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Sarada Vilas Educational Institutions (R.)

SARADA VILAS COLLEGE

Krishnamurthypuram, Mysuru - 570 004
(Affiliated to the University of Mysore)
Reaccredited by NAAC with A grade (CGPA : 3.19)
E-mail : principal@saradavilas.com Website : www.saradavilas.com

Dr. M. Devika, M.Sc., M.Phil., Ph.D.
Principal
Mobile : 9880024483

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1.2 Academic Flexibility

Data related to – 1.2.1

Number of programmes in which Choice Based Credit System, National Education Policy/elective course system has been implemented

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UNIVERSITY OF MYSORE

Estd. 1916

NEP

VishwavidyanilayaKaryasoudha
Crawford Hall, Mysuru- 570 005

No.AC2(S)/151/2020-21

Dated: 26-10-2021

Notification

Sub:- Syllabus and Examination Pattern of Physics (UG) with effective from the Academic year 2021-22 as per NEP-2020.

Ref:-
1. Decision of Board of Studies in Physics (UG) meeting held on 27-09-2021.
2. Decision of the Faculty of Science & Technology Meeting held on 16-10-2021.
3. Decision of the Academic Council meeting held on 22-10-2021.

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The Board of studies in Physics (UG) which met on 27-09-2021 has recommended & approved the syllabus and pattern of Examination of Physics Programme with effective from the Academic year 2021-22 as per NEP -2020.

The Faculty of Science & Technology and Academic Council at their meetings held on 16-10-2021 and 22-10-2021 respectively have also approved the above said proposal and it is hereby notified.

The syllabus and Examination pattern is annexed herewith and the contents may be downloaded from the University Website i.e., www.uni-mysore.ac.in.

Registrar
Registrar
University of Mysore
Mysore

To:-

1. All the Principal of affiliated Colleges of University of Mysore, Mysore. Those who are running B.Sc Courses.
2. The Registrar (Evaluation), University of Mysore, Mysuru.
3. The Chairman, BOS/DOS, in Physics, Manasagangothri, Mysore.
4. The Dean, Faculty of Science & Technology, DoS in Psychology, MGM.
5. The Director, Distance Education Programme, Moulya Bhavan, Manasagangotri, Mysuru.
6. The Director, PMEB, Manasagangothri, Mysore.
7. Director, College Development Council , Manasagangothri, Mysore.
8. The Deputy Registrar/Assistant Registrar/Superintendent, Administrative Branch and Examination Branch, University of Mysore, Mysuru.
9. The PA to Vice-Chancellor/ Registrar/ Registrar (Evaluation) University of

SYLLABUS FOR OPEN ELECTIVE

ENERGY SOURCES

Time: 2 hrs./week + 01 Hr tutorial **Max Marks:**

		No. of lectures
Unit-I	**Non-Renewable energy sources**	
	Chapter-1: Introduction	
	Energy concept-sources in general, its significance & necessity. Classification of energy sources: Primary and Secondary energy, Commercial and Non-commercial energy, Renewable and Non-renewable energy, Conventional and Non-conventional energy, Based on Origin-Examples and limitations. Importance of Non-commercial energy resources.	04
	Chapter-2: Conventional energy sources	
	Fossil fuels & Nuclear energy- production & extraction, usage rate and limitations. Impact on environment and their issues& challenges. Overview of Indian & world energy scenario with latest statistics- consumption & necessity. Need of eco-friendly & green energy & their related technology.	09
	Total	13
Unit-II	**Renewable energy sources**	
	Chapter-1: Introduction:	
	Need of renewable energy, non-conventional energy sources. An overview of developments in Offshore Wind Energy, Tidal Energy, Wave energy systems, Ocean Thermal Energy Conversion, solar energy, biomass, biochemical conversion, biogas generation, geothermal energy tidal energy, Hydroelectricity.	05
	Chapter 2 : Solar energy:	
	Solar Energy-Key features, its importance, Merits & demerits of solar energy, Applications of solar energy. Solar water heater, flat plate collector, solar distillation, solar cooker, solar green houses, solar cell -brief discussion of each. Need and characteristics of photovoltaic (PV) systems, PV models and equivalent circuits, and sun tracking systems.	08
	Total	13
Unit-III	**Chapter-3: Wind and Tidal Energy harvesting**:	
	Fundamentals of Wind energy, Wind Turbines and different electrical machines in wind turbines, Power electronic interfaces, and grid interconnection topologies. Ocean Energy Potential against Wind and Solar, Wave Characteristics and Statistics, Wave Energy Devices. Tide characteristics and Statistics, Tide Energy Technologies, Ocean Thermal Energy.	08
	Chapter-4 : Geothermal and hydro energy	
	Geothermal Resources, Geothermal Technologies.	02
	Hydropower resources, hydropower technologies, environmental impact of hydro power sources.	03
	Carbon captured technologies, cell, batteries, power consumption	01
	Total	13

Medical Physics

Time: 2 hrs./week + 01 Hr tutorial **Max Marks:**

Unit I:	**Human Anatomy and Physiology** Overview of human anatomy - cells, cell structure, type of cells and their functions, tissues, organs, and their functions. Different systems in the human body, their structure and function, physiological properties of the circulatory system, digestive system, respiratory system, reproductive system, excretory system, endocrine system and nervous system	(13 hours)
Unit II:	**Physics of Medical Diagnostics** Principle of production of X-rays. Use of X-rays in medical diagnosis, X-ray imaging systems. Computed Tomography (CT): principle and generation of CT. Magnetic Resonance Imaging (MRI): basic principle and image characteristics. Ultrasound Imaging: Interaction of sound waves with body tissues, production of ultrasound, transducers, acoustic coupling, image formation, modes of image display and color Doppler.	(13 hours)
Unit III:	**Physics of Radiotherapy** Clinical aspects of radiation therapy: Biological basis of radiotherapy, radiation sources, radiation dose, time dose fractionation. External beam radiation therapy, radiation therapy modalities, production of radioisotopes, use of radioisotopes in therapy, particle and ion beam radiotherapy. Brachytherapy - principle of brachytherapy and classification of brachytherapy techniques.	(13 hours)
	Class Room Activities Unit I: Students can demonstrate the shape, size, positions and functions of different organs in the body with the help of models. Unit II: The use of X-rays in the diagnosis of the fractured bone can be demonstrated with the help of a gamma source and a gamma ray survey meter. As the density of materials between the source and the detector changes the reading on the meter (or intensity of the beefing sound) changes. Unit III: (i) Students can be asked to list out different type of cancers and possible causative factors. They can be asked to list out the healthy practices to reduce the risk of cancers. (ii) As there will be students from different disciplines in the OE course, group discussion can be arranged to discuss about their programme and outcome. This will be an opportunity for the students to know about other disciplines. **Other related activities/projects:** 1. Visit to nearby hospitals/diagnostic centers to study the working of X-ray machines. 2. Visit to ultrasound diagnostic centers to study the principle and use of ultrasound in diagnosis. 3. Project on principle and use of X-ray films in imaging. 4. Visit to radiotherapy centers to study the modalities of radiotherapy.	

Sports Science

Time: 2 hrs./week + 01 Hr tutorial **Max Marks:**

Content (Use maths of 10th Std only – Only qualitative discussion)		Hrs
Unit - 1		
Chapter No. 1	**Measurement**: Physical quantities. Standards and Units. International system of Units. Standards of time, length and mass. Precision and significant figures.	o4
Chapter No. 2	**Newton's laws of motion**: Newton's first law. Force, mass. Newton's second law. Newton's third law. Mass and weight. Applications of Newton's laws.	03
Chapter No. 3	**Projectile motion**: Shooting a falling target. Physics behind Shooting, Javelin throw and Discus throw.	03
Topics for self study (If any)	**https://www.real-world-physics-problems.com/physics-of-sports.html**	
Unit - 2		
Chapter No. 4.	**Conservation laws**: Conservation of linear momentum, collisions – elastic and inelastic. Angular momentum. (Physics behind Carom, Billiards, Racing)	04
Chapter No. 5.	**Centre of mass**: Physics behind Cycling, rock climbing, Skating,	02
Chapter No. 6.	**Gravitation**: Origin, Newton's law of gravitation. Archimedes's principle, Buoyancy (Physics behind swimming)	04
Topics for self study (If any)	Archimedes' Principle: Made EASY | Physics in You tube	
Unit - 3		
Chapter No.7	**Food and Nutrition:** Proteins, Vitamins, Fat, Blood pressure. Problems due to the deficiency of vitamins.	04
Chapter No. 8	**Energy:** Different forms of Energy, Conservation of mass-energy.	03
Chapter No . 9	**Physical exercises:** Walking, Jogging and Running, Weight management.	03
Topics for self study (If any)	10 Best Exercises for Everyone – Healthline	
	Suggested Activities	
Activity No. 1	Identify the methods of measurement of time, length and mass from ancient time and build models for them.	02
	Reference : History of measurement - Wikipedia *https://en.wikipedia.org › wiki › History_of_measurem*	

ELECTRICAL INSTRUMENTS

Time: 2 hrs./week + 01 Hr tutorial **Max Marks:**

Content		Hrs
Unit - 1		
Chapter No. 1	Voltage and current sources, Kirchoff's current and voltage laws, loop and nodal analysis of simple circuits with dc excitation. Ammeters,voltmeters: (DC/AC)	03
Chapter No. 2	Representation of sinusoidal waveforms, peak and rms values, power factor. Analysis of single-phase series and parallel R-L-C ac circuits. Three-phase balanced circuits, voltage and current relations in star and delta connections. Wattmeters: Induction type, single phase and three phase wattmeter, Energy meters: AC. Induction type single phase and three phase energy meter	05
Chapter No. 3	Instrument Transformers: Potential and current transformers, ratio and phase angle errors, phasor diagram, methods of minimizing errors; testing and applications.	05
Topics for self study (If any)	Types of switches and Circuits, Safety precautions and rules in handling electrical appliances, Electric shock, first aid for electrical shocks, Fuses, MCB, ELCB and Relays, Filament lamp, Tube light, CFL and LED	
	Suggested Activities	
Activity No. 1	Identify variety of electrical switches and note down their applications/utility. Reference: Weblink/Youtube/Book	
Activity No. 2	Identify the hazards involved in handling electrical circuits and instruments, make a list of safety precautions as well as first aid for electrical shocks. Reference : Weblink/Youtube/Book	
Unit - 2		
Chapter No. 4.	Galvanometers: General principle and performance equations of D'ArsonvalGalvanometers, Vibration Galva nometer and Ballistic Galvanometer.	03
Chapter No. 5.	Potentiometers: DCPotentiometer, Crompton potentio meter, construction, standardization, application. AC Potentio meter, Drysdalepolar potentio meter; standardization, application.	03
Chapter No. 6.	DC/AC Bridges: General equations for bridge balance, measurement of self inductance by Maxwell's bridge (with variable inductance & variable capacitance), Hay's bridge, Owen's bridge, measurement of capacitance by Schearing bridge, errors, Wagner's earthing device, Kelvin's double bridge.	07
Topics for self study (If any)	Importance of grounding and Earthing, Methods for Earthing,	

	Suggested Activities	
Activity No. 3	Make a study of importance of grounding in electrical circuits.	
	Reference : Weblink/Youtube/Book	
Activity No. 4	Prepare a detailed account of various methods of earthing and their utility/applications	
	Reference : Weblink/Youtube/Book	
	Unit - 3	
Chapter No.7	Transducer: Strain Gauges, Thermistors, Thermocouples, Linear Variable Differential Transformer (LVDT), Capacitive Transducers, Peizo-Electric transducers, Optical Transducer, Hall Effect Transducer	06
Chapter No. 8	CRO: Block diagram, Sweep generation, vertical amplifiers, use of CRO in measurement of frequency,phase, Amplitude and rise time of a pulse. Digital Multi-meter: Block diagram, principle of operation	03
Chapter No. 9	Basics of lead acid batteries, Lithium Ion Battery , Battery storage capacity, Coulomb efficiency, Numerical of high and low charging rates, Battery sizing.	04
Topics for self study (If any)	Fuses, MCB, ELCB and Relays, Filament lamp, Tube light, CFL and LED	
	Suggested Activities	
Activity No. 5	Prepare a document on evolution of incandescent bulbs to the present day LED lights	
	Reference : Weblink/Youtube/Book	
Activity No.6	Make a comparative study of Fuses, MCB, ELCB and Relays highlighting their use and applications	
	Reference : Weblink/Youtube/Book	

Text Books

AK.Sawhney, ACourse inElec.&Electronics Measurements&Instrumentation ,**Dhanpatrai& Co. 1978**

A.D. Helfrick& W.D. Cooper, Modern Electronic Instrumentation and Measurement Techniques **PHI,2016**

References Books

1. D C Kulshreshtha, Basic Electrical Engineering, Mc Graw Hill Publications,**2019**
2. David G Alciatore and Michel B Histand, Introduction to Mechatronics and Measurement Systems, 3rd, Tata McGraw Hill Education Private Limited, New Delhi., 2005
3. Vincent Del Toro, Electrical Engineering Fundamentals Prentice Hall India**2009**

Open Elective Course - Semester – I

Title of the Course: OE-1: CHEMISTRY IN DAILY LIFE

Unit- I

Dairy Products: Composition of milk and milk products. Analysis of fat content, minerals in milk and butter. Estimation of added water in milk. Beverages: Analysis of caffeine in coffee and tea, detection of chicory in coffee, chloral hydrate in toddy, determination of methyl alcohol in alcoholic beverages.
Food additives, adulterants, and contaminants- Food preservatives like benzoates, propionates, sorbates, disulphites. Artificial sweeteners: Aspartame, saccharin, dulcin, sucralose, and sodium cyclamate. Flavors: Vanillin, alkyl esters (fruit flavors), and monosodium glutamate.
Artificial food colorants: Coal tar dyes and non-permitted colors and metallic salts. Analysis of pesticide residues in food.

[14 hours]

Unit- II

Vitamins: Classification and Nomenclature. Sources, deficiency diseases, and structures of Vitamin A1, Vitamin B1, Vitamin C, Vitamin D, Vitamin E & Vitamin K1.
Oils and fats: Composition of edible oils, detection of purity, rancidity of fats and oil. Tests for adulterants like argemone oil and mineral oils. Halphen test.
Soaps & Detergents: Definition, classification, manufacturing of soaps and detergents, composition and uses

[14 hours]

Unit- III

Chemical and Renewable Energy Sources:
principles and applications of primary & secondary batteries and fuel cells. Basics of solar energy, future energy storer.
Polymers: Basic concept of polymers, classification and characteristics of polymers. Applications of polymers as plastics in electronic, automobile components, medical fields, and aerospace materials. Problems of plastic waste management. Strategies for the development of environment-friendly polymers.

[14 hours]

COURSE OUTCOMES OEC-1 Chemistry

On completion of the course students will be able to:

1. Understand the chemical constituents in various day to day materials using by a common man.
2. Understand the chemical constituents in vitamins, soaps and detergents
3. Understand the renewable chemical energy resources
4. Understand different types of polymers and their applications.

Reference Books

1. B. K. Sharma: Introduction to Industrial Chemistry, Goel Publishing, Meerut (1998)
2. Medicinal Chemistry- Ashtoush Kar.
3. Analysis of Foods – H.E. Cox: 13.
4. Chemical Analysis of Foods – H.E. Cox and Pearson.
5. Foods: Facts and Principles. N. Shakuntala Many and S. Swamy, 4thed. New Age International (199
6. Physical Chemistry – P I Atkins and J. de Paula – 7thEd. 2002, Oxford University Press.
7. Handbook on Fertilizer Technology by Swaminathan and Goswamy, 6th ed. 2001, FAI.
8. Organic Chemistry by I. L. Finar, Vol. 1 & 2. 9. Polymer Science and Technology, J. R. Fired (Pre Hall).

Open Elective Course - Semester – II

Title of the Course: OE-2: Molecules of Life

UNIT I

Carbohydrates

Classification of carbohydrates, reducing and non-reducing sugars, General properties of glucose fructose, their open chain structures. Epimers, mutarotation and anomers.

Linkage between monosaccharides, structure of disaccharides (sucrose, maltose, lactose) polysaccharides (starch and cellulose) excluding their structure elucidation.

Amino Acids, Peptides and Proteins

Classification of amino acids, Zwitterion structure and Isoelectric point. Overview of Prim Secondary, Tertiary and Quaternary structure of proteins. Determination of primary structure of pepti

UNIT II

Enzymes and correlation with drug action

Mechanism of enzyme action, factors affecting enzyme action, Co-enzymes and cofactors and their in biological reactions, Specificity of enzyme action (including stereospecificity),

Enzyme inhibitors and their importance, phenomenon of inhibition (Competitive and Non competitiv inhibition including allosteric inhibition).

Drug action-receptor theory. Structure–activity relationships of drug molecules, binding role of -OH group, -NH2 group, double bond and aromatic ring

Lipids

Introduction to lipids, classification. Biological importance of triglycerides, phospholipids, glycolip and steroids (cholesterol).

UNIT III

Nucleic Acids

Components of nucleic acids: Adenine, guanine, thymine and cytosine (Structure only), other components of nucleic acids, Nucleosides and nucleotides (nomenclature), Structure of polynucleotides; Structure of DNA (Watson-Crick model) and RNA (types of RNA), Genetic Code, Biological roles of DNA and RNA: Replication, Transcription and Translation.

Concept of Energy in Biosystems

Calorific value of food. Standard caloric content of carbohydrates, proteins and fats. Oxidation of foodstuff (organic molecules) as a source of energy for cells. Introduction to Metabolism (catabolism, anabolism), ATP: the universal currency of cellular energy, ATP hydrolysis and free energy change. Conversion of food into energy. Outline of catabolic pathways of Carbohydrate- Glycolysis, Fermentation, Krebs Cycle. Overview of catabolic pathways of Fats and Proteins. Interrelationships in the metabolic pathways of Proteins, Fats and Carbohydrates

Course Outcome / Learning Outcome:

After studying this paper the student would be able to

1. Acquire knowledge about different types of sugars and their chemical structures.
2. Identify different types of amino acids and determine the structure of peptides.
3. Explain the actions of enzymes in our body and interpret enzyme inhibition.
4. Predict action of drugs. Depict the biological importance of oils and fats. Importance of lipids in the metabolism. Differentiate RNA and DNA and their replication. Explain production of energy in our body.

Reference Books:

1. Morrison, R. T. & Boyd, R. N. Organic Chemistry, Dorling Kindersley (India) Pvt.Ltd. (Pearson Education).
2. Finar, I. L. Organic Chemistry (Volume 1), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
3. Finar, I. L. Organic Chemistry (Volume 2), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
4. Nelson, D. L. & Cox, M. M. Lehninger's Principles of Biochemistry 7th Ed.,
5. W. H. Freeman. Berg, J.M., Tymoczko, J.L. & Stryer, L. Biochemistry, 2002.

Company Ltd.
21. P L Soni, O P Dharmarha and U N Dash, Textbook of Physical Chemistry, Sultan Chand and Sons.
22. Vogel's Qualitative analysis, Revised by G. Svehla, Pearson education, 2002
23. J B Yadav, Advanced Physical Chemistry, Krishna Prakashan Media (P) Ltd, Meerut.
24. Khosla, B. D.; Garg, V. C. & Gulati, A. Senior Practical Physical Chemistry, S. Chand & Co.: New Delhi (2011).
25. Garland, C. W.; Nibler, J. W. & Shoemaker, D. P. Experiments in Physical Chemistry 8th Ed.; McGraw-Hill: New York (2003).
26. Halpern, A. M. & McBane, G. C. Experimental Physical Chemistry 3rd Ed.; W.H. Freeman & Co.: New York (2003).

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Open Elective Course

III SEMESTER

OEC-3: Atomic Structure, Bonding and Concepts in Organic Chemistry

(L:T:P = 3:0:0) Contact Hours: 42 Credits: 3 Workload:3Hours/Week

Course Objectives:

1. To develop an understanding of principles of atomic structure.
2. To know the importance of quantum numbers, writing of electronic configurations and representation of orbitals.
3. To develop an understanding of the periodic trends.
4. To understand the nature of bonding and to predict the shapes of molecules.
5. To construct MO energy level diagrams and predict the properties of molecules.
6. To understand the formation of sigma and pi bonds and the bond strength.
7. To study the classification of organic reactions.
8. To learn nomenclature preparation and reactions of alkanes, alkenes, alkynes and stability of alicyclic compounds.

Course Specific Outcomes: On completion of the course the student will learn and be able to understand/explain;

1. The concept of atomic structure, significance of quantum numbers, filling of electrons of atoms/ions in various orbitals as per rules.
2. The trends in periodic properties.
3. The structures of ionic solids, applications of B-H cycle, solubility of compounds and consequences of polarization of ions.
4. The shapes of molecules/ions based on VSEPR theory.
5. The construction of MO energy level diagrams and prediction of properties of molecules/ions like bond order, bond energies, bond lengths and magnetic properties.
6. The formation of sigma and pi bonds and the bond strength.
7. The classification of organic reactions.

