

Interdisciplinary Courses/ Open Electives:

S.No.	Paper Code	Course Title	L	T	P	Cr
1	EVS 561	Dynamics of Biogeography	4	0	0	4
2	EVS 562	Green Technology	4	0	0	4
3	EVS 661	Environmental Toxicology	4	0	0	4
4	BOT 505	Forestry	4	0	0	4
5	BOT 535	Conservation of Natural Resources	4	0	0	4
6	ENG 531	Writing Skills	4	0	0	4
7	ENG 532	Creative Writing	4	0	0	4
8	ENG 533	Living Literature	4	0	0	4
9	MIC 591	Fermentation Microbiology	4	0	0	4
10	MIC 592	Microbiology of Diseases	4	0	0	4
11	MGT 551	Research Methodology	4	0	0	4
12	MGT 552	Business Strategy	4	0	0	4
13	MGT 553	Principles of Marketing	4	0	0	4
14	CHE 615	Chemistry of Materials	4	0	0	4
15	CHE 616	Medicinal Chemistry	4	0	0	4
16	PHY 670	Nanoscience and Nanotechnology	4	0	0	4
17	PHY 671	Computational Techniques	4	0	0	4
18	CSA 551	Computer Fundamentals and office Automation	3	0	0	3
	CSA 553	Computer Fundamentals and office Automation Laboratory	0	0	2	1
19	CSA 555	Fundamentals of Computer and Programming using C	3	0	0	3
	CSA 556	Fundamentals of Computer and Programming using C Laboratory	0	0	2	1
20	CSA 653	Database Management System using Oracle	3	0	0	3
	CSA 654	Database Management System using Oracle Laboratory	0	0	2	1
21	CSA 655	Analysis and Design of Information Systems	4	0	0	4
22	CSA 656	Electronic Commerce	4	0	0	4
23	CSA 657	Computer Networks and its Algorithms	4	0	0	4
24	CSA 658	Object Oriented Programming	3	0	0	3
	CSA 659	Object Oriented Programming Laboratory	0	0	2	1
25	CSA 660	Software Project Planning and Management	4	0	0	4
26	CSA 661	Web Designing using ASP.NET	3	0	0	3
	CSA 662	Web Designing using ASP.NET Laboratory	0	0	2	1
27	CSA 663	Operating Systems	4	0	0	4
28	CSA 664	Wireless Technologies	4	0	0	4
29	CSA 665	Data Mining and Warehousing	4	0	0	4

Course Title: Dynamics of Biogeography
Paper Code: EVS 561

L	T	P	Credits
4	0	0	4

Objective:

To understand the students about earth's processes and effect of topography on distribution of species on earth.

Unit-I: Geological history of the earth

9 Hours

Biogeography and its history: Basic principles, its relationship to physiography and other modern sciences, biology, geography, biodiversity, and landscape ecology, age of exploration, biogeography of 18th, 19th and 20th centuries, biogeographic distribution of globe, vegetation types and classification of floristic regions. The geological time scale, Wegner's theory of continental drift, tectonic history of the planet, patterns of continents.

Unit-II: Climate and environment

8 Hours

Physical setting of the planet, climatic zones of the world, ombrothermic and climate diagrams, solar energy and temperature regimes, winds and rainfall, soils and successions, formation of major soil types, aquatic environments, stratification and oceanic circulation. Island biogeography: Types of islands, islands as model systems, MacArthur-Wilson theory of island biogeography, Effects of size and distance, equilibrium equation, modifications caused by selective nature of immigration and extinction and interspecific interactions; Endemic species.

Unit-III: Distributions of species

8 Hours

The geographic range projections and geographic coordinate systems, mapping and measuring range, distribution of individuals, populations and ecosystems, Hutchinson's multidimensional niche concept, relationship between distribution and abundance.

Unit-IV: Dispersal and immigration

10 Hours

Mechanisms of active and passive dispersal, Physiological, ecological and psychological barriers, biotics, exchange and dispersal routes: corridors, filters, sweepstakes routes, dispersal curves within and among species, establishment of colony and habitat selection, ecosystem theories (Wedge effect, Bergmann's rule, Allen's rule, Gloger's rule, Jordon's rule and Merriam's classification).

Reference Books:

1. Brown, J.H. and Lomolino, M.V. *Biogeography*. Sinauer Associates Inc., Sunderland, Massachusetts. 1998.
2. Cox, C. B. and Moore, P.D. *Biogeography – An Ecological and Evolutionary Approach*. Blackwell Scientific Ltd. pp. 298. London. 2000.
3. Fahrig, L., and K. Freemark. *Landscape-scale effects of toxic events for ecological risk assessment*. In J. Cairns and B.R. Niederlehner (eds.), *Ecological Toxicity Testing, Scale, Complexity, and Relevance*. Lewis Publishers, Boca Raton, FL. 1994.
4. Weinstein, D.A., and H.H. Shugart. *Ecological modeling of landscape dynamics*. In H.A. Mooney and M. Godron (eds.), *Disturbance and Ecosystems*. Springer-Verlag, New York. 1983.

Course Title: Green Technology
Paper Code: EVS 562

L	T	P	Credits
4	0	0	4

Objective:

To aware the student about green technology and its application in daily life.

Unit-I: Overview Green technology

8 Hours

Green chemistry, Chemistry of the atmosphere, principles of sustainable and green chemistry. Basic principles of green technology, concepts of atom economy and carbon trading, tools of green technology. Waste minimization and climate change, Zero waste technology, concept of environmentally balanced industrial complexing and industrial ecology, greenhouse effect, climate change, photochemical smog.

Unit-II: Green synthetic methods and designs

8 Hours

Catalytic methods in green synthesis, safer chemicals – different basic approaches; selection of auxiliary substances (solvents, separation agents), green solvents, solventless processes, immobilized solvents and ionic liquids; energy requirements-use of microwaves, ultrasonic energy; selection of starting materials; use of blocking/protecting groups, catalytic reagents; Designing of biodegradable products.

Unit-III: Green Nanotechnology

8 Hours

Introduction to Nanomaterials and green nanotechnology, Fullerene, carbon nanotubes, Nanoparticles; Green nanoparticle production and characterization; Biocompatibility; Nanomedical applications of green nanotechnologies; use of nanotechnologies and materials impact on biodiversity, resource conservation, ecosystems and human.

Unit-IV: Green technology applications

10 Hours

Biocatalysis, green chemistry in industries, fuel cell and electric vehicles, solar energy and hydrogen production, energy from alternate sources; Solar photovoltaic technology, Biofuel production (bio-ethanol and biodiesel), Biomass, prevention/minimization of hazardous/ toxic products. Agricultural related practices and food processing, Production of biodegradable materials, concept of green building, and Pollution free engineering processes.

Reference Books:

1. Fulekar, M. H. *Nanotechnology Importance and applications*, IK international publishing house Pvt.Ltd. 2010
2. Matlack, A. S. *Introduction to Green Chemistry*. Marcel Dekker: New York. 2001.
3. Anastas, P. T. and Warner, J. C. *Green Chemistry: Theory and Practice*. Oxford Univ. Press: Oxford. 1998.
4. Lakhtakia, A. *The Handbook of Nanotechnology. Nanometer Structures: Theory, Modeling, and Simulation*. SPIE Press, Bellingham, WA, USA. 2004.

Course Title: Environmental Toxicology
Paper Code: EVS 661

L	T	P	Credits
4	0	0	4

Objective:

To aware the student about toxins in environment and their harmful effects.

Unit-I: Introduction

8 Hours

Toxicology: Definition, Classification of toxic substance i.e. Toxic gases, organic Poison, Inorganic poison, Toxins; Emergence as a science; concepts and definitions; Factors affecting toxicity; Evaluation of Toxicity: Evaluation of LC50, LD50, LCIC and IT; Toxic Chemical in the Environment: Metals and other inorganic contaminants; Organic contaminants; Fate of organic contaminants; Pesticides; Biochemical aspects of Arsenic, cadmium, lead, mercury, carbon monoxide, ozone and PAN.

Unit-II: Toxic substances and risk assessment

10 Hours

Introduction, Toxic substances, xenobiotics, Acceptable Daily Intake (ADI), Procedure for estimating ADI, Potential Daily Intake (PDI), Relationship between ADI and PDI, Models for estimating risk; Conventional toxicity studies: Acute toxicity studies, Short term and Long term toxicity studies, Importance of conventional toxicity studies, Examples for acute, short term and long term toxicity studies; Toxic effects: Spectrum of toxic effects: Quantal and graded effects, idiosyncratic and allergic effects, immediate and prolonged effects, Target organs: liver, kidney, intestine, central nervous system, Molecular targets: DNA, RNA, Proteins, Enzymes.

Unit-III: Mutagenicity and genotoxicity testing

9 Hours

Microbial: Ames *Salmonella* mutagenicity assay, Disc diffusion assay, Plant: *Allium cepa* root chromosomal aberration assay, *Allium cepa* chromosomal aberration and micronuclei assay in pollen mother cells, *Tradescantia* stamen hair mutation assay, *Tradescantia/Vicia faba* micronuclei assay; Animal: Comet assay, Rattus micro nuclei assay.

