : 01.30 pm to 05.30 pm.

2) Candidate should be present at the place of their examination at least 20 minutes before the commencement of the examination.

3) Each candidate will get about 15-20 minutes.

4) Candidate should bring with them their certified ORIGINAL copy of project documentation. It should bear your Examination seat number on the cover.

5) Note that if a project has been done in a group (for any reason whatsoever), each one of the candidate must have a complete and separate certified copy of the project document.

6) Candidate will not be allowed to keep any books, notes or papers with them except writing instruments and ruler at the time of examination.

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7) The projects are to be demonstrated to the Examiner in the laboratory. Please set them up in advance
with the consent of the expert or the internal guide.
8) The candidates will be examined through the demonstration of the project, presentation of the projec
quality of the project and viva-voce.
9) Each candidate must obtain at least 40% marks in project evaluation and viva-voce to qualify.
10) The candidate will be examined individually and should not leave the laboratory till they are allow
to do so by the Examiners.

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PSO

After completing the course students shall be able to

*apply their knowledge in different types of jobs

*handle all types of business

*provide services to other organisations

*can start a business of their own

COURSE OUTCOME: fybcom

Sem I

DRE course..... Business economics

* clarifies the basics of microeconomics
* explains the scope of business economics
* enables the students to understand the importance of business economics
* attributes in providing services or self employment
* helps in decision making related to production planning techniques to be opted
* throws light on cost concepts which helps to know the actual real profit
* teaches the consequences of wrong decisions .

Sub- Foundation course –I

- To understand the multi-cultural diversity Of Indian society through its demographic composition.
- To understand appreciate the concept of linguistic diversity in relation to the Indian situation
- To understand the concept of Disparity as arising out of stratification and inequality
- To Explain explore the disparities arising Out of gender with special reference to violence against woman and female foeticide
- To appreciate The inequalities Faced by people with Disabilities and understand the issue people with physical and mental disabilities.
- To understand inequalities main tested due to the cast system and inter group conflict arising thereof
- To understand inter-group conflict arising group of communication
- To understand philosophy of the constitution as set act in the preamble , and the structure of the constitution the preamble ,main body and schedule.
- To understand duties of Indian, citizens,tolerance,peace and communal .
- harmony as criminal values in strengthening the social fabric Indian society .
- To Understand The party system in Indian society,73rd and 74th Amendment
- implication for incisive politics and Role and significance of woman in politics.

Sub- Accountancy and Financial Management

- To explain Accounting Standards
- To clarify inventory valuation
- To clarify calculation of interest
- To clarify Journal entries, Ledger Accounts and disclosure in balance sheet for hirer and vendor
- To clarify Departmental Trading and Profit and Loss Account and Balance sheet
- To Understand Expenditure: capital , revenue

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- To Understand Receipt capital Revenue
- To clarify Adjustment And closing Entries Final Accounts Of manufacturing Account.

Subject:- Commerce 1(Introduction To Business)

- To Examine the concept, Functions & scope of Business
- To pin point the steps in setting Business objectives
- To differentiate the various objectives of Business
- To describe the impact of LPG on Business
- To identify various types of strategies for business
- To explain the importance of Business Environment
- To define the different constituents of Business Environment
- To review the various types of Trading Blocks
- To explain the business planning process its concept & importance
- To summarize the feasibility study & its importance
- To analyse the different stages of Business unit promotion
- To define the concept of Entrepreneurship
- To classify the difference between Entrepreneur , manager & Intrapreneur
- To clarify the problems faced by women Entrepreneurs.

Subject:- business communication

- To examine the concept, importance &process of communication.
- To classify difference between verbal & non verbal communication.
- To review business etiquette & modes of communication.
- To differentiate channels of internal communication.
- To pin point the barriers to communication & tips for effective communication.
- To define the concept of Listening Skill.
- To review types of listening.
- To explain concept, importance of Business Ethics.
- To illustrate CSR.
- To explain the importance of Business correspondence.
- To bring out parts & layouts of business letter.
- To compose job application & attachments.
- To compose job related letters.
- To generate commercial terms used in business communication.

Subject: Environmental Studies

- To examine the concept of environment & ecosystem.
- To explain the different types of ecosystem.
- To recognise the man & environment relationship.
- To describe the classification & types of resources.
- To clarify the resources conservation.
- To throw light upon the problems associated with management of water, forest & ener resources.
- To compile the resources utilization & sustainable development.
- To recognise the population explosion in the world & in India arising concerns.
- To review the measures taken to control population growth in India.
- To examine the human population - environment- human health.

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- To ascertain the human development index.
- To describe the concept of Urbanisation & problems of migration.
- To classify degradation of air & water.
- To explain emerging smart cities & safe cities in India.
- To illustrate the map filling of world map.

Subject:- mathematical & statistical technique 1

- To explain the concept of shares, mutual funds & different terminologies like face value, market value, and dividend.
- To clarify different types of shares.
- To solve the dividend examples.
- Averaging of price under systematic investment plan.
- To calculate the number of ways of arrangements & selections with the help of certain mathematical techniques such as permutation, combination & fundamental principle of addition & multiplication.
- To demonstrate some geometrical concept will useful to solving optimisation problem.
- To analyze data to get one single value which can describe characteristic of entire mass of the data with the help of measures of central tendencies mean, median & mode.
- To explain different types of dispersion.
- To count a measure for probability.
- To describe application of mathematical models for different situations & suggest best possible decisions.

Sem 2

Sub- Foundation course –I

- To understand the concept of Liberalization, privatization, Globalization.
- To Clarify concept of human Rights, origins and evaluation of the concept and human rights constitute with special references to fundamental rights stated in the constitutions.
- To understand concept of environment Ecology and their interconnectedness.
- To clarify environmental degradation-causes and impact of human life.
- To understand stress and conflict.
- To understand significance o f value, ethics and prejudices in developing the individual stereotyping and prejudices as significant factors causing conflict in society.
- To explain theory of self-actualization and different method of responding to conflict in society.

Sub: DRE course..... Business economics

- * different types of market structures
- * pricing practices under different market conditions
- * importance of market structures before starting a business
- * helps to change /modify /decide and plan to maximise the profit of the company

Sub- Accountancy and Financial Management

- To understand single entry system Accounting for incomplete record
- To understand conversion method
- To Clarify concept of consignment
- To understand procedure of consignment
- To Solve Accounting of consignment

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- To write stock valuation
- To understand concept of branch
- To understand dependent branches
- To clarify Indian system
- To understand Stock Exchange system
- To clarify need of insurance
- To understand procedure of determination of insurance claim
- To understand Treatment of abnormal items
- To Clarify calculation of insurance claim
- To clarify lodged with the insurance company application of average clause

Subject : Commerce 2

- To explain the concept of services
- To pinpoint the importance of service sector in the Indian context
- To explain the marketing mix for services
- To analyse the market research & service development cycle
- To examine the opportunities & challenges in service sector
- To differentiate the business of Retailing
- To classify various types of retailing
- To identify the Retail scenario , its prospects & challenges in India
- To throw light on FDI in Retail sector
- To collate the concept of BPO,KPO & LPO
- To review the Banking & Insurance sector
- To figure out the impact of Banking & Insurance sector in India
- To summarize the functions, scope of E commerce
- To describe the different types of Ecommerce
- To elucidate the present status of Ecommerce in India.

Subject:- business communication

- To examine the concept, importance &process of communication.
- To classify difference between verbal & non verbal communication.
- To review business etiquette & modes of communication.
- To differentiate channels of internal communication.
- To pin point the barriers to communication & tips for effective communication
- To define the concept of Listening Skill.
- To review types of listening.
- To explain concept, importance of Business Ethics.
- To illustrate CSR.
- To explain the importance of Business correspondence.
- To bring out parts & layouts of business letter.
- To compose job application & attachments.
- To compose job related letters.
- To generate commercial terms used in business communication.

Subject: Environmental Studies

- To examine the concept of environment & ecosystem.
- To explain the different types of ecosystem.

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- To recognise the man & environment relationship.
- To describe the classification & types of resources.
- To clarify the resources conservation.
- To throw light upon the problems associated with management of water, forest & energy resources.
- To compile the resources utilization & sustainable development.
- To recognise the population explosion in the world & in India arising concerns.
- To review the measures taken to control population growth in India.
- To examine the human population - environment- human health.
- To ascertain the human development index.
- To describe the concept of Urbanisation & problems of migration.
- To classify degradation of air & water.
- To explain emerging smart cities & safe cities in India.
- To illustrate the map filling of world map.

Subject: business communication

- To explain the concept of group discussion & interview.
- To set role of leadership in GD.
- To pinpoint the types & steps of interviews.
- To explain the needs & importance of meetings, conduct of meeting.
- To identify role of chairperson & participants.
- To compose drafting of Notice, Agenda, & Resolution.
- To explain the meaning, importance & types of Committees & Conference.
- To examine Organizing a Conference.
- To describe functions of Public Relations Department.
- To classify internal & external measures of PR.
- To recognise the different Trade Letters.
- To throw light on parts & types of Report.