8. Nomenclature preparation, and reactions of alkanes, alkenes, alkynes and stability of alicyclic compounds.

Unit I: Atomic Structure and Periodic Properties

History of an atom. Idea of de Broglie matter waves. Heisenberg uncertainty principle. Schrödinger wave equation, significance of wave functions, Bohr's model of hydrogen atom and its limitations. Quantum numbers and their importance, atomic orbitals and shapes of s, p, d orbitals, multi-electron atoms, Aufbau and Pauli exclusion principle and Hund's multiplicity rule- Electronic configurations of the elements (atomic no. up to 30), effective nuclear charge and shielding. **8 Hrs.**

Periodic Properties: Atomic radius, Covalent, ionic and van der Waal radii-explanation with examples. Definition and periodicity of the following properties - ionic radii, ionization potential, electron affinity and electronegativity, methods of determination of electronegativity. Factors affecting the values of ionization energy. **6 Hrs.**

Unit II: Chemical Bonding:

Ionic Solids– Ionic structures (NaCl, CsCl, TiO_2, ZnS), radius ratio rule and coordination number, limitation of radius ratio rule, lattice energy and Born-Haber cycle, solvation energy and solubility of ionic solids, polarizing power and polarizability of ions, Fajan's rule and their consequences. **4 Hrs.**

Covalent Bond – Valence bond theory and its limitations, directional characteristics of covalent bond, various types of hybridization with examples and shapes of simple inorganic molecules and ions. Shapes of NH_3, I_3^+, I_3^-, SF_4, ClF_3, IF_5, ICl_2^- and H_2O using valence shell electron pair repulsion (VSEPR) theory, linear combination of atomic orbitals (LCAO), bonding, nonbonding and antibonding molecular orbitals, physical picture of bonding and antibonding wave functions. Applications of MO theory to explain the stability of homo dinuclear (He_2, N_2, O_2, F_2, C_2) and hetero dinuclear (NO and CO) molecules. Comparison of M.O. and V.B. Models. **7 Hrs.**

Metallic bond-free electron, Band theory-electrical properties of metals, semiconductors and insulators. Weak interactions – Hydrogen bonding and its consequences, van der Waals forces. **3 Hrs.**

Unit III: Bonding and molecular structure and hydrocarbons

Bonding and molecular structure: Introduction to organic chemistry, atomic orbitals, sigma and pi bond formation-molecular orbital [MO] method, sp, sp^2 and sp^3 hybridization, bond length, bond dissociation energies and bond angles (open chain and cyclic compounds). Electronegativity and polarity of the bonds. Classification and reactions of organic compounds (with examples).

7 Hrs.

Alkanes, Alkenes and Alkynes: Definition, Nomenclature, preparations (any two methods). Reactions: Electrophilic, nucleophilic and free radical addition reactions.

Alicyclic compounds: Nomenclature, preparation and stability of cyclopropane, cyclobutane, cyclopentane and cyclohexane. **7 Hrs.**

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REFERENCE BOOKS:

1. Concise Inorganic Chemistry, J. D. Lee, ELBS, 1996.
2. Inorganic Chemistry, A. K. Das.
3. Inorganic Chemistry: Principles of Structure and Reactivity, Huheey, J. E., Keiter, E.A., Keiter, R.L. & Medhi, O. K. Pearson Education India, 2006.
4. Inorganic Chemistry, Shriver, D.F. & Atkins, P.W. Oxford University Press.
5. Schaum's Outline Series Theory and Problems of Organic Chemistry.SI (metric) Ed Herbert Meislich, Howard Nechamkin and Jacob Sharefkin.
6. Organic chemistry. Robert T. Morrison Robert N. Boyd, 6th Ed.
7. Organic Chemistry Volume-1, I.L. Finar.

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IV SEMESTER

OEC-4: Electrochemistry, Corrosion and Metallurgy

(L:T:P = 3:0:0) Contact Hours: 42 Credits: 3 Workload:3Hours/Week

Course Objectives: This course will deal with

1. Types of conductance, concept of electrolytes, electrolysis, redox reactions and EMF.
2. Concept of different types of electrochemical cells, Types of electrodes and electrode potential. Application of electrochemical series.
3. Basic principles and applications of conductometric, potentiometric and pH titrations.
4. Different types of Batteries their principle construction and working - lead-acid storage and lithium ion battery. Study of Fuels cells.
5. Concept of corrosion, types of corrosion and its prevention by different methods. Introduction to electroplating.
6. Introduction to ores and minerals, extraction of metals from their ores, and purification. Eg., Manganese, Titanium and Uranium. Study of alloys, classification, production and uses of alloys.

Course Specific Outcomes: Upon completion of the course students will be able to;

1. Understand the concept of conductance in electrolytic solutions, electrolysis and redox reactions involved in electrode reactions.
2. Learn the different types of electrochemical cells, their symbolical representation and application of electrochemical series.
3. Apply conductometric, potentiometric and pH titrations.
4. Know the principle, construction and working of batteries.
5. Understand different types of corrosion and its prevention by different methods.
6. Learn the methods of extraction of metals from their ores and purification.

Unit I: Electrochemistry: Conductance, specific and molar conductance Types of Electrolytes, Conductivity in electrolytic solution, Electrolysis, Kohlrausch's law and its application, Equivalent Conductance of Weak electrolyte at Infinite dilution. Oxidation -reduction reactions, electrode potential, EMF of an electrochemical cell, cell

reaction, Daniel cell, dry Cells - electrolytic and Galvanic cell, Representation of a cell. Standard electrode potential, Nernst equation (No derivation) and its application to chemical cell, Electrochemical series and its importance. Types of Electrodes.
Basic Principles of (i) Conductometric titrations- HCl Vs NaOH, CH_3COOH Vs NaOH
Potentiometric titrations: Acid-base titration HCl Vs NaOH, Redox titration (FAS Vs $K_2Cr_2O_7$) Determination of PH using glass electrode. **12Hrs.**

Batteries- Primary and Secondary batteries, Battery components and their role. Working of the following Batteries- Lead acid, Lithium Storage, Batteries, Fuel cells. **2 Hrs.**

Unit II: Corrosion: Introduction, definition, Types of Corrosion, Corrosion rate, Factors affecting corrosion rate, Metallic factor-purity, electrode potential of metal, hydrogen over voltage, nature of corrosion product. Environmental Factors-Temperature, pH of the medium, humidity, presence of impurities, electrical conductivity of the medium, velocity of the medium, concentration of the medium.
Prevention of Corrosion: Material selection - Metals and alloys, metal purification, non-metallic, Alteration of environment - Changing media, inhibitors, Design-wall thickness, design rules, Coating-Metallic and other inorganic coatings, organic coating.
Electroplating: Introduction, Electroplating of chromium (hard and decorative). Electro less plating: Introduction, distinction between electroplating and electroless plating processes. Electroless plating of copper. **14 Hrs.**

Unit III: Metallurgy: Introduction: Ore, minerals, important ores of some common elements in India, General Principles of pyrometallurgy, roasting, Calcination, Gangue, Smelting, Flux, Gravity separation, Froth flotation process, leaching. Techniques employed for Purification of metal (Distillation process, Bessemerization, Electro-refining, Van Arkel and De Boer's Filament. **7 Hrs.**
Extraction of metals: Extraction of Manganese (Pyrolusite), Titanium (Ilmanite) and Uranium. **4 Hrs.**
Alloys: Introduction, Classification of alloys, commercially important alloys, gold karats, **Production of Ferro alloys**; Ferrochrome, Ferro Manganese, Uses of alloys.
4Hrs.

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REFERENCE BOOKS:

1. Barrow. G.M, Physical Chemistry, Tata McGraw-Hill, (2007).
2. An introduction to electrochemistry, Samuel Glasstone, East-West edition New Delhi, (1942).
3. Text book of physical chemistry, Samuel Glasstone, 2ndEdition, Mac Millan India Ltd, (1991).
4. Principles and applications of Electrochemistry, D. R. Crow, 3rd edition, Chapman Hall London, (1988).
5. Fundamentals of electrochemical deposition, Milan Paunovic and Mordechay Schlesinger, Wiley Interscience Publications, New York, (1998).

Open Elective

(For Students of all Streams)

MATOET 3.2: Mathematical Aptitude-III	
Teaching Hours : 3 Hours/Week	**Credits: 3**
Totat Teaching Hours: 42 Hours	**Max. Marks: 100 (S.A.- 60 + I.A. – 40)**

Course Learning Outcomes: This course will enable the students to

- have a strong base in the fundamental mathematical concepts.
- grasp the approaches and strategies to solve problems with speed and accuracy
- gain appropriate skills to succeed in preliminary selection process for recruitment

Unit I: Algebraic Expressions, Polynomials, Fundamental operations on Algebraic expressions, Factorisation, Linear equations and problems based on Ages, Quadratic equations. **(14 hrs)**

Unit II:

Mensuration

Area, Volume and Surface area (Cylinder, Cone, Sphere). **(14 hrs)**

Unit III:

Verbal Reasoning

Direction Test, Relation Test, Venn Diagram Analysis Test, Seating puzzles. **(14 hrs)**

Reference Books:

1. R.S. Aggarwal, "Quantitative Aptitude for Competitive Examinations", Revised Edition, S. Chand and Co. Ltd, New Delhi, 2018.
2. Quantitative Aptitude and Reasoning by R V Praveen, PHI publishers.
3. Quantitative Aptitude : Numerical Ability (Fully Solved) Objective Questions, Kiran Prakashan, Pratogita prakasan, Kic X, Kiran Prakasan publishers.
4. Quantitative Aptitude for Competitive Examination by Abhijit Guha, Tata Mc Graw hill publications.

Open Elective

(For Students of all Streams)

MATOET 4.2: Mathematical Aptitude – IV	
Teaching Hours : 3 Hours/Week	**Credits: 3**
Totat Teaching Hours: 42 Hours	**Max. Marks: 100 (S.A.- 60 + I.A. – 40)**

Course Learning Outcomes: This course will enable the students to

- have a strong base in the fundamental mathematical concepts.
- grasp the approaches and strategies to solve problems with speed and accuracy
- gain appropriate skills to succeed in preliminary selection process for recruitment

Unit I: Data interpretation, Data sufficiency. **(14 hrs)**

Unit II: Surds & Indices, Logarithm and its properties. **(14 hrs)**

Unit III:
Non-verbal Reasoning
Series Test, Analogy, Classification, Cube and Dice, Analytical Reasoning. **(14 hrs)**

Reference Books:

1. R.S. Aggarwal, "Quantitative Aptitude for Competitive Examinations", Revised Edition, S. Chand and Co. Ltd, New Delhi, 2018.
2. Quantitative Aptitude and Reasoning by R V Praveen, PHI publishers.
3. Quantitative Aptitude : Numerical Ability (Fully Solved) Objective Questions, Kiran Prakashan, Pratogita prakasan, Kic X, Kiran Prakasan publishers.
4. Quantitative Aptitude for Competitive Examination by Abhijit Guha, Tata Mc Graw hill publications.

London.
3. Quantitative Techniques in Management, Vohra, N.D., Tata McGraw Hill, New Delhi.
4. Business Mathematics, Soni R.S., Pitamber Publishing House, Delhi.

Open Elective

(For Students of all Streams)

MATOET 1.3: Mathematical Aptitude-I	
Teaching Hours : 3 Hours/Week	**Credits: 3**
Totat Teaching Hours: 42 Hours	**Max. Marks: 100 (S.A.- 70 + I.A. – 30)**

Course Learning Outcomes: This course will enable the students to

- have a strong base in the fundamental mathematical concepts.
- grasp the approaches and strategies to solve problems with speed and accuracy
- gain appropriate skills to succeed in preliminary selection process for recruitment

Unit-I: Number System, Types of Numbers, series (AP and GP), Algebraic operations BODMAS, Divisibility, LCM and HCF, Fraction, Simplification. **14 Hours**

Unit-II: Time and Distance, Problems based on Trains, Boats and Streams. **14 Hours**

Unit-III: Time, work and wages, Pipes and Cistern, Problems on Clock, Problems on Calendar. **14 Hours**

Reference Books:

1. R.S. Aggarwal, "Quantitative Aptitude for Competitive Examinations", Revised Edition, S. Chand and Co. Ltd, New Delhi, 2018.
2. Quantitative Aptitude and Reasoning by R V Praveen, PHI publishers.
3. Quantitative Aptitude : Numerical Ability (Fully Solved) Objective Questions, Kiran Prakashan, Pratogitaprakasan, Kic X, Kiran Prakasan publishers.
4. Quantitative Aptitude for Competitive Examination by Abhijit Guha, Tata Mc Graw hill publications.

Open Elective

(For Students of all Streams)

MATOET 2.3: Mathematical Aptitude-II	
Teaching Hours : 3 Hours/Week	**Credits: 3**
Totat Teaching Hours: 42 Hours	**Max. Marks: 100** **(S.A.- 70 + I.A. – 30)**

Course Learning Outcomes: This course will enable the students to

- have a strong base in the fundamental mathematical concepts.
- grasp the approaches and strategies to solve problems with speed and accuracy
- gain appropriate skills to succeed in preliminary selection process for recruitment

Unit-I: Percentage, Average, Problems based on Ages, Ratio and Proportion, Partnership and share, Mixtures.

14 Hours

Unit-II: Profit, Loss and Discount, Simple Interest, Compound Interest, Shares and Debentures.

14 Hours

Unit-III: Permutations and Combinations, Probability, True discount and Banker's discount.

14 Hours

Reference Books:

1. R.S. Aggarwal, "Quantitative Aptitude for Competitive Examinations", Revised Edition, S. Chand and Co. Ltd, New Delhi, 2018.
2. Quantitative Aptitude and Reasoning by R V Praveen, PHI publishers.
3. Quantitative Aptitude : Numerical Ability (Fully Solved) Objective Questions, Kiran Prakashan, Pratogitaprakasan, Kic X, Kiran Prakasan publishers.
4. Quantitative Aptitude for Competitive Examination by Abhijit Guha, Tata Mc Graw hill publications.

Department of Higher Education

National Education Policy - 2020 (NEP-2020)

Model Syllabus for Bachelor of Science (B.Sc) in Computer Science and Bachelor of Computer Application (B.C.A)

(III & IV Semester)

Submitted to
Karnataka State Higher Education Council
Department of Higher Education
Government of Karnataka
Bengaluru.

Curriculum Design/Syllabus Framing Committee

Sl. No	Name	Designation
1.	Dr. Siddu P. Algur Vice Chancellor, VSK University, Ballari	Chairperson
2.	Dr. D.S. Guru Professor, University of Mysore, Mysuru	Member
3.	Dr. Shivashankar S Professor, Karnatak University, Dharwad.	Member
4.	Dr. B. L. Muralidhara Professor, Bangalore University, Bengaluru.	Member
5.	Dr. D.H. Manjaiah Professor, Mangalore University, Mangalore	Member
6.	Dr. Prabhakar C.J. Professor, Kuvempu University, Shankaraghatta	Member
7.	Dr. Aziz Makandar Professor, KSAW University, Vijayapura	Member
8.	Dr. Shivanand Gornale Professor, Rani Channamma University, Belagavi	Member
9.	Dr. Bhagyavana S Mudigoudra Assoc. Professor, Maharani Cluster University, Bengaluru	Member
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11.	Dr. Vijayakumar Kulkarni, Assoc. Professor, GFGC for Women, Jewargi Colony, Kalaburgi	Member
12.	Smt. Dr. Sharada Bhat Assoc. Professor, GFGC, Arikola	Member
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17	Shri. Anand V. Patil DMSM College of Computer Applications, Belagavi	Member
18	Smt. Deepa S. Garag Karnataka State Higher Education Academy. Dharwad.	Member
19	Dr. M. Jayappa Special Officer, KHSEC, Bengaluru	Member Convener

Index:

Model Curriculum Structure

Program: BSc (Basic and Honors) **Subject: Computer Science**

For

1. Computer Science as MAJOR with another Subject as MINOR (Table IIA of Model Curriculum)

2. Computer Science as MAJOR with another Subject also as MAJOR (Table IIIA of Model Curriculum)

3. Computer Science as MINOR with another Subject as MAJOR (As per Table IIA of Model Curriculum)

Sem	Discipline Specific Core Courses (DSC)	Hour / Week		DS Elective Courses	Hours/ Week
		Theory	Lab		
III	**DSC-3:** Object Oriented Programming Concepts and Programming in JAVA	4			
	DSC-3 Lab: JAVA Lab		4		
IV	**DSC-4:** Database Management Systems	4			
	DSC-4 Lab: DBMS Lab		4		

Model Syllabus for BSc (Basic and Honors), Semesters III and IV

Semester: III

Course Title: Object Oriented Programming Concepts and Programming in Java	Course code: DSC3
Total Contact Hours: 52	Course Credits: 04+02
Formative Assessment Marks: 40	Duration of SEE/Exam: 03 Hours
Summative Assessment Marks: 60	

Course Outcomes (COs):

At the end of the course, students will be able to:

- Explain the object-oriented concepts and JAVA.
- Write JAVA programs using OOP concepts like Abstraction, Encapsulation, Inheritance and Polymorphism.
- Implement Classes and multithreading using JAVA.
- Demonstrate the basic principles of creating Java applications with GUI.

DSC3: Object Oriented Programming Concepts and Programming in Java

Unit	Description	Hours
1	**Introduction to Java:** Basics of Java programming, Data types, Variables, Operators, Control structures including selection, Looping, Java methods, Overloading, Math class, Arrays in java.	09
2	**Objects and Classes:** Basics of objects and classes in java, Constructors, Finalizer, Visibility modifiers, Methods and objects, Inbuilt classes like String, Character, String Buffer, File, this reference.	10
3	**Inheritance and Polymorphism:** Inheritance in java, Super and sub class, Overriding, Object class, Polymorphism, Dynamic binding, Generic programming, Casting objects, Instance of operator, Abstract class, Interface in java, Package in java, UTIL package.	09
4	**Event and GUI programming:** Event handling in java, Event types, Mouse and key events, GUI Basics, Panels, Frames, Layout Managers: Flow Layout, Border Layout, Grid Layout, GUI components like Buttons, Check Boxes, Radio Buttons, Labels, Text Fields, Text Areas, Combo Boxes, Lists, Scroll Bars, Sliders, Windows, Menus, Dialog Box, Applet and its life cycle, Introduction to swing, Exceptional handling mechanism.	12
5	**I/O programming:** Text and Binary I/O, Binary I/O classes, Object I/O, Random Access Files. Multithreading in java: Thread life cycle and methods, Runnable interface, Thread synchronization, Exception handling with try catch-finally, Collections in java, Introduction to JavaBeans and Network Programming	12

References:

1. Programming with Java, By E Balagurusamy – A Primer, 4th Edition, McGraw Hill Publication.
2. Core Java Volume I – Fundamentals, By Cay S. Horstmann, Prentice Hall.
3. Object Oriented Programming with Java: Somashekara M.T., Guru, D.S., Manjunatha K.S, 1st Edition, PHI Learning 2017.
4. Java 2 - The Complete Reference, Herbert Schildt, 5th Edition, McGraw Hill Publication, 2017.
5. Java - The Complete Reference, Herbert Schildt, 7th Edition, McGraw Hill Publication, 2017.

Semester: IV

Course Title: Database Management System	Course code: DSC4
Total Contact Hours: 52	Course Credits: 04+02
Formative Assessment Marks: 40	Duration of SEE/Exam: 03 Hours
Summative Assessment Marks: 60	

Course Outcomes (COs):

At the end of the course, students will be able to:

- Explain the various database concepts and the need for database systems.
- Identify and define database objects, enforce integrity constraints on a database using DBMS.
- Demonstrate a Data model and Schemas in RDBMS.
- Identify entities and relationships and draw ER diagram for a given real-world problem.
- Convert an ER diagram to a database schema and deduce it to the desired normal form.
- Formulate queries in Relational Algebra, Structured Query Language (SQL) for database manipulation.
- Explain the transaction processing and concurrency control techniques.

DSC7: Database Management System (DBMS)

Unit	Description	Hours
1	**Database Architecture:** Introduction to Database system applications. Characteristics and Purpose of database approach. People associated with Database system. Data models. Database schema. Database architecture. Data independence. Database languages, interfaces, and classification of DBMS.	10
2	**E-R Model:** Entity-Relationship modeling: E – R Model Concepts: Entity, Entity types, Entity sets, Attributes, Types of attributes, key attribute, and domain of an attribute. Relationships between the entities. Relationship types, roles and structural constraints, degree and cardinality ratio of a relationship. Weak entity types, E -R diagram.	10
3	**Relational Data Model:** Relational model concepts. Characteristics of relations. Relational model constraints: Domain constrains, key constraints, primary & foreign key constraints, integrity constraints and null values. Relational Algebra: Basic Relational Algebra operations. Set theoretical	12

	operations on relations. JOIN operations Aggregate Functions and Grouping. Nested Sub Queries-Views. Introduction to PL/SQL & programming of above operations in PL/SQL	
4	**Data Normalization:** Anomalies in relational database design. Decomposition. Functional dependencies. Normalization. First normal form, Second normal form, Third normal form. Boyce-Codd normal form.	09
5	**Query Processing Transaction Management:** Introduction Transaction Processing. Single user & multiuser systems. Transactions: read & write operations. Need of concurrency control: The lost update problem, Dirty read problem. Types of failures. Transaction states. Desirable properties (ACID properties) of Transactions. Concurrency Control Techniques: Locks and Time stamp Ordering. Deadlock & Starvation.	11

References:

1. Fundamentals of Database Systems, Ramez Elamassri, Shankant B. Navathe, 7th Edition, Pearson, 2015
2. An Introduction to Database Systems, Bipin Desai, Galgotia Publications, 2010.
3. Introduction to Database System, C J Date, Pearson, 1999.
4. Database Systems Concepts, Abraham Silberschatz, Henry Korth, S.Sudarshan, 6th Edition, McGraw Hill, 2010.
5. Database Management Systems, Raghu Rama Krishnan and Johannes Gehrke, 3rd Edition, McGraw Hill, 2002

Practicals:

CO: Student would be able to create tables, execute queries and PL/SQL programs.