UNIT-IV: Indices of Toxicology

10 Hours

Detoxification; Ecological Monitoring and Tests; Ecological risk assessment of toxic chemicals. Symptoms, epidemiology and control of vector borne diseases: amoebiasis, trypanosomiasis, filariasis, leishmaniasis, schistosomiasis. Water borne diseases and their control-chlorea, diarrhea. Control of Malaria, Tuberculosis and AIDS. Carcinogenesis, Chemistry of Carcinogenic compound carcinogens, mutagens and teratogens, cancer causing agent Neoplasm. Drugs, Tobacco, Narcotic.

Reference Books:

1. Frank, C.L. and Sam, K. *Basic toxicology: Fundamentals, target organs and risk assessment* (4th edition). Taylor and Francis, London. 2002.
2. Tambrell, J. *Introduction to Toxicology*. Taylor and Francis, London. 2002.
3. Casseret, L. J. and Doull, J. *Toxicology. The basic science of Poisons*. Macmillan publishers, New York. 1982.
4. Stake, M.Y., Mido, M.S., Sethi, S., Iqbal, A., Yasuhisa, H. and Taguchi, S. *Environmental Toxicology*. Discovery publishing house, New Delhi. 1997.
5. De, A. K. *Environmental Chemistry*. Willey Eastern Limited, New Delhi. 1986.

6. Botkin, D.B. and Keller, E.A. Environment Science: Earth as a Living Planet, John Wiley & Sons Inc., New York. 2004.
7. Levin, S.A. Ecotoxicology: Problems and Approaches. Springer-Verlag, New York. 1989.
8. Manahan, S.E. Environmental Chemistry. Seventh Edition. Lewis Publishers, New York. 2000.

Course Title: Forestry

Paper code: BOT 636

L	T	P	Credits
4	0	0	4

Objective:

To expose the students about the practice of growing trees, their legal and social protection, plantation of trees for different purposes etc.

Teaching Methodology:

Traditional method of class room Lectures, forest visits, and performing practicals related forestry.

Learning outcomes:

The studies will provide students with the knowledge of importance and conservation of forests.

UNIT-I

8 Hours

Common forestry Practices and Forest dynamics: Forest regeneration, tending, thinning, pruning and harvesting. Various interactions within forest communities, disturbances and succession, Gap dynamics

UNIT – II

5 Hours

Forest Protection: Protection, causes and control of forest fires; Major diseases of forest plants.

Forest Laws and Forest Conservation: Salient features of the Indian Forest Act 1972 (preliminary, reserved forests, protected forests), different methods employed for conservation of forests.

Ecosystem Services: Definition, General account; Different types; Significance.

UNIT – III

13 Hours

Forests Types: Climate of India, different climatic regions of India; Central characters and distribution of the different forest types of India.

Forest Effects: General effects of forests on climate, control of runoff, effects on snow, soil erosion, wild life, pollution control, nutrient cycling, social values and ecotourism, economic values, floods, green belts and control of temperature.

UNIT – IV

12 Hours

Social Forestry: Social forestry- social land allocation programmes (Taungya system).

Economic benefits of social forestry.

Agroforestry: role in- soil conservation, soil restoration, conservation of biodiversity.

Watershed Management: Physiographic features, infiltration, soil water storage, pore spaces, available water, evapotranspiration.

Climate change and Forestry: definition of climate change, impact of climate change on forests, adaptation of trees to climate change.

Reference Books:

1. Batish, D.R., Kohli, R.K., Jose, S., and Singh, H.P. *Ecological Basis of Agroforestry*. CRC Press: New York, 2008.
2. Chaturvedi, A.N. *Forest Mensuration*. International Book Distributors: Dehradun, 1982.
3. Dwivedi, A.P. *A Text Book of Silviculture*. International Book Distributors: Dehradun, 2006.

4. Gopikumar, K., Gopakumar, S., and Anoop, E.V. *Forest Nursery and Tree Husbandry*. International Book Distributors: Dehradun, 2003.
5. Jha, L.K. *Forestry for Rural Development*. APH Publishing Corporation: New Delhi, 1996.
6. Khosla, P.K. and Kohli, R.K. *Social Forestry for Rural Development*. I.S.T.S. Solan, India, 1988.
7. Kohli, R.K., Arya, K.S., Singh, H.P. and Dhillon, H.S. *Tree Directory of Chandigarh*. DNAES, Chandigarh, India, 1994.
8. Negi, S.S. *Elements of General Silviculture*. International Book Distributors: Dehradun, pp. 269, 2003.
9. Negi S.S. *Hand Book of Forest Ecology and Biology*. International Book Distributors: Dehradun, 2004.
10. Puri, G.S., Mehr-Homji, V.M., Gupta, R.K., and Puri, S. *Forest Ecology Vol. 2*. Oxford & IBH: New Delhi, 1989.
11. Sahni, K.C. *The Book of Indian Trees*. 2nded. Oxford University Press: Mumbai, 2000.
12. Stoddard, C.H. *Essentials of Forestry Practice*. R.P.C., New York, 1959.

Course Title: Conservation of Natural Resources

L	T	P	Credits
4	0	0	4

Paper code: BOT 535

Objective:

To make the students learn about the significance of different natural resources and their conservation strategies.

Teaching Methodology:

Class room Lectures, practicals, models, charts, power point presentations.

Learning outcomes

The students will gain the knowledge of significance of biodiversity, different conservation strategies, biosphere reserves etc.

UNIT-I

12 Hours

Conservation: Concept; Objectives and aims; definition and classification of resources, basic principles of resource management, problems of resource depletion, preservation, conservation and restoration

Conservation of Soil: Reasons of soil degradation, Soil erosion and its check; Role of soil micro-organisms; Soil reclamation.

Conservation of Mineral Resources: Demographic quotient and depletion curves.

UNIT-II

12 Hours

Conservation of Agriculture: Conservation of arable land; Conservation of crop genome; Strategies of conservation of crops.

Pesticides and herbicides in crop protection; Organic, inorganic and hormonal pesticides and herbicides.

Environmental hazards of pesticides and insecticides - their impact on life and life support system.

Role of botanicals in crop protection; Biological management of pests; Integrated weed management.

UNIT- III

12 Hours

Biodiversity and its Conservation: Definition, levels, measurement, threats, strategies for biodiversity conservation.

Endangered and threatened species: IUCN Categories of Extinction

Concept of National Parks, Wildlife Sanctuaries; Biosphere Reserves

Biodiversity Hotspots – concept; A brief account of Biodiversity hotspots of India; Classification of protected areas as per UN.

UNIT- IV

12 Hours

Conservation of Forests: Joint Forest Management, Plantation Programmes in India – Social, Community, Farm and Urban Forestry; Forest Conservation Act.

Strategies for conservation of wastelands and deserts

Conservation of Wildlife: Concept of wildlife; Habitat Improvement; Wildlife Protection Act.

Conservation of Aquatic System: Need and strategies of conservation of Aquatic systems; Conservation of Wetlands.

Course Title: Writing Skills
Paper Code: ENG 531

L	T	P	Credits
4	0	0	4

Objective:

The main objective of this course is to acquaint the students with basic formats of written discourse. This course will enable them to attain proficiency in producing a variety of written forms.

Learning Outcomes:

- To introduce learners to the fundamentals of writing skills
- To develop and enhance learners' ability of communication in the written mode with accuracy and fluency
- To introduce and train learners in the use of specific formats of written discourse
- To familiarize learners with various aspects of the mechanism of language the study skills to collect, classify & retrieve information from different sources and to record and store it.
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Unit-I

15 Hours

Tenses, types of sentences

Register

Mechanism of Punctuation – the use of full stop, comma, semi colon, colon, dash and hyphen

Features of formal and informal letters, letter writing of all the types (Applied work).

Unit-II

15 Hours

Paragraph writing

Transcoding information: - Dialogue to Paragraph, Paragraph to Dialogue, Diagram to Paragraph

Interpreting information presented in charts, graphs & tables.

Unit-III

15 Hours

Report writing – types and format

Notice, email, power point presentation

Agenda

Minutes

Unit-IV

15 Hours

The use of dictionary (origin, meaning, spelling, pronunciations and usage

Writing articles, research papers and editorials (format and content)

Using style guide books for research material(Placement of quotations, in-text citations, references and bibliography)

Reference Books:

1. *Byrne, Donn. Teaching Writing Skills.* London and New York: Longman, 1988.
2. *Dean, Michael. Write it.* Cambridge: CUP, 1988.
3. *Frank, O'Hare. Writer's Work: A Guide to Effective Composition.* New Delhi: Prentice Hall, 1976. *Heage, Tricia. Writing.* Oxford: OUP, 1983. *Print.*
4. *Kane, T.S. The Oxford Guide to Writing.* Oxford: OUP, 1983.
5. *Krishnaswami, N. Current English for College.* Hyderabad: Macmillan. 1990.
6. *Little, Peter. Oral and Written Communication.* London: Orient Longman, 1973.
7. *Lyons, Lizhamp and Ben Heasley. Study Writing.* Cambridge: CUP, 1980.

8. Narayanaswamy, V.R. *Strengthen your Writing*. London: Orient Longman, 1987.
9. Sashi Kumar, Jaya and Champa Tickoo. *Writing with a Purpose*. Oxford: OUP, 1990.
Scale, Barbara. *Writing Efficiently*. New Delhi: Prentice Hall, 1978. Print.
10. Singh, Vandana R. *The written Word*. Delhi: OUP, 2006.

Course Title: Creative writing**Paper Code: ENG 370**

L	T	P	Credits
4	0	0	4

Objective:

1. To introduce the student to effective creative writing skills.
2. To make them understand the writing process.
3. To facilitate workshops with the tutors based on their own writings.
4. To hone students' imagination, its cultivation and expression.