Subject: Environmental Studies

- To recognise the classification, types & sources of Solid waste.
- To demonstrate the effect of Solid Waste on health & environment.
- To collate the solid waste management in Mumbai & role of citizens in rural and urban areas.
- To identify the environmental problems association with agriculture & Industries.
- To recognise uneven food production – Hunger, Malnutrition.
- To specify the sustainable agriculture practices.
- To describe the concept of sustainable industrial practices.
- To throw light upon the meaning, nature, scope, & typology of Tourism.
- To illustrate the Tourism potentials & policy in India.
- To describe the consequences of tourism & Ecotourism
- To explain environmental movements in India.
- To compile environmental management.
- To clarify the concept, components & applications of Geospatial Technology in environmental Management.
- To illustrate map of Konkan including Mumbai.

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Subject: mathematical & statistical technique 2

- To clarify the concept of different standard mathematical functions & economic functions.
- To calculate the derivatives of functions.
- To describe the different terms such as EMI, CI, SI with the help of small examples.
- To clear up the behaviour of two variables simultaneously by means of co-correlation regression.
- To analyze the time series & index numbers.
- To explain probability distribution- binomial, Poisson & normal.

COURSE OUTCOME: sybcom

Sem 3

Sub: DRE course..... Business economics

* describes macroeconomics
* differentiate different schools of thoughts
* enables students to understand the current scenario of the country
* concepts of business cycles
* analyse the government' policy, it's success and failure
* emphasis is given on inflationary conditions
* students can correlate with current conditions and thus figure out the underlying causes .

Sub – **Business Law**

1. To understand concept, essential and types of contract and agreement
2. To understand concept and essential element of indemnity and guarantee
3. To understand concept, essential, type, parties and rights of parties of bailment and pledg
4. To understand concept, modes of creation and modes of termination of agency
5. To understand concept , essential of contract of sale and distinguish it from agreement t sale and hire purchase agreement
6. To identify rule of transfer of property
7. To understand concept and right of unpaid seller
8. To understand concept, characteristics and classification of negotiable instrument.

Subject: Accountancy & Financial Management

- To recognise the concept of Partnership Final Accounts
- To demonstrate the effect on final accounts when the partner is admitted.
- To identify the gross profit prior to & after Admission , retirement or death of partner
- To recognise the concept o Excess capital method of Piecemeal distribution
- To specify the assets taken over by partner, treatment of past profits or past losses in the balance sheet
- To separate the treatment of secured liabilities
- To collate the treatment of preferential liabilities
- To examine the Realisation method of Amalgamation of firms
- To describe the concept of purchase consideration
- To throw light upon the balance sheet of new firm
- To illustrate the adjustment of goodwill of the new firm
- To relate the realignment of capitals in the new firm by current accounts .

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- To describe the conversion of partnership firm into a Limited company
- To clarify the Calculation of Purchase consideration & preparing balance sheet of new company.

Sub- Foundation course –III

- To understand Human rights violation and redressal related SC, ST, Woman children and people with disabilities, Monorities and the elderly population.
- To clarify a concept of disaster and general affect of disaster an human life.
- To understanding dealing with disaster factor to be considered in prevention, mitigation and disaster preparedness.
- 'To understand Development of sciences, its principle and charactriristics and effect of science on superstition and importance of science in everyday life.
- To explain effective Listning, Verbal-Non verbal communication skill, Public speaking and presentation skill.
- To explain purpose and types of communication, writing of formal Application, statement of purpose and preparing of group discussion, interview and presentation.
- To clarify leadership skill and Self government and stylish of leadership and team building .

Sub: Introduction Management Accounting

- To clear up concept of management accounting
- To understand financial statement and its users
- To analysis and interpretation of vertical format of income statement and balance sheet with the help of common size statement, comparative statement and trend analysis.
- To classify ratio analysis with the help of revenue, balance sheet and composite Ratios
- To understand working capital and estimation of working capital
- To clear up capital budgeting and its different types of capital investment decision.

Sub: Management: functions and challenges

- To define management , principles of management
- To identified management skills and competency in 21th century
- To define planning, its features and steps of planning
- To understand management by objectives
- To described the concept of decision making and its techniques.
- To explain on span of control and its factors affecting span of control
- To distinguish between tall organization and flat organization
- To classify departmentation and its bases.
- To clear out corporate social responsibility
- To understand corporate governance
- To explain stress management and measure to manage stress.

Sem 4

Sub: DRE course..... Business economics

* elucidate public finance
*role and importance of government 's role in a country like India
* specifies the fiscal policy and it's economic and social impact on people and country

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Sub – **Business Law**

1. To understand concept, features and types of company
2. To understand the role, duties and liability of promoters
3. To identify who can become a member of a company, modes of acquiring membership.
4. To identify different types of meeting
5. To understand the concept and essentials of partnership, types of partner
6. To understand the concept and characteristic of Limited Liability Partnership Act-2008
7. To understand the concept, objective and reason for enacting the Consumer Protection Act
8. To identify consumer protection councils and redressal agencies
9. To understand concept and features of Competition Act-2002
10. To understand concept , nature and types of Intellectual Property Rights.

Subject Accountancy & Financial Management

- To Examine the concept of Company Accounts
- To explain the different types of companies
- To describe the different modes of IPO
- To throw light upon the various concepts of shares & debentures
- To compile the different types of debentures
- To identify the procedure for Issue of debentures
- To recognise the sec 55 of Companies act 2013
- To review various issues of redemption of Preference shares
- To devise the concept of Capital Redemption Reserve
- To define the provisions of Sec 71 & 4 of Companies act 2013
- To classify the methods of writing off discounts / loss on debentures
- To examine the methods of redemption of debentures
- To ascertain the treatment of profit prior to Incorporation
- To recognise the treatment of columnar profit & loss Account.

Sub- Foundation course – IV

- To understand significant, contemporary Rights of citizens, importance Laws to protect consumers and protection of public interest, public service guaranty Act.
- To understand Approaches to ecology such as Anthropocentrism, Biocentrism and sustainability Principles, The equity principle, and The Human Rights Principles.
- To understand some significant Modern technology Features and application.
- Use of ledger Technology, Satellite Technology IT & Communication technology.
- To Explain Basic information an competitive Examination the patterns, Eligibility Criteria and local centers.
- To understand How Conducted Examination for entry into professional Course and entry into Job by union Public Service commission, Staff select commission, NET, SET Exam for entry into teaching profession.
- To understand Soft skill required for competitive examination, quantitative, verbal logical information an area tested and Motivation time management, writing skill.

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Sub: Auditing

- To understand financial statement and its users
- To define an auditing, its objective and different types of auditing
- To explain audit planning, programmer and procedure
- To understand auditing techniques and internal audit
- To classified auditing techniques as vouching of income and expenses
- To classified auditing techniques as verification of assets and liabilities.

Sub: Management : production and finance

- To make clear about production planning and control
- To understand inventory management and its techniques
- To make clear quality management and its tools
- To explain service quality management
- To summarized Indian financial system and credit Rating
- To explain mutual fund and its types
- To clear up on micro finance and its importance.

COURSE OUTCOME: ty. bcom

Sem 5

Sub: DRE course..... Business economics

* detailed explanation of public finance
* classifies different types of budgets

Sub: – **Financial Accounting**

1. To understand concept of amalgamation
2. To understand meaning of purchase consideration and methods of calculation of purchase consideration
3. To understand concept, legal provision and accounting procedure of Internal Reconstruction
4. To draw balance sheet of a company after reconstruction
5. To prepare final account of companies
6. To understand why investment are made and its type
7. To know accounting of purchases and sale of investment
8. To understand apportioning income, pre and post acquisition period
9. To identify treatment of bonus shares and right shares
10. To bring out valuation of investment at the end of accounting period
11. To understand revised schedule VI of final account of company
12. To understand financial statement as per the revised schedule
13. To understand importance, features and challenges of IFRS
14. To understand financial statement as per IFRS
15. To understand concept of fair value
16. To understand chart conversion of IFRS

Sub: Introduction to management accounting

- To clear up concept of management accounting
- To understand financial statement and its users

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- To analysis and interpretation of vertical format of income statement and balance sheet with the help of common size statement, comparative statement and trend analysis
- To classify ratio analysis with the help of revenue, balance sheet and composite Ratios
- To understand working capital and estimation of working capital
- To classify cash flow statement and its analysis.

Sub Cost Accounting

- To clarify concept of cost accounting and distinguish between cost account and financial account
- To explain about evolution of costing
- To determine stock levels and EOQ
- To understand various remuneration method and incentive plans
- To clarify concept of overheads and allocation of overheads
- To make clear cost classification and to determination of total cost
- To make clear cost sheet with direct cost and indirect cost
- To distinguish between cost sheet and financial account.

)sub: Direct Taxation

- To distinguish the concept of Person, Assessee & Assessment Year
- To review the income tax act 1961
- To summarize the Scope of Total Income under Sec 5
- To figure out the Residential Status as per sec 6
- To summarize the Income Exempt under sec 10
- To identify the Perquisites & Profits in lieu of salary
- To Collate the Salary Income & Deductions under sec 16
- To recognise Income earned through House Property
- To Classify the Income earned through Business Or Profession
- To Justify the Income earned through Other sources
- To describe the Income earned through Capital gain
- To Explain the deductions to be made from gross Total Income
- To differentiate various Income through Computation of Total Income.