1. Execute a single line query and group functions.
2. Execute DDL Commands.
3. Execute DML Commands
4. Execute DCL and TCL Commands.
5. Implement the Nested Queries.
6. Implement Join operations in SQL
7. Create views for a particular table
8. Implement Locks for a particular table
9. Write PL/SQL procedure for an application using exception handling.
10. Write PL/SQL procedure for an application using cursors.
11. Write a PL/SQL procedure for an application using functions
12. Write a PL/SQL procedure for an application using package

Model Curriculum for BCA

Sem	Core Courses	Hour / Week		DS Elective Courses	Hours/ Week
		Theory	Lab		
III	Database Management Systems	3			
	C# and DOT NET Framework	3			
	Computer Communication and Networks	3			
	LAB: DBMS		4		
	LAB: C# and DOT NET Framework		4		
IV	Python Programming	3			
	Computer Multimedia and Animation	3			
	Operating Systems Concepts	3			
	LAB: Multimedia and Animation		4		
	LAB: Python programming		4		

Model Course Content for BCA, Semesters III and IV

Semester: III

Course Title: Database Management System	Course code: 21BCA3C7L
Total Contact Hours: 42	Course Credits: 03+02
Formative Assessment Marks: 40	Duration of SEE/Exam: 03 Hours
Summative Assessment Marks: 60	

Course Outcomes (COs):

At the end of the course, students will be able to:

- Explain the various database concepts and the need for database systems.
- Identify and define database objects, enforce integrity constraints on a database using DBMS.
- Demonstrate a Data model and Schemas in RDBMS.
- Identify entities and relationships and draw ER diagram for a given real-world problem.
- Convert an ER diagram to a database schema and deduce it to the desired normal form.
- Formulate queries in Relational Algebra, Structured Query Language (SQL) for database manipulation.
- Explain the transaction processing and concurrency control techniques.

DSC7: Database Management System (DBMS)

Unit	Description	Hours
1	**Database Architecture:** Introduction to Database system applications. Characteristics and Purpose of database approach. People associated with Database system. Data models. Database schema. Database architecture. Data independence. Database languages, interfaces, and classification of DBMS.	08
2	**E-R Model:** Entity-Relationship modeling: E – R Model Concepts: Entity, Entity types, Entity sets, Attributes, Types of attributes, key attribute, and domain of an attribute. Relationships between the entities. Relationship types, roles and structural constraints, degree and cardinality ratio of a relationship. Weak entity types, E -R diagram.	08
3	**Relational Data Model:** Relational model concepts. Characteristics of relations. Relational model constraints: Domain constrains, key constraints, primary & foreign key constraints, integrity constraints and null values.	10

	Relational Algebra: Basic Relational Algebra operations. Set theoretical operations on relations. JOIN operations Aggregate Functions and Grouping. Nested Sub Queries-Views. Introduction to PL/SQL & programming of above operations in PL/SQL	
4	**Data Normalization:** Anomalies in relational database design. Decomposition. Functional dependencies. Normalization. First normal form, Second normal form, Third normal form. Boyce-Codd normal form.	07
5	**Query Processing Transaction Management:** Introduction Transaction Processing. Single user & multiuser systems. Transactions: read & write operations. Need of concurrency control: The lost update problem, Dirty read problem. Types of failures. Transaction states. Desirable properties (ACID properties) of Transactions. Concurrency Control Techniques: Locks and Time stamp Ordering. Deadlock & Starvation.	09

References:

1. Fundamentals of Database Systems, Ramez Elamassri, Shankant B. Navathe, 7th Edition, Pearson, 2015
2. An Introduction to Database Systems, Bipin Desai, Galgotia Publications, 2010.
3. Introduction to Database System, C J Date, Pearson, 1999.
4. Database Systems Concepts, Abraham Silberschatz, Henry Korth, S.Sudarshan, 6th Edition, McGraw Hill, 2010.
5. Database Management Systems, Raghu Rama Krishnan and Johannes Gehrke, 3rd Edition, McGraw Hill, 2002

Practicals:

CO: Student would be able to create tables, execute queries and PL/SQL programs.

1. Execute a single line query and group functions.
2. Execute DDL Commands.
3. Execute DML Commands
4. Execute DCL and TCL Commands.
5. Implement the Nested Queries.
6. Implement Join operations in SQL
7. Create views for a particular table
8. Implement Locks for a particular table
9. Write PL/SQL procedure for an application using exception handling.
10. Write PL/SQL procedure for an application using cursors.
11. Write a PL/SQL procedure for an application using functions
12. Write a PL/SQL procedure for an application using package

Course Title: C# and Dot Net Framework	Course code: 21BCA3C8L
Total Contact Hours: 42	Course Credits: 03+02
Formative Assessment Marks: 40	Duration of SEE/Exam: 03 Hours
Summative Assessment Marks: 60	

Course Outcomes (COs):

At the end of the course, students will be able to:

- Describe Object Oriented Programming concepts like Inheritance and Polymorphism in C# programming language.
- Interpret and Develop Interfaces for real-time applications.
- Build custom collections and generics in C#.

DSC8: C# and Dot Net Framework

Unit	Description	Hours
1	**Introduction to .Net Technologies:** Introduction to Web Technologies. HTML Basics, Scripts. Sample Programs. Advantages and Disadvantages of Client-side and Server-side Scripts. Overview of Client-side Technologies and Server-side Technologies.	08
2	**Introduction to C#:**Overview of C#, Literals, Variables, Data Types, Operators, Expressions, Control Structures-Methods, Arrays, Strings, Structures, Enumerations. **OOPS with C#:** Classes, Objects, Inheritance, Polymorphism, Interfaces, Operator Overloading Delegates, Events, Errors and Exceptions.	08
3	**Introduction to VB.NET**: Introduction VB.NET -IDE – Creating a shortcut to start VB.NET. Maneuverings the Toolbar Auto-hide, Docking and Undocking, Placing and Resizing the Windows, Forms, Properties Window and Solution Explorer. Writing and Event Procedure. Execution Basic Keywords. Data Types. VB.NET statements. Conditional statements: If Else, Select Case, Switch and Choose Loops: Do, For Next, For Each Next, While loop. Arrays.	08
4	**Application Development on .NET:**C#.NET: Building Windows Applications, VB.NET: Windows Forms. Working with Controls, Timer, Picture-box, Group-box, Combo-box, Horizontal and Vertical Scrollbar, Numeric-up-down, Track-bar, and Progress-bar. Subroutines and Functions in VB.NET. Database applications	10
5	**ADO .NET Connectivity:** Introduction to ADO.NET, ADO vs ADO.NET. Architecture: Data reader, Data adopter, Accessing Data with ADO.NET. Programming Web Applications with Web Forms. ASP .NET applications with ADO.NET	08

References:

1. "Programming in C#", E. Balagurusamy, 4th Edition, Tata McGraw-Hill, 2017.
2. "Visual Basic.NET", Shirish Chavan, 3rd Edition, Pearson Education, 2009.
3. "ASP.NET and VB.NET Web Programming", Matt J. Crouch, Edition 2012.
4. "Computing with C# and the .NET Framework", Arthur Gittleman, 2nd Edition, Jones & Bartlett Publishers, 2011

Practicals:

1. Develop a C# .NET console application to demonstrate the conditional statements.
2. Develop a C# .NET console application to demonstrate the control statements.
3. Develop an application in C#.NET that demonstrates the windows controls
4. Demonstrate Multithreaded Programming in C#.NET
5. Demonstrate subroutines and functions in C#.NET
6. Develop an application for deploying various built-in functions in VB.NET
7. Develop an MDI application for Employee Pay-roll transactions in VB.NET
8. Construct a console application to demonstrate the OOP Concepts
9. Develop a web application in VB.NET for dynamic Login Processing
10. Develop a Windows application with database connectivity for core-banking transactions

Course Title: Computer Communication and Networks	Course code: 21BCA3C9L
Total Contact Hours: 42	Course Credits: 03
Formative Assessment Marks: 40	Duration of SEE/Exam: 03 Hours
Summative Assessment Marks: 60	

Course Outcomes (COs):

At the end of the course, students will be able to:

- Explain the transmission technique of digital data between two or more computers and a computer network that allows computers to exchange data.
- Apply the basics of data communication and various types of computer networks in real world applications.
- Compare the different layers of protocols.
- Compare the key networking protocols and their hierarchical relationship in the conceptual model like TCP/IP and OSI.

DSC9: Computer Communication and Networks

Unit	Description	Hours
1	**Introduction:** Computer Networks and its applications, Network structure, network architecture, Topologies, LAN, WAN, MAN, The OSI reference model, The TCP/IP reference model.	08
2	**The Physical Layer:** Transmission Media – Twisted pair, coaxial cable, optical fiber, radio transmission, microwaves and infrared transmission, Switching – message switching, Multiplexing.	07
3	**The Data Link Layer:** Data Link Layer design issues, Error detection – Single parity checking, Checksum, polynomial codes – CRC, Error correction- Hamming code, Elementary data link protocols, sliding window protocols	08
4	**The Network Layer:** Network layer design issues, Routing algorithms – Flooding, Distance vector routing, Hierarchical routing, Link state routing, Congestion, control algorithms – Leaky bucket, token bucket algorithm, admission control, Hop by Hop choke packets.	09
5	**The Transport Layer and Application Layer:** Elements of Transport service, Elements of Transport, protocols, Internet transport protocols (TCP & UDP), DNS, Electronic Mailing, and World Wide Web.	10

References:

1. Computer Networks, Andrew S. Tanenbaum, 5th Edition, Pearson Education, 2010.
2. Data Communication & Networking, Behrouza A Forouzan, 3rd Edition, Tata McGraw

Hill,2001.
3. Data and Computer Communications, William Stallings, 10th Edition, Pearson Education, 2017.
4. Data Communication and Computer Networks, Brijendra Singh, 3rd Edition, PHI, 2012.
5. Data Communication & Network, Dr. Prasad, Wiley Dreamtech.
6. http://highered.mheducation.com/sites/0072967757/index.htmls

Semester: IV

Course Title: Python Programming	Course code: 21BCA3C10L
Total Contact Hours: 42	Course Credits: 03+02
Formative Assessment Marks: 40	Duration of SEE/Exam: 03 Hours
Summative Assessment Marks: 60	

Course Outcomes (COs):

At the end of the course, students will be able to:

- Explain the basic concepts of Python Programming.
- Demonstrate proficiency in the handling of loops and creation of functions.
- Identify the methods to create and manipulate lists, tuples and dictionaries.
- Discover the commonly used operations involving file handling.
- Interpret the concepts of Object-Oriented Programming as used in Python.
- Develop the emerging applications of relevant fields using Python.

DSC10: Python Programming

Unit	Description	Hours
1	**Introduction** to Features and Applications of Python; Python Versions; Installation of Python; Python Command Line mode and Python IDEs; Simple Python Program. **Python Basics:** Identifiers; Keywords; Statements and Expressions; Variables; Operators; Precedence and Association; Data Types; Indentation; Comments; Built-in Functions- Console Input and Console Output, Type Conversions; Python Libraries; Importing Libraries with Examples. Python Control Flow: Types of Control Flow; Control Flow Statements- if, else, elif, while loop, break, continue statements, for loop Statement; range () and exit () functions.	08
2	**Exception Handling:** Types of Errors; Exceptions; Exception Handling using try, except and finally. **Python Functions:** Types of Functions; Function Definition- Syntax, Function Calling, Passing Parameters/arguments, the return statement; Default Parameters; Command line Arguments; Key Word Arguments; Recursive Functions; Scope and Lifetime of Variables in Functions. **Strings:** Creating and Storing Strings; Accessing Sting Characters; the str() function; Operations on Strings- Concatenation, Comparison, Slicing and Joining, Traversing; Format Specifiers; Escape Sequences; Raw and Unicode Strings; Python String Methods.	08
3	**Lists:** Creating Lists; Operations on Lists; Built-in Functions on Lists; Implementation of Stacks and Queues using Lists; Nested Lists. Dictionaries: Creating Dictionaries; Operations on Dictionaries; Built-in Functions on Dictionaries; Dictionary Methods; Populating and Traversing Dictionaries. **Tuples and Sets:** Creating Tuples; Operations on Tuples; Built-in Functions	08

	on Tuples; Tuple Methods; Creating Sets; Operations on Sets; Built-in Functions on Sets; Set Methods.	
4	**File Handling:** File Types; Operations on Files– Create, Open, Read, Write, Close Files; File Names and Paths; Format Operator. **Object Oriented Programming:** Classes and Objects; Creating Classes and Objects; Constructor Method; Classes with Multiple Objects; Objects as Arguments; Objects as Return Values; Inheritance- Single and Multiple Inheritance, Multilevel and Multipath Inheritance; Encapsulation- Definition, Private Instance Variables; Polymorphism- Definition, Operator Overloading.	08
5	**GU Interface:** The tkinter Module; Window and Widgets; Layout Management- pack, grid and place. **Python SQLite:** The SQLite3 module; SQLite Methods- connect, cursor, execute, close; Connect to Database; Create Table; Operations on Tables- Insert, Select, Update. Delete and Drop Records. **Data Analysis:** NumPy- Introduction to NumPy, Array Creation using NumPy, Operations on Arrays; Pandas- Introduction to Pandas, Series and DataFrames, Creating DataFrames from Excel Sheet and .csv file, Dictionary and Tuples. Operations on DataFrames. **Data Visualisation:** Introduction to Data Visualisation; Matplotlib Library; Different Types of Charts using Pyplot- Line chart, Bar chart and Histogram and Pie chart.	10

References:

1. Think Python How to Think Like a Computer Scientist, Allen Downey et al., 2nd Edition, Green Tea Press. Freely available online @ https://www.greenteapress.com/thinkpython/thinkCSpy.pdf, 2015.
2. Introduction to Python Programming, Gowrishankar S et al., CRC Press, 2019.
3. Python Data Analytics: Data Analysis and Science Using Pandas, matplotlib, and the Python Programming Language, Fabio Nelli, Apress®, 2015
4. Advance Core Python Programming, MeenuKohli, BPB Publications, 2021.
5. Core PYTHON Applications Programming, Wesley J. Chun, 3rd Edition, Prentice Hall, 2012.
6. Automate the Boring Stuff, Al Sweigart, No Starch Press, Inc, 2015.
7. Data Structures and Program Design Using Python, D Malhotra et al., Mercury Learning and Information LLC, 2021.
8. http://www.ibiblio.org/g2swap/byteofpython/read/
9. https://docs.python.org/3/tutorial/index.html

Programs for Practical Component:

Part-A

1. Check if a number belongs to the Fibonacci Sequence
2. Solve Quadratic Equations
3. Find the sum of n natural numbers
4. Display Multiplication Tables
5. Check if a given number is a Prime Number or not
6. Implement a sequential search
7. Create a calculator program
8. Explore string functions

9. Implement Selection Sort
10. Implement Stack
11. Read and write into a file

Part-B

1. Demonstrate usage of basic regular expression
2. Demonstrate use of advanced regular expressions for data validation.
3. Demonstrate use of List
4. Demonstrate use of Dictionaries
5. Create SQLite Database and Perform Operations on Tables
6. Create a GUI using Tkinter module
7. Demonstrate Exceptions in Python
8. Drawing Line chart and Bar chart using Matplotlib
9. Drawing Histogram and Pie chart using Matplotlib
10. Create Array using NumPy and Perform Operations on Array
11. Create DataFramefrom Excel sheet using Pandas and Perform Operations on DataFrames

Note: A minimum of 10 Programs should be done in each Part.

Evaluation Scheme for Lab Examination:

Assessment Criteria		**Marks**
Program – 1 from Part A	Writing the Program	03
	Execution and Formatting	07
Program -2 from Part B	Writing the Program	03
	Execution and Formatting	07
Viva Voice based on Python Programming and Practical Record		10
Total		30

Course Title: Computer Multimedia & Animation	Course code: 21BCA3C11L
Total Contact Hours: 42	Course Credits: 03+02
Formative Assessment Marks: 40	Duration of SEE/Exam: 03 Hours
Summative Assessment Marks: 60	

Course Outcomes (COs):

At the end of the course, students will be able to:

- Write a well-designed, interactive Web site with respect to current standards and practices.
- Demonstrate in-depth knowledge of an industry-standard multimedia development tool and its associated scripting language.
- Determine the appropriate use of interactive versus standalone Web applications.

DSC11: Computer Multimedia & Animation

Unit	Description	Hours
1	Web Design: Origins and evolution of HTML, Basic syntax, Basic text markup, Images, Lists, Tables, Forms, Frame, Overview and features of HTML5. CSS: Introduction, Levels of style sheets, Style specification formats, Selector forms, Property value forms, Font properties, List properties, Color, Alignment of text, The and tags; Overview and features of CSS3. JavaScript: Object orientation and JavaScript; General syntactic characteristics; Primitives, operations, and expressions; Screen output and keyboard input.	10
2	Animation: What is an Animation? The Start and End States, Interpolation, Animations in HTML. All About CSS Animations, Creating a Simple Animation, Detailed Look at the CSS Animation Property, Keyframes, Declaring Multiple Animations, Wrap-up. All About CSS Transitions, Adding a Transition, Looking at Transitions in Detail, The Longhand Properties, Longhand Properties vs. Shorthand Properties, Working with Multiple Transitions.	09
3	HTML5 – SVG: Viewing SVG Files, Embedding SVG in HTML5, HTML5 − SVG Circle, HTML5 − SVG Rectangle, HTML5 − SVG Line, HTML5 − SVG Ellipse, HTML5 − SVG Polygon, HTML5 − SVG Polyline, HTML5 − SVG Gradients, HTML5 − SVG Star.	08
4	HTML5 – CANVAS: The Rendering Context, Browser Support, HTML5 Canvas Examples, Canvas - Drawing Rectangles, Canvas - Drawing Paths, Canvas - Drawing Lines, Canvas - Drawing Bezier Curves, Canvas - Drawing Quadratic Curves, Canvas - Using Images, Canvas - Create Gradients,	08
5	HTML5 - Styles and Colors, Canvas - Text and Fonts, Canvas - Pattern and Shadow, Canvas - Save and Restore States, Canvas - Translation, Canvas - Rotation, Canvas - Scaling, Canvas - Transforms, HTML5 Canvas - Composition, Canvas – Animations.	07

References:

1. The Complete Reference HTML and CSS, 5th Edition, Thomas A Powell, 2017.
2. Animation in HTML, CSS, and JavaScript, Kirupa Chinnathambi, 1st Edition, Createspace Independent Pub, 2013.
3. https://www.w3.org/Style/CSS/current-work#CSS3
4. http://bedford-computing.co.uk/learning/cascading-style-sheets-css/

Course Title: Operating System Concepts	Course code: 21BCA3C12L
Total Contact Hours: 42	Course Credits: 03
Formative Assessment Marks: 40	Duration of SEE/Exam: 03 Hours
Summative Assessment Marks: 60	

Course Outcomes (COs):

At the end of the course, students will be able to:

- Explain the fundamentals of the operating system.
- Comprehend multithreaded programming, process management, process synchronization, memory management and storage management.
- Compare the performance of Scheduling Algorithms
- Identify the features of I/O and File handling methods.

DSC12: Operating System Concepts

Unit	Description	Hours
1	**Introduction to Operating System:** Definition, History and Examples of Operating System; Computer System organization; Types of Operating Systems; Functions of Operating System; Systems Calls; Operating System Structure. **Process Management:** Process Concept- Process Definition, Process State, Process Control Block, Threads; Process scheduling- Multiprogramming, Scheduling Queues, CPU Scheduling, Context Switch; Operations on Processes- Creation and Termination of Processes; Inter process communication (IPC)- Definition and Need for Inter process Communication; IPC Implementation Methods- Shared Memory and Message Passing;	08
2	**Multithreaded Programming**: Introduction to Threads; Types of Threads; Multithreading- Definition, Advantages; Multithreading Models; Thread Libraries; Threading Issues. **CPU Scheduling**: Basic concepts; Scheduling Criteria; Scheduling Algorithms; Multiple-processor scheduling; Thread scheduling; Multiprocessor Scheduling; Real-Time CPU Scheduling.	10
3	**Process Synchronization:** Introduction; Race Condition; Critical Section Problem and Peterson's Solution; Synchronization Hardware, Semaphores; Classic Problems of Synchronization- Readers and Writers Problem, Dining Philosophers Problem; Monitors. **Deadlocks:** System Model; Deadlocks Characterization; Methods for Handling Deadlocks; Deadlock Prevention; Deadlock Avoidance; Deadlock Detection; and Recovery from Deadlock.	10

4	**Memory Management:** Logical and Physical Address Space; Swapping; Contiguous Allocation; Paging; Segmentation; Segmentation with Paging. **Virtual Memory:** Introduction to Virtual Memory; Demand Paging; Page Replacement; Page Replacement Algorithms; Allocation of frames, Thrashing.	08
5	**File System:** File Concepts- Attributes, Operations and Types of Files; File System; File Access methods; Directory Structure; Protection; File System Implementation- File System Structure, Allocation Methods, Free Space Management	06

References:

1. Operating System Concepts, Silberschatz' et al., 10th Edition, Wiley, 2018.
2. Operating System Concepts - Engineering Handbook, Ghosh PK, 2019.
3. Understanding Operating Systems, McHoes A et al., 7th Edition, Cengage Learning, 2014.
4. Operating Systems - Internals and Design Principles, William Stallings, 9th Edition, Pearson.
5. Operating Systems – A Concept Based Approach, Dhamdhere, 3rd Edition, McGraw Hill Education India.
6. Modern Operating Systems, Andrew S Tanenbaum, 4th Edition, Pearson.