Learning Outcomes: This course helps the student to find their literary voice/voices and channelize their creative writing efforts; to find inspiration more readily and to learn about new authors and literary voices to follow.

Unit-A Literary Devices in Poetry

Alliteration, imagery, simile and metaphor, personification, homophones and oxymorons, prosody, verse, free verse, blank verse, couplet, lyric, sonnet, ballad, vignette and villanelle, rhyme, rhythm, meter, cadence, epiphora and epigraph 6 hours

Unit-B A Gallery of Poets**Classical**

- **William Blake: "London"** (Writing about place and nature, rhymed stanza and music, social commentary) 4 hour
- **S.T. Coleridge: "Kubla Khan"** (Understanding the writing process, the exotic in poetry, dream writing, prophetic voices) 4 hours
- **T.S. Eliot: "Journey of the Magi"** (Writing the conversation narrative, the autobiographical element, using symbols, tone) 4 hours

Post War

- **Amrita Pritam: "Me"** trans. D.H. Tracy and Mohan Tracy: (Writing about yourself, the psychological poem) 4 hours
- **Derek Walcott: "Elsewhere"** (Writing about contemporary issues, understanding race and writing) 4 hours
- **Pablo Neruda: "One Hundred Love Sonnets XVII"** (Writing love poetry, imagery and emotional appeal in poetry) 4 hours

Unit – C Literary Devices in Prose 10 hours

- Character, protagonist and antagonist, plot, theme, setting, plot, voice, denouement, dialogue, flashback, irony, motif, persona, point of view, symbol, atmosphere, anaphora, local colour, bildungsroman, bathos, catharsis, hamartia, tragedy, comedy, flashback, foreshadowing, ellipsis, irony, tone

Unit- D Prose Writing: An Analysis of Technique

- Travelogue : *Gulliver's Travels* (Section 4: Houyhnhnm Land) by Jonathan Swift 7 hours
 - A. Travelogue in Literature
 - B. Travelogue Documentary
 - C. Travel as a Rich Source of Experience and Writing 7 hours

- Short Story: “The Bet” by Anton Chekhov
 - A. Introduction to Prose/ Short Story
 - B. Modern times and Short Story
 - C. *Thematic Appreciation, Plot, Setting, Style, Use of language*
 - D. *Literary Devices*
 - *Script: Script of Swami Vivekananda’s Speech “The Sages Of India”*
 - A. Script Writing
 - B. Creative Vs. Artificial Script
 - C. Script in Play/Theatre
- 6 hours

References Books:

1. Morley, David. *The Cambridge Companion to Creative Writing*. Pune: Cambridge University Press India Ltd., 2012.
2. Clark, Peter Roy. *Writing Tools*. USA: Hachette Book Group, 2008. Print.
3. Field, Syd. *The Screen Writer’s Problem Solver*. New York: Random House Publishing, 1998. Print.
4. Lajos, Egri. *The Art of Dramatic Writing*. USA: Merricat Publications, 2009. Print.
5. Kundera, Milan. *The Art of the Novel*. London: Harper Perennial Modern Classics, 2003. Print.
6. Spiro, Jane. *Creative Writing Poetry*. USA: Oxford University Press, 2004. Print.
7. Davidson, Chad. *Writing Poetry: Creative and Critical Approaches*. USA: Palgrave Macmillan, 2009. Print.
8. Swift, Jonathan. *Gulliver’s Travels*. Edited with an Introduction by Claude Rawson and Notes by Ian Higgins. Oxford: Oxford University Press. 2005.

Websites

1. www.poetryfoundation.org
2. <http://www.eastoftheweb.com/short-stories/UBooks/Bet.shtml>
3. http://www.ramakrishnavivekananda.info/vivekananda/volume_3/lectures_from_colomb_o_to_almora/the_sages_of_india.htm

Course Title: FERMENTATION MICROBIOLOGY

Paper Code: MIC 591

L	T	P	Credits
4	0	0	4

Unit-I Fermented foods

Definition, types, advantages and health benefits

Unit-II Milk based fermented foods

Dahi, Yogurt, Buttermilk (Chach) and cheese: Preparation of inoculums, types of microorganisms and production process

Unit-III Grain based fermented foods

Soy sauce, Bread, Idli and Dosa: Microorganisms and production process

Unit-IV Vegetable based fermented foods

Pickels, Saeurkraut: Microorganisms and production process

Unit-V Fermented meat and fish

Types, microorganisms involved, fermentation process

Unit-VI Probiotic foods

Definition, types, microorganisms and health benefits

Reference Books:

1. Frazier, W.C. Food Microbiology
2. Hui Y.H., Meunier-Goddik L, Josephsen J, Nip W.K. Stanfield P.S. *Handbook of food and fermentation technology*. CRC Press. 2004.
3. Holzapfel W. *Advances in Fermented Foods and Beverages*, Woodhead Publishing. 2014.
4. Yadav J.S. Grover, S. and Batish V.K. *A comprehensive dairy microbiology*, Metropolitan. 1993.
5. Jay J.M., Loessner M.J. Golden D.A. *Modern Food Microbiology* (7th edition). Springer. 2005.

Course Title: MICROBIOLOGY OF DISEASES
Paper Code: MIC 592

L	T	P	Credits
4	0	0	4

Unit-I Human Diseases

4 Hours

Infectious and non-infectious diseases, microbial and non-microbial diseases, Deficiency diseases, Occupational diseases, Incubation period, mortality rate, nosocomial infections.

Unit-II Microbial diseases

12 Hours

Respiratory microbial diseases, gastrointestinal microbial diseases, Nervous system diseases, skindiseases, eye diseases, urinary tract diseases, Sexually transmitted diseases: Types, route of infection, clinical systems and general prevention methods, study of recent outbreaks of human diseases (SARS/Swine flu/Ebola) – causes, spread and control, Mosquito borne disease – Types and prevention.

Unit-III Therapeutics of Microbial diseases

8 Hours

Treatment using antibiotics: beta lactam antibiotics (penicillin, cephalosporin's), quinolones, polypeptides and aminoglycosides.

Judicious use of antibiotics, importance of completing antibiotic regimen, Concept of DOTS, emergence of antibiotic resistance, current issues of MDR/XDR microbial strains.

Treatment using antiviral agents: Amantadine, Acyclovir, Azidothymidine. Concept of HAART.

Unit-IV Prevention of Microbial Diseases

6 Hours

General preventive measures, Importance of personal hygiene, environmental sanitation and methods to prevent the spread of infectious agents transmitted by direct contact, food, water and insect vectors.

Vaccines: Importance, types, vaccines available against microbial diseases, vaccination schedule (Compulsory and preventive) in the Indian context.

Reference Books:

1. Ananthanarayan R. and Paniker C.K.J. *Textbook of Microbiology* (8th edition). University Press Publication. 2009.
2. Brooks G.F., Carroll K.C., Butel J.S., Morse S.A. and Mietzner, T.A. Jawetz, Melnick and Adelberg's *Medical Microbiology* (26th edition). McGraw Hill Publication. 2013.
3. Goering R., Dockrell H., Zuckerman M. and Wakelin D. Mims' *Medical Microbiology*. (4th Edition). Elsevier. 2007.
4. Willey J.M., Sherwood L.M., and Woolverton C.J. Prescott, Harley and Klein's *Microbiology*. 2013.

Course Title: Chemistry of Materials

Paper Code: CHE 615

L	T	P	Credits
4	0	0	4

Objective:

This course is intended to learn the basic concepts of material science. The present syllabus has been framed as per the latest UGC guidelines and recent research trends in the subject. The various topics of the syllabus are grouped under different units in order to bring forth the importance of academic and laboratory skills for the students.

Expected Prospective: This course will equip students with the necessary chemical knowledge concerning the fundamentals in the basic areas of Industrial chemistry. The students will be able to pursue their career objectives in advance education, in scientific research and in teaching careers.

Unit-I

Solid State Chemistry: Types of solids, band and bond theories, crystal lattice energy, point defects in metals and ionic compounds, energy and entropy of defects, their concentration, diffusion and electrical conduction via defects, non-stoichiometry types, colour centres and electrical properties of alkali halides, electron theories for metal conduction in metals, in insulators, impurity semi-conductors, reactions in organic solids, photochemical reactions, solid-solid reactions, decomposition and dehydration reaction.

Unit-II

Macromolecules: Types of polymers, regular and irregular polymers, synthesis of polymers by chain and step reactions, physical properties of solid polymers (crystallinity, plasticity and elasticity), vulcanization of rubbers, molecular mass determination by osmometry, viscometer, light scattering and ultracentrifuge methods, number and mass average molecular masses, polymer solutions, factors affecting the solubility of polymers, conducting polymers, doping of polymers, mechanism of conduction, polarons and bipolarons.

Unit-III

Glasses and Ceramics: Factors affecting glass formation, oxide glasses, electronegativity and bond type, viscosity, structural effects (Zachariasen's rule (1932), criteria of SUN and Rawson, thermodynamics of glass formation, behavior of liquids on cooling, kinetics of crystallization and glass formation, structure of glasses: vitreous silica, silicate glasses, vitreous B_2O_3 and borate glasses, viscosity, electrical conductivity of glasses and the mixed alkali effect, commercial silicate and borate glasses, metallic glasses, glass ceramics, refractories, important glass-ceramics compositions, properties of glass ceramics, applications.