- Subject:- MARKETING
- Introduction to MARKETING concept
- To identify the features , significance , functions as well as the evolution of Marketing
- To review the concept of Strategic Marketing and Traditional Marketing by examining the differences between the two
- To examine in detail the recent trends in marketing exam ple customer relationship management , social marketing, green marketing , digital marketing and event marketing
- To review the emergence of ethical issues in marketing as well as the challenges faced by Marketing Managers today
- To provide a detailed overview of Marketing Information System
- To analyse Customer buying behaviour as well as buying decision process
- To elaborate Market Segmentation and review the bases of segmentation
- To review Product positioning and its importance
- To elaborate analyse and explain the MARKETING MIX concept in depth
- To analyse and review the elements of Marketing Mix namely PRODUCT, PRICE . PLACE[physical distribution] and PROMOTION in depth

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- To understand the concept of Integrated Marketing Communication.

Sem 6

Sub: DRE course..... Business economics

* distinguishes between international trade theories given by different economists
*deals with Bollywood, WTO, Foreign markets and exchange rate management

Sub – Financial Accounting

1. To understand allocation as per co-operative society act
2. To understand final accounts of co-operative housing societies
3. To understand the concept and treatment of accounts of profit prior to incorporation
4. To understand the allocation of various expenses
5. To calculate/solve profit prior to incorporation and post incorporation
6. To understand the concept of goodwill
7. To identify method of valuation of goodwill, equity shares and preference shares
8. To understand foreign currency transaction and its need for conversion
9. To recognise exchange difference and accounting of foreign currency translation
10. To understand the concept and condition of buy back
11. To identify methods of buy back and accounting of buyback

Sub: Auditing

- To understand financial statement and its users
- To define an auditing, its objective and different types of auditing
- To explain audit planning, programmer and procedure
- To understand auditing techniques and internal audit
- To classified auditing techniques as vouching of income and expenses
- To classified auditing techniques as verification of assets and liabilities.

Sub Cost Accounting

- To explain basic documents used in cost accounting
- To identify advantages and disadvantages of control account
- To solve financial and cost journal and ledger
- To understand contract costing with running contract cash received, work certified by architects.
- To understand estimated contract, completed contract
- To solve process costing problems
- To understand normal loss, abnormal loss, abnormal gain etc.
- To define technique of costing
- To clarifybreak-even point, margin of safety using equation to ascertain missing amount
- To define standard costing and solve various variances on material and labour
- To decide standard material and labour cost.

sub: Indirect Taxation

- To Review the Basic terms of Service Activity , Consideration , Person , Declared services
- To identify the Registration under Service tax law 69
- To describe the Registration procedure
- To pin point the Mega Exemptions from service tax
- To describe the service tax returns & penalty for late filing

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- To specify the Negative list as per sec 66 D
- To distinguish the point of Taxation
- To summarize the Special provision for Individual
- To Review the Basic concept of Business , Dealer, Goods, Importer, Manufacturer & Sales
- To explain the incidence & Levy of Tax
- To collate the Composition scheme as per Sec 42
- To differentiate sec 48 & sec 49 of Setoff & Refund of Vat.

SUBJECT:-HUMAN RESOURCE DEVELOPMENT

- To explain in depth the meaning , significance and scope[functions] of Human Resource Management
- To analyse the concept and difference between Strategic HRM and Traditional HRM
- To analyse the concept and importance of Human Resource Information System
- To understand in detail the meaning and steps of Human Resource Planning
- To elaborate the concept of Job Analysis by understanding its importance as well as its components
- To understand the concept of Job Design and analyse the factors effecting Job Design
- To review the concepts of Recruitment and Selection along with elaborating on the differences between them and their sources and steps
- To list and understand the different types of Tests and Interviews
- To understand the concept and scope of Human Resource Development
- To elaborate the concepts of Training and development , Performance Appraisal, Career Development and Career Planning along with understanding its advantages , methods and role
- To understand the concept of Human Relations along with its significance
- To elaborate on meaning and styles of Leadership as well as the different theories of Leadership
- To understand the concepts of Motivation as well as Employee Morale along with theories and factors influencing the two concepts
- To analyse Grievance Handling and the causes and procedure of Grievance Handling
- To elaborate on the latest trend in HRM
- To understand the various concepts if Human Resource Accounting, Emotional Quotient , Spiritual Quotient ,Mentoring and Counselling along with their advantages and techniques
- To analyse the Challenges before the HR Manager in today's Changing Business Environment

M.com part -1

PSO

Makes students independent of taking business decisions, specially if they are running their own business.

Course Outcome:

Sem 1

Subject: Business Ethics & Corporate Social Responsibility.

- To Review the concept, importance, needs & various approaches of business ethics
- To describe sources ethics & concept of corporate ethics.

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- To identify the Gandhian approach in management & trusteeship.
- To describe ethics in functional areas.
- To pin point the concept, importance, evolution & principals of Corporate Governance.
- To describe the SEBI guidelines & clause 49.
- To specify the audit committee & protection of stakeholder.
- To explain the concept, scope & importance of CSR.
- To Review the models, drivers of CSR & awards for CSR in India.
- To explain the CSR & Indian corporations.
- To collate the role of NGO's and international agencies in CSR.
- To differentiate CSR towards stakeholders and environmental concerns.
- To specify the factors & designing CSR policy.
- To examine global recognition of CSR.
- To explain CSR & sustainable development.

Sub: strategic management

- To summarized on strategic management
- To throw light upon different levels of strategies.
- To explain on business environment.
- To clarify process of strategic management
- To learn different formation of alternative strategies
- To spot on corporate portfolio analysis
- To understand budgetary control
- To make clear on public-private participation
- To clear up business process outsourcing and knowledge outsourcing
- To understand disaster management
- To learn how start up business with the help of strategies
- To clear out concept on make in India model.

Sub: Economics for business decisions

- * basic principles of business economics, accounting and economic profit, market failure and economic role of government
- * determinants of demand, snob appeal, bandwagon effect and veblan effect
- * theory of consumer choice, consumer preference and budget constraint
- * production decisions and cost analysis
- * market structure analysis and different forms of market structure

Sub: Advanced cost accounting

- To enhance the abilities of learners to develop the concept of cost and management accounting and its significance in the business
- To enhance the learners to understand , develop and apply the techniques of casting in the decision making in the business corpoartes
- To enable the learners in understanding , developing preparing and presenting the financial report in the business corporates
- To understand cash budget, flexible budget, zero budget
- To understand operation costing

Sem 2

Subject: Research Methodology for Business

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- To clarify the importance of research in business, objectives & types of research.
- To describe hypothesis.
- To describe the research process.
- To explain the concept, types, steps of questionnaire.
- To analyze the statistical data & processing.
- To summarize the research reporting & modern practices in research.

Sub: Economics for business decisions

- Macro economic concepts and applications
- Heavily application oriented nature of macroeconomic course enables the learners to understand the rationale behind policies at country as well as corporate level
- * aggregate income and its dimensions - - - - GDP, GNP, NDP
- * Keynesian concepts __aggregate demand function and aggregate supply function
- * trade off between inflation and unemployment i.e. Phillips curve
- * ISLM model
- * International aspect of macroeconomic policy
- * BOP adjustments

Sub: Advanced cost accounting

- To enhance the abilities of learner to develop the objective of financial management
- To understand, develop and apply the technique of investment in the financial decision making in the business corporate
- To analysis the financial statement
- To understand management analysis with financial ratios
- To understand business risk , financial risk and capital structure

M.com part -2

Sem 3

Sub – Advance Financial Accounting

1. To understand the rules for conversion, Branch accounting and solve the problem of Foreign currency conversion
2. To understand important Account provision of Banking Regulation Act-1949
3. To understand provisioning of Non-Performing Assets
4. To Understand preparation of financial statement Form –A-RA, Form-A-PL and Form A-BS
5. To understand procedure to calculate profit or loss
6. To understand preparation of financial statements Form-B-RA, Form B-PL and Form B-BS
7. To understand Maharashtra state co-operative society act and rules
8. To identify types of co-operative society
9. To calculate net profit
10. To calculate appropriation of net profit
11. To understand various items in the final accounts and other related matters.

Sub: Advanced cost accounting

- To enable the student in understand and solve problems on process costing to clarify abnormal loss, abnormal gain

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- To clarify concept of overheads, cost and cost drivers, method of allocation central costs
- To understand activity based costing, its advantages and limitation
- To understand how to prepare managerial report
- To solve inflation accounting problems

Sub: Direct Taxation

- To distinguish the concept of Person, Assessee & Assessment Year
- To review the income tax act 1961
- To summarize the Scope of Total Income under Sec 5
- To figure out the Residential Status as per sec 6
- To summarize the Income Exempt under sec 10
- To identify the Perquisites & Profits in lieu of salary
- To Collate the Salary Income & Deductions under sec 16
- To recognise Income earned through House Property
- To Classify the Income earned through Business or Profession
- To Justify the Income earned through Other sources
- To describe the Income earned through Capital gain
- To Explain the deductions to be made from gross Total Income.
- To differentiate various Income through Computation of Total Income

Sem 4

Sub – Advance Financial management

- To enable the learner on understanding types of financing like as owners capital, loan from financial institutions banks, trade credit, overdraft, cash credit etc.
- To understand basic principal of measuring project cash flow
- To understand management of cash and marketable securities, receivable management and inventory management
- To students able to distinguish between sales budget, production budget, cash and master budget.