Skill Enhancement Course: SEC for B.Sc. & other Subject Students

Note: The respective BOS may adopt either SEC Model-1 or SEC Model-2

SEC Model-1

Semester: III/IV

Course Title: **Artificial Intelligence**	Course Credits: 2
Total Contact Hours: 13 hours of theory and 26 hours of practical	Duration of ESA: 01 Hour
Formative Assessment Marks: 2**0 marks**	Summative Assessment Marks: 30 marks

Course Outcomes (COs):

At the end of the course, students will be able to:

- Appraise the theory of Artificial intelligence and list the significance of AI.
- Discuss the various components that are involved in solving an AI problem.
- Illustrate the working of AI Algorithms in the given contrast.
- Analyze the various knowledge representation schemes, Reasoning and Learning techniques of AI.
- Apply the AI concepts to build an expert system to solve the real-world problems.

Course Content (Artificial Intelligence)

	Details of topic	**Duration**
Course – 1 - Azure AI Fundamentals (AI-900)	AI-900 pathway consists of 5 courses and 2 reading material: i. Introduction to AI on Azure ii. Use visual tools to create machine learning models with Azure Machine Learning iii. Explore computer vision in Microsoft Azure iv. Explore natural language processing v. Explore conversational AI vi. Tune Model Hyperparameters - Azure Machine Learning (Reading) vii. Neural Network Regression: Module Reference - Azure Machine Learning (Reading	05 hours
Practical	1. Prepare the data 2. Model the data 3. Visualize the data 4. Analyse the data 5. Deploy and maintain deliverables	13 hours

Course – 2 - Data Analyst Associate (DA-100)	DA-100 pathway consists of 5 courses and 2 reading material: 1. Get started with Microsoft data analytics 2. Prepare data for analysis 3. Model data in Power BI 4. Visualize data in Power BI 5. Data analysis in Power BI 6. Manage workspaces and datasets in Power BI 7. Key Influencers Visualizations Tutorial - Power BI 8. Smart Narratives Tutorial - Power BI | Microsoft Docs	08 hours
Practical	1. Describe Artificial Intelligence workloads and considerations 2. Describe fundamental principles of machine learning on Azure 3. Describe features of computer vision workloads on Azure 4. Describe features of Natural Language Processing (NLP) workloads on Azure	13 hours

References to learning resources:

1. The learning resources made available for the course titled "Azure AI Fundamentals (AI-900) and Data Analyst Associate (DA-100)." on Future Skills Prime Platform of NASSCOM.

Pedagogy

Flipped classroom pedagogy is recommended for the delivery of this course.
For every class:

1. All the faculty who takes this class should go for a Faculty Development Program on these before starting the session.
2. Faculty needs to introduce this course to the students then students need to start learning from Future Skills PRIME platform.
3. Faculty also needs to explain the course outcomes and needs of the course and why it is needed for the students.
4. Then students need to start learning online after registering on the platform.
5. Classroom activities are designed around the topic of the session towards developing better understanding, clearing doubts and discussions of high order thinking skills like application, analysis, evaluation, and design.
6. Every theory class ends with announcement of exercise for practical activity of the week.

Exercises:

Practical Exercises	Weightage in marks
After each chapter students' needs to complete exercises based on the learning in Azure environment.	No Weightage (But students need to complete it to move to next chapter) .

Assessment:

Formative Assessment	
Assessment Occasion	**Weightage in Marks**
1. Summative Assessment: After completion of both the courses, the student can optionally give Assessment for each of the courses on Future Skills Prime platform. Students will have two attempts and those who score at least 50% marks per course will get certificate from NASSCOM-MeitY.	This assessment may be given 50% weight in computing the final grade of the students.

SEC Model-2

Semester: III/IV

Course Title: **Artificial Intelligence**	Course Credits: 2
Total Contact Hours: 13 hours of theory and 26 hours of practical	Duration of ESA: 01 Hour
Formative Assessment Marks: 2**0 marks**	Summative Assessment Marks: 30 marks

Course Outcomes (COs):

At the end of the course, students will be able to:

- Appraise the theory of Artificial intelligence and list the significance of AI.
- Discuss the various components that are involved in solving an AI problem.
- Illustrate the working of AI Algorithms in the given contrast.
- Analyze the various knowledge representation schemes, Reasoning and Learning techniques of AI.
- Apply the AI concepts to build an expert system to solve the real-world problems.

Course Content

Unit - 1	
Overview of AI: Definition of Artificial Intelligence, Philosophy of AI, Goals of AI, Elements of AI system, Programming a computer without and with AI, AI Techniques, History of AI. **Intelligent Systems:** Definition and understanding of Intelligence, Types of Intelligence, Human Intelligence vs Machine Intelligence.	05
Unit – 2	
AI Applications: Virtual assistance, Travel and Navigation, Education and Healthcare, Optical character recognition, E-commerce and mobile payment systems, Image based search and photo editing. **AI Examples in daily life:** Installation of AI apps and instructions to use AI apps.	05
Unit – 3	
Robotics: Introduction to Robotics, Difference in Robot System and Other AI Program, Components of a Robot.	03

Laboratory Activities: • **Amazon Alexa:** https://play.google.com/store/apps/details?id=com.amazon.dee.app&hl=en&gl=US • **Google Lens:** https://play.google.com/store/search?q=google+lens&c=apps&hl=en&gl=US • **Image to Text to Speech ML OCR:** https://play.google.com/store/apps/details?id=com.mlscanner.image.text.speech&hl=en_IN&gl=US • **Google Pay:** https://play.google.com/store/apps/details?id=com.google.android.apps.nbu.paisa.user&hl=en_IN&gl=US	**26**

- **Grammarly:** https://play.google.com/store/search?q=grammarly&c=apps&hl=en_IN&gl=
- **Google Map:** https://play.google.com/store/search?q=google+maps&c=apps&hl=en&gl=US
- **FaceApp:** https://play.google.com/store/apps/details?id=io.faceapp&hl=en_IN&gl=US
- **Socratic:** https://play.google.com/store/apps/details?id=com.google.socratic&hl=en_IN&gl=US
- **Google Fit: Activity Tracking:** https://play.google.com/store/apps/details?id=com.google.android.apps.fitness&hl=en_IN&gl=US
- **SwiftKey Keyboard:** https://swiftkey-keyboard.en.uptodown.com/android
- **E-commerce App:** https://play.google.com/store/apps/details?id=com.jpl.jiomart&hl=en_IN&gl=US

Text Books:

1. Wolfgang Ertel, "Introduction to Artificial Intelligence", 2nd Edition, Springer International Publishing 2017.
2. Michael Negnevitsky, "Artificial Intelligence A Guide to Intelligent Systems", 2nd Edition, Pearson Education Limited 2005.

References:

1. https://www.tutorialspoint.com/artificial_intelligence/artificial_intelligence_tutorial.pdf
2. Kevin Knight, Elaine Rich, Shivashankar B. Nair, "Artificial Intelligence", 3rd Edition, July 2017.

Reference Links:

1. Voice Assistant: https://alan.app/blog/voiceassistant-2/
2. Browse with image: https://www.pocket-lint.com/apps/news/google/141075-what-is-google-lens-and-how-does-it-work-and-which-devices-have-it
3. OCR: https://aws.amazon.com/what-is/ocr/
4. Mobile Payment system: https://gocardless.com/en-us/guides/posts/how-do-mobile-payment-systems-work/
5. Grammarly: https://techjury.net/blog/how-to-use-grammarly/#gref
6. Travel & Navigation: https://blog.google/products/maps/google-maps-101-ai-power-new-features-io-2021/
7. AI in photo editing: https://digital-photography-school.com/artificial-intelligence-changed-photo-editing/
8. AI in education: https://www.makeuseof.com/what-is-google-socratic-how-does-it-work/
9. AI in health and fitness: https://cubettech.com/resources/blog/implementing-machine-learning-and-ai-in-health-and-fitness/
10. E-commerce and online shopping: https://medium.com/@nyxonedigital/importance-of-e-commerce-and-online-shopping-and-why-to-sell-online-5a3fd8e6f416

Open Source Tools
(Skill Enhancement Course: SEC for BCA Course)

Semester: III

Course Title: **Open Source Tools**	Course Credits: 2 (1L+0T+2P)
Semester: III	Duration of SEE: 01 Hour
Total Contact Hours: 13 hours of theory and 26-28 hours of practicals	SEE: 30 Marks IA: 20 Marks

Course Outcomes (COs):

- Recognize the benefits and features of Open Source Technology and to interpret, contrast and compare open source products among themselves
- Use appropriate open source tools based on the nature of the problem
- Write code and compile different open-source software.

Course Content (Open Source Tools)

Module	Details of topic	Duration
Module 1: Open Source Softwares	i. Introduction to Open sources, Need of Open Sources, Open Source –Principles, Standard Requirements, Advantages of Open Sources – ii. Free Software – FOSS iii. Licenses – GPL, LGPL, Copyrights, Patents, Contracts & Licenses and Related Issues iv. Application of Open Sources. Open Source Operating Systems : FEDORA, UBUNTU	05 hours
Module 2: Programming Tools And Techniques	i. Usage of design Tools like Argo UML or equivalent ii. Version Control Systems like Git or equivalent iii. Bug Tracking Systems (Trac, BugZilla) iv. BootStrap	04 hours
Module 3: Case Studies	**i.** Apache ii. Berkeley Software Distribution iii. Mozilla (Firefox) iv. Wikipedia v. Joomla vi. GNU Compiler Collection vii. Libre Office	04 hours

Text Book:

1. KailashVadera, Bhavyesh Gandhi, "Open Source Technology", Laxmi Publications Pvt. Ltd 2012, 1st Edition.

Reference Book:

1. Fadi P. Deek and James A. M. McHugh, "Open Source: Technology and Policy", Cambridge Universities Press 2007.

Open Elective for III & IV Semester

Python Programming Concepts

Course Title: **Python Programming Concepts**	Course Credits: 3 (3L+0T+0P)
Semester: III/IV	Duration of SEE: 03 Hour
Total Contact Hours: 42	SEE: 60 Marks IA: 40 Marks

Course Outcomes (COs):

- Explain the fundamentals of Computers.
- Explain the basic concepts of Python Programming.
- Demonstrate proficiency in the handling of loops and the creation of functions.
- Identify the methods to create and store strings.

Unit I Fundamentals of Computers 10 Hrs

Introduction to Computers - Computer Definition, Characteristics of Computers, Evolution and History of Computers, Types of Computers, Basic Organization of a Digital Computer; Number Systems – different types, conversion from one number system to another; Computer Codes – BCD, Gray Code, ASCII and Unicode; Boolean Algebra – Boolean Operators with Truth Tables; Types of Software – System Software and Utility Software; Computer Languages - Machine Level, Assembly Level & High Level Languages, Translator Programs – Assembler, Interpreter and Compiler; Planning a Computer Program - Algorithm, Flowchart and Pseudo code with Examples.

Unit II Python Basics 10 Hrs

Introduction to Features and Applications of Python; Python Versions; Installation of Python; Python Command Line mode and Python IDEs; Simple Python Program. Identifiers; Keywords; Statements and Expressions; Variables; Operators; Precedence and Association; Data Types; Indentation; Comments; Built-in Functions- Console Input and Console Output, Type Conversions; Python Libraries; Importing Libraries with Examples; Illustrative programs.

Unit III 08 Hrs

Python Control Flow: Types of Control Flow; Control Flow Statements- if, else, elif, while loop, break, continue statements, for loop Statement; range() and exit () functions; Illustrative programs.

Unit IV 08 Hrs

Python Functions: Types of Functions; Function Definition- Syntax, Function Calling, Passing Parameters/arguments, the return statement; Default Parameters; Command line Arguments; Key Word Arguments; Illustrative programs.

Unit V **06 Hrs**

Strings: Creating and Storing Strings; Accessing Sting Characters; the str() function; Operations on Strings- Concatenation, Comparison, Slicing and Joining, Traversing; Format Specifiers; Escape Sequences; Raw and Unicode Strings; Python String Methods; Illustrative programs.

References

1. Computer Fundamentals (BPB), P. K. Sinha & Priti Sinha
2. Think Python How to Think Like a Computer Scientist, Allen Downey et al., 2nd Edition, Green Tea Press. Freely available online 2015. @https://www.greenteapress.com/thinkpython/thinkCSpy.pdf
3. Introduction to Python Programming, Gowrishankar S et al., CRC Press, 2019.
4. http://www.ibiblio.org/g2swap/byteofpython/read/
5. http://scipy-lectures.org/intro/language/python_language.html
6. https://docs.python.org/3/tutorial/index.html

Open Elective

ELECTRONIC COMMERCE

Course Title: **E-Commerce**	Course Credits: 3 (3L+0T+0P)
Semester: III/IV	Duration of SEE: 03 Hour
Total Contact Hours: 42	SEE: 60 Marks IA: 40 Marks

Course Outcomes (COs):

- Compare how internet and other information technologies support business processes.
- Demonstrate an overall perspective of the importance of application of internet technologies in business administration
- Explain the basic business management concepts.
- Demonstrate the basic technical concepts relating to E-Commerce.
- Identify the security issues, threats and challenges of E-Commerce.

UNIT I Introduction to E-Commerce and Technology Infrastructure 09 Hrs

Working of Web - HTML Markup for Structure - Creating simple page - Marking up text - Adding Links - Adding Images - Table Markup - Forms - HTML5

UNIT II Building an E-Commerce Website, Mobile Site and Apps 10 Hrs

Systematic approach to build an E-Commerce: Planning, System Analysis, System Design, Building the system, Testing the system, Implementation and Maintenance, Optimize Web Performance – Choosing hardware and software – Other E-Commerce Site tools – Developing a Mobile Website and Mobile App

UNIT III E-Commerce Security and Payment Systems 09 Hrs

E-Commerce Security Environment – Security threats in E-Commerce – Technology Solutions: Encryption, Securing Channels of Communication, Protecting Networks, Protecting Servers and Clients – Management Policies, Business Procedure and Public Laws - Payment Systems

UNIT IV Business Concepts in E-Commerce 09 Hrs

Digital Commerce Marketing and Advertising strategies and tools – Internet Marketing Technologies – Social Marketing – Mobile Marketing – Location based Marketing – Ethical, Social, Political Issues in E-Commerce

UNIT V Project Case Study 05 Hrs

Case Study: Identify Key components, strategy, B2B, B2C Models of E-commerce Business model of any e-commerce website - Mini Project : Develop E-Commerce project in any one of Platforms like Woo-Commerce, Magento or Opencart

Text Book:

1. Kenneth C. Laudon, Carol Guercio Traver - E-Commerce, Pearson, 10th Edition, 2016

References:

1. http://docs.opencart.com/
2. http://devdocs.magento.com/
3. http://doc.prestashop.com/display/PS15/Developer+tutorials
4. Robbert Ravensbergen, ―Building E-Commerce Solutions with Woo Commerce‖, PACKT, 2nd Edition

B.Sc. BOTANY: Open Elective Course (OE-1.1)

Semester I

OE-1.1: PLANTS AND HUMAN WELFARE

Course Outcome:

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

1. To make the students familiar with economic importance of diverse plants that offer resources to human life.
2. To make the students known about the plants used as-food, medicinal value and also plant source of different economic value.
3. To generate interest amongst the students on plants importance in day today life, conservation, ecosystem and sustainability.

Number of Theory Credits	Number of lecture hours/semester	Number of practical Credits	Number of practical hours / semester
3	39	0	00

Content of Theory Course OE-1.1: PLANTS AND HUMAN WELFARE	39 Hrs
Unit I	13
Origin of Cultivated Plants. Concept of Centres of Origin, their importance with reference to Vavilov's work. Examples of major plant introductions. Crop domestication and loss of genetic diversity (Only conventional plant breeding methods). Importance of plant bio- diversity and conservation. **Cereals**: Wheat and Rice (origin, evolution, morphology, post-harvest processing & uses).Green revolution. Brief account of millets and their nutritional importance. **Legumes:** General account (including chief pulses grown in Karnataka- red gram, green gram, chick pea, soybean). Importance to man and ecosystem.	
Unit II	13
Cash crops: Morphology, new varieties and processing of sugarcane, products and by-products of sugarcane industry. Natural Rubber –cultivation, tapping and processing. **Spices:** Listing of important spices, their family and parts used, economic importance with special reference to Karnataka. Study of fennel, clove, black pepper and cardamom. **Fruits:** Mango, grapes and Citrus (Origin, morphology, cultivation ,processing and uses) **Beverages:** Tea, Coffee (morphology, processing&uses)	
Unit III	13
Oils and fats: General description, classification, extraction, their uses and health implications; groundnut, coconut, sunflower and mustered (Botanical name, family & uses). Non edible oil yielding trees and importance as biofuel. Neem oil and applications.	

Essential Oils: General account. Extraction methods of sandal wood oil, rosa oil and eucalyptus oil. Economic importance as medicine, perfumes and insect repellents. **Drug-yielding plants:** Therapeutic and habit-forming drugs with special reference to Cinchona, Digitalis, Aloe vera and Cannabis. **Fibers:** Classification based on the origin of fibers; Cotton and jute (origin morphology, processing and uses).	

Text Books and References

1. Kochhar, S.L. (2012). Economic Botany in Tropics. MacMillan & Co. New Delhi.
2. Wickens, G.E. (2001). Economic Botany: Principles & Practices. The Netherlands: Kluwer Academic Publishers. Netherland.
3. Chrispeels, M.J. and Sadava, D.E. (1994) Plants, Genes and Agriculture. Jones & Bartlett - Publishers. Lincoln, United Kingdom

Pedagogy:

Lectures, Practicals, Field and laboratory visits, Participatory Learning, Seminars, Assignments, specimen submission etc

Formative Assessment	
Assessment Occasion/ type	**Weightage in Marks**
I TEST	10
II TEST	10
ASSIGNMENT	10
Total	30

Date **Course Co-ordinator** **Subject Committee Chairperson**

B.Sc. BOTANY: Open Elective Course (OE-2.1)

Semester II

OE-2.1: PLANT PROPAGATION, NURSERY MANAGEMENT AND GARDENING

Paper Outcome:

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

1. To gain knowledge of gardening, cultivation, multiplication, raising of seedlings of garden plants.
2. To get knowledge of new and modern techniques of plant propagation.
3. To develop interest in nature and plant life.

Number of Theory Credits	Number of lecture hours/semester	Number of practical Credits	Number of practical hours / semester
3	39	0	00

Content of Theory Course OE-2.1: PLANT PROPAGATION, NURSERY MANAGEMENT AND GARDENING	30 Hrs
Unit I :Nursery and Vegetative propagation	13
Definition, objectives and scope and general practices and building up of infrastructure for nursery, planning and seasonal activities. Planting - direct seeding and transplants, Soil free/soilless/ synthetic growth mediums for pots and nursery. Air-layering, cutting, selection of cutting, collecting season, treatment of cutting, rooting medium and planting of cuttings. Hardening of plants .Green house, mist chamber, shed root, shade house and glass house.	
Unit II :Gardening	13
Definition, objectives and scope. Different types of gardening - landscape and home/terrace gardening, parks and its components. Plant materials and design. Computer applications in landscaping, Gardening operations: soil laying, manuring, watering, management of pests and diseases and harvesting.	
Unit III: Seed, Sowing/raising of seeds and seedlings	13
Structure and types - Seed dormancy; causes and methods of breaking dormancy. Seed storage: Seed banks, factors affecting seed viability, genetic erosion Seed production technology. Seed testing and certification. Transplanting of seedlings - Study of cultivation of different vegetables and	

flowering plants: cabbage, brinjal, lady's finger, tomatoes, carrots, bougainvillea, roses, geranium, ferns, petunia, orchids etc. Storage and marketing procedures. Developing and maintence of different types of lawns. Bonsai technique.	

Text Books and References

1. Agrawal, P.K. (1993). Hand Book of Seed Technology. Dept. of Agriculture and Cooperation, National Seed Corporation Ltd. New Delhi.
2. Bose T.K., Mukherjee, D. (1972). Gardening in India. Oxford & IBH Publishing Co. New Delhi.
3. Jules, J. (1979). Horticultural Science, 3rd edition. W.H. Freeman and Co. San Francisco, California.
4. Kumar, N. (1997). Introduction to Horticulture. Rajalakshmi Publications. Nagercoil, Tamil Nadu.
5. Musser E., Andres. (2005). Fundamentals of Horticulture. McGraw Hill Book Co. New Delhi
6. Sandhu, M.K. (1989). Plant Propagation. Walle Eastern Ltd. Bangalore.

Pedagogy:
Lectures, Practicals, Field and laboratory visits, Participatory Learning, Seminars, Assignments, specimen submission etc

Formative Assessment	
Assessment Occasion/ type	**Weightage in Marks**
I TEST	10
II TEST	10
ASSIGNMENT	

B.Sc. BOTANY – III Semester

Open Elective Course (OEC - 3)

(OEC for other students)

Paper: Landscaping and Gardening

Code: OEC-3.3

Course No.	Type of Course	Theory / Practical	Credits	Instruction hour per week	Total No. of Lectures / Hours / Semester	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
OEC-3.3	OEC	Theory	03	03	42 hrs	2 hrs	40	60	100

Learning outcomes:

After the completion of this course the learner will be able to:

- Apply the basic principles and components of gardening
- Conceptualize flower arrangement and bio-aesthetic planning
- Design various types of gardens according to the culture and art of bonsai
- Distinguish between formal, informal and free style gardens
- Establish and maintain special types of gardens for outdoor and indoor land scaping

Keywords:

Gardening, Landscaping, Flower arrangement, Vertical gardens, Roof gardens, Computer aided designing

Unit I

14 lectures

Principles of gardening, garden components, adornments, lawn making, methods of designing rockery, water garden, etc. Special types of gardens, their walk-paths, bridges, constructed features. Green house. Special types of gardens, trees, their design, values in landscaping, propagation, planting shrubs and herbaceous perennials. Importance, design values, propagation, planting, climbers and creepers, palms, ferns, grasses and cacti succulents.