Unit-IV

Smart Materials: Methods of preparation- conventional ceramic methods, hot pressing and hot static pressing techniques, precursor method, gel method, co-precipitation method, glass crystallization methods, vacuum techniques- chemical vapor deposition method, organic superconductors, magnetism in organic materials, magnetic nano materials, energy storage materials, nanomaterials for targeted drug delivery, fullerenes as superconductors. High temperature ceramic superconductors, electrical and magnetic properties of superconductors,

critical temperature T_c , thermodynamics of superconductors, London equation, BCS theory, applications.

Reference Books:

1. Cornell, P. J. Flory. *Principles of polymer chemistry*, University Press.
2. Tager, A. J. *Physical chemistry of polymers*, Mir Publishers.
3. Dekker, A. J. *Solid state physics*, MacMillan Publishers.
4. West, A. R. *Solid state chemistry and its applications*, Wiley Publishers.
5. Byrn, S. R. *Solid state chemistry of drugs*, Academic Press.
6. Puri, Sharma and Pathania, *Principles of physical chemistry*, Vishal Publishers.
7. Gray, G. W. *Thermotropic Liquid crystals*, John Wiley.
8. Malcolm, P and Stevens, *Polymer Chemistry*, Oxford University Press.
9. Keer, H. V. *Principles of Solid States*, Wiley Eastern.

Course Title: Medicinal Chemistry

L	T	P	Credits
4	0	0	4

Course Code: CHE616

Objective:

This course is intended to learn the basic concepts of Medicinal Chemistry. The present syllabus has been framed as per the latest UGC guidelines and recent research trends in the subject. The various topics of the syllabus are grouped under different units in order to bring forth the importance of academic interest.

Expected Prospective:

This course will equip students with the necessary medicinal chemistry knowledge concerning the fundamentals in the basic areas of pharmaceutical sciences. The students will be able to pursue their career objectives in advance education, in scientific research and in teaching careers.

Unit-I

13 Hours

Enzymes: Basic considerations. Proximity effects and molecular adaptation. Introduction and historical perspective, chemical and biological catalysis, remarkable properties of enzymes like catalytic power, specificity and regulation. Nomenclature and classification, extraction and purification. Fischer's lock and key and Koshland's induced fit hypothesis, concept and identification of active site by the use of inhibitors, affinity labelling and enzyme modification by site-directed mutagenesis. Enzyme kinetics, Michaelis-menten and Lineweaver-Burk plots, reversible and irreversible inhibition.

Mechanism of Enzyme Action: Transition-state theory, orientation and steric effect, acid-base catalysis, covalent catalysis, strain or distortion. Examples of some typical enzyme mechanisms for chymotrypsin, ribonucleases, lysozyme and carboxypeptidase A.

Unit-II

8 Hours

Kinds of Reaction Catalysed by Enzymes: Nucleophilic displacement on a phosphorus atom, multiple displacement reaction and the coupling of ATP cleavage to endergonic processes. Transfer of sulphates, addition and elimination reactions, enolic intermediates in isomerization reactions, β -cleavage and condensation, some isomerisation and rearrangement reactions. Enzyme catalyzed carboxylation and decarboxylation.

Unit-III

6 Hours

Co-Enzyme Chemistry: Cofactors as derived from vitamins, coenzymes, prosthetic groups, apoenzymes. Structure and biological function of coenzyme A, thiamine pyrophosphate, pyridoxal phosphate, NAD⁺, NADP⁺, FMN, FAD, LIPOIC ACID, vitamin B12. Mechanisms of reactions catalysed by the above cofactors.

Unit-IV

18 Hours

Drug Design: Development of new drugs, procedures followed in drug design, concepts of lead compound and lead modification, concepts of prodrugs and soft drugs, structure-activity relationship (SAR), factors affecting bioactivity, resonance, inductive effect, isosterism, bio-isosterism, spatial considerations. Theories of drug activity: occupancy theory, rate theory, induced fit theory. Quantitative structure activity relationship. History and development of QSAR. Concepts of drug receptors. Elementary treatment of drug receptors interactions. Physico-chemical parameters: lipophilicity, partition coefficient, electronic ionization constants, steric, Shelton and surface activity parameters and redox potentials. LD-50, ED-50 (Mathematical equations excluded).

Reference Books:

1. Lehninger, *Principles of Biochemistry*, WH-Freeman, 5th edition.
2. Silverman, R. B. *The organic chemistry of drug design and drug action*, Academic press 2nd edition, 2004.
3. Pandeya S. S. and Dimmock, J.R. *An introduction to drug design*, New Age International.

Course Title: Research Methodology
Paper Code: MGT 551

L	T	P	Credits
4	0	0	4

Objective:

The course is designed to enable students to understand & apply concepts research process on real research problems

Learning Outcomes:

At the end of the course a student should be able to design research proposal and apply statistical tools manually as well as with the help of software.

Hours

Unit – I

Research Methods-Introduction : Introduction to Research-Basic and applied Research Methods, Road Map to Learn Business Research Methods, Business research methods: A Decision Making Tool, Use of Software in Data Preparation and Analysis, Introduction and Business Research Process Design **5**

Unit- II

Introduction and Scales of Measurement, Four Levels of Data Measurement, The Criteria for Good Measurement, Factors in selecting an appropriate Measurement Scale, Questionnaire: Introduction and Design Process. **5**

Introduction to Sampling- Importance and Sampling Design Process, Random Sampling Methods and Non-Random Sampling, Central Limit Theorem and Sampling distribution. Classification of Secondary Data Sources, Road Map to Use Secondary Data, Survey and Observation: Classification of Survey Methods, Observation Techniques and Classification of Observation Methods, Experimental Research Designs **10**

Unit-III

Field-work and Data Preparation, Hypothesis Testing for Single Population: Introduction, Hypothesis Testing Procedure, Two-Tailed Test of Hypothesis and One - Tailed Test of Hypothesis, Type-I and Type-II Error, **5**

Hypothesis Testing for a Single Population Mean Using the Z and T statistic, Hypothesis Testing for a Population Proportion, Hypothesis Testing for Two Populations, Hypothesis Testing for the Difference Between Two Population Means Using the z and t-Statistic, **10**

Statistical Inference About the Difference between the means of Two Related Population, One way ANOVA and Experimental Research Designs **10**

Unit –IV

Hypothesis testing for Categorical data (Chi-square test), Non-parametric statistics , Correlation- Karl Pearson and Spearman's Rank Correlation, Introduction of Simple Linear Regression and Determining the Equation of a Regression Line, **10**

Presentation of Result: Report Writing, Organization of Written Report, Tabular and Graphical Representation of Data, Oral Presentation **5**

60 Hours

Reference Books:

1. Business Research Methods by Naval Bajpai, Pearson, 1st Edition, (2011)
2. Research Methodology: Methods and Techniques by C R Kothari, New Age International (2013)
3. Marketing Research: Text and Cases by Nargundkar, R., Tata McGraw Hill, 3rd Edition, (2010)

Course Title: Business Strategy
Paper Code: MGT552

L	T	P	Credits
4	0	0	4

Objective:

To develop an understanding of fundamental concepts in strategic management: the role of the general manager, the levels and components of strategy, competitive analysis, and organizational evolution.

Learning Outcomes:

The participants will develop essential skills and knowledge peculiar to general management. They will appreciate the inter-functional issues in organisation better after undergoing this course.

UNIT-I

Nature of Strategic Management. Dimensions, benefits and risks. The strategic management process, Strategy formulation. Business Vision and Mission, Importance, Characteristics, and Components. Evaluating Mission statements. **12 hours**

UNIT-II

The External Assessment, Porters five Force Analysis. Industry and competitive analysis The Global Environment: Development of a Global Corporation. Complexity of Global Environment , Competitive Strategies for Firms in Global Markets. The Internal Assessment: SWOT Analysis, Strategy and Culture. Value Chain Analysis. Resource Based view of the Firm. Benchmarking. Strategies in Action: The Balanced scorecard, Types of strategies, Integrative, Intensive, Diversification strategies, Defensive Strategies, Porters Generic Strategies. **18 hours**

UNIT-III

Strategy Analysis and Choice: Business level strategies. Cost leadership, Differentiation, Speed and Market Focus. Multi business Strategy: BCG Matrix, GE Nine Cell matrix. Limitations of Portfolio Approaches. The Parenting Framework. Strategy Implementation: Short Term Objectives, Functional Tactics. Empowering Operating personnel. Allocation of Resources, Managing Resource Conflict. **15 hours**

UNIT-IV

Structure and Strategy: Improving effectiveness of Traditional Organisational Structures. Creating Agile Virtual Organisations, Modular Organisation. Towards Boundary less Structures. Leadership and Culture: Strategic Intent. Shaping Organisational Culture. Role of Leader in Organisational Culture. Strategy Evaluation :Strategic Evaluation Process **15 hours**

60 hours

Text Book:

1. Strategic Management: Formulation, Implementation and Control. Pearce, Robinson & Mittal , TATA Mc Graw Hill Special Indian Edition

Reference Books:

1. Strategic Management: Concepts and Cases. Fred David. Prentice Hall India
2. Strategic Management: an Integrated Approach, Hill & Jones. Cengage

Course Title: Principles of Marketing
Paper Code: MGT553

L	T	P	Credits
4	0	0	4

Objective:

This course will enable the students to understand the theories and practices behind the marketing mix variables, to appreciate the holistic role of marketing in a firm, and develop knowledge of and skill in the operating techniques of the marketing management

Learning Outcomes:

Students will be able to design the marketing mix for the customers as per their needs and will learn to create product package which sells itself.