Sub: Indirect Taxation

- To Explain the Meaning of GST & IGST
- To identify the Present /old Tax structure
- To classify the GST in other countries
- To pin point the Existing taxes proposed to be subsumed under GST
- To describe the Benefits of GST
- To specify the Registration under GST
- To distinguish the Rules & Procedure of registration
- To summarize the Amendment of registration
- To Review the Sec 5 & Sec 6 of GST
- To explain the Payment of GST
- To collate the Challan Generation & CPIN
- To identify the payment details of GST.

Sub – International Financial Reporting Standards

1. To understand the objective and qualitative characteristics of financial reporting
2. To understand elements of financial statements
3. To understand role/objective of accounting standard

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4. To identify requirement of international accounting standard
5. To understand role of IASB in developing IFRS
6. To compare Indian ASIFRS and AS
7. To understand valuation of inventories, cash flow statement
8. To understand accounting for tangible non-current assets, intangible assets, impairment of assets and borrowing costs
9. To understand accounting policies, accounting estimates, structure and contents of financial statements

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Department of Microbiology
T.Y. BSC Microbiology
USMB-501

CO'S

- To understand the molecular mechanism of dna replication in prokaryotes and eukaryotes
- To know the types of mutation and repair mechanism of genetic material
- To understand the gene transfer mechanism in bacteria through transformation,conjugation and transduction
- To understand the basic mechanism of homologous recombination in bacteria
- To understand the regulatory mechanism and concept of plasmid ,transposons in bacteria.

USMB-502

CO'S

- Give details of the virulence factor and other features of pathogens
- Correlates these virulence factors with the pathogenesis and clinical features of diseases
- Comment on the mode of the transmission ,epidemiology and therefore mode of prophilaxis of disease
- To understand a few clinical features to identify the causative agent
- To know the method of diagnosis of disease
- To understand the concept of innate and adaptive immune response to fight against pathogens
- To know the antigen in initiating the immune response
- To understand the structure and function of immunoglobulin
- To understand the importance of all the other entities involved i.e T-cell,B-cell,NK-cell,APCs,cytokines,MHC,TcR,BcR,CO-receptors,signaling pathways etc

USMB-503

CO'S

- Understand the architechture of the membrane and how solute is transported inside the cell
- To know the electron transport chains in prokaryotes and mitochondria and understand the mechanism of ATP synthesis
- To understand the concept and mechanism of bioluminescence and its significance
- To discuss the experimental aspect of studying catabolism and anabolism and various pathways for the breakdown of carbohydrates along with the reaction in amphibolic pathways
- To know various pathways which produce different end products
- To know the different anabolic reaction in carbohydrate synthesis
- To understand and correlates the concept of energetic and catabolism in biodegradation of various substrates.

No. of Lectures

USMB-504

CO'S

- To know the application of microbes and its strain improvement in industrial microbiology
- Apply kinetic formulae to determine the growth and productivity parameters of batch and continous fermentation
- To understand the design of bioreactor for different application and its process parameters
- To design the media ,growth,condition,and technique for producing and recoverin different types of products of commercial value
- To understand the concept of environmental aspects such as carbon credits and containment level
- Learn to measure corrective measures for dealing with the environmental pollutio and its consequences

USMB-601

CO'S

- To understand the basic concept and technique of recombinant DNA technology
- To understand the basic concept of bioinformatics
- To understand the basic structure ,classification,enumeration,cultivation and life cycle of viruses
- Understand the term like cancer ,prions,viriods, and their mechanism
- Understand the regulation of lambda phage

USMB-602

CO'S

- To know details of virulence factors and other features of the pathogen
- To correlate virulence factor with the pathogenesis and clinical feature of the disease
- To understand the mode of transmission ,epidemiology and therefore modes of prophylaxis of the disease
- To know key clinical features ,identify the causative agents
- To understand the methods of diagnosis of the disease
- To understand the effector response –humoral immunity and cell mediated immunity and differentiate between them
- To acquire the understanding of the role of immune system in disease unregulated response resulting in hypersensitivity
- To understand the mechanism of antigen –antibody interaction and its significanc in diagnosis
- To apply he concept of immunity to prevention of disease by development of vaccines

USMB-603

CO'S

- To understand the reactions involved in the metabolism of lipids and hydrocarbo
- To know the protein catabolism and anabolic process in the cell

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- To understand nucleic acid metabolism and recycling of neuclotides
- To know the mechanism of regulation with regards to allosteric proteins gene expression as well as through other mechanism like end product inhibition and covalent modification
- To understand the prokaryotic photosynthesis with respect to photosynthetic pigments ,photochemical apparatus and light and dark reactions
- To know the metabolism of inorganic compounds and lithotropy

USMB-604

CO'S

- To understand the actual process involved in fermentation of important products
- To apply the knowledge of application of animal and plant tissue culture techniques
- To learn the application of enzymes in various fields
- To understand the working of important instruments used in biochemical analysis and learn to analyze the results using statistical tools
- To leran the salient features of quality management and regulatory procedures
- To understand the commercial and economics aspects of applied microbiology

T.Y. BSC Microbiology

USMB-501

P.S.Os

- To make the learner understand dna replication
- To make the learner understand mutation and repair mechanism in bacteria
- To make the learner understand homologues recombination and genetics exchange
- To make the learner understand plasmids transposons and operons

USMB-502

P.S.Os

- To make the learner understand bacterial strategies for evasion and study of few disease
- To make the learner understand etiology agents,pathogenesis,laboratory diagnosis, and prevention
- To make the learner understand general immunology

USMB-503

P.S.Os

- To make the learner understand biological membrane and transport
- To make the learner understand bioenergetics and bioluminescence
- To make the learner understand methods of studying metabolism and catabolism of carbohydrates
- To make the learner understand fermentative pathways and anabolism of carbohydrates

USMB-504

P.S.Os

- To make the learner understand upstream processing
- To make the learner understand fermenter equipment and control system

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- To make the learner understand downstream processing and environmental aspects
- To make the learner understand traditional industrial fermenter

T.Y. BSC Microbiology

USMB-601

P.S.Os

- To make the learner understand recombinant DNA technology and its application
- To make the learner understand basic techniques and bioinformatics
- To make the learner understand basic virology
- To make the learner understand advanced virology

USMB-602

P.S.Os

- To make the learner understand disease with their cultural,etiological,pathogenesis,laboratory diagnosis and prevention
- To make the learner understand chemotherapy of infectious agent
- To make the learner understand humoral response,cell mediated effector response,antigen antibody reaction
- To make the learner understand vaccines,immunohaemotology,hypersensitivity

USMB-603

P.S.Os

- To make the learner understand lipid metabolism and catabolism of carbohydrates
- To make the learner understand metabolism of protein and nucleic acids
- To make the learner understand metabolic regulation
- To make the learner understand prokaryotic photosynthesis and inorganic metabolism

USMB-604

P.S.Os

- To make the learner understand traditional industrial fermentation
- To make the learner understand advances in bioprocess technology
- To make the learner understand bioinstrumentation and biostatistics
- To make the learner understand quality assurances and regulatory practices

S.Y. BSc Microbiology

USMB-301

CO'S

- To understand the composition and study the methods of estimation of biomolecules
- To study the structure, function and chemistry of nucleic acids
- To understand the system of classification and methods of analysis used in classification of microbial taxonomy

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USMB-302

- To study important pathogens, sampling devices and air quality standards
- To study and understand the fresh water environment, water quality standards and microbial analysis of water
- To study and understand the nature of waste water treatment processes
- To study the removal of pathogens by sewage treatment processes and the disposal methods
- To study the composition of soil and types of microorganisms
- To understand the methods of studying soil microorganisms and the biogeochemical cycles

USMB-303

- To study and understand the morphology, physiology and types of microorganisms
- To study the cultural methods, media and bacterial growth and taxonomy of bacteria
- To study the common infectious diseases and public health measures for control of diseases
- To study the methods of sterilization and disinfection and safety methods in clinical microbiology

USMB-401

- To understand the concept of metabolism and study the pathway and mechanism of metabolism
- To study the experimental approaches and thermodynamics of metabolism
- To study the general properties, classification and enzyme kinetics
- To study the types, principles and procedures of chromatographic techniques
- To study the basic principles, types and applications of centrifugation

USMB-402

- To study types and classification of immune system
- To study and understand the physical and chemical barriers, cells of immune system and process of phagocytosis and inflammation
- To study the tools of epidemiology, spread and recognition of an infectious diseases
- To study food as a substrate for microorganisms and the combined effect of factors affecting growth of microorganisms
- To study different food control agencies
- To understand and study the causative agents, general principles of food spoilage and preservation
- To study the microbiology of dairy products and methods of preservatio

USMB-403

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- To study the applications of nanobiotechnology
- To study the types, working and applications of biofilms and biosensors
- To study and learn the skills writing research report, abstracts and papers
- To analyze and interpret the data by different methods of statistical analysis
- To study the types, principles, factors affecting, advantages and disadvantages biofertilizres, biopesticides and bioremediation