Unit II

14 lectures

Flower arrangement: importance, production details and cultural operations, constraints, post-harvest practices. Bio-aesthetic planning, definition, need, round country planning, urban planning and planting avenues, schools, villages, beautifying railway stations, dam sites, hydroelectric stations, colonies, river banks, planting material for play grounds.

Unit III

14 lectures

Types of gardens: Kitchen gardens,Vertical gardens, roof gardens. Art of making bonsai. Parks and public gardens. Landscape designs, Styles of gardens: formal, informal and freestyle gardens, Urban landscaping, Landscaping for specific situations: institutions, industries, residents, hospitals, road sides, dam sites, IT parks, corporate. Establishment and maintenance, special types of gardens, Bio-aesthetic planning, eco-tourism, indoor gardening, therapeutic gardening, non-plant components, water-scaping, xeri-scaping, hardscaping

Suggested Readings

1. Berry, F. and Kress, J. (1991). Heliconia: An Identification Guide. Smithsonian Books

2. Butts, E. and Stensson, K. (2012). Sheridan Nurseries: One hundred years of People, Plans, and Plants. Dundurn Group Ltd.

3. Russell, T.(2012). Nature Guide: Trees: The world in your hands (Nature Guides).

B.Sc. BOTANY – IV Semester

Open Elective Course (OEC - 4)

(OEC for other students)

Paper: Medicinal Plants in Health Care

Code: OEC-4.2

Course No.	Type of Course	Theory / Practical	Credits	Instruction hour per week	Total No. of Lectures / Hours / Semester	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
OEC - 4.2	OEC	Theory	03	03	42 hrs	2 hrs	40	60	100

Learning outcomes:

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

- Recognize the basic medicinal plants
- Apply techniques of conservation and propagation of medicinal plants.
- Setup process of harvesting, drying and storage of medicinal herbs
- Propose new strategies to enhance growth of medicinal herbs considering the practical issues pertinent to India

Keywords:

Medicinal plants, Traditional systems, endangered medicinal plants, Ethnobotany, Folk medicines, Ethnic communities

Unit I: History and Traditional System of Medicine — 14 lectures

History, Scope and Importance of Medicinal Plants; Traditional systems of medicine; Definition and Scope.

Ayurveda: History, origin, panchamahabhutas, saptadhatu and tridosha concepts, Rasayana, plants used in ayurvedic treatments.

Siddha: Origin of Siddha medicinal systems, Basis of Siddha system, plants used in Siddha medicine.

Unani: History, concept: Umoor-e-tabiya, tumors treatments / therapy, polyherbal formulations.

Unit II: Conservation, Augmentation and Ethnobotany and Folk Medicine — 14 lectures

Conservation of Endemic and endangered medicinal plants, Red list criteria; ***In situ*** conservation: Biosphere reserves, sacred groves, National Parks; ***Ex situ*** conservation: Botanic Gardens, Ethno medicinal plant Gardens.

Propagation of Medicinal Plants: Propagation through cuttings, layering, grafting and

budding. Ethnobotany and Folk medicines. Definition; Ethnobotany in India: Methods to study ethnobotany; Applications of Ethnobotany: Folk medicines of ethnobotany, ethnomedicine, ethnoecology, ethnic communities of India.

Unit III Medicinal Plants **14 lectures**

Brief description of selected plants and derived drugs, namely Guggul (*Commiphora*) for hypercholesterolemia, *Boswellia* for inflammatory disorders, Arjuna (*Terminalia arjuna*) for cardioprotection, turmeric (*Curcuma longa*) for wound healing, antioxidant and anticancer properties, Kutaki (*Picrorhiza kurroa*) for hepatoprotection, Opium Poppy for analgesic and antitussive, Salix for analgesic, Cincona and Artemisia for Malaria, Rauwolfia as tranquilizer, Belladona as anticholinergic, Digitalis as cardiotonic, Podophyllum as antitumor.

Suggested Readings:

1. Akerele, O., Heywood, V. and Synge, H. (1991). The Conservation of Medicinal Plants. Cambridge University Press.
2. AYUSH (www.indianmedicine.nic.in). About the systems—An overview of Ayurveda, Yoga and Naturopathy. Unani, Siddha and Homeopathy. New Delhi: Department of Ayurveda, Yogaand Naturopathy, Unani, Siddha and Homoeopathy (AYUSH), Ministry and Family Welfare. Government of India.
3. CSIR- Central Institute of Medicinal and Aromatic Plants, Lucknow (2016). *Aush Gyanya*: Handbook of Medicinal and Aromatic Plant Cultivation.
4. Dev, S. (1997). Ethno-therapeutics and modern drug development: The potential of Ayurveda. *Current Science* 73:909–928.
5. Evans, W.C. (2009). Trease and Evans Pharmacognosy, 16thedn. Philadelphia, PA: Elsevier Saunders Ltd.
6. Jain, S.K. and Jain, Vartika. (eds.) (2017). Methods and Approaches in Ethnobotany: Concepts, Practices and Prospects. Deep Publications, Delhi
7. Kapoor, L.D. (2001). Handbook of Ayurvedic medicinal plants. Boca Raton, FL: CRC Press.
8. Saroya, A.S. (2017). Ethnobotany. ICAR publication.
9. Sharma, R.(2003). Medicinal Plants of India-An Encyclopaedia. Delhi: Daya Publishing House.
10. Sharma, R. (2013) Agro Techniques of Medicinal Plants. Daya Publishing House, Delhi.
11. Thakur, R.S., H.S. Puri, and Husain, A.(1989). Major medicinal plants of India. Central Institute of Medicinal and Aromatic Plants, Lucknow, India.

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UNIVERSITY OF MYSORE

Estd. 1916

VishwavidyanilayaKaryasoudha
Crawford Hall, Mysuru- 570 005

No.AC2(S)/164/2021-22

Dated: 16-02-2022

Notification

Sub:- Examination pattern, Scheme of Practical Exams & Open Elective of Botany (UG) with effective from the Academic year 2021-22 Academic year 2021-22 as per NEP-2020.

Ref:-
1. Decision of Board of Studies in Botany (UG) meeting held on 24-11-2021.
2. Decision of the Faculty of Science & Technology Meeting held on 20-12-2021.
3. Decision of the Academic Council meeting held on 23-12-2021.

*****

The Board of studies in Botany (UG) which met on 24-11-2021 has made changes of examination pattern, Scheme of Practical Exams & Open Elective of Botany (UG) with effective from the Academic year 2021-22 as per NEP-2020.

The Faculty of Science & Technology and Academic Council at their meetings held on 20-12-2021 and 23-12-2021 respectively have also approved the above said proposal and it is hereby notified.

The Curriculum & Syllabus is annexed herewith and the contents may be downloaded from the University Website i.e., www.uni-mysore.ac.in.

DRAFT APPROVED BY THE REGISTRAR

16/2

Deputy Registrar (Academic)
University of Mysore
Mysore 570 005

Deputy Registrar(Academic)

To:-

1. All the Principal of affiliated Colleges of University of Mysore, Mysore.
2. The Registrar (Evaluation), University of Mysore, Mysuru.
3. The Chairman, BOS/DOS, in Botany (UG), Manasagangothri, Mysore.
4. The Dean, Faculty of Science & Technology, DoS in Earth Science, MGM.
5. The Director, Distance Education Programme, Moulya Bhavan, Manasagangotri, Mysuru.
6. The Director, PMEB, Manasagangothri, Mysore.
7. Director, College Development Council , Manasagangothri, Mysore.
8. The Deputy Registrar/Assistant Registrar/Superintendent, Administrative Branch and Examination Branch, University of Mysore, Mysuru.
9. The PA to Vice-Chancellor/ Registrar/ Registrar (Evaluation), University of Mysore, Mysuru.
10. Office Copy

Telephone No. 2419677/2419361
Fax: 0821-2419363/2419301

e-mail : registrar@uni-mysore.ac.in
www.uni-mysore.ac.in

UNIVERSITY OF MYSORE

Estd. 1916

VishwavidyanilayaKaryasoudha
Crawford Hall, Mysuru- 570 005

No.AC2(S)/151/2020-21

Dated: 26-10-2021

Notification

Sub:- Syllabus and Examination Pattern of Zoology (UG) with effective from the Academic year 2021-22 as per NEP-2020.

Ref:- 1. Decision of Board of Studies in Zoology (UG) meeting held on 23-09-2021.
2. Decision of the Faculty of Science & Technology Meeting held on 16-10-2021.
3. Decision of the Academic Council meeting held on 22-10-2021.

*****

The Board of studies in Zoology (UG) which met on 23-09-2021 has recommended & approved the syllabus and pattern of Examination of Zoology Programme with effective from the Academic year 2021-22 as per NEP -2020.

The Faculty of Science & Technology and Academic Council at their meetings held on 16-10-2021 and 22-10-2021 respectively have also approved the above said proposal and it is hereby notified.

The syllabus and Examination pattern is annexed herewith and the contents may be downloaded from the University Website i.e., www.uni-mysore.ac.in.

Registrar

Registrar
University of Mysore
Mysore

To:-

1. All the Principal of affiliated Colleges of University of Mysore, Mysore. Those who are running B.Sc Courses.
2. The Registrar (Evaluation), University of Mysore, Mysuru.
3. The Chairman, BOS/DOS, in Zoology, Manasagangothri, Mysore.
4. The Dean, Faculty of Science & Technology, DoS in Psychology, MGM.
5. The Director, Distance Education Programme, Moulya Bhavan, Manasagangotri, Mysuru.
6. The Director, PMEB, Manasagangothri, Mysore.
7. Director, College Development Council , Manasagangothri, Mysore.
8. The Deputy Registrar/Assistant Registrar/Superintendent, Administrative Branch and Examination Branch, University of Mysore, Mysuru.
9. The PA to Vice-Chancellor/ Registrar/ Registrar (Evaluation), University of

University of Mysore

Syllabus for

B.Sc. Hons ZOOLOGY (UG)

I & II SEMESTERS

Framed According to the National Educational Policy (NEP 2020)

To be implemented from Academic year 2021-22

Assignment/Monograph	05
Test	10
Participation in class	05
Total	**20**

Date: **Co-Ordinator** **Subject Committee Chairperson**

Open Elective Course Content

Semester: **I**

Course Title: **Economic Zoology** Course Code: **OEC5ZOOT1**	Course Credits:**3**
Total Contact Hours: **42**	Duration of ESA: 3 Hours
Formative AssessmentMarks: **40**	Summative AssessmentMarks:**60**
Model SyllabusAuthors:	

Course Outcomes (COs):

At the end of the course the student will be able to:

1. Gain knowledge about silkworms rearing and their products.
2. Gain knowledge in Bee keeping equipment and apiary management.
3. Acquaint knowledge on dairy animal management, the breeds and diseases of cattle and learn the testing of egg and milk quality.
4. Acquaint knowledge about the culture techniques of fish and poultry.
5. Acquaint the knowledge about basic procedure and methodology of vermiculture.
6. Learn various concepts of lac cultivation.
7. Students can start their own business i.e. self-employments.
8. Get employment in different applied sectors

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs)

Course Outcomes (COs) / Program Outcomes (POs)	**CC 1**	**CC 2**	**CC 3**	**CC 4**	**CC 5**	**CC 6**	**CC 7**	**CC 8**	**CC 9**	**CC 10**	**CC 11**	**CC 12**
I Core competency	X											
II Critical thinking	X											
III Analytical reasoning	X											
IV Research skills	X											
V Team work	X											

Course Articulation Matrix relates course outcomes of course with the corresponding program outcomes whose attainment is attempted in this course.Mark _X' in the intersection cell if a course outcome addresses a particular program outcome.

Course Content

Content	Hrs
Unit I	**14**
Chapter 1. Sericulture: • History and present status of sericulture in India • Mulberry and non-mulberry species in Karnataka and India • Mulberry cultivation • Morphology and life cycle of *Bombyxmori* • Silkworm rearing techniques: Processing of cocoon, reeling • Silkworm diseases and pest control **Chapter 2. Apiculture:** • Introduction and present status of apiculture • Species of honey bees in India, life cycle of *Apisindica* • Colony organization, division of labour and communication • Bee keeping as an agro based industry; methods and equipments: indigenous methods, extraction appliances, extraction of honey from the comb and processing • Bee pasturage, honey and bees wax and their uses • Pests and diseases of bees and their management	
Unit II	**14**
Chapter 3. Live Stock Management: • **Dairy:**Introduction to common dairy animals and techniques of dairy management • Types, loose housing system and conventional barn system; advantages and limitations of dairy farming • Establishment of dairy farm and choosing suitable dairy animals-cattle • Cattle feeds, milk and milk products • Cattle diseases • **Poultry:** Types of breeds and their rearing methods • Feed formulations for chicks • Nutritive value of egg and meat • Disease of poultry and control measures **Chapter 4. Aquaculture:** • Aquaculture in India: An overview and present status and scope of aquaculture • Types of aquaculture: Pond culture: Construction, maintenance and management; carp culture, shrimp culture, shellfish culture, composite fish culture and pearl culture	
Unit - 3	**14**
Chapter 5. Fish culture: • Common fishes used for culture. • Fishing crafts and gears. • Ornamental fish culture: Fresh water ornamental fishes- biology, breeding techniques • Construction and maintenance of aquarium: Construction of home aquarium, materials used, setting up of freshwater aquaria, aquarium plants, ornamental objects, cleaning the aquarium, maintenance of water quality, control of snail and algal growth. • Modern techniques of fish seed production **Chapter 6. Prawn culture:** • Culture of fresh and marine water prawns. • Preparation of farm. • Preservation and processing of prawn, export of prawn. **Chapter 7. Vermiculture:** • Scope of vermiculture. • Types of earthworms. • Habit categories - epigeic, endogeic and anecic; indigenous and exotic species. • Methodology of vermicomposting: containers for culturing, raw materials	

required, preparation of bed, environmental pre-requisites, feeding, harvesting and storage of vermicompost. • Advantages of vermicomposting. • Diseases and pests of earthworms. **Chapter 8.Lac Culture:** • History of lac and its organization, lac production in India. • Life cycle, host plants and strains of lac insect. • Lac cultivation: Local practice, improved practice, propagation of lac insect, inoculation period, harvesting of lac. • Lac composition, processing, products, uses and their pests.	

Text Books

Suggested Readings:

1. Eikichi, H. (1999). Silkworm Breeding (Translated from Japanese). Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.
2. Ganga, G. (2003). Comprehensive Sericulture Vol-II: Silkworm Rearing and Silk Reeling.
3. Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.
4. Mahadevappa, D., Halliyal, V.G., Shankar, D.G. and Bhandiwad, R., (2000). Mulberry Silk
5. Reeling Technology Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.
6. Roger, M (1990). The ABC and Xyz of Bee Culture: An Encyclopedia of Beekeeping, Kindle Edition.
7. Shukla and Upadhyaya (2002). Economic Zoology, Rastogi Publishers
8. YadavManju (2003). Economic Zoology, Discovery Publishing House.
9. JabdePradip V (2005). Textbook of applied Zoology, Discovery Publishing House, New Delhi.
10. Cherian &Ramachandran Bee keeping in-South Indian Govt. Press, Madras.
11. Sathe, T.V. Vermiculture and Organic farming.
12. Bard, J (1986). Handbook of Tropical Aquaculture.
13. Santhanam, R. A. Manual of Aquaculture.
14. Zuka, R.1 and Hamiyn (1971). Aquarium fishes and plants
15. Jabde, P.V. (2005) Text Book of Applied Zoology: Vermiculture, Apiculture, Sericulture, Lac culture.
16. Animal Disease- Bairagi K. N. Anmol Publications Pvt.Ltd 2014
17. Economics Of Aquaculture - Singh(R.K.P) - Danika Publishing Company 2003
18. Applied and Economic Zoology (SWAYAM) web https://swayam.gov.in/nd2_cec20_ge23/preview

Course Books published in English and Kannada may be prescribed by the Universities and College

References

Pedagogy: Chalk and Talk, PPT, Group discussion, Seminar, Field visit

Formative Assessment	
Assessment Occasion	**Weightage in Marks**
House Examination/Test	**20**
Written Assignment/Presentation/Project / Term Papers/Seminar	**15**
Class performance/Participation	**05**
Total	**40**

Suggested Readings:

1. Harveyetal:TheVertebrateLife(2006)
2. Colbertetal:Colbert'sEvolutionoftheVertebrates:Ahistoryofthebackbonedanimalsthroughtime (5thed2002, Wiley-Liss)
3. Hildebrand: Analysis of Vertebrate Structure(4thed1995,JohnWiley)
4. KennethV.Kardong(2015)Vertebrates:ComparativeAnatomy,Function,EvolutionMcGrawHill
5. McFarlandetal:VertebrateLife(1979,MacmillanPublishing)
6. Parkerand Haswell: Text Book of Zoology, Vol. II(1978,ELBS)
7. Romerand Parsons: The Vertebrate Body(6thed 1986,CBSPublishingJapan)
8. Young: The Life of vertebrates(3rded2006,ELBS/Oxford)
9. WeichertC.KandWilliamPresch(1970).ElementsofChordateAnatomy,TataMcGrawHills

Web Sources:

1. https://www.khanacademy.org/science/biology/crash-course-bio-ecology/crashncourse-biology-science/v/crash-course-biology-123
2. https://opentextbc.ca/biology2eopenstax/chapter/chordates/

Pedagogy: Lectures, Presentations, videos, Assignments and Weekly Formative Assessment Tests.

Formative Assessment	
Assessment Occasion	**Weightage in Marks**
Assignment/Monograph	05
Test	10
Participation in class	05
Total	**20**

Date:Co-Ordinator **Subject Committee Chairperson**

Open Elective Course Content

Semester: **II Zoology**

Course Title: **Parasitology** Course Code: **OEC5ZOOT2**	Course Credits:**3**
Total Contact Hours: **42**	Duration of ESA: 3 Hours
Formative Assessment Marks: **40**	Summative Assessment Marks:**60**
Model Syllabus Authors:	

Course Outcomes (COs):

At the end of the course the students will be able to:

9. Know the stages of the life cycles of the parasites and infective stages.
10. Develop ecological model to know population dynamics of parasite, establishment of parasite population in host body, adaptive radiations and methods adopted by parasite to combat with the host immune system.
11. Develop skills and realize significance of diagnosis of parasitic infection and treatment.
12. Understand about diseases caused by Protozoa, Helminthes, Nematodes and Arthropods at molecular level.
13. Develop their future career in medical sciences and related administrative services.

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs)

Course Outcomes (COs) / Program Outcomes (POs)	CC 1	CC 2	CC 3	CC 4	CC 5	CC 6	CC 7	CC 8	CC 9	CC 10	CC 11	CC 12
I Core competency	X											
II Critical thinking	X											
III Analytical reasoning	X											
IV Research skills	X											
V Team work												

Course Articulation Matrix relates course outcomes of course with the corresponding program outcomes whose attainment is attempted in this course. Mark _X' in the intersection cell if a course outcome addresses a particular program outcome.

Course Content

Content	42Hrs
Unit – 1	
Chapter 1. General Concepts • Introduction, Parasites, parasitoids, host, zoonosis • Origin and evolution of parasites • Basic concept of Parasitism, symbiosis, phoresis, commensalisms and mutualism • Host-parasite interactions and adaptations • Life cycle of human parasites • Occurance, mode of infection and prophylaxis **Chapter 2. Parasitic Platyhelminthes** • Study of morphology, life cycle, pathogenicity, prophylaxis and control measures of • *Fasciolopsisbuski* • *Schistosomahaematobium* • *Taeniasolium* • *Hymenolepis nana* **Chapter 3. Parasitic Protists** • Study of morphology, life cycle, pathogenicity, prophylaxis and control *measures* of • *Entamoebahistolytica* • *Giardia intestinalis*	**14**

• *Trypanosomagambiense* • *Plasmodium vivax*	
Unit – 2	**14**

Chapter 4. Parasitic Nematodes
• Study of morphology, life cycle, pathogenicity, prophylaxis and control measures of
  • *Ascarislumbricoides*
  • *Ancylostomaduodenale*
  • *Wuchereriabancrofti*
  • *Trichinellaspiralis*
• Nematode plant interaction ; Gall formation
Chapter 5. Parasitic Arthropods
• Biology, importance and control of
  • Ticks (Soft tick *Ornithodoros*, Hard tick *Ixodes*)
  • Mites(*Sarcoptes*)
  • Lice (*Pediculus*)
  • Flea (*Xenopsylla*)
  • Bug (*Cimex*)
• Parasitoid (Beetles)
Chapter 6. Parasitic Vertebrates
• Cookicutter Shark
• Hood Mocking bird and
Vampire bat and their parasitic behavior and effect on host	

Unit – 3	**14**

Chapter 7.Molecular diagnosis & clinical parasitology
• General concept of molecular diagnosis for parasitic infection
• Advantages and disadvantages of molecular diagnosis
• Fundamental techniques used in molecular diagnosis of endoparasites
• Immunoassay or serological techniques for laboratory diagnosis of endoparasites on the basis of marker molecules like G.intestinalis, B. coli, E. histolytica, L. donovani, Malarial parasite using
  • ELISA, RIA
  • Counter Current Immunoelectrophoresis (CCI)
  • Complement Fixation Test (CFT) PCR, DNA, RNA probe	

Suggested Readings:

19. Arora, D. R and Arora, B. (2001) Medical Parasitology. II Edition. CBS Publications and Distributors.
20. E.R. Noble and G.A. Noble (1982) Parasitology: The biology of animal parasites. V Edition, Lea &Febiger.
21. Ahmed, N., Dawson, M., Smith, C. and Wood, Ed. (2007) Biology of Disease. Taylor and Francis Group.
22. Parija, S. C. Textbook of medical parasitology, protozoology & helminthology (Text and colour Atlas), II Edition, All India Publishers & Distributers, Medical Books Publishers, Chennai, Delhi.
23. Meyer, Olsen & Schmidt's Essentials of Parasitology, Murray, D. Dailey, W.C. Brown Publishers.
24. K. D. Chatterjee (2009). Parasitology: Protozoology and Helminthology. XIII Edition, CBS Publishers & Distributors (P) Ltd.
25. Gunn, A. and Pitt, S.J. (2012). Parasitology: an Integrated Approach. Wiley Blackwell.
26. Noble, E. R. and G.A.Noble (1982) Parasitology: The biology of animal parasites. V th Edition, Lea &Febiger.
27. Paniker, C.K.J., Ghosh, S. {Ed} (2013). Paniker's Text Book of Medical Parasitology. Jaypee, New Delhi.
28. Parija,S.C.Textbookofmedicalparasitology,protozoology&helminthology(Textand color Atlas),II Edition, All India Publishers & Distributers, Medical Books Publishers, Chennai, Delhi.
29. Roberts, L.S and Janovy, J. (2009). Smith & Robert's Foundation of Parasitology. 8th. Edn. McGraw Hill.