UNIT-I

Understanding Marketing Management: Defining Marketing for the 21st Century, **15 hours**
Core marketing concepts, Company Orientation toward the marketplace, Four Ps, Scanning the Marketing environment, Forecasting demand, Marketing research, Creating Customer value and Customer relationships.

UNIT-II

Analyzing Consumer Markets, Identifying Market Segments and Targets, Product **15 hours**
Life Cycle marketing strategies, Brand Positioning, Creating Brand Equity.

UNIT-III

Product Characteristics and Classifications, Product and Brand relationships, **15 hours**
Packaging, Labelling, warranties and Guarantees, Pricing strategies and programs.

UNIT-IV

Managing Integrated Marketing channels, Integrated Marketing Communications, **15 hours**
Mass communications, Personal Communications.

60 hours

Reference Books:

1. Kotler, Keller, Koshy & Jha. *Marketing Management: A South Asian Perspective, 14th Edition*, Pearson Education
2. Saxena, R. *Marketing Management*, Tata McGraw-Hill Education, 4th Edition
3. Baines, P. *Marketing: Asian Edition*, Oxford University Press, 1st Edition
4. Czinkota Michael R, *Marketing Management*, Cengage Learning, 2nd Edition
5. Chopra, P.K. and Mehra, B. *Marketing Management*, Wiley

Course Name: Nanoscience and Nanotechnology
Course Code: PHY670

L	T	P	Credits
4	0	0	4

Unit-I

15 Hours

Introductory Aspects: Free electron theory and its features, Idea of band structure - metals, insulators and semiconductors. Density of state and its variation with energy, Effect of crystal size on density of states and band gap. Electron confinement in one, two and two-dimensions, Nanostructures and its types, role of size, quantum confinement, surface to volume ratio, Size-dependent properties and applications, Single electron tunneling.

Unit-II

15 Hours

Preparation of Nanomaterials: Nucleation and growth of nanostructures: Homogenous and heterogeneous, Top down and bottom up approaches, Chemical route: Chemical precipitation, Sol-gel, Microemulsions or reverse micelles, Solvothermal/hydrothermal, Electrochemical, Self-Assembly Monolayers (SAM), Physical routes - Inert gas condensation, Sputtering, Laser ablation, Ball Milling, Molecular beam epitaxy, Chemical and Molecular vapour deposition methods, Lithography.

Unit-III

15 Hours

Characterization Techniques: X-ray diffraction (XRD), determination of particle size, study of texture and microstructure, Scanning Electron Microscopy (SEM), Scanning Probe Microscopy (SPM) - Scanning Tunneling Microscopy (STM), Atomic force Microscopy (AFM) Transmission Electron Microscopy (TEM), Optical characterization – UV-Visible, Photoluminescence, Vibrational spectroscopy, Magnetic resonance spectroscopy.

Unit-IV

15 Hours

Special Nanomaterials: Carbon: nature of carbon bond; new carbon structures; Carbon clusters: small carbon clusters, structure of C₆₀, alkali doped C₆₀; Carbon nanotubes: fabrication, structure, electrical properties, vibrational properties, mechanical properties, application of carbon nanotubes: field emission and shielding, computers, fuel cells, chemical sensors, catalysis, Graphene – fabrication and properties.

Reference Books:

1. Chow, G.M. and Gonsalves, K.E., *Nanotechnology - Molecularly Designed Materials*, American Chemical Society (1996).
2. Jain, K.P., *Physics of Semiconductor Nanostructures*, Narosa (1997).
3. Cao, G., *Nanostructures and Nanomaterials: Synthesis, Properties and Applications*, Imperial College Press (2004).
4. B. D. Cullity, *Elements of X-ray Diffraction*, Prentice Hall, 3rd edition (2001).
5. R.F. Egerton, *Physical Principles of Electron Microscopy: An Introduction to TEM, SEM, and AEM* F. Egerton, Springer (2005).
6. Nalwa, H.S. *Encyclopedia of Nanotechnology*, Springer (2012).
7. Bhusan, B. *Springer Handbook of Nanotechnology*, Springer, 3rd edition (2010).

Course Name: Computational Techniques
Course Code: PHY671

L	T	P	Credits
4	0	0	4

UNIT-I

17 Hours

Flow Chart symbols, Low level and High level languages, Characters used in Fortran, Fortran constants and variables, Type declaration for integers and reals, arithmetic expressions and their evaluation using rules of hierarchy, Mixed mode expression, Special functions and their uses, I/O Statements, Simple Fortran Programs.

UNIT-II

17 Hours

Relational Operator, Logical IF Statement, Statement Labels, GO TO Statement, Examples of use of logical IF Statement, Nested Logical IF statement, Arithmetic IF Statement, Do Statement, Subscript expressions, Dimension Statement, Examples of Do loops with subscripts, Functions and Subroutines.

UNIT-III

14 Hours

Approximate values of roots, Bisection Method, Regula-Falsi Method, Newton-Raphson method, Bairstow Method, Simultaneous Linear Algebraic Equations, Interpolation, Newton's formula for forward and backward interpolation, Divided difference, Symmetry of divided differences, Newton's general interpolation formula, Lagrange's interpolation formula.

UNIT-IV

12 Hours

Derivatives using forward and backward difference formula Numerical integration, A general quadrature formula for equidistant ordinates, Trapezoidal rule, Simpson's rule, Weddle's rule, Euler's method, Modified Euler's method, Runge-Kutta Method.

Reference Books:

1. Verma, R.C., Ahluwalia P.K. and Khosla, U.N. FORTRAN 77: Programming and Applications New Delhi: Allied Publishers, 2006
2. Rajaraman, V. Programming with Fortran-77. New Delhi: Tata McGraw-Hill Publishing Company
3. Mittal, V.K. Verma R.C. and Gupta S.C. Fortran for Computational Physics New Delhi: Anne Books, 2008.
4. Scarborough, B.J. Numerical Mathematical Analysis New Delhi: Oxford and IBH Publishing Company 1966
5. Dhaliwal, R.S. Programming with Fortran-77. Wiley-Eastern Ltd., New Delhi.

Course Title: Computer Fundamentals and Office Automation

Paper Code: CSA 551

Course Duration: 45 Hours

L	T	P	Credits
3	0	0	3

Objective:

The objective of this course is to develop understanding of different software and hardware systems available in industry among the participants and to build up the experience of computer usage in business organizations with specific reference to commercial data processing systems.

UNIT – I

11 Hours

Computer Fundamentals and Number System

- Block Structure of a Computer
- Characteristics of Computers
- Generations of Computers, Uses of Computers
- Classification of Computers
- Input-Output Devices, Memory and Mass Storage Devices
- Bit, Byte, Binary, Decimal, Hexadecimal, and Octal Systems, Conversion from One System to the other

UNIT – II

11 Hours

Computer Software , Network & Communication

- Application and system software
- Programming languages and their classification
- Assemblers, compilers and interpreters, Process of software development
- Operating systems: functions of operating systems
- Network topologies
- Network communication devices, Physical communication media
- Network protocol (TCP/ IP)
- Internet and its applications: e-mail, TELNET, FTP, World Wide Web, Internet chatting

UNIT – III

12 Hours

Word Processing and Spreadsheets

- Editing and Formatting a Document, Text Formatting, Paragraph Formatting, Headers and Footers
- FIND command & REPLACE command, Checking Spelling and Grammar; On-line Spelling and Grammar correction using Auto correct, Auto Text, Using Thesaurus, Using Clip Gallery
- Inserting Graphics From files, Working with Tables - Entering Text in the Table, Creating Table, Changing Format of Text of cells, Changing Column width and Row height, Formatting Table Border
- Using Mail Merge - Mail Merge Procedure, Printing a document

- Basic Operations - Arithmetic operators, Comparison operators, Text operator & (ampersand) Reference operator
- Modifying the worksheet layout - Changing Width of Column, Changing Height of Row, Deleting Rows/Columns/Cells, Moving and copying contents of cell, Alignment of text in the cell
- Working with functions - Date and time function, Statistical function, Financial function, Mathematical and Trigonometric functions, Lookup and Reference Functions, Data Base functions, Text function, Logical functions
- Printing the workbook - Setting up Print Area, Setting up Margins, Defining Header and Footer, Controlling Gridlines
- Introduction to CHARTS - Formatting Charts

UNIT – IV

11 Hours

Presentations and DBMS

- Creating a presentation slide, Design Templates and Blank presentations, Power Point standard toolbar buttons
- Changing Font, Font Size and Bold; Moving the frame and inserting clip art; Different slide layouts; Formatting the Slide Design; Work with the Slide Master; Saving the presentation
- The Auto Content Wizard; Using Existing Slides; Using the different views of a slide, Adding Transitions and Animation, Running Slide Show
- Adding and Deleting Records
- Creating, Saving , Editing, Joining Tables in Queries
- Creating and Using Forms
- Creating and Printing Reports

Reference Books:

1. K. Kumar, and R. Rajkumar, Computer Applications in Business, Tata McGraw Hill
2. Kogent Learning Solutions Inc, Office 2010 in Simple Steps, DreamTech Press
3. A. Goel, Computer Fundamentals, Pearson
4. Silberschatz & A. Korth, Database System Concepts, New York, McGraw-Hill
5. A. Simpson, C. Robinson, Mastering Access 2000, New Delhi, BPB
6. R. K. Taxali, P C Software Made Simple, New Delhi, Tata McGraw-Hill

Course Title: Computer Fundamentals and Office Automation Laboratory

Paper Code: CSA553

L	T	P	Credits
0	0	2	1

- The laboratory will comprise of using commands and tools available in MS Word, PowerPoint, and Excel.
- Assignments based on the applications of above mentioned software packages.