S.Y. BSc Microbiology

USMB-301

P.S.Os

- To study the estimation of biomolecules
- To understand the system and methods of microbial taxonomy
- To understand the structure and chemistry of nucleic acids

USMB-302

P.S.Os

- To study the types of aeromicrobiology and air quality standards
- To study the nature, microbiological analysis, treatment process of fresh and sewa water
- To study the soil and geo microbiology

USMB-303

P.S.Os

- To study and understand the basic of microbiology
- To study common infection disease,epidemiology and public health awarnesss
- To study epidemiology,spread and control of infectious disease
- To study the control methods and safety in clinical microbiology

S.Y. BSc Microbiology

USMB-401

P.S.Os

- To study the metabolism and bioenergetics
- To study and understand the enzyme kinetics
- To study the different typed of analytical techniques

USMB-402

- To study the immune system ,classification,and the cells of immune system
- To study the microbiology of the food,spoilage causing microorganism and preservation
- To study the microbiology of dairy products

USMB-403

P.S.Os

- To study nanobiotechnology and its application

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- To learn the scientific writing, research methodology and biostatistics
- To study the concepts of biofertilizers,biopesticide,and bioremediation

F.Y. BSc Microbiology
Sem -1

USMB-101

CO'S

- To make the learner understand history of microbiology,development of microbiology
- To make the learner understand the working areas in subdisciplines of microbiology and carrer opportunities
- To make the learner understand the basic organization of prokaryotes cell
- To make the learner understand the uniqye complex ,structure and function of prokaryotic cell
- To make the learner understand basic structure and organization of eukaryotics cell and the difference between the domains of life
- To make the learner understand the biosynthetic and secretory pathways of cells and the aware the learners about precautions and cares during actual laboratory works
- To make the learner understand the significance of chemical principles in life science
- To make the learner understand the basic structure of all biological macromolecules

USMB-102

CO'S

- To make the learner understand the basic types of microscopes
- To make the learner understand the need of analytical chemicals and special staining in microbiology
- To make the learner understand the basic principle of microbial control and the asessement of antimicrobial agents
- To make the learner understand the knowledge of antibiotics with respect to their mode of action
- To make the learner understand the group pf organism on the basis of nutritional requirements
- To know various microbial culture collection centres in india and world wide

F.Y. BSc Microbiology
Sem -2

USMB-201

CO'S

- To make the learner understand the life cycles of various prokaryotic cells and eukaryotic cells
- To make the learner understand basic morphology of eukaryotic microorganism

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- To make the learner understand basic principles behind microbial growth and techniques to evaluate it

USMB-202

CO'S

- To make the learner understand the impact of pathogenic organism on human health
- To make the learner understand defence strategies of human body against infections and disease
- To make the learner understand validation and caliberation of microbiological instruments
- To make the learner understand macromolecules in life system and biosafety in microbiological laboratories

F.Y. BSc Microbiology
Sem -1

USMB-101

P.S.Os

- To make the learner understand history of eukaryotic and prokaryotic organism
- To make the learner understand validation and caliberation of microbiological instruments
- To make the learner understand macromolecules in life system and biosafety in microbiological laboratories

USMB-102

P.S.Os

- To make the learner understand the microscopes and staining procedure in microbiological analysis
- To make the learner understand the different physical and chemical methods for microbial count
- To make the learner understand cultural aspects of microorganism such as nutrition,isolation and preservation

F.Y. BSc Microbiology
Sem -1

USMB-201

P.S.Os

- To make the learner understand properties of different prokaryotic organism and viruses
- To make the learner understand eukaryotic microorganism like protozoa,algae,funfi,molds and actinomycetes
- To make the learner understand the aspects of microbial growth

USMB-202

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PSOs:-

To understand relationship between microorganisms and higher organisms like plants and animals

To elaborate impacts of pathogens on host and defense mechanism of the host

To understand various advance microbiological techniques and specialized working compartments

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Foundation course
Sem -1

P.S.O.S

- To make the learner understand the Indian society
- To make the learner understand concept of disparity
- To make the learner understand the Indian constitution
- To make the learner understand the political process

C.O.S

- To study india multicultural,multilingual,multireligious society
- To study gender disparity
- To make the learner understand various diabilities,visual,hearing,mental and the treatment and welfare measures to be taken
- To make the learner understand caste system and intergroup conflicts
- To make the learner understand communalism
- To make the learner understand regionalism
- To make the learner understand the structure and philosophy of Indian constitution
- To make the learner understand basic features of Indian constitution
- To make the learner understand the fundamental duties of Indian citizen
- To make the learner understand the party system in Indian politics
- To make the learner understand role and significance of women in politics

SEM-2

P.S.O.S

- To make the learner understand globalization and Indian society
- To make the learner understand the awareness of human rights
- To make the learner understand ecology and environment
- To make the learner understand stress and conflict
- To make the learner understand how stress and conflict are managed

C.O.S

- To make the learner understand concept of liberalization ,privatization,and globalistation
- To make the learner understand the growth of IT and communication in everyday life
- To make the learner understand impact of globalization on industry
- To make the learner understand farmers suicide
- To make the learner understand concept of human rights
- To make the learner understand universal declaration of human rights
- To make the learner understand human rights with reference to fundamental rights
- To make the learner understand concept of ecology ,ecosystem and environmental degradation
- To make the learner understand the concept and composition of sustainable development
- To make the learner understand stress and conflict and how to manage them

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SEM-3

P.S.O.s

- To make the learner understand the humans right violation and redressal mechanism
- To make the learner understand dealing with environmental concern
- To make the learner understand science and technology
- To make the learner understand soft skills for effective interpersonal communication
- To make the learner understand issue of right to health and education

C.O.S

- To make the learner understand the study types and nature of human rights violation faced by vulnerable groups.
- To make the learner understand violation faced by people with disabilities and by the elderly person
- To make the learner understand the constitutional provisions and laws protecting the rights of vulnerable groups.
- To make the learner understand the threats to environment and its reasons
- To make the learner understand the case studies of environmental disasters
- To make the learner understand the concept of disaster and also effect and precautionary measures of disasters
- To make the learner understand the human rights issues in addressing disasters
- To make the learner understand the development of science and nature of science
- To make the learner understand the business etiquette,public speaking,presentation skills
- To make the learner understand formal and informal communication and writing applications, group discussion,interviews and presentation
- To make the learner understand leadership skills and self improvement
- To make the learner understand the determinants of health,food security,adequate nutrition,safe drnking water and sanitation
- To make the learner understand the right to health
- To make the learner understand the right to education
- To make the learner understand the contemporary challenges in the education sector

SEM-4

P.S.O.s

- To make the learner understand the significant contemporary rights of citizen
- To make the learner understand the approaches to understand ecology
- To make the learner understand science and technology
- To make the learner understand competitive exam
- To make the learner understand urban rural disparities in development

C.O.S

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- To make the learner understand the rights of consumer,rights to information,and protection of citizen and public interest
- To make the learner understand the approaches to ecology
- To make the learner understand the environmental ethics
- To make the learner understand issues and principal of environments
- To make the learner understand technology and its development
- To make the learner understand modern technology,basic features and applications
- To make the learner understand the issue of control access and misuse of technology
- To make the learner understand basic information on competitive examinations ,pattern,eligibility and centres
- To make the learner understand soft skills require for competitive exams
- To make the learner understand the distribution of natural resources ,increase in urbanization etc
- To make the learner understand the issues of adequate water availability , housing transport,waste management and social tension

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DEPARTMENT OF PHYSICS

BSc PROGRAMME

Program Outcomes:

1. To gain an understanding of the history, knowledge of physics and the physics principles that shape our world.
2. To develop problem solving and critical thinking skills which is applicable to design and solve the problems facing by society.
3. To develop insight into the scientific process by making connections between ideas and elements not just within physics, but within all disciplines.
4. To develop familiarity with the physical concepts and facility with the Physical sciences.
5. To develop skills in formulating and solving physics problems.

FYBSC

SEM I

PAPER I

Paper Specific Objectives:

6. To develop analytical abilities towards real world problems.
7. To familiarize with current and recent scientific and technological developments.
8. To enrich knowledge through problem solving, hands on activities, study visits, projects etc.

Course Outcomes:

On successful completion of this course students will be able to:

1. Understand Newton's laws and apply them in calculations of the motion of simple systems.
2. Use the free body diagrams to analyze the forces on the object.
3. Understand the concepts of friction and the concepts of elasticity, fluid mechanics and be
4. able to perform calculations using them.
5. Understand the concepts of lens system and interference.
6. Apply the laws of thermodynamics to formulate the relations necessary to analyze
7. a thermodynamic process.
8. Demonstrate quantitative problem solving skills in all the topics covered

PAPER II

Paper Specific Objectives:

1. To develop analytical abilities towards real world problems
2. To familiarize with current and recent scientific and technological developments
3. To enrich knowledge through problem solving, hands on activities, study visits, projects etc.

Course Outcomes:

1. After successful completion of this course students will be able to
2. Understand nuclear properties and nuclear behavior.
3. Understand the type isotopes and their applications.
4. Demonstrate and understand the quantum mechanical concepts.
5. Demonstrate quantitative problem solving skills in all the topics covered.