30. Bogitsh, B. J. and Cheng, T. C. (2000). Human Parasitology. 2nd Ed. Academic Press, New York.
31. Chandler, A. C. and Read, C. P. (1961). Introduction to Parasitology, 10th ed. John Wiley andSons Inc.
32. Cheng, T. C. (1986). General Parasitology. 2nd ed. Academic Press, Inc. Orlando.U.S.A.
33. Schmidt, G. D. and Roberts, L. S. (2001). Foundation of Parasitology. 3rd ed. McGraw Hill Publishers.
34. Schmidt, G. D. (1989). Essentials of Parasitology. Wm. C. Brown Publishers (Indian print1990, Universal Book Stall).
35. John Hyde (1996) Molecular Parasitology Open University Press.
36. J Joseph Marr and Miklos Muller (1995) Biochemistry and Molecular Biology of Parasites 2 ndEdn Academic Press.

Course Books published in English and Kannada may be prescribed by the Universities and College

Pedagogy: Chalk and Talk, PPT, Group discussion, Seminar, Interaction, virtual lab, Lab visit

Formative Assessment	
Assessment Occasion	**Weightage in Marks**
House Examination/Test	**20**
Written Assignment/Presentation/Project / Term Papers/Seminar	**15**
Class performance/Participation	**05**
Total	**40**

Date: **Course Co-Ordinator** **Subject Committee Chairperson**

Skill Enhancement Course Content

Semester: II Zoology

Course Title: Sericulture Course Code: VEC5ZOOP2	Course Credits: 2
Total Contact Hours: 56 Hours	Duration of ESA: 3 Hrs.
Formative Assessment Marks: 20	Summative Assessment Marks: 30
Model Syllabus Authors:	

Course Outcomes (COs):

At the end of the course the student acquires the following knowledge:

1. Sericulture is an agro-based industry which gives economic empowerment to the students.
2. Sericulture may be taken up as a small scale industry by the small farmers and unemployed youth.
3. Get jobs in teaching profession, silk board and other Govt. institutions as technicians.
4. Student can be self-employed after successful completion of the course.

4. Principles of Practical Chemistry- M. Viswanathan
5. Instrumental Methods of chemical Analysis B.K Sharma.
6. Experiments in Physical Chemistry R.C. Das and B. Behra, Tata McGraw Hill
7. Advanced Practical Physical Chemistry J.B.Yadav, Goel Publishing House
8. Advanced Experimental Chemistry. Vol-I J.N.Gurtu and R Kapoor, S.Chand and Co.
9. Practical Chemistry K.K. Sharma, D. S. Sharma (Vikas Publication).
10. General Chemistry experiment – Anil J Elias (University press).
11. Vogel textbook of quantitative chemical analysis G.H. Jeffery, J. Basset.
12. Quantitative chemical analysis S. Sahay (S. Chand & Co.).
13. Practical Chemistry Dr O P Pandey, D N Bajpai, Dr S Giri. S. Chand Publication
14. College Practical Chemistry. V K Ahluwalia, SunithaDingra, Adarsh Gulati
15. Practical Physical Chemistry- B. Viswanathan, P S Raghavan. MV Learning Publication

Pedagogy: MOOC/desk work/book chapter/problem solving /assignment

Formative Assessment	
Assessment occasion	Weightage in marks
Class test (Two class tests)/ Continuous evaluation	10
Practical record and Viva voce	05
Total	15

Open Elective Course Code: OE-1T:BC-103;
Course Title: Biochemistry in Health and Diseases (theory)

COURSE TITLE	**Biochemistry in Health and Diseases**
Couse code	OE-1T: BC-103
Course credits	03
Total contact hours	42
Duration of ESA (Hour)	03
Formative assessment marks	30
Summative assessment marks	70

Course Outcome: This open elective course offering to students of various streams gives knowledge about health and various terminologies used in health and disease conditions; Difference between communicable and non-communicable diseases; Health promotion and treatments for various diseases and disorders.

Content of Theory course- Biochemistry in Health and Diseases Total credits =3	**42 hr**
Unit 1: Introduction::	**14 hr**
WHO definition of health, Health and hygiene, General health care, Factors affecting health, Indices and evaluation of health, Disease patterns in developed and developing world; Classification of diseases - Endemic, Epidemic, Pandemic; Professional health hazards. Disease conditions: Acute disease, Chronic disease, Incurable disease, Terminal disease, Illness, disorders, Syndrome, Pre-disease.	

Treatment: Psychotherapy, Medications, Surgery, Medical devices, and Self-care. Dimensions of Health: Physical, Mental, Spiritual, Emotional, Environmental, and Philosophical.	
Unit 2:Communicable Diseases:	**14 hr**
Tuberculosis, Cholera, Typhoid, Conjunctivitis. Sexually transmitted diseases (STD): Information, statistics, and treatment guidelines for STD, Prevention: Syphilis, Gonorrhea, AIDS, etc. Non-communicable diseases: Malnutrition- Under nutrition, Over nutrition, Nutritional deficiencies; Anemia, Stroke, Rheumatic heart disease, Coronary heart disease, Cancer, blindness, accidents, mental illness, Iodine deficiency, Fluorosis, Epilepsy, Asthma. Genetic disorders: Down's syndrome, Klinefelter's syndrome, Turner's syndrome, Thalassemia, Sickle cell anemia. Lifestyle disorders: Obesity, Liver cirrhosis, Diabetes mellitus, Hypertension (Causative agents, symptoms, diagnosis, treatment, prognosis, prevention)	
Unit 3: Health Promotions:	**14 hr**
Preventing drug abuse, Oral health promotion by tobacco control. Mental hygiene and mental health: Concepts of mental hygiene and mental health,Characteristics of mentally healthy person, Warning signs of poor mental health, Promotive mental health, strategies and services, Ego defense mechanisms and implications, Personal and social adjustments, Guidance and Counseling. Infection control: Nature of infection, Chain of infection transmission, Defenses against infection transmission	
References 1. Modern Nutrition in Health and Disease 2006 10th Edition by Maurice E. Shils, Moshe Shike, A Catharine Ross. 2. Clinical Biochemistry and Metabolic Medicine, 2012 Eighth Edition by Martin Andrew Crook, CRC Press, 3. Nutrition & Health in Developing Countries, 2000, Editors: R. Semba and M.W. Bloem, Humana Press	

Pedagogy: MOOC/desk work/book chapter/problem solving /assignment

Formative Assessment	
Assessment occasion	Weightage in marks
Class test (Two class tests)/ Continuous evaluation	20
Seminar/ class work	05
Assignment/ open discussion/ quiz	05
Total	30

biomolecule by using colorimeter

8. Calibration of pH meter and determination of pH of aerated soft drinks.

References

1. Svehla, G. Vogel's Qualitative Inorganic Analysis, Pearson Education, 2012.
2. Mendham, J. Vogel's Quantitative Chemical Analysis, Pearson, 2009.
3. Dr. O. P. Pandey, D. N. Bajpai, dr. S. Giri, Practical Chemistry S. Chand and Co
4. Principles of Practical Chemistry- M. Viswanathan
5. Instrumental Methods of chemical Analysis B.K Sharma.
6. Experiments in Physical Chemistry R.C. Das and B. Behra, Tata McGraw Hill
7. Advanced Practical Physical Chemistry J.B.Yadav, Goel Publishing House
8. Advanced Experimental Chemistry. Vol-I J.N.Gurtu and R Kapoor, S.Chand a
9. Practical Chemistry K.K. Sharma, D. S. Sharma (Vikas Publication).
10. General Chemistry experiment – Anil J Elias (University press).
11. Vogel textbook of quantitative chemical analysis G.H. Jeffery, J. Basset.
12. Quantitative chemical analysis S. Sahay (S. Chand & Co.).
13. Practical Chemistry Dr O P Pandey, D N Bajpai, Dr S Giri. S. Chand Publicatio
14. College Practical Chemistry. V K Ahluwalia, SunithaDingra, Adarsh Gulati
15. Practical Physical Chemistry- B. Viswanathan, P S Raghavan. MV Learning Publication

Pedagogy: MOOC/desk work/book chapter/problem solving /assignment

Formative Assessment	Weightage in marks
Assessment occasion	10
Class test (Two class tests)/ Continuous evaluation	05
Practical record and Viva voce	15
Total	

Open Elective Course Code: OE-2T:BC-203;
Course Title: Nutrition and Dietetics (theory)

Course title	**Nutrition and Dietetics**
Couse code	OE-2T: BC-203
Course credits	03
Total contact hours	56
Duration of ESA (Hour)	03
Formative assessment marks	30
Summative assessment marks	70

Course outcomes:

- The student will gain knowledge about energy requirements and t Recommended Dietary Allowances.
- The student will understand the functions and role of macronutrients, the requirements and the effect of deficiency and excess
- The student learns the impact of various functional foods on our health

- The student will be able to apply basic nutrition knowledge in making foods choices and obtaining an adequate diet.
- The student gains competence in connecting the role of various nutrients in maintaining health and learn to enhance traditional recipes.

Content of Theory course- Nutrition and Dietetics **Total credits =3**	**42 hr**
Unit 1: Basic Concepts of Nutrition:	**14 hr**
Introduction, Basic principles of a balanced diet to provide energy and nutrients. Composition of foods and proximate analysis of foods. Calorific value of foods and Basal metabolism. Basal Metabolic Rate (BMR), Factors affecting BMR, Energy requirements for different physical activities, Specific dynamic action of food, Nutritive value of proteins. Energy requirements and recommended dietary allowance (RDA) for infants, children and pregnant women. Protein calorie malnutrition.	
Unit 2: Macronutrients and Micronutrients:	**14 hr**
Carbohydrates- Digestible and non-digestible, Dietary fibers, Essential fatty acids, lipoproteins and cholesterol. Essential amino acids, Fortification of foods, Protein requirement for different categories. Vitamins-Sources, requirements, functions and deficiency symptoms of Vitamin-C, Thiamine, Riboflavin, Pyridoxine, Folic acid, Vitamin B12. Absorption of fat-soluble vitamins- A, D, E and K. Micronutrients: Source, Daily requirement, functions and deficiency disease symptoms of Macro-minerals (Ca, P, and Cl) and micro minerals/trace elements (I, Fe, Zn and Se).	
Unit 3: Dietetics and Diet Therapy:	**14 hr**
Introduction. Food pyramid. Diet planning and introduction to diet therapy. Nutritionalrequirements for different age groups, anemic child, expectant women, and lactating women. Diet planning for prevention and cure of nutritional deficiency disorders. Diet therapy: Functional foods, Anthropometric measurements, dietary considerations during fever, malaria, and tuberculosis. Prevention and correction of obesity, underweight, and metabolic diseases by diet therapy. Dietary interventions to correct and or manage the gastrointestinal diseases (indigestion, peptic ulcer, constipation, diarrhea, steatorrhea, irritable bowel syndrome. Functional foods-based diet therapy for diabetes, cardiovascular disease and cancer.	

References

1. Clinical Dietetics and Nutrition, 2002, Antia FP and Abraham P. Oxford University Press; 4th Edition. ISBN-10: 9780195664157.
2. Oxford Handbook of Nutrition and Dietetics, 2011, Webster-Gandy J, Madden A and Holds worth M. Oxford University Press, Print ISBN-13: 9780199585823.
3. Krause's Food, Nutrition and Diet therapy, 2003, Mahan KL and Escott-Stump S.

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UNIVERSITY OF MYSORE

Estd. 1916

VishwavidyanilayaKaryasoudha
Crawford Hall, Mysuru- 570 005

No.AC2(S)/151/2020-21 Dated: 26-10-2021

Notification

Sub:- Syllabus and Examination Pattern of Bio-Technology (UG) with effective from the Academic year 2021-22 as per NEP-2020.

Ref:- 1. Decision of Board of Studies in Bio-Technology (UG) meeting held on 28-09-2021.
2. Decision of the Faculty of Science & Technology Meeting held on 16-10-2021.
3. Decision of the Academic Council meeting held on 22-10-2021.

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The Board of studies in Bio-Technology (UG) which met on 28-09-2021 has recommended & approved the syllabus and pattern of Examination of Bio-Technology Programme with effective from the Academic year 2021-22 as per NEP -2020.

The Faculty of Science & Technology and Academic Council at their meetings held on 16-10-2021 and 22-10-2021 respectively have also approved the above said proposal and it is hereby notified.

The syllabus and Examination pattern is annexed herewith and the contents may be downloaded from the University Website i.e., www.uni-mysore.ac.in.

Registrar
Registrar
University of Mysore
Mysore

To:-

1. All the Principal of affiliated Colleges of University of Mysore, Mysore. Those who are running B.Sc Courses.
2. The Registrar (Evaluation), University of Mysore, Mysuru.
3. The Chairman, BOS/DOS, in Bio-Technology, Manasagangothri, Mysore.
4. The Dean, Faculty of Science & Technology, DoS in Psychology, MGM.
5. The Director, Distance Education Programme, Moulya Bhavan, Manasagangotri, Mysuru.
6. The Director, PMEB, Manasagangothri, Mysore.
7. Director, College Development Council , Manasagangothri, Mysore.
8. The Deputy Registrar/Assistant Registrar/Superintendent, Administrative Branch and Examination Branch, University of Mysore, Mysuru.
9. The PA to Vice-Chancellor/ Registrar/ Registrar (Evaluation), University of

Text Books / References

Reference:

1. Molecular Biology of Cell - Bruce Alberts et al, Garland publications.
2. Animal Cytology and Evolution- MJD, White Cambridge University Publications
3. Molecular Cell Biology-Daniel, Scientific American Books
4. Cell Biology - Jack d Bruke, The William Twilkins Company
5. Principles of Gene Manipulations- Old & Primrose, Black Well Scientific Publications
6. Cell Biology-Ambrose &Dorothy M Easty, ELBS Publications
7. Fundamentals of Cytology- L. W. Sharp, McGraw Hill Company
8. Cytology-Willson&Marrison, Reinform Publications
9. Molecular Biology- Christopher Smith, Faber & Faber Publications
10. Cell Biology & Molecular Biology – EDP De Robertis& EMF Robertis, Saunder College.
11. Cell Biology- C.B Powar, Himalaya Publications
12. Basic Genetics- Daniel L. Hartl, Jones &Barlett Publishers USA
13. Human Genetics and Medicine lark Edward Arnold P London
14. Genetics – Monroe W Strickberger, Macmillain Publishers, New York
15. Genes V - Benjamin Lewin, Oxford University Press.
16. Genes I - Benjamin Lewin, Wiley Eastern Ltd., Delhi
17. Genes II - Benjamin Lewin, Wiley & Sons Publications
18. Genes III- Benjamin Lewin, Wiley & Sons Publications
19. Principles of Genetics- Sinnott, L.C. Dunn, Dobzhansky, McGraw-Hill.
20. Genetics – Edgar Altenburg Oxford & IBH publications
21. Principles of Genetics – E.J. Gardener, M.J. Simmons and D.P. Snustad, John Wiley & Son Publications
22. Genetics- P.K.Gupta, Rastogi Publication, Meert, India

Course 2: Theory: OE 1T, BTC 301, Biotechnology for Human Welfare

Course 2: OE 1T, BTC 301, Microbial Technology for Human Welfare	**42Hrs**
Unit – 1: Industry	14Hrs
Introduction, Scope, branches and applications of Biotechnology. Biotechnology in industry: Industrial production of alcoholic beverage (wine), antibiotic (Penicillin), enzyme (lipase) Applications of biotechnology in food, detergent and pharmaceutical industries	
Unit – 2: Environment	14Hrs
Application of biotechnology in environmental aspects : Bioremediation: Degradation organic pollutants, hydrocarbons and agricultural wastes, Superbug Bioplastics and Biofuels.	

Unit – 3: Forensic and Health Sciences	14Hrs
Application of biotechnology in forensic science: Solving crimes of murder and rape, paternity testing and theft using DNA finger printing techniques Application of biotechnology in health: Genetically engineered insulin, recombinant vaccines, gene therapy, diagnostics-ELISA and PCR, human genome project	

References:

1. Crueger W and Crueger A. (2000). Biotechnology: A textbook of Industrial Microbiology.2nd edition. Panima Publishing Co. New Delhi.
2. Patel AH. (1996). Industrial Microbiology. 1st edition, Macmillan India Limited.
3. Stanbury PF, Whitaker A and Hall SJ. (2006). Principles of Fermentation Technology. 2nd edition, Elsevier Science Ltd.
4. Environmental Biotechnology, Pradipta Kumar Mohapatra
5. Environmental Biotechnology – Concepts and Applications, Hans-Joachim Jordening andJesef Winter
6. B.B. Nanda and R.K. Tiwari, Forensic Science in India: A Vision for the Twenty First
   Century, Select Publishers, New Delhi (2001).
7. M.K. Bhasin and S. Nath, Role of Forensic Science in the New Millennium, University of Delhi, Delhi (2002).
8. S.H. James and J.J. Nordby, Forensic Science: An Introduction to Scientific and Investigative Techniques, 2nd Edition, CRC Press, Boca Raton (2005).
9. W.G. Eckert and R.K. Wright in Introduction to Forensic Sciences, 2nd Edition, W.G.Eckert (ED.), CRC Press, Boca Raton (1997).

Course 3: Theory: SEC 1T, BTC 701, Biotechnological Skills and Analytical Techniques

LEARNING OUTCOMES

- Skill enhancement as per National Occupational Standards (NOS) of "Lab Technician/ Assistant" Qualification Pack issued by Life Sciences Sector Skill Development Council - LFS/Q0509, Level 3.
- Knowledge about major activities of biotech industry, regulations, and compliance, environment, health, and safety (EHS), good laboratory practices (GLP), standard operating procedures (SOP) and GMP as per the industry standards.
- Demonstrate soft skills, such as decision making, planning, organizing, problem solving, analytical thinking, critical thinking, and documentation.

3. **Principles and practices of lab safety:**

   Knowledge about safety symbols and hazard signs. Personal safety gears, utility, and disposal. Equipment safety protocols, chemical safety protocols. Documentation of chemical and equipment usage records. Handling hazardous chemicals.

4. **Best practices of usage and storage of chemicals:**

   Knowledge and practice in handling of chemicals, labelling and stock maintenance. SOP and material handling. Procedures to maintain chemicals, labelling, storage, and disposal.

5. **Record maintenance as per SOPs**

   Labelling of samples and reagents as per SOPs.

   Recording detail of work done for research experiments. Importance of study of manuals, health and safety instructions.

6. **Usage and maintenance of basic equipment of biotechnology lab**: Principles, calibrations, and SOPs of weighing balances, pH meters, autoclaves , laminar flows and biosafety cabinets (levels), basic microscopes, homogenizers, stirrers, colorimeters, UV, and Visible spectrophotometers.

7. **Preparation of solutions and standards -** Properties and uses of chemicals commonly used in life sciences laboratories. Maintaining safety standards for handling various solutions and chemicals. Preparation of test reagents and buffers,
   Protocols for proper mixing of chemicals. Safety precautions while preparation and storage of incompatible chemicals and reagents.

8. **Preparation of media**: Maintenance and storage of purified water for media (Plant Tissue culture media, Microbiological media, and Animal cell culture media) preparation. Preparation and storage of concentrated stock solutions. Documentation and disposal of expired stocks.
   Collection of indents of media requirement, preparation, and storage. Media coding, documentation, and purpose of usage.

9. **Practical methods for decontamination and disposal**:

   Decontamination methods, Safe disposal practices of decontaminated media or materials.