Course Title: Computer Fundamentals and Programming in C
Paper Code: CSA 555
Course Duration: 45-60 Hours

L	T	P	Credits
3	0	0	3

Objective: The objective of this course is to familiarize students with concepts of fundamentals of information technology along with developing the logic for solving a given problem using the procedure oriented language C for construction of code.

UNIT– I

18Hours

Computer Fundamentals

- Definition, Block Diagram Along With Computer Components, Characteristics of Computers
- Classification of Computers, Hardware & Software, Types of Software, Firmware.

Planning the Computer Program

- Concept of Problem Solving, Problem Definition
- Program Design, Debugging
- Types of Errors In Programming, Documentation, Algorithms, Flowchart
- Decision Table, Structured Programming Concepts, Programming Methodologies Viz. Top Down and Bottom Up Programming

UNIT – II

13 Hours

Overview of C

- History of C, Importance of C, Structure of a C Program

Elements of C

- C Character Set, Identifiers and Keywords,
- Data Types
- Constants and Variables. Operators: Arithmetic,
- Relational, Logical, Bitwise
- Unary, Assignment, Conditional Operators and Their Hierarchy & Associativity

UNIT – III

15 Hours

Input/Output

- Unformatted & Formatted I/O Function in C

Control Statements

- Sequencing, Selection: if and switch statement; alternation,
- Repetition: for, while, and do while loop
- break, continue, goto

Functions

- Definition, Prototype, Passing Parameters, Types of Functions
- Recursion

Arrays

- Definition, Types, Initialization, Processing an Array, Passing Arrays to Functions, Strings

Structure & Union

- Definition, Processing, Structure
- Passing Structures To Function

Reference Books:

1. Gottfried and Byron S., *Programming with C*, New Delhi: Tata McGraw Hill, 1992.
2. E. Balagurusamy, *Programming in ANSI C*, New Delhi: McGrawHill, 2011.
3. Hanly R. Jeri and Koffman Elliot P., *Problem Solving and Program Design in C*, India: Addison Wesley, 2011.
4. Kanetker Yashwant, *Let us C*, New Delhi: BPB Publications, 2011.

Course Title: C Programming Laboratory
Paper Code: CSA556

L	T	P	Credits
0	0	2	1

Implementation of C programs: Control Structures, Arrays, Strings, Pointers, Structures, Union, Files, etc.

Course Title: Database Management System using Oracle**Paper Code: CSA653****Course Duration: 45-60 Hours**

L	T	P	Credits
3	0	0	3

Course Objective: The concepts related to database, database design techniques, transaction management, SQL, PL/SQL and database operations are introduced in this subject. This creates strong foundation for data base creation

UNIT - I**15 Hours****Data Base Concepts**

- Data base vs. file oriented approach, Data Independence
- Data Base Models
- General Architecture of a Data Base Management Software, Components of a DBMS
- Advantages and Disadvantages of DBMS

Introduction to Data Models

- Entity Relationship model, hierarchical model
- from network to hierarchical, relational model
- object oriented database, object relational database
- Comparison of OOD & ORD, comparison of network, hierarchical and relational models.

UNIT– II**15 Hours****Data Base Design**

- Entities, Attributes, ER Diagrams
- Functional dependencies; Normalization
- Multivalued dependencies, decomposition
- Relational algebra and calculus
- The relational calculus query processor and optimizer, Storage organization for relations.

Data Base Protection

- Concurrency, recovery
- Integrity, Protection, essentials of security
- authorization, types of database security

UNIT– III**15 Hours****Relational Query Language**

- SQL, client/server architecture
- Technical introduction to Oracle.

Software Development using SQL

- SQL data types, Querying database tables
- Conditional retrieval of rows, working with Null values, matching a pattern from the table
- querying multiple tables: Equijoins, Cartesian joins, Outer joins, Self joins;
- Set operator: Union, Intersect, Minus, Nestedqueries

UNIT– IV

15 Hours

Introduction to PL/SQL

- The PL/SQL block structure, PL/SQL data types
- Variables and constants, assignment and expressions
- Writing PL/SQL code, cursor management in PL/SQL
- Concept of stored packages
- Database triggers, types of triggers, Dropping triggers, storage of triggers
- Program Design & Development for Inventory, Personnel and Financial Management using Oracle

Reference Books:

1. Desai, B.C “An Introduction to Database Systems”, Galgotia Publ. Private Ltd.
2. Date, C.J, “Data Base Systems”, Vols. I & II, Narosa Publishers.
3. Silberschatz, Korth and Sudarshan, “Database System Concepts”, Third Ed., McGraw Hill International Editions, Computer Science Series.
4. Peter Rob Carlos Coronel, “Data Base Systems (3rd Edition)”, Galgotia Publications (P) Ltd.

**Course Title: Database Management System using Oracle
Laboratory**

L	T	P	Credits
0	0	2	1

Paper Code: CSA 654

Implementation of SQL: DDL, DML, DCL, TCL
Practice of PL/SQL.

Course Title: Analysis and Design of Information Systems**Paper Code: CSA655****Course Duration: 45-60 Hours**

L	T	P	Credits
4	0	0	4

Objective: This course provides a comprehensive understanding of the information systems, types of systems, subsystems, management information systems, decision support systems, expert systems, enterprise information systems and decision making and analysis.

UNIT-I**15 Hours****System and Information Concepts**

- General Model, Types of systems, Subsystems
- Attributes of Information, Evolution of Information Systems, categories of Information Systems, Building and Maintaining Information Systems
- Feedback Control, Systems approach to organization, Law of requisite variety, Control by exception
- Information Concepts, Types of Information, Quality of Information, Value of Information

Management Information System

- Definitions, Role of MIS, MIS in Academics
- Structure of MIS based on management activity and functions System and Information concepts to MIS

UNIT-II**15 Hours****Decision Support Systems**

- Conceptual Foundations of DSS, Concepts of DSS
- DSS Software, Strategies for DSS, GDSS, and Executive Support System (ESS),
- Fundamentals of Knowledge Management systems, Knowledge Based Decision Support
- DSS Application, Case Study

UNIT-III**15 Hours****Expert System**

- Basic concepts of Expert System, Structure of Expert System, How Expert System works
- Expert System Application, Comparison of Conventional & Expert System
- Case Study

Executive Information and Support Systems

- Enterprise & Executive Information System, Concept and Definition
- Information needs of Executives, Characteristics and benefits of EIS
- Comparing and Integrating EIS and DSS.

Decision Making Systems, Modelling and Analysis

- Decision Making Definition and Concept, Phases of Decision Making Process
- Modelling Process, Static and Dynamic Models
- Sensitivity Analysis
- Heuristic programming, Simulation

Reference Books:

1. Robert Murdick, Joel e. Ross, Information Systems for Modern Management, PHI, 3rd Ed.
2. Efraim Turban, Decision Support & Intelligent System, Pearson, 8th Ed.
3. Laudon C. Kenneth & Laudon P. Janes, Management Information Systems, Pearson Education, 2002.
4. Paolo Bellavista and Antonio Corradi (Eds.), Handbook of Mobile Middleware, Auerbach Publication.
5. Alter Steven, Information Systems , 3rd Edition, Pearson Education, 2000
6. McNurlin C.Barbara & Spargue H. Ralph, Information Systems Management in Practice, fifth Edition, Pearson Education, 2003
7. V.Rajaraman, Analysis and Design of Information System, PHI, 2nd Ed

Course Title: Electronic Commerce

Paper Code: CSA 656

Course Duration: 45-60 Hours

L	T	P	Credits
4	0	0	4

Objective: The course provides the knowledge about Business transactions using new technologies.

UNIT—I

10 Hours

- Introduction to Electronics Commerce.
- Defining Electronics Commerce, Forces Fueling Electronics Commerce.
- Electronics Commerce Industry Frame Work, Types of Electronics Commerce.
- World Wide Web and Its Applications:-Brief History and Introduction of WWW, The Web and The Electronicscommerce.
- Key Concepts Behindweb, Web and Database Integration, Websoftware Development Tools (HTML, XML, UML, Java Script, VB Script, ASP, JSP).
- Multimedia Web Extensions (VRML, Real Audio, Internet and Web Based Tech3. Firewalls and Transaction Security.

UNIT—II

15 Hours

- Introduction to Firewalls and Network Security (Types, Policies and Management).
- Transaction Security, Encryption and Transaction Security, The Comparison of Encryption Methods.
- Security in WWW (Netscape's Secure Socket Layer, Security and Online Web Based Banking).
- Electronic Payment Systems :-Overview of the Electronics payment technology.
- Electronics cash, Electronics checks, online credit cards based system
- Other emerging financial instruments.

UNIT—III

13 Hours

- Electronics Commerce and banking ,Home Banking
- Banking via the PC using Internet/Intranet, Banking via online services, Banking via Web.
- Electronics Commerce and Retailing, Changing Retail industry dynamics and technology improvements in Electronics retailing, Mercantile models from consumers perspective , Directories and search engines.
- Supply Chain Management Fundamentals and Management of Supply Chains, Supply Chain Application Software Ad Its Future.