SEM II

Paper I

Paper Specific Objectives:

1. To develop analytical abilities towards real world problems.
2. To familiarize with current and recent scientific and technological developments.

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3. To enrich knowledge through problem solving, hands on activities, study visits, projects etc.

Course Outcomes:

1. On successful completion of this course students will be able to:
2. Understand the basic mathematical concepts and applications of them in physical situations.
3. Demonstrate quantitative problem solving skills in all the topics covered.

PAPER II

Paper Specific Objectives:

1. To develop analytical abilities towards real world problems.
2. To familiarize with current and recent scientific and technological developments.
3. To enrich knowledge through problem solving, hands on activities, study visits, projects etc.

Course Outcomes:

1. On successful completion of this course students will be able to:
2. Describe and understand the basic concepts underpinning electricity and magnetism such as potential and field.
3. Understand the relationship between electric and magnetic fields.
4. Calculate the electrostatic and magnetic fields produced by static and moving charges in a variety of simple configurations.
5. Determine the transient and AC response of circuits containing R, L and C components.
6. Use methods of vector calculus to solve problems in electromagnetism.
7. Describe and explain the relationship between the electric field and the electrostatic potential.

Practical I and II

Leaning Outcome:-

1. On successful completion of this course students will be able to:
2. To demonstrate their practical skills.
3. To understand and practice the skills while doing physics practical.
4. To understand the use of apparatus and their use without fear.
5. To correlate their physics theory concepts through practical.
6. Understand the concepts of errors and their estimation.

SYBSC

SEM III

PAPER I

Paper Specific Objectives:

1. To develop analytical abilities towards real world problems
2. To familiarize with current and recent scientific and technological developments
3. To enrich knowledge through problem solving, hands on activities, study visits, projects etc.

Course Outcomes:

On successful completion of this course students will be able to:

1. Understand the basic mathematical concepts and applications of them in physical situations.

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2. Understand the concepts of mechanics, acoustics and the properties of matter and be able to

perform calculations using them

3. Demonstrate quantitative problem solving skills in all the topics covered.

PAPER II

Paper Specific Objectives:

1. To develop analytical abilities towards real world problems
2. To familiarize with current and recent scientific and technological developments
3. To enrich knowledge through problem solving, hands on activities, study visits, projects etc.

Course Outcomes:

On successful completion of this course students will be able to:

1. Understand the basic mathematical physics concepts and applications of them in physical
2. situations.
3. Understand the basic laws of electrostatics and magneto statics and applications of them and be able to perform calculations using them.
4. Demonstrate quantitative problem solving skills in all the topics covered.

PAPER III

Paper Specific Objectives:

1. To develop analytical abilities towards real world problems
2. To familiarize with current and recent scientific and technological developments
3. To enrich knowledge through problem solving, hands on activities, study visits, projects etc.

Course Outcomes:

On successful completion of this course students will be able to:

1. Understand the basic concepts of thermodynamics and its applications in physical situations.
2. Understand and learn low temperature physics
3. Demonstrate quantitative problem solving skills in all the topics covered.

SEM IV

PAPER I

Paper Specific Objectives:

1. To develop analytical abilities towards real world problems
2. To familiarize with current and recent scientific and technological developments
3. To enrich knowledge through problem solving, hands on activities, study visits, projects etc.

Course Outcomes:

On successful completion of this course students will be able to:

1. Understand the diffraction and polarization processes and applications of them in physical

situations.

2. Understand the applications of interference in design and working of interferometers.
3. Understand the resolving power of different optical instruments.
4. Demonstrate quantitative problem solving skills in all the topics covered.

PAPER II

Paper Specific Objectives:

1. To develop analytical abilities towards real world problems

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2. To familiarize with current and recent scientific and technological developments
3. To enrich knowledge through problem solving, hands on activities, study visits, projects etc.

Course Outcomes:

On successful completion of this course students will be able to:

1. Understand the basics of transistor biasing, operational amplifiers, their applications.
2. Understand the basic concepts of oscillators and be able to perform calculations using them.
3. Understand the working of digital circuits.
4. Use IC 555 timer for various timing applications.
5. Demonstrate quantitative problem solving skills in all the topics covered.

PAPER III

Paper Specific Objectives:

1. To develop analytical abilities towards real world problems
2. To familiarize with current and recent scientific and technological developments
3. To enrich knowledge through problem solving, hands on activities, study visits, projects etc.

Course Outcomes:

On successful completion of this course students will be able to:

1. Understand the basic terms like Cosmology, galaxy, quasars.
2. Understand the postulates of quantum mechanics and to understand need of quantum
3. mechanics.
4. Demonstrate quantitative problem solving skills in all the topics covered.

Practical Course I,II and III

Course Outcomes:

1. On successful completion of this course students will be able to:
2. To demonstrate their practical skills.
3. To understand and practice the skills while doing physics practical.
4. To understand the use of apparatus and their use without fear.
5. To correlate their physics theory concepts through practical.
6. Understand the concepts of errors and their estimation.

TYBSC

SEM-V

Paper I (MMP)

1. Program Specific objectives:
2. This course enables to provide an overview of partial derivatives and its applications which is used for solving optimization problems and concepts is needed in study of wave, heat equation of various .
3. To understand First order first degree Differential equations and its applications in basic electrical circuits and motion of a particle.
4. To build ability to solve differential equations numerically.
5. To provide an overview of the experimental aspect of applied mathematics.

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6. It helps the students to understand and apply the concept of existence of limits, indeterminate conditions, and expansion of standard and non standard functions in series form.
7. To acquire working knowledge of the second law of thermodynamics.
8. To apply the laws of thermodynamics.
9. To link thermodynamics to the micro description used in classical- Statistical Mechanics.
10. To introduce advanced topics related to Quantum Statistical Mechanics.

Course Outcomes:

1. On successful completion of this course students will be able to:
2. Know and to understand various types of numerical methods.
3. Inculcate the Habit of Mathematical Thinking through Indeterminate forms and probability statistics.
4. Solve and analyze the Partial derivatives and its application in related field of applied sciences.
5. To understand First order first degree Differential equations and its applications in basic electrical circuits and motion of a particle.
6. To build ability to solve differential equations numerically.
7. To provide an overview of the experimental aspect of applied mathematics.
8. Uses either Fermi-Dirac or Bose-Einstein statistics according to the spin of the particles.
9. Acquainted with advanced topics such as the Fermi energy of a system of noninteracting Fermions and its relation to the chemical potential.
10. Derive Planck's law of blackbody radiation.
11. Recover the laws of thermodynamics and the equipartition theorem from the statistical description using microstates.
12. Use the partition function for calculations about the canonical ensemble.
13. Use the appropriate normalization for the Boltzmann factor and the appropriate degeneracy's and densities of states.

PAPER II (SSP)

Paper Specific Objectives

1. This course enables to provide an overview of Atomic structure, crystallography, symmetries, order and disorder. Reciprocal space, Brillion zones, structure determination by diffraction.
2. To introduce Lattice vibrations, the continuum approximation, phonons, heat capacity.
3. To understand Free electron gas, Fermi-Dirac distribution, electrons in periodic solids, Nearly-free-electron model, and energy bands. Intrinsic semiconductors, extrinsic semiconductors.
4. To calculate electronic conductivity of solids
5. To evaluate thermal properties of solids using statistical approach

Course Outcomes:

On successful completion of this course students will be able to:

1. Gain basic knowledge of solid state physics.
2. Account for interatomic forces and bonds.
3. Have a basic knowledge of crystal systems and spatial symmetries.
4. Account for how crystalline materials are studied using diffraction, including concepts like the ewald sphere, form factor, structure factor, and scattering amplitude.

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5. Perform structure determination of simple structures.
6. Understand the concept of reciprocal space and be able to use it as a tool.
7. Know the significance of brillouin zones.
8. Know what phonons are, and be able to perform estimates of their dispersive and thermal properties.
9. Calculate thermal and electrical properties in the free-electron model.
10. Know Bloch's theorem and what energy bands are.
11. Know the fundamental principles of semiconductors, including pn-junctions, and be able to estimate the charge carrier mobility and density.
12. Account for what the Fermi surface is and how it can be measured.
13. Know basic models of magnetism.
14. Outline the importance of solid state physics in the modern society.

PAPER III (AMP)

Paper Specific Objectives:

1. Objective of this course is to learn atomic, molecular and spin resonance spectroscopy.
2. The study of atoms and molecules has played a major role in the development of physics and in the development of our understanding of the structures of matter as it is encountered in everyday life.
3. Describe theories explaining the structure of atoms and the origin of the observed spectra.
4. Identify atomic effect such as space quantization and Zeeman effect.
5. Describe the molecular bonding and molecular energies.

Course Outcomes:

Students will have achieved the ability to:

1. Describe the atomic spectra of one and two valance electron atoms.
2. Explain the change in behavior of atoms in external applied electric and magnetic field.
3. Explain rotational, vibration, electronic and Raman spectra of molecules.
4. Describe electron spin and nuclear magnetic resonance spectroscopy and their applications.
5. Recognizes the electronic structure and properties of atomic spectra and molecular spectra.
6. Draws energy levels of atomic spectra.
7. Describes types and applications of atomic spectra.
8. Recognizes the effect of the magnetic field on atomic spectra.
9. Of magnetic energy, anomalous Zeeman's effect and Lande's splitting factor.
10. Molecular spectra of diatomic molecules vibration and rotational energy levels.