10. **Laboratory record writing**

    Method of record writing , data collection and recording , reporting of result, discussion of result , summary writing, effective powerpoint presentation taking any experiment as example

11. **Industry visit or Analytical laboratory visit**

Text Books / References

1. Atlas RM. (1997). Principles of Microbiology. 2nd edition. WM.T. Brown Publishers.
2. Black JG. (2008). Microbiology: Principles and Explorations. 7th edition. Prentice Hall
3. Madigan MT, and Martinko JM. (2014). Brock Biology of Micro-organisms. 14th edition. Parker J. Prentice Hall International, Inc.
4. Pelczar Jr MJ, Chan ECS, and Krieg NR. (2004). Microbiology.
5. 5th edition Tata McGraw Hill.
6. Srivastava S and Srivastava PS. (2003). Understanding Bacteria. Kluwer Academic Publishers, Dordrecht
7. Stanier RY, Ingraham JL, Wheelis ML and Painter PR. (2005). General Microbiology. 5th edition McMillan.
8. Tortora GJ, Funke BR, and Case CL. (2008). Microbiology: An Introduction. 9th edition Pearson Education.
9. Willey JM, Sherwood LM, and Woolverton CJ. (2013). Prescott's Microbiology. 9th edition. McGraw Hill Higher Education.
10. Cappucino J and Sherman N. (2010). Microbiology: A Laboratory Manual. 9th edition. Pearson Education Limited
11. Microbiology- Concepts and applications by Paul A. Ketchum, Wiley Publications
12. Fundamentals of Microbiology –Frobisher, Saunders & Toppan Publications
13. Introductory Biotechnology-R.B Singh C.B.D. India (1990)
14. Fundamentals of Bacteriology - Salley
15. Frontiers in Microbial technology-P.S. Bison, CBS Publishers.
16. Biotechnology, International Trends of perspectives A. T. Bull, G.
17. General Microbiology –C.B. Powar

Course 2 :Theory: OE- 2T, BTC 302, Applications of Biotechnology in Agriculture

Course 2 :Theory: OE- 2T, BTC 302, Applications of Biotechnology in Agriculture	**42 Hrs**
Unit – 1: Agricultural Biotechnology	14 Hrs
Concepts and scope of biotechnology in Agriculture. Plant tissue culture, micro propagation, entrepreneurship in commercial plant tissue culture. Banana tissue culture - primary and secondary commercial setups, Small scale bioenterprises: Mushroom cultivation	
Unit – 2: Transgenic plants	14 Hrs
The GM crop debate – safety, ethics, perception and acceptance of GM crops GM crops case study :Bt cotton, Bt brinjal,	

Biopesticides: Baculovirus pesticides, Mycopesticides Genetic Engineering for quality improvement: Golden rice, Seed storage proteins, Flavours– capsaicin, vanillin	
Unit – 3: Molecular pharming and post harvest protection	14 Hrs
Plants as biofactories for molecular pharming: edible vaccines, plantibodies, nutraceuticals Post-harvest Protection: Antisense RNA technology for extending shelf life of fruits and shelf life of flowers. Biosafety, bioethics and IPR	

References

1. Chrispeels M.J.et al. Plants, Genes and Agriculture-Jones and Bartlett Publishers, Boston.1994.
2. Gamborg O.L. and Philips G.C.Plant cell, tissue and organ culture (2nd Ed.) Narosa Publishing House. New Delhi.1998
3. Hammound J, P McGravey&Yusibov.V. Plant Biotechnology, Springer verlag.2000
4. Heldt. Plant Biochemistry and Molecular Biology.Oxford and IBH Publishing Co. Pvt.Ltd. Delhi. 1997
5. LydianeKyte and John Kleyn.Plants from test tubes. An introduction to
6. Micropropagation (3 rd. Ed.). Timber Press, Portland. 1996
7. Murray D.R. Advanced methods in plant breeding and biotechnology.Panima Publishing Corporation.1996
8. NickoloffJ.A.Methods in molecular biology, Plant cell electroporation and electrofusion protocols-Humana press incorp, USA. 1995.
9. Sawahel W.A. Plant genetic transformation technology.Daya Publishing House, Delhi.1997
10. Gistou, P and Klu, H.Hand book of Plant Biotechnology (Vol. I & II).John Publication.2004
11. Sateesh M.K. 2008. Biosafety and Bioethics. Oxford and IBH Publishers, New Delhi.

Text Books / References

1. Prescott, Harley, Klein's Microbiology, J.M. Willey, L.M. Sherwood, C.J. Woolverton, 7th International, edition 2008, McGraw Hill.
2. Foundations in Microbiology, K. P. Talaro, 7th International edition 2009, McGraw Hill.
3. A Textbook of Microbiology, R. C. Dubey and D. K. Maheshwari, 1st edition, 1999, S. Chand & Company Ltd.
4. Brock Biology of Microorganisms, M.T.Madigan, J.M.Martinko, P. V. Dunlap, D. P. Clark- 12th edition, Pearson International edition 2009, Pearson Benjamin Cummings.
5. Microbiology – An Introduction, G. J.Tortora, B. R.Funke, C. L. Case, 10th ed. 2008,Pearson Education.
6. General Microbiology, Stanier, Ingraham et al, 4th and 5th edition 1987, Macmillan education limited.
7. Microbiology- Concepts and Applications, PelczarJr,Chan, Krieg, International ed, McGraw Hill.
8. Alexopoulos, C.J., Mims, C.W., and Blackwell, M. 2002. Introductory Mycology. John Wiley and Sons (Asia) Pvt. Ltd. Singapore. 869 pp.
9. Atlas, R.M. 1984. Basic and practical microbiology. Mac Millan Publishers, USA. 987pp.
10. Black, J.G. 2008. Microbiology principles and explorations. 7edn. John Wiley and Sons Inc., New Jersey 846 pp.
11. Pommerville, J.C. Alcamo's Fundamentals of Microbiology. Jones and Bartlett Pub..Sudburry, 835 pp.
12. Schlegel, H.G. 1995.General Microbiology. Cambridge University Press, Cambridge, 655 pp.
13. Toratora, G.J., Funke, B.R. and Case, C.L. 2007. Microbiology 9th ed. Pearson Education Pte. Ltd., San Francisco. 958pp.

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UNIVERSITY OF MYSORE

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Crawford Hall, Mysuru- 570 005

No.AC2(S)/151/2020-21 Dated: 04.10.2023

Notification

Sub:- Modification Syllabus and Scheme of Examinations Microbiology (UG) (Ist & IInd Semester) with effect from the Academic year 2023-24.

Ref:- Decision of Board of Studies in Microbiology (UG) meeting held on 01.09.2023.

*****

The Board of Studies in Microbiology (UG) which met on 01.09.2023 has resolved to recommended and approved the syllabus and scheme of Examinations of Microbiology Programme (Ist & IInd Semester) with effect from the Academic year 2023-24.

Pending approval of the Faculty of Science & Technology and Academic Council meetings the above said syllabus and scheme of examinations are hereby notified.

The syllabus and scheme of Examinations contents may be downloaded from the University website i.e., www.uni-mysore.ac.in.

DRAFT APPROVED BY THE REGISTRAR

Deputy Registrar (Academic)
Deputy Registrar (Academic)
University of Mysore
Mysore-570 005

To;

1. All the Principal of affiliated Colleges of University of Mysore, Mysore.
2. The Registrar (Evaluation), University of Mysore, Mysuru.
3. The Chairman, BOS/DOS in Microbiology, Manasagangothri, Mysore.
4. The Director, Distance Education Programme, Moulya Bhavan, Manasagangotri, Mysuru.
5. The Director, PMEB, University of Mysore, Mysore.
6. Director, College Development Council , Manasagangothri, Mysore.
7. The Deputy Registrar/Assistant Registrar/Superintendent, Administrative Branch and Examination Branch, University of Mysore, Mysuru.
8. The PA to Vice-Chancellor/ Registrar/ Registrar (Evaluation), University of Mysore, Mysuru.
9. Office Copy.

Course 2: Theory: OE 1T, Microbial Technology for Human Welfare

Course 2 : OE 1T, Microbial Technology for Human Welfare	42 Hrs.
Unit 1: Food and Fermentation Microbial Technology	**14 Hrs.**
Fermented Foods– Types, Nutritional Values, Advantages and Health Benefits Prebiotics, Probiotics, Symbiotics and Nutraceutical Foods Fermented Products– Alcoholic and non-alcoholic beverages, fermented dairy products, Fruit fermented drinks	
Unit 2: Agricultural Microbial Technology	**14 Hrs.**
Microbial Fertilizers Microbial Pesticides Mushroom Cultivation Biogas Production	
Unit 3: Pharmaceutical Microbial Technology	**14 Hrs.**
Microbial Drugs– Types and Development of Drug Resistance Antibiotics– Types, Functions and Antibiotic Therapy Vaccines– Types, Properties, Functions and Schedules	

Text Books / References

1. Adams, M. R. and Moss, M. O.(1995). Food Microbiology. Royal Society of Chemistry, Cambridge University Press.
2. Ananthanarayan, R. and Paniker, C. K. J. (2009). Textbook of Microbiology. 8th ed., University Press Publication.
3. Frazier and Westhoff, D. C. (1995). Food Microbiology. Tata McGraw Hill Pub. Company Ltd., New Dehli.
4. Nandini Shetty (1993). Immunology: Introductory Textbook. NewAge International Ltd.
5. Rangaswamy, G. and Bagyaraj, D. J. (2001). Agricultural Microbiology, 2nd ed., Prentice hall of India Pvt. Ltd., New Delhi.
6. Stanbury, P. T. and Whitaker, (1984). Principles of Fermentation Technology, Pergamon Press, Newyork.
7. Subba Rao, N. S. (1988). Biofertilizers in Agricultural 2nd ed., Oxford and IBH Pub.Co., New Delhi.
8. Wiley, J. M., Sherwood, L. M. and Woolverton, C. J. (2013) Prescott, Harley and Klein's Microbiology. 9th edition. McGraw Hill Higher Education.

Course 2: Theory: OE- 2T, Environmental and Sanitary Microbiology

Course 2: Theory: OE- 2T, Environmental and Sanitary Microbiology	**42 Hrs.**
Unit 1: Soil and Air Microbiology	**14 Hrs.**
Soil and Air as a major component of environment. Types, properties and uses of soil and air. Distribution of microorganisms in soil and air. Major types of beneficial microorganisms in soil. Major types of harmful microorganisms in soil	
Unit 2: Water Microbiology	**14 Hrs.**
Water as a major component of environment. Types, properties and uses of water. Microorganisms of different water bodies. Standard qualities of drinking water	
Unit 3: Sanitary Microbiology	**14 Hrs.**
Public health hygiene and communicable diseases. Survey and surveillance of microbial infections. Airborne microbial infections, waterborne microbial infections, Food borne microbial infections. Epidemiology of microbial infections, their detection and control.	

Text Books / References

1. Dubey, R. C. and Maheshwari, D. K. (1999). A Textbook of Microbiology. 1st ed., S. Chand & Company Ltd.
2. Jeffrey C. Pommerville (2011).Alcamo's Fundamentals of Microbiology,9 th Ed.Jones and Bartlett publishers.
3. Lansing, M. Prescott, John, P. Harley, Donald A. Klein. (2002). Microbiology, 5th ed., WCB Mc Graw Hill, New york.
4. Madigan, M. T. Martinko, J. M. Dunlap, P. V. and Clark, D. P. (2009). Brock Biology of Microorganisms. 12th ed., Pearson International edition Pearson Benjamin Cummings.
5. Pelczar, M. J., Chan, E. C. S. and Krieg, N. R. (1993). Microbiology. 5th edition. McGraw Hill Book Company.
6. Seeley, H. W. and Demark, J. V. (1962) Microbes in Action-A laboratory Manual of Microbiology , Freeman Publisher.
7. Stanier and Ingraham et al, (1987). General Microbiology, 4th and 5th ed., Mc Millan education limited.
8. Sullia, S. B and Shantharam, S. (1998). General Microbiology. Oxford and IBM Publishing Company Pvt Ltd,New Delhi.
9. Tortora, G. J. Funke, B. R. and Case, C. L. (2008). Microbiology-An Introduction, 10th ed. 2008, Pearson Education.
10. Gregory, P. H. (1961). The Microbiology of the atmosphere. Interscience Publishers,New York.
11. Subba Rao, N. S. (2002). Soil Microorganisms and Plant Growth 4th ed., Oxford and IBH Pub. Co. Pvt. Ltd., New Delhi.

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No.AC2(S)/151/2020-21

Dated: 04.10.2023

Notification

Sub:- Modification Syllabus and Scheme of Examinations Biotechnology (UG) (III[rd] & IV[th] Semester) with effect from the Academic year 2023-24.

Ref:- Decision of Board of Studies in Biotechnology (UG) meeting held on 15.09.2023.

*****

The Board of Studies in Biotechnology (UG) which met on 15.09.2023 has resolved to recommended and approved the syllabus and scheme of Examinations of Biotechnology Programme (III[rd] & IV[th] Semester) with effect from the Academic year 2023-24.

Pending approval of the Faculty of Science & Technology and Academic Council meetings the above said syllabus and scheme of examinations are hereby notified.

The syllabus and scheme of Examinations contents may be downloaded from the University website i.e., www.uni-mysore.ac.in.

DRAFT APPROVED BY THE REGISTRAR

Deputy Registrar (Academic)

Deputy Registrar (Academic)
University of Mysore
Mysore-570 005

To;

1. All the Principal of affiliated Colleges of University of Mysore, Mysore.
2. The Registrar (Evaluation), University of Mysore, Mysuru.
3. The Chairman, BOS/DOS in Biotechnology, Manasagangothri, Mysore.
4. The Director, Distance Education Programme, Moulya Bhavan, Manasagangotri, Mysuru.
5. The Director, PMEB, University of Mysore, Mysore.
6. Director, College Development Council , Manasagangothri, Mysore.
7. The Deputy Registrar/Assistant Registrar/Superintendent, Administrative Branch and Examination Branch, University of Mysore, Mysuru.
8. The PA to Vice-Chancellor/ Registrar/ Registrar (Evaluation), University of Mysore, Mysuru.
9. Office Copy.

Program Name	**BSc Biotechnology**		Semester	**Third Sem**
Course Title	**Nutrition and Health**			
Course Code		**OE-3**	No. of Theory Credits	**3**
Contact hours	**Lecture**	42 h	Duration of ESA/Exam	**2.5 Hours**
	Practical	-		
Formative Assessment Marks	40		Summative Assessment Marks	60

Course Pre-requisite(s):

Course Outcomes (COs): At the end of the course the student should be able to:

1. Study the concepts of food, nutrition, diet and health
2. To apply the best practices of food intake and dietary requirements
3. Acquire knowledge about various sources of nutrients and good cooking practices

Content	**42 Hrs**
Unit–I - Introduction	**14 Hrs**
Concepts of nutrition and health. Definition of Food, Diet and nutrition, Food groups. Food pyramids. Functions of food. Balanced diet. Meal planning. Eat right concept. Functional foods, Prebiotics, Probiotics, and antioxidants	
Unit -II - Nutrients	**14 Hrs**
Macro and Micronutrients - Sources, functions and deficiency. Carbohydrates, Proteins, Fats – Sources and calories. Minerals –Calcium, Iron, Iodine. Vitamins – Fat soluble vitamins –A, D, E & K. Water soluble vitamins – vitamin C, Thiamine, Riboflavin, Niacin. Water–Functions and water balance. Fibre –Functions and sources. Recommended Dietary Allowance, Body Mass Index and Basal Metabolic Rate.	
Unit -III – Nutrition and Health	**14 Hrs**
Methods of cooking affecting nutritional value. Advantages and disadvantages. Boiling, steaming, pressure cooking. Oil/Fat – Shallow frying, deep frying. Baking. Nutrition through lifecycle. Nutritional requirement, dietary guidelines: Adulthood, Pregnancy, Lactation, Infancy- Complementary feeding, Pre-school, Adolescence, geriatric. Nutrition related metabolic disorders- diabetes and cardiovascular disease.	

Pedagogy: Lectures, Seminars, Industry Visits, Debates, Quiz and Assignments

Summative Assessment = 60 Marks	
Formative Assessment Occasion / type	Weightage in Marks
Attendance	10
Seminar	10
Debates and Quiz	10
Test	10
Total	60 marks + 40 marks = 100 marks

References

1	Sri Lakshmi B, (2007), Dietetics. New Age International publishers. New Delhi
2	Sri Lakshmi B, (2002), Nutrition Science. New Age International publishers. New Delhi
3	Swaminathan M. (2002), Advanced text book on food and Nutrition. Volume I. Bappco
4	Gopalan.C., RamaSastry B.V., and S.C.Balasubramanian (2009), Nutritive value of Indian Foods.NIN.ICMR.Hyderabad.
5	Mudambi S R and Rajagopal M V, (2008), Fundamentals of Foods, Nutrition & diet therapy by New Age International Publishers, New Delhi

Program Name	**BSc Biotechnology**		Semester	**Fourth Sem**
Course Title	**Intellectual Property Rights**			
Course Code		**OE-4**	No. of Theory Credits	**3**
Contact hours	**Lecture**	42 h	Duration of ESA/Exam	**2.5 Hours**
	Practical	-		
Formative Assessment Marks	40		Summative Assessment Marks	60

Course Pre-requisite(s):

Course Outcomes (COs): At the end of the course the student should be able to:

1. Knowledge about need and scope of Intellectual property rights
2. Acquire knowledge about filing patents, process, and infringement
3. Knowledge about trademarks, industrial designs, and copyright

Content	**42 Hrs**
Unit–I - Introduction to Intellectual property rights (IPR): Genesis and scope. Types of Intellectual property rights - Patent, Trademarks, Copyright, Design, Trade secret, Geographical indicators, Plant variety protection. National and International agencies – WIPO, World Trade Organization (WTO), Trade-Related Aspects of Intellectual Property Rights (TRIPS), General Agreement on Tariffs and Trade (GATT).	**14 Hrs**
Unit -II - Patenting, process, and infringement Basics of patents - Types of patents; Patentable and Non-Patentable inventions, Process and Product patent. Indian Patent Act 1970; Recent amendments; Patent Cooperation Treaty (PCT) and implications. Process of patenting. Types of patent applications: Provisional and complete specifications; Concept of "prior art", patent databases (USPTO, EPO, India). Financial assistance, schemes, and grants for patenting. Patent infringement- Case studies on patents (Basmati rice)	**14 Hrs**
Unit -III - Trademarks, Copy right, industrial Designs Trademarks- types, Purpose and function of trademarks, trademark registration, Protection of trademark. Copy right- Fundamentals of copyright law, Originality of material, rights of reproduction, industrial Designs: Protection, Kind of protection provided by industrial design.	**14 Hrs**

Pedagogy

Summative assessment = 60 marks theory paper, End semester Exam duration: 2.5 hours	
Formative Assessment Occasion / type	Weightage in Marks
Assignment	10
Seminar	10
Case studies	10
Test	10
Total	40 marks

References

1	Manish Arora. 2007. Universal's Guide to Patents Law (English) 4th Edition) -Publisher: Universal Law Publishing House
2	Kalyan C. Kankanala. 2012. Fundamentals of Intellectual Property. Asia Law House
3	Ganguli, P. 2001. Intellectual Property Rights: Unleashing the knowledge economy. New Delhi: Tata McGraw-Hill Pub
4	World trade organization - http://www.wto.org
5	World Intellectual Property organization – www.wipo.intOffice of the controller general of Patents, Design & Trademarks - www.ipindia.nic.in

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VishwavidyanilayaKaryasoudha
Crawford Hall, Mysuru- 570 005

No.AC2(S)/151/2020-21

Dated: 04.10.2023

Notification

Sub:- Modification Syllabus and Scheme of Examinations Microbiology (UG) (III[rd] & IV[th] Semester) with effect from the Academic year 2023-24.

Ref:- Decision of Board of Studies in Microbiology (UG) meeting held on 16.09.2023.

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The Board of Studies in Microbiology (UG) which met on 16.09.2023 has resolved to recommended and approved the syllabus and scheme of Examinations of Microbiology Programme (III[rd] & IV[th] Semester) with effect from the Academic year 2023-24.

Pending approval of the Faculty of Science & Technology and Academic Council meetings the above said syllabus and scheme of examinations are hereby notified.

The syllabus and scheme of Examinations contents may be downloaded from the University website i.e., www.uni-mysore.ac.in.

DRAFT APPROVED BY THE REGISTRAR

Deputy Registrar (Academic)
Deputy Registrar (Academic)
University of Mysore
Mysore-570 005

To;

1. All the Principal of affiliated Colleges of University of Mysore, Mysore.
2. The Registrar (Evaluation), University of Mysore, Mysuru.
3. The Chairman, BOS/DOS in Microbiology, Manasagangothri, Mysore.
4. The Director, Distance Education Programme, Moulya Bhavan, Manasagangotri, Mysuru.
5. The Director, PMEB, University of Mysore, Mysore.
6. Director, College Development Council , Manasagangothri, Mysore.
7. The Deputy Registrar/Assistant Registrar/Superintendent, Administrative Branch and Examination Branch, University of Mysore, Mysuru.
8. The PA to Vice-Chancellor/ Registrar/ Registrar (Evaluation), University of Mysore, Mysuru.
9. Office Copy.

Course 3: Theory: OE 3T, Microbial Entrepreneurship

Course Outcomes (COs): At the end of the course the student should be able to:

1. Demonstrate Entrepreneurial skills
2. Acquire knowledge industrial Entrepreneurship
3. Acquire knowledge about Healthcare Entrepreneurship

Course 3: Theory: OE 3T, Microbial Entrepreneurship	**42Hrs**
Unit 1: General Entrepreneurship	**14Hrs**
Entrepreneurship and microbial entrepreneurship - Introduction and scope, Business development, product marketing, HRD, Bio-safety and Bioethics, IPR and patenting, Government organization/ institutions/ schemes, Opportunities and challenges.	
Unit 2: Industrial Entrepreneurship	**14Hrs**
Microbiological industries – Types, processes and products, Dairy products, Fermented foods, Bakery and Confectionery, Alcoholic products and Beverages, Enzymes – Industrial production and applications. Biofertilizers and Biopesticides, SCP (Mushroom and *Spirulina*) etc.	
Unit 3: Healthcare Entrepreneurship	**14Hrs**
Production and applications: Sanitizers, Antiseptic solutions, Polyphenols (Flavonoids), Alkaloids, Cosmetics, Biopigments and Bioplastics, vaccines, Diagnostic tools and kits.	