UNIT—IV

7 Hours

- Roadmaps to E-Business
- Challenges and strategy creation, Roadmaps to E-Business
- Translating E-Business strategy into action
- Beginning of a virtual factor
- E-business blueprint creation, E-Business project planning checklist, an execution blueprint.
- Failures of E-Business Initiatives.

Reference Books:

1. Dr Ravi Kalkota, E-Business - Roadmap for success, Addison Wesley (Pearson Education Asia).
2. David Kosiur, Electronic Commerce, Microsoft Press.
3. Ravi Kalakota and Andrew B. Whinston, Electronic Commerce, Addison Wesley.

Course Title: Computer Networks and its Algorithms

Paper Code: CSA 657

Course Duration: 45-60 Hours

L	T	P	Credits
4	0	0	4

Objective: As part of this course, students will be introduced to computer networks and data communication paradigms, about network models and standards, network protocols and their use, wireless technologies.

UNIT– I

18 Hours

Introduction to Data Communication

- Components of Data Communication, Data Representation
- Transmission Impairments, Switching, Modulation, Multiplexing

Review of Network Hardware

- LAN, MAN, WAN
- Wireless networks, Internetworks

Review of Network Software

- Layer, Protocols, Interfaces and Services

Review of Reference Models

- OSI, TCP/IP and their comparison

Physical Layer

- Transmission Media: Twisted pair, Coaxial cable, Fiber optics
- Wireless transmission (Radio, Microwave, Infrared)
- Introduction to ATM, ISDN
- Cellular Radio and Communication Satellites

UNIT– II

15 Hours

Data Link Layer

- Framing, Error control, Sliding window protocols (one bit, Go back n, selective repeat)
- Examples of DLL Protocols–HDLC, PPP

Medium Access Sub layer

- Channel Allocation, MAC protocols – ALOHA, CSMA protocols
- Collision free protocols, Limited Contention Protocols
- Wireless LAN protocols
- IEEE 802.3, 802.4, 802.5 standards and their comparison

Bridges

- Transparent, source routing, remote

UNIT– III

15 Hours

Network Layer

- Design Issues, Routing Algorithms (Shortest Path, Flooding, Distance Vector, Hierarchical, Broadcast, Multicast
- Internetworking, IP Protocol, ARP, RARP.

Network Trouble Shooting

- Using Ping, Traceroute, IP config, Netstat, nslookup etc.

UNIT– IV

12 Hours

Transport Layer

- Addressing, Establishing and Releasing Connection
- Flow Control, Buffering
- Internet Transport Protocol (TCP and UDP).
- Congestion Control Algorithms (Leaky bucket, Token bucket, Load shedding)

Application Layer

- Domain name system, Email, File transfer protocol
- HTTP, HTTPS, World Wide Web.

Reference Books:

1. Andrew S. Tanenbaum ,Computer Networks, 4th Edition, PHI.
2. B. A. Forouzan, Data Communications and Networking, Fourth Edition, Tata McGraw Hill..
3. William Stallings,Computer Communications, Data (8th Edition), PHI
4. Bary Nance, Introduction to Networking, 4th Edition, PHI.

Course Title: Object Oriented Programming

Paper Code: CSA658

Course Duration: 45-60 Hours

L	T	P	Credits
3	0	0	3

Objective: This course will expose you to the features in C++, which help you design software using the object oriented programming concepts such as inheritance, encapsulation, polymorphism, exception and file handling.

UNIT - I

18 Hours

Introduction

- Evolution of OOP, OOP features of C++
- Characteristics of object oriented language – objects, classes, inheritance, reusability, user defined data types, polymorphism, overloading
- Comparison of C with C++.

Class Concepts

- Class and Objects, Inline functions, Static data members and member functions
- ReadOnly objects, Pointers, Dynamic memory allocation and deallocation
- Constructors and Destructors
- Dynamic objects, array of pointers to object, Pass by value vs. Pass by Reference
- Local and Global class, nested and empty class, preprocessor directives, namespace.

Console I/O

- Hierarchy of console stream classes
- Unformatted and formatted I/O operations, Manipulators

UNIT– II

12 Hours

Operator Overloading

- Overloadable operators, overloading unary and binary arithmetic and relational operators
- Overloading subscript, array, insertion, extraction, new and delete operators.

Friend Function and Type Conversion

- Friend function, Function overloading, overloading operators through friend function
- Basic type conversion, conversion between Objects and Basic Types
- Conversion between objects of different classes

UNIT– III

15 Hours

Inheritance

- Derivation Rules, Different forms of inheritance
- Roles of constructors and destructors in inheritance.

Virtual Functions

- Virtual functions and their needs, Pure virtual function
- Virtual destructor, virtual derivation, abstract class.

UNIT– IV

15 Hours

Generic Programming & Exception Handling

- Template functions, Template class
- Exception handling features of C++

File Handling

- Hierarchy of File Stream classes, Opening and Closing files
- File modes, testing for errors
- File pointers and their manipulations, ASCII & Binary files
- Sequential and Random access files

Reference Books:

1. Bjarne Stroustrup, "The C++ Programming Language", Pearson.
2. "Object Oriented Programming in C++", Robert Lafore
3. E. Balaguruswami, "Object Oriented Programming In C++," Tata McGrawHill
4. Lippman, Tom Weiss, "C++ Primer", 3/e, AddisonWesley.
5. Herbert Schildt, "C++The Complete Reference", Tata McGrawHill

Course Title: Object Oriented Programming Laboratory
Paper Code: CSA659

L	T	P	Credits
0	0	2	1

- Implementation of OOP concepts using C++
- Write program in 'C++' language
- Using input and output statements
- Using control statements.
- Using functions.
- Using array
- Using Classes and implementation of Constructor and Destructor.
- Using files.
- Using OOP's Concepts (Inheritance, Polymorphism, Encapsulation, Friend and Static Functions, Exception Handling)

Course Title: Software Project Planning and Management**Paper Code: CSA660****Course Duration: 45-60 Hours**

L	T	P	Credits
4	0	0	4

Objective: This course provides the understanding of software project planning, various software process models, system design analysis, various testing techniques and software engineering tools.

UNIT-I**15 Hours****Introduction**

- Software Engineering goals, Characteristics, Components Applications
- Software Process Models: Waterfall, Spiral, Prototyping, Fourth Generation Techniques
- Concepts of Project Management, Role of Metrics And Measurement
- Software requirements, Definition, Software requirements specifications (SRS), Components of SRS.
- Software engineering features (data abstraction exception handling and concurrency mechanism).

Software Project Planning

- Objectives, Decomposition Techniques: Software Sizing, Problem Based Estimation
- Process Based Estimation, Cost Estimation Models: COCOMO Model, The Software Equation

UNIT-II**15Hours****System Analysis**

- Principles of Structured Analysis, Requirement Analysis
- DFD, Entity Relationship Diagram, Data Dictionary

Software Design

- Objectives, Principles, Concepts
- Design Mythologies: Data Design, Architecture Design
- Procedural Design, Object–Oriented Concepts

UNIT-III**15 Hours****System Administration and Training**

- User manual, Implementation Documentation, Operation plan and maintenance

Hardware and Software Selection

- Hardware acquisition, Benchmarking, Vendor selection, Software selection, Performance and acceptance criteria, Site preparation

UNIT-IV**15 Hours****Testing Fundamentals**

- Objectives, Principles, Testability
- Test Cases: White Box & blackbox Testing
- Testing Strategies: Verification & Validation
- UNIT Test, Integration Testing, Validation Testing, System Testing
- Software documentation procedures, Software reliability and quality assurance. Quality Matrices and software models
- Software maintenance and configuration management

Software engineering tools and environment

- International software engineering standards and their relevance
- Case studies in software engineering

Reference Books

1. Fairley, R.E., Software Engineering Concepts, McGraw Hill.
2. Lewis, T.G., Software Engineering, McGraw Hill.
3. Sergio F.Ochoa and Gruiia-Catalin Roman, Advanced Software Engineering
4. Pressman, Software Engineering, Tata McGraw Hill
5. Doug Bell, Ian Murrey and John Pugh, Software Engineering: A Programming.
6. Meyers, G., The Art of Software Testing, Wiley-Inter-Science
7. Sommerville, Ian, Software Engineering, Addison Wesley, 4th Ed.

Course Title: Web Designing using ASP.NET

Paper Code: CSA661

Course Duration: 45-60 Hours

L	T	P	Credits
3	0	0	3

Objective:

- To build web applications using ASP and client side script technologies use with Microsoft's IIS.
- To build XML applications with DTD and style sheets that span multiple domains ranging from finance to vector graphics to genealogy for use with legacy browsers.

UNIT—I

15Hours

Introduction to Three-Tier Architecture

- Overview of .NET Framework , Common Language Runtime (CLR)
- The .NET Framework Class Library, familiarization with visual studio .NET IDE, Design Window, Code Window, Server.
- Explorer, Toolbox, Docking Windows, Properties Explorer, Solution Explorer, Object Browser, Dynamic Help, Task List Explorer.
- Features of VS.NET, XML Editor, Creating a Project, Add Reference, Build the Project, Debugging a Project.