PAPER IV (ED)

Paper Specific Objectives:

1. To provide the basic skills required to understand, develop, and design various industrial applications involving electric fields and image potential problems.
2. To study Basic Electrostatic and Magneto static Laws, Theorems.
3. To understand Maxwell's Equation and apply to the basic electromagnetic problem.
4. To interpret the given problem, and solve it using Maxwell's equations.
5. To analyze boundary conditions, and understand the field at the interface of two different media.
6. To analyze time varying electric and magnetic fields, wave propagation in different types

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Course Objectives:

After successfully completing the course students will be able to:

1. Interpret the electromagnetic problem and solve using Maxwell's equations.
2. Apply boundary conditions to different media, and formulate uniform plane wave equation, which is the basic of Antenna and wave propagation calculations.
3. Describe and understand the basic concepts underpinning electricity and magnetism such as potential and field.
4. Understand the relationship between electric and magnetic fields.
5. Calculate the electrostatic and magnetic fields produced by static and moving charges in a variety of simple configurations.
6. See how the theory describing electricity and magnetism relates to areas in physics such as gravitation, fluids, thermal physics and quantum mechanics.
7. Describe and explain the relationship between the electric field and the electrostatic potential.
8. Describe and explain electrodynamics, and explain Maxwell's equations in vacuum;

PAPER V (Applied Component-I)

Paper Specific Objectives:

1. To introduce students to monitor, analyze and control any physical system.
2. To introduce to the students the operation of various electronic Instruments which are used to measure the electronic parameters.
3. To prepare students to perform the analysis of any electromechanical system.
4. To empower students to understand the working of electrical equipment used in everyday life.

Course Outcomes:

After successfully completing the course students will be able to:

1. Understand operation of different instruments.
2. Describe different terminology related to measurements.
3. Understand the principles of various types of transducers and sensors.
4. Measure various electrical parameters with accuracy, precision, resolution.
5. Use AC and DC bridges for relevant parameter measurement.
6. Select appropriate passive or active transducers for measurement of physical phenomenon.
7. Use Signal Generator, frequency counter, CRO and digital IC tester for appropriate measurement.
8. Test and troubleshoot electronic circuits using various measuring instruments.
9. Maintain various types of test and measuring instruments.

SEM VI

PAPER-I (CLASSICSL MECHANICS)

Paper Specific Objectives:

1. Consolidate the understanding of fundamental concepts in mechanics such as force, energy, momentum etc. more rigorously as needed for further studies in physics, engineering and technology.
2. Expand and exercise the students' physical intuition and thinking process through the understanding of the theory and application of this knowledge to the solution of practical problems.

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3. To apply the methods of Hamiltonian Dynamics to the study of continuum mechanics and Relativistic Mechanics.
4. To acquire working knowledge of the methods of Lagrangian Dynamics.
5. To apply the methods of Lagrangian Dynamics to the study of small oscillations and the motion of rigid bodies.
6. To acquire working knowledge of the methods of Hamiltonian Dynamics.

Course Outcomes:

After successfully completing the course students will be able to:

1. Uses the D'Alambert principle to derive the Lagrange equations.
2. Computes the generalized momenta and conserved quantities without solving the equations of motion.
3. Finds the forces of constraint by including extra coordinates in the Lagrangian formulations.
4. Compute the Hamilton equations of motion for systems such as the charged particle in an electromagnetic field, two spherical coupled pendulums.
5. Uses canonical transformations to find the constants of motion according to the Hamilton Jacobi theory.
6. Define moment of inertia and use it in simple problems.
7. Explain the origin of the Coriolis and centrifugal terms in the equation of motion in a rotating frame.
8. Demonstrate an intermediate knowledge of central-force motion
9. Apply advanced methods to complex central-force motion problems.
10. Derives the equations of motion for relativistic particles and relativistic fields after determining their Lagrangian and Hamiltonian using Lorentz-group symmetry considerations.

PAPER-II (ELECTRONICS)

Paper Specific Objectives:

1. To study biasing and working of FET and MOSFET.
2. To study the types of rectifiers.
3. To understand the importance of regulators.
4. To understand the operation of the various bias circuits of MOSFET and Analyze and design MOSFET bias circuits.
5. To acquire the basic knowledge of digital logic levels and application of knowledge
6. To understand digital electronics circuits.
7. Provide a strong foundation on Linear Circuits.
8. To study Linear circuits and oscillators using Op-amps.
9. Familiarize the conversion of data from Analog to Digital and Digital to Analog.
10. To prepare students to perform the analysis and design of various digital electronic circuit

Course Outcomes:

After successfully completing the course students will be able to:

1. To understand Basic differential amplifier and their applications in linear Integrated circuits.
2. To learn basic function of operational amplifier, Ideal and practical characteristics and their mathematical application.

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3. To understand basic construction of active filters, comparators and their application in electronics.
4. Students understand different types of multivibrator and wave form generator using IC 555.
5. Students will be introduced to Flip-flop, shifts register, counters.
6. To learn working principle of CMOS and TTL LOGIC for Digital electronics.
7. Distinguish the constructional features and operation of FET and MOSFET and their applications
8. Design regulated power supply.
9. Understand communication system by modulation way.
10. To recognize and analyze the digital circuits

PAPER- III (Nuclear physics)

Paper Specific Objectives:

1. Introduce students to the fundamental principles and concepts governing nuclear and particle physics and have a working knowledge of their application to real-life problems
2. The objective of the nuclear physics program is to provide the best possible education in science areas relevant to effective understanding and utilization of nuclear processes to benefit society in an economically and environmentally sustainable world.
3. Students understand various phenomenological models of nuclei
4. Students understand basic reaction theory

Course outcomes:

1. Identify basic nuclear properties and outline their theoretical descriptions
2. Understand the differences between various decay modes, state selection rules, and determine whether a given decay can take place
3. Calculate Q-values for alpha and beta decays and for nuclear reactions
4. Students understand the liquid drop model
5. Student understand the Shell Model
6. Students can discuss properties of N-N scattering
7. Students are familiar with basic properties of alpha, beta, and gamma emission from nuclei
8. Students understand the classification and properties of elementary particles
9. Students understand nuclear interactions and elementary particles involved in the interactions.

PAPER- IV (Special Theory of Relativity)

Paper Specific Objectives:

1. This course aims at introducing students the essence of special relativity. It is designed as an elective for students in all disciplines and all years with science background.
2. Introduce students to the concept of special relativity and its applications to Physical Sciences and provide students with knowledge and proof of the validity of Physical Laws and nonexistence of the hypothetical stationary a ether.
3. Establish the non-existence of the hypothesized stationary a ether through the null result of Michelson-Morley experiments with interferometer.
4. Explain the true nature of Newtonian mechanics and Lorentz Transformation equations.
5. Understand the concept of constant relative motion of different bodies in different frames of references
6. Understand the concept of a 4-vector as a geometrical object, and the distinction between a vector and its components.
7. Understand the concept of twin Paradox, Transformation of Electric and Magnetic field.

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8. Explain the Gravitational red shift which is the effect of relativistic magnetism.

Course Outcomes:

On completion of the course, students are able to:

1. State the basic postulates and the space-time concept of special relativity
2. Explain time dilation and length contraction
3. Describe Lorentz transformation and its applications
4. State the resolution of the twin and pole-in-the-barn paradoxes
5. Recall the setup and significance of Michelson-Morley experiment
6. Discuss the space-time approach to relativity and four-vectors;
7. Explain relativistic kinematics and optics
8. Discuss relativistic analytic mechanics for a particle coupled to a field;
9. Discuss covariant form of Maxwell's electromagnetic equations;
10. Recognize and communicate appropriate techniques for solving a range of problems;

PAPER- IV (EI-II)

Paper Specific Objectives:

1. Make known the theoretical and practical aspects of the analysis and synthesis of digital systems (combinational and sequential).
2. Equip students with skills to design and handle embedded systems based on microprocessors in general.
3. To understand basic architecture of 16 bit.
4. To understand interfacing of 16 bit microprocessor with memory and peripheral chips involving system design.
5. To understand techniques for faster execution of instructions and improve speed of operation and performance of microprocessors.
6. To learn advanced features of the C++ programming language as a continuation of the previous course.
7. To learn the characteristics of an object-oriented programming language: data abstraction and information hiding, inheritance, and dynamic binding of the messages to the methods.
8. To enhance problem solving and programming skills in C++ with extensive programming projects.

Course Outcomes:

On completion of the course, students are able to:

1. The circuits that implement them, from informal descriptions of combinational functions.
2. Analyze and design simple circuits with combinational digital basic blocks such as logic gates, multiplexers, decoders, adders and comparators.
3. Understand the functioning of bi-stable digital devices (flip-flops) and its use in performing synchronous sequential circuits.
4. Write programs to run on 8085 microprocessor based systems.
5. Design system using memory chips and peripheral chips for 16 bit 8085 microprocessor..
6. Understand and devise techniques for faster execution of instructions, improve speed of operations and enhance performance of microprocessors.
7. Use the characteristics of an object-oriented programming language in a program.
8. Use the basic object-oriented design principles in computer problem solving.
9. Use the basic principles of software engineering in managing complex software project.
10. Program with advanced features of the C++ programming language.