Text Books / References

1. Srilakshmi B, (2007). Dietetics. New Age International publishers. New Delhi
2. Srilakshmi B, (2002). Nutrition Science. New Age International publishers. New Delhi
3. Swaminathan M. (2002). Advanced text book on food and Nutrition. Volume I. Bappco
4. Gopalan.C., Ramasastry, B.V., and Balasubramanian, S.C.(2009). Nutritive value of IndianFoods. NIN. ICMR. Hyderabad.
5. Mudambi, S. R. and Rajagopal, M. V. (2008. Fundamentals of Foods, Nutrition & diet therapy by NewAge International Publishers, New Delhi

Course 4: Theory: OE- 4T, Human Microbiome

Course Outcomes (COs): At the end of the course the student should be able to:

1. Articulate a deeper understanding on biological complexities of human microbiome.
2. Understand broader goals of biological anthropology.
3. Compare and contrast the microbiome of different human body sites and impact human health promotion

Course 4: Theory: OE- 4T, Human Microbiome	**42Hrs**
Unit 1: Introduction to Microbiome	**14Hrs**
Evolution of microbial life on Earth, Symbiosis host-bacteria. Microbial association with plants and animals, Symbiotic and parasitic, Normal human microbiota and their role in health. Microbiomes other than digestive system.	
Unit 2: Microbiomes and Human health	**14Hrs**
Microbiome in early life, Nutritonal modulation of the gut microbiome for metabolic health-role of gut mocrobiomes in human obesity, human type 2 diabetes and longevity. Probiotics- Criteria for probiotics, Development of Probiotics for animal and human use; Pre and synbiotics. Functional foods-health claims and benefits, Development of functional foods.	
Unit 3: Culturing of Microbes from Microbiomes	**14Hrs**
Culturing organisms of interest from the microbiome: bacterial, archaeal, fungal, and yeast, viral. Extracting whole genomes from the microbiome to study microbiome diversity Microbiomes and diseases: Microbiome and disease risks: The gut microbiome and host immunity, bacteriocins and other antibacterials. Human microbiome research in nutrition	

Text Books / References

1. Angela E Douglas, (2018). Fundamentals of Microbiome Science: How Microbes Shape Animal Biology. Princeton University Press. 248pp.
2. Giulia Enders and Jill Enders, (2018). Gut: The Inside Story of Our Body's Most Underrated Organ (Revised Edition). Greystone Books, 304pp.
3. Emeran Mayer, (2018). The Mind-Gut Connection: How the Hidden Conversation within our bodies impacts our mood, our choices, and our overall Health. Harper Wave, 336pp.
4. Edward Ishiguro, Natasha Haskey and Kristina Campbell, (2018). Gut Microbiota. 1st edition. 2008pp.
5. Natalia V Beloborodova, (2021). Human Microbiome. IntechOpen, 166pp. Gregory, P. H. (1961). The Microbiology of the atmosphere. Interscience Publishers,New York.

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UNIVERSITY OF MYSORE

Estd. 1916

VishwavidyanilayaKaryasoudha
Crawford Hall, Mysuru- 570 005

No.AC2(S)/151/2020-21 Dated: 01.09.2023

Notification

Sub:- Syllabus and Scheme of Examinations of Biotechnology (UG) (V & VI Semester) with effect from the Academic year 2023-24.

Ref:- 1. This office letter No: AC6/303/2022-23 dated: 28-07-2023.
2. Decision of BOS in Biotechnology (UG) meeting held on 04-08-2023.

*****

The Board of Studies in Biotechnology (UG) which met on 04-08-2023 has resolved to recommended and approved the syllabus and scheme of Examinations of Biotechnology programme (V & VI Semester) with effect from the Academic year 2023-24.

Pending approval of the Faculty of Science & Technology and Academic Council meetings the above said syllabus and scheme of examinations are hereby notified.

The syllabus and scheme of Examinations contents may be downloaded from the University website i.e., www.uni-mysore.ac.in.

Registrar
University of Mysore
Mysore

Registrar

To:-

1. All the Principal of affiliated Colleges of University of Mysore, Mysore.
2. The Registrar (Evaluation), University of Mysore, Mysuru.
3. The Chairman, BOS/DOS, in Biotechnology, Manasagangothri, Mysore.
4. The Director, Distance Education Programme, Moulya Bhavan, Manasagangotri, Mysuru.
5. The Director, PMEB, Manasagangothri, Mysore.
6. Director, College Development Council , Manasagangothri, Mysore.
7. The Deputy Registrar/Assistant Registrar/Superintendent, Administrative Branch and Examination Branch, University of Mysore, Mysuru.
8. The PA to Vice-Chancellor/ Registrar/ Registrar (Evaluation), University of Mysore, Mysuru.
9. Office Copy.

1. Bhojwani, S.S., and Razdan, M.K. (2004). Plant Tissue Culture: Theory and Practice. Amsterdam: Elsevier Science.
2. Brown, T.A. (2010). Gene Cloning and DNA Analysis: An Introduction. 7th edition. Oxford: Wiley-Blackwell.
3. Gardner, E.J., Simmons, M.J., and Snustad, D.P. (2008). Principles of Genetics. 10th edition. Hoboken, NJ: John Wiley & Sons.
4. Glick, B.R., and Pasternak, J.J. (2018). Molecular Biotechnology: Principles and Applications of Recombinant DNA. 5th edition. Washington, DC: ASM Press.
5. Raven, P.H., Johnson, G.B., Losos, J.B., and Singer, S.R. (2013). Biology. 10th edition. New York, NY: McGraw-Hill Education.
6. Reinert, J., and Bajaj, Y.P.S. (1997). Applied and Fundamental Aspects of Plant Cell, Tissue and Organ Culture. Berlin: Springer.
7. Russell, P.J. (2013). Genetics: A Molecular Approach. 3rd edition. Boston, MA: Benjamin Cummings.
8. Slater, A., Scott, N.W., and Fowler, M.R. (2008). Plant Biotechnology: The Genetic Manipulation of Plants. Oxford: Oxford University Press.
9. Smith, R. (2012). Plant Tissue Culture: Techniques and Experiments. 3rd edition. San Diego, CA: Academic Press.
10. Taiz, L., and Zeiger, E. (2014). Plant Physiology. 5th edition. Sunderland, MA: Sinauer Associates.
11. Vasil, I.K., and Vasil, V. (2007). Molecular Improvement of Cereal Crops. Dordrecht: Springer
12. Umesha S. (2018) Plant Biotechnology. TERI Publishers, New Delhi.
13. Wilson, K., & Walker, J. (2018). Principles and Techniques of Biochemistry and MolecularBiology (8th ed.). Cambridge University Press. ISBN: 978-1316614761.
14. Gahlawat, S.K., Duhan, J.S., Salar, R.K., Siwach, P., Kumar, S., & Kaur, P. (2018). Advancesin Animal Biotechnology and its Applications. Springer. ISBN: 978-981-10-4701-5.
15. Primrose, S.B., & Twyman, R.M. (2016). Principles of Gene Manipulation (8th ed.).Blackwell Science. ISBN: 978-1405135442.
16. Verma, A., & Singh, A. (2013). Animal Biotechnology. Elsevier. ISBN: 978-0124160026.
17. Glick, B.R., & Pasternak, J.J. (2009). Molecular Biotechnology (4th ed.). ASM Press. ISBN:978-1555814984.
18. Ranga M.M. Animal Biotechnology. Agrobios India Limited, 2002
19. Watson, J.D., Meyers, R.M., AC, A., & AW, J. (2006). Recombinant DNA (3rd ed.). ColdSpring Harbor Laboratory Press. ISBN: 978-0716728665.
20. Clynes, M. (Ed.). (1998). Animal Cell Culture Techniques. Springer.
21. Masters, J.R.W. (Ed.). (2000). Animal Cell Culture - Practical Approach. Oxford UniversityPress.
22. Freshney, I. (2016). Culture of Animal Cells: A Manual of Basic Technique and SpecializedApplications (8th ed.). Wiley-Blackwell.
23. Pörtner, R. (Ed.). (2007). Animal Cell Biotechnology: Methods and Protocols. Humana Press.
24. Singh, B., & Gautam, S.K. (2013). Textbook of Animal Biotechnology. The Energy andResources Institute (TERI).
25. Gupta, P.K. (2018). Animal Biotechnology. Rastogi Publications.
26. Mather, J.P., & Barnes, D. (Eds.). (Year N/A). Animal Cell Culture Methods. In Methods inCell Biology, Vol. 57. Academic Press.
27. Singh, B.D. (2006). Biotechnology: Expanding Horizons (3rd ed.). Kalyani Publishers.
28. Srivastava A.K. Animal Biotechnology. (2018). Oxford & IBH Publishing Co Pvt.Ltd.

Program Name	**B.Sc. Biotechnology**	Semester	**5th Semester**
Course Title	**Biotechnology Skills and Analytical Techniques**		

Course No.	**SEC- 4**	No. of Theory Credits	**2+1 (Theory+Practical)**
Contact hours	**45 hrs**	Duration of ESA/Exam	**2 hrs**
Formative Assessment Marks	**20**	Summative Assessment Marks	**30**

Course Outcomes (COs): At the end of the course the student should be able to:

1. Demonstrate skills as per National Occupational Standards (NOS) of the "Lab Technician/Assistant" Qualification Pack issued by the Life Sciences Sector Skill Development Council-LFS/Q0509.
2. Develop knowledge of laboratory safety procedures and protocols and acquire skills in handling and maintaining laboratory equipment and instruments.
3. Operate analytical equipment and instruments as per standard operating procedures (SOP)
4. Knowledge about major activities of the biotech industry, regulations and compliance, environment, health and safety (EHS), good laboratory practices (GLP), and Good Manufacturing Practices (GMP) as per the industry standards.
5. Demonstrate soft skills, such as decision-making, planning, organizing, problem-solving, analytical thinking, critical thinking, and documentation.

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs 1-13)

Course Outcomes (COs)/Program Outcomes (POs)	1	2	3	4	5	6	7	8	9	10	11	12	13
Develop knowledge of laboratory safetyprocedures and protocols and acquireskills in handling and maintaining laboratory equipment and instruments.	✔	✔											
Operate analytical equipment and instruments as per standard operating procedures (SOP)		✔	✔									✔	
Knowledge about major activities of thebiotech industry, regulations and compliance, environment, health and safety (EHS), good laboratory practices (GLP), and Good Manufacturing Practices (GMP) as per the industry standards.		✔							✔		✔		
Demonstrate soft skills, such as decision making, planning, organizing, problemsolving, analytical thinking, criticalthinking and documentation.	✔	✔						✔	✔				

Biotechnology Skills and Analytical Techniques Content	**30 Hrs**
Unit-I Insights into the biotechnology industry and basic professional skills	**15**

Biotechnology Industry in Indian and Global Context- Organization in the context of large/medium/small enterprises, their structure, and benefits.

Industry-oriented professional skills: Planning and organizing skills, decision-making, problem-solving skills, analytical thinking, critical thinking, team management, and risk assessment. Interpersonal skills: Writing skills, reading skills, oral communication, conflict resolution techniques, interpretation of research data, and troubleshooting in the workplace.

Digital skills: Basic computer skills (MS Office, excel, power point, internet) for the workplace. Professional E-mail drafting skills and PowerPoint presentation skills. Overview of good manufacturing practices (GMP), Good Documentation practices (GDP), and good laboratory practices (GLP).

Unit- II Basic laboratory skills and Analytical Techniques	**15**

Analytical skills in the laboratory: Preparations of solutions, molarity, molality, normality, mass percent % (w/w), percent by volume (%v/v), parts per million (ppm), parts per billion (ppb), dilution of concentrated solutions. Standard solutions, stock solution, and solution of acids. Reagent bottle label reading and precautions.

Analytical techniques: Basic principle, operation, application, maintenance, calibration, validation, and troubleshooting of instruments- Microscope-Simple, compound, TEM, SEM, fluorescence. Centrifuge and different types, Hot air oven, pH meter, different types of pH electrodes Autoclave, Incubator, BOD, COD, cell counter, Laminar airflow. Spectroscopy-Colorimeter, UV-Visible spectroscopy. Electrophoresis- Agarose Gel electrophoresis, SDS-PAGE, PCR, Conductivity meter, and
Potentiometer. Biosafety cabinets.

Pedagogy: Lectures, Seminars, Industry Visits, Debates, Quiz, and Assignments

Course title	**Quality control methods in biology (Practical)**	**Practical credits-1**	**5th Semester**
Course No.	**SEC -4**	Contact hours	4hrs/week

Content

Unit-1

Methods and practices of cleaning and management of lab: Learning and Practice of Integratedclean-in-place (CIP) and sterilize-in-place (SIP) as per industry standards, material requirementsfor cleaning specific areas, equipment, ventilation area, personal protective requirements Calibration of and use of micropipette.

Unit-2

Preparation of Standard Operating Procedure (SOP) for various equipment in the QC Lab, Best practices of using and storing chemicals: Knowledge and practice in handling chemicals, labeling, and stock maintenance. SOP and material handling. Procedures to maintain chemicals, labeling, storage, and disposal.

Handling and calibration of lab equipment- weighing balance, Autoclave, Hot air Oven, Incubator, Centrifuge, Water bath, Colony Counter, and stability chamber, Preparation of Normality, Molarity, and buffer solutions

Unit-3

Preparation of media: Maintenance and storage of purified water for media (plant tissue culture media, microbiological media, and animal cell culture media) preparation. Preparation and storage of concentrated stock solutions. Documentation and disposal of expired stocks. Collection ofindents of media requirement, preparation, and storage. Media coding, documentation, and purpose of usage.

Demonstration, handling, and troubleshooting of High-Performance Liquid Chromatography and Gas chromatography.

Demonstration of Polymerase Chain Reaction (PCR), Hands-on training on colorimeter and spectrophotometer, Industry visit, or analytical laboratory visit.

Note: Semester end examination is only in the theory component; questions from the practical partcould be included, if any.

References:

1. Douglas A. Skoog, F. James Holler, and Stanley R. Crouch (2017). "Principles ofInstrumental Analysis". Cengage Learning.
2. J. Perry Gustafson (2017). "Analytical Methods and Techniques for Advanced Sciences".CRC Press.
3. Dean F. Martin, William M. Ritchey, and Michael W. Wood (2017). "Laboratory Manual forPrinciples of General Chemistry". Wiley.
4. Michael Lufaso (2016). "Laboratory Skills for Science and Medicine: An Introduction". CRCPress.
5. David J. Livingstone and Christopher H. Amonette (2016). "Analytical Techniques inEnvironmental Chemistry: Applications to Air, Water and Soil". CRC Press.
6. Colin A. Ramsden (2014). "Analytical Molecular Biology". Oxford University Press.
7. John M. Walker and Ralph Rapley (2014). "Molecular Biomethods Handbook". HumanaPress.
8. Gary D. Christian, Purnendu K. Dasgupta, and Kevin A. Schug (2013). "AnalyticalChemistry". Wiley.
9. Roger L. Lundblad and Fiona M. Macdonald (2010). "Handbook of Biochemistry andMolecular Biology". CRC Press.

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No.AC2(S)/151/2020-21

Dated: 01.09.2023

Notification

Sub:- Syllabus and Scheme of Examinations of Microbiology (UG) (V & VI Semester) with effect from the Academic year 2023-24.

Ref:- 1. This office letter No: AC6/303/2022-23 dated: 28-07-2023.
2. Decision of BOS in Microbiology (UG) meeting held on 05-08-2023.

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The Board of Studies in Microbiology (UG) which met on 05-08-2023 has resolved to recommended and approved the syllabus and scheme of Examinations of Microbiology programme (V & VI Semester) with effect from the Academic year 2023-24.

Pending approval of the Faculty of Science & Technology and Academic Council meetings the above said syllabus and scheme of examinations are hereby notified.

The syllabus and scheme of Examinations contents may be downloaded from the University website i.e., www.uni-mysore.ac.in.

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University of Mysore
Mysore

Registrar

To:-

1. All the Principal of affiliated Colleges of University of Mysore, Mysore.
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B. Sc. Microbiology 5th Semester

Program name	B. Sc. in MICROBIOLOGY		Semester	V
Course Title	MICROBIAL AND BIOCHEMICAL TECHNIQUES (Theory)			
Course Code	SEC-4T		No. of Credits	02
Contact Hours	30 (2 Hrs. per week)		Duration of SEA/Exam (Hrs.)	02
Formative Assessment Marks		20	Summative Assessment Marks	30

Course Outcomes (COs):

After the successful completion of the course, the student will be able to:

CO1: Demonstrate skills in microbiological and analytical techniques.

CO2: Understand principles which underlie sterilization of culture media, glassware and plastic ware to be used for microbiological work.

CO3: Understand principles of a number of analytical instruments which the students have to use during the study and also later as microbiologists for performing various laboratory manipulations.

CO4: Handle several separation techniques which may be required to be handled later as microbiologists.

Content of Course: Theory: Microbial and Biochemical Techniques	30 Hrs.
Unit 1: Microbial Techniques	**15 Hrs.**
Methods and practices of cleaning and management of lab: Learning and Practice of Integrated clean-in-place (CIP) and sterilize-in-place (SIP) as per industry standards, Standard Operating Procedure (SOP) for various equipment in the QC Lab. Sterility check, Bio-burden and Logbook maintenance. **Handling and calibration of lab equipment**- weighing balance, Micropipette Autoclave, Hot air Oven, Incubator, Centrifuge, Water bath, Colony Counter, and stability chamber, Preparation of Normality, Molarity, and buffer solutions. **Types of culture media and their maintenance:** Preparation of various culture media. Cultivation of Bacteria, Fungi, Actinomycetes and Algae. Isolation and preservation of pure culture. Morphological and biochemical characterization of bacteria.	
Unit 2: Biochemical Techniques	**15 Hrs.**
Centrifugation: Principles of Centrifugation and Ultracentrifugation techniques and its applications. **Chromatography**: Principle and techniques with applications (Partition, adsorption, ion exchange, exclusion and affinity chromatography). Electrophoretic technique (agarose and polyacrylamide gel) its components, working and applications. **Spectrophotoscopy and Radiobiology**: Principle, mechanism and application of instruments used in Spectrophotometric techniques (UV and visible).Radiobiological techniques – characters of radioisotopes, autoradiography, Radioisotope dilution technique and pulse chase experiments. Basic principles & Law of absorption and radiation and its application.	

Practical: Microbial and Biochemical Techniques

Course Title	Microbial and Biochemical Techniques (Practical)		
Course Code	SEC-5P	No. of Credits	01
Contact Hours	30 (2 Hrs. per session)	Duration of SEA/Exam (Hrs.)	03
Formative Assessment Marks	25	Summative Assessment Marks	25

Practical Content

1. Usage and maintenance of basic equipment of microbiology lab: Principles, calibrations, and SOPs of balances, pH meter, Autoclaves, Laminar flows, Biosafety cabinets, Microscopes, Homogenizers and Magnetic stirrers.
2. Cultivation of microorganisms: (i) Bacterial cultivation: (a) Streak-plate method (*E.coli, Staphylococcus aureus*) Streaking with inoculation loop. Streaking with toothpick. (b) Pour-plate method (*E.coli*).
3. Maintenance of microorganisms (slant culture, stab culture, glycerol stocks) (ii) Fungal cultivation (a) Yeast (*Saccharomyces cervisiae*) Moulds (*Penicillium notatum, Aspergillus niger*)
4. Estimation of CFU count by serial dilution- spread plate method/pour plate method.
5. Study of colony characteristics on nutrient agar
6. Biochemical characterization of bacteria:
   a. Sugar utilization test (minimal medium + sugar)
   b. Sugar fermentation test (peptone water method, Ammonium salt sugar method
   c. IMViC reactions
   d. Enzyme detection – Amylase, Gelatinase, lipase, caseinase, Catalase, and Oxidase
   e. Oxidative-fermentative test, arginine hydrolysis, ornithine, lysine decarboxylase, nitrate, nitrite reduction
7. Separation of mixtures by paper / thin layer chromatography.
8. Demonstration of column packing in any form of column chromatography.
9. Separation of protein mixtures by any form of chromatography.
10. Separation of protein mixtures by Polyacrylamide Gel Electrophoresis (PAGE).
11. Determination of absorption max for an unknown sample and calculation of extinction coefficient.
12. Separation of components of a given mixture using a laboratory scale centrifuge.

Program Name	**B.Sc./B.C.A**	Semester	**V**
Course Title	**Cyber Security(Theory)**		
Course Code:	**SEC-5**	No. of Credits	**03**
Contact hours	**30Hrs**	Duration of SEA/Exam	**01hrs**
Formative Assessment Marks	**25**	Summative Assessment Marks	**25**

Course Outcomes(COs): After the successful completion of the course, the student will be able to:

CO1	After completion of this course, students would be able to understand the concept of Cyber security and issues and challenges associated with it.
CO2	Students, at the end of this course, should be able to understand the cyber crimes, their nature, legal remedies and as to how report the crimes through available platforms and procedures.