UNIT—II

15 Hours

Introducing C# Programming

- Introduction, Basic Language Constructs, Types (Reference and Value, Relations Between Types)
- Delegates, Generics, Collections
- Strings , Exceptions, Threads , Networking

UNIT—III

15 Hours

Windows Forms, Adding Controls

- Adding An Event Handler, Adding Controls at Runtime
- Attaching An Event Handler at Runtime, Writing a Simple Text Editor, Creating a Menu Adding a New Form,
- Creating a Multiple Document Interface, Creating a Dialog Form Using form Inheritance, Adding a Tab-Control, Anchoring Controls,
- Changing the Startup Form, Connecting The Dialog, Using Listview and Treeview Controls,
- Building an Image list and add Them To The Listview, Using Details inside The Listview,
- Attaching A Context Menu, Adding a Treeview, Implementing Drag And Drop, Creating Controls at Run Time, Creating a User Control, Adding a Property, Adding Functionality,
- Writing a Custom Control, Testing the Control.

UNIT—IV

15 Hours

ADO.NET Architecture

- Understanding the Connection object
- Building the Connection String, Understanding the Command object,

- Understanding Datareaders, Understanding Datasets and Dataadapters, Datatable, DataColumn, DataRow
- Differences between Datareader Model and Dataset Model, Understanding the DataViewobject, Working with System.Data.OleDb
- Using Datareaders, Using Datasets, Working with SQL.NET, Using Stored Procedures, Working With Odbc.NET, Using DSN Connection

Introducing The ASP.NET Architecture

- ASP.NET Server Controls, Working with User, Controls, Custom Controls, Understanding the Web.Config File, Using the Global.asax Page

Reference Books:

1. Paul J. Deitel and Harvey M. Deitel, C# 2010 for Programmers, Forth Edition Pearson 2010.
2. Imar Spaanjaars, Beginning ASP.NET 4: in C# and VB (Wrox), Paperback Edition
3. George Shepherd, Microsoft ASP.NET 4 Step by Step (Microsoft), Paperback Edition
4. Scott Mitchell, Sams Teach Yourself ASP.NET 4 in 24 Hours, Complete Starter Kit

Course Title: Web Designing using ASP.NET Laboratory

L	T	P	Credits
0	0	2	1

Paper Code: CSA662

- Implementation of ASP.NET classes and Tools
- Connectivity with database

Course Title: Operating Systems**Paper Code: CSA663****Course Duration: 45-60 Hours**

L	T	P	Credits
4	0	0	4

Objective: To understand and learn the fundamentals of Operating System including dealing with memory management, process management, CPU scheduling, deadlocks and file management.

UNIT - I**15 Hours****Introduction to Operating System**

- OS, History of OS, Types of OS
- Functions/operations of OS, User services/jobs, system calls
- Traps, architectures for operating systems

CPU Scheduling

- Process states, virtual processors
- interrupt mechanism, scheduling algorithms
- Preemptive scheduling & Non-Preemptive scheduling

UNIT- II**18 Hours****Process Management**

- Process overview, process states and state transition
- Levels of schedulers and scheduling algorithms
- Process Synchronization Critical section and mutual exclusion problem
- Classical synchronization problems, deadlock prevention. Multithreading.

System Deadlock

- Deadlock characterization, Deadlock prevention and avoidance
- Deadlock detection and recovery, practical considerations

UNIT - III**15 Hours****Storage Management**

- Storage allocation methods: Single contiguous allocation
- Multiple contiguous allocation

Memory Management

- Paging, Segmentation combination of Paging and Segmentation
- Virtual memory concepts, Demand Paging, Page replacement Algorithms
- Thrashing. Address Protection, segmentation, virtual memory, paging
- Page replacement algorithms
- Cache memory, hierarchy of memory types, associative memory.

UNIT– IV

12 Hours

File Management

- Overview of File Management System
- Disk Space Management, Directory Structures
- Protection Domains, Access Control Lists, Protection Models

Device Management

- Goals of I/O software, Design of device drivers, Device scheduling policies

Multiprogramming System

- Queue management, File and directory systems, disk scheduling: FCFS, SSTF, SCAN, CSCAN, LOOK, CLOOK

Reference Books:

1. Silberschatz Galvin, Operating System Concepts, Forth Addition, Addison Wesley.
2. Crowley, Operating Systems: A Design Oriented Approach, Tata McGraw Hill.
3. Donovan J.J, Systems Programming, New York, McGraw Hill.
4. Dhamdhare, D.M, System Programming and Operating Systems, Tata McGraw Hill.
5. Madnick and Donovan, Operating System, McGraw Hill.
6. Leland L. Beck, System Software, San Diego State University, Pearson Education.
7. P.B. Henson, Operating System Principles, Prentice Hall
8. A.S. Tenenbaum, Operating System: Design and Implementation, PHI

Course Title: Wireless Technologies

Paper Code: CSA664

Course Duration: 45-60 Hours

L	T	P	Credits
4	0	0	4

Objective:To familiarize students with wireless technology, wireless networking, wireless architecture, wireless applications.

UNIT-I

15 Hours

Introduction

- Differences between wireless and fixed telephone networks
- Evolution of wireless networks
- Examples of Wireless Communication Systems: Paging Systems, Cordless Telephone Systems, Cellular Telephone Systems
- Comparison of common Wireless Communication systems
- Traffic routing in wireless networks: circuit switching and packet switching.

UNIT-II

15 Hours

Wireless Local Area Networks

- Introduction
- WLAN topologies requirements
- Working and function of physical layer and MAC layer
- IEEE standards for wireless networks
- Wi-Fi
- Bluetooth
- WiMax.

UNIT-III

15 Hours

Wireless Internet

- Mobile IP components
 - Process of agent discovery
 - Registration and de-registration
 - Care-of-address
 - Concept of tunnelling
 - Limitations of Mobile IP
- Introduction to micro-mobility protocols.

UNIT-IV

15 Hours

Ad Hoc Wireless Networks

- Introduction
- Challenges in ad hoc networks: spectrum allocation, media access, routing, multicasting, energy efficiency, security and privacy
- Problems in ad hoc channel access
- Receiver-initiated MAC protocols
- Sender-initiated MAC protocols and existing ad hoc MAC protocols,

- Ad hoc routing protocols: Destination sequenced distance vector (DSDV)
- Ad hoc on demand distance vector routing (AODV), Dynamic source routing (DSR), Temporally ordered routing algorithm (TORA).

Reference Books

1. Pahlavan and Krishnamurthy, "Principles of Wireless Networks", Prentice Hall, 2002.
2. Schiller J, "Mobile Communications", Addison-Wesley, 2000.
3. Jerry D. Gibson, "The Mobile Communications Handbook", CRC Press, 1999.
4. G.Held, "Data over Wireless Networks", McGraw-Hill, 2001.
5. Blake, "Wireless Communication Systems", Cengage Learning, New Delhi

Course Title: Data Mining and Warehousing**Paper Code: CSA665****Course Duration: 45-60 Hours**

L	T	P	Credits
4	0	0	4

Objective: To introduce the concepts and techniques of data mining and data warehousing, including concept, principle, architecture, design, implementation, applications of data warehousing and data mining.

UNIT-I**15 Hours****Introduction**

- Basic Systems Concepts, Elements (Components) of System, Characteristics of System, Types of Systems, System Approach.
- Information Systems: Definition & Characteristics, Types of Information, Role of Information in Decision - Making, Levels of Management.
- Introduction to different kinds of Information Systems: ESS, EIS, DSS, MIS, KWS, TPS, OAS and EDP

Data Warehousing Architecture

- Design and Construction of Data-Warehouses, Three-Tier Data Warehouse Architecture
- Data content, metadata, distribution of data
- Tools for Data Warehousing, Crucial decisions in Designing a Data Warehouse

UNIT-II**12 Hours****Data Mart**

- Types of Data Marts, Loading a Data Mart, Metadata for a data Mart
- Data Model for a Data Mart, Maintenance of a Data Mart
- Software components for a Data Mart, Tables in Data Mart, External Data, Performance issues
- Monitoring requirements for a Data Mart, Security in Data Mart.

UNIT-III**15 Hours****OLTP and OLAP Systems**

- Data Modelling, Star Schema for multidimensional view, multi fact star schema
- Types of OLAP Servers: ROLAP, MOLAP, HOLAP
- Efficient Computation of Data Cubes, Indexing OLAP Data
- Efficient Processing of OLAP Queries, Categories of OLAP tools
- Metadata Repository, Data Warehouse Back-End Tools and Utilities

UNIT-IV**18 Hours****Data Mining**

- Basic Concepts; From Data Warehouse to Data Mining
- Steps of Data Mining Process, Types of Data Mining Tasks
- Data Mining Techniques: Predictive Modeling, Database Segmentation, Link Analysis, Deviation Detection in details
- Data Mining Algorithms Viz. Classification
- Association Rules and Clustering, Database Segmentation
- Data Mining Query Languages, Applications and Trends in Data Mining

Reference Books:

1. Inmon, W. H., Building the Data Warehouse, John Wiley 2002.
2. Inmon, W. H., Data Warehousing and Knowledge Management, John Wiley 1996.
3. Romez Elmasri, Shamkant B. Navathe, Fundamentals of Database Systems, Pearson Education.
4. Han, Kamber, Morgan Kaufmann, Data Mining: Concepts and Techniques, 2nd Edition.
5. Inmon, W.H., C. L. Gasse, Managing the Data Warehouse, John Wiley 1999.
6. Fayyad, Usama M., Advances in Knowledge Discovery and Data Mining, MIT Press, 1996.
7. Silberschatz, Korth, Sudershan, Database System Concepts, McGraw Hill, 4th Edition