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MSC
Sem-I

Program Outcomes:

1. To gain an understanding of the history, knowledge of physics and the physics principles that shape our world.
2. To develop problem solving and critical thinking skills which is applicable to design and solve the problems facing by society.
3. To develop insight into the scientific process by making connections between ideas and elements not just within physics, but within all disciplines.
4. To develop familiarity with the physical concepts and facility with the Physical sciences.
5. To develop skills in formulating and solving physics problems.
6. To develop the skill regarding the current research in different areas in physics and to resolve the problems have been facing by the society in day today life.

Paper-I (Mathematical Methods in Physics)

Paper Specific Objectives:

1. To Introduce students to the use of mathematical methods to solve physics problems.
2. To Provide students with basic skills necessary for the application of mathematical methods in physics

Course Outcomes:

On completion of the course, students are able to:

1. Understand the basic elements of complex analysis, including the important integral theorems and able to determine the residues of a complex function and use the residue theorem to compute certain types of integrals.
2. Apply techniques of complex analysis, such as contour integrals and analytic continuation, to the study of special functions of mathematical physics.
3. Identify various types of matrices and explain how one type of matrix differs from another;
4. Identify different special mathematical functions.
5. Define and manipulate the Dirac Delta and other distributions and be able to derive their various properties.
6. Explain linear dependence and linear combination of vectors as quantities in physics.
7. Differentiate between Fourier transform and Laplace transform.
8. Use matrices and determinants to solve sets of simultaneous linear equations arising from physical problems.
9. Apply special mathematical function appropriately in solving problems in physics
10. Use Fourier transform to obtain the Fourier series of periodic functions in physics.
11. Apply transform methods to solve elementary differential equations of interest in physics.
12. Aware of the connection between this and integral transforms (Fourier and Laplace) and be able to use the latter to solve mathematical problems relevant to the physical sciences.
13. Understand basic of tensor calculus and will be familiar with examples of how to formulate certain physical laws in terms of tensors.
14. Solve partial differential equations with appropriate initial or boundary conditions with Green function techniques.
15. Have confidence in solving mathematical problems arising in physics by a variety of mathematical techniques.

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Paper-II (Classical Mechanics)

Program Specific Objectives:

1. To acquire working knowledge of the methods of Lagrangian Dynamics.
2. To apply the methods of Lagrangian Dynamics to the study of small oscillations and the motion of rigid bodies.
3. To acquire working knowledge of the methods of Hamiltonian Dynamics.
4. To apply the methods of Hamiltonian Dynamics to the study of continuum mechanics and Relativistic Mechanics.
5. Demonstrate an intermediate knowledge of Newton's Laws.
6. Demonstrate a basic knowledge of equations of motion.
7. Apply advanced Newtonian methods to complex motion problems.
8. Demonstrate a basic knowledge of Lagrangian & Hamiltonian dynamics
9. Apply Lagrangian & Hamiltonian methods to complex motion problems.
10. Demonstrate an intermediate knowledge of central-force motion.
11. Apply advanced methods to complex central-force motion problems.

Course Outcomes:

On completion of the course, students are able to:

1. Understand the D'Alambert principle to derive the Lagrange equations.
2. Know calculus of variations to the Euler-Lagrange equations.
3. Computes the generalized momenta and conserved quantities without solving the equations of motion.
4. Finds the forces of constraint by including extra coordinates in the Lagrangian.
5. Transforms a Lagrangian to normal coordinates and computes the frequencies of oscillation by diagnalizing the modal matrix.
6. Compute several quantities related to the motion of rigid bodies such as: the principal axes of the inertia tensor, the Euler angles, description of torque-free motion in an inertial frame.
7. Compute the Hamilton equations of motion for systems such as: the charged particle in an electromagnetic field, two spherical coupled pendulums.
8. Use of canonical transformations to find the constants of motion according to the Hamilton-Jacobi theory.
9. Use the Poisson brackets to find derivatives in phase space.
10. Demonstrate an understanding of intermediate classical mechanics topics such as coordinate transformations, oscillatory motion, gravitation and other central forces, and Lagrangian mechanics.
11. Understand the applications of the Inverse square law of force, The motion in time in the Kepler problem, Scattering in a central force field.
12. Students will be able to apply their mathematics skills to intermediate classical mechanics problems.
13. To learn the symplectic approach to canonical transformations, Poisson brackets and other canonical invariants
14. Find the Frequencies of free vibration and normal coordinates
15. Understand Legendre transformations and the Hamilton equations of motion, cyclic coordinates and conservation theorems etc.

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PAPER- III (SOLID STATE PHYSICS)

Program Specific Objectives:

1. This course includes theoretical description of crystal and electronic structure, lattice dynamics, and optical properties of different materials
2. This course aims at introducing students about Vibrations of Monatomic Lattice, normal mode frequencies, dispersion relation
3. Introduce students to the concept of quantization of lattice vibrations, phonon momentum, Inelastic scattering of neutrons by phonons, Surface vibrations, Inelastic Neutron scattering
4. Understand the significance of Langevin diamagnetic equation, diamagnetic response, Quantum mechanical formulation, core diamagnetism.
5. Explain the Quantum Theory of Paramagnetism, Rare Earth Ions, Hund's Rule, Iron Group ions, Crystal Field Splitting and Quenching of orbital angular momentum.
6. Understand the concept Ferromagnetic order, spinels, Yttrium Iron Garnets, Anti Ferromagnetic order, Ferromagnetic Domains.

Course Outcomes:

1. On completion of the course, students will:
2. Be able to gain basic knowledge of solid state physics. Be able to account for how crystalline materials are studied using diffraction, including concepts like the Ewald sphere, form factor, structure factor, and scattering amplitude.
3. Understand the concept of reciprocal space and be able to use it as a tool.
4. Know the significance of Brillion zones.
5. Know what phonons are, and be able to perform estimates of their dispersive and thermal properties.
6. Become familiar with the free-electron model for metals and use the concept of Fermi energy and Fermi temperature.
7. Be able to calculate thermal and electrical properties in the free-electron model.
8. Know Bloch's theorem and what energy bands are.
9. Be able to account for what the Fermi surface is and how it can be measured.
10. Know basic models of magnetism.
11. Be able to outline the importance of solid state physics in the modern society.
12. Formulate the theory of lattice vibrations (phonons) and use that to determine thermal properties of solids.
13. Formulate the problem of electrons in a periodic potential, examine its consequence on the band-structure of the solid and develop a framework that explains the physical properties of solids in terms of its band-structure.
14. Be able to calculate the Braggs conditions for X-ray diffraction in crystals and will calculate the conditions for allowed and forbidden reflections in crystals.
15. Learn the basic properties of superconductors in the frame of BCS theory.
16. Be able to understand Langevin diamagnetic equation, diamagnetic response, Quantum mechanical formulation, core diamagnetism.
17. Theory of Paramagnetism, Rare Earth Ions, Hund's Rule.

PAPER-IV (Quantum Mechanics)

Paper Specific Objectives:

1. To study Linear Vector Spaces and operators, Dirac notation, Hilbert space, Hermitian operators and their properties, Matrix mechanics.
2. To understand the origin of Quantum mechanics by the study of Postulates of quantum mechanics, observables and operators, measurements, state function and expectation values, the time-dependent Schrodinger equation, time development of state functions, solution to the initial value problem.
3. To develop the skill regarding Matrix mechanics and to study unitary transformations, the energy representation. Schrodinger, Heisenberg and interaction picture.
4. To formalize General properties of one dimensional Schrodinger equation, Particle in a box.
5. To understand Harmonic oscillator by raising and lowering operators and to study Orbital angular momentum operators in cartesian and spherical polar coordinates, commutation and uncertainty relations.
6. To Study Orbital angular momentum operators in cartesian and spherical polar coordinates, commutation and uncertainty relations, spherical harmonics.
7. To Study two particles problem- coordinates relative to centre of mass, radial equation for a spherically symmetric central potential.

Course Outcomes:

On completion of the course, students will:

1. Realize that quantum mechanics is based on postulates.
2. Be familiar with the concept of a wave function and the born interpretation of the wave function;
3. Be able to sketch wave functions and probability densities for simple problems.
4. Be familiar with eigenfunctions and energy eigenstates of simple systems.
5. Be familiar with the concept of operators (specifically those relating to the energy, position and momentum) and any resulting eigenvalue equations
6. Calculate the expectation value and observable using its related operator
7. Calculate the uncertainty of an observable.
8. Be familiar with the time independent Schrodinger equation (TDSE) and Time independent Schrödinger equation (TISE). Be familiar with the Heisenberg uncertainty relation.
9. Realize that the most general solution to a quantum mechanical system is a linear combination of eigenfunctions.
10. Be able to understand to application of the operators in Quantum mechanics.
11. Able to demonstrate the raising and lowering operators.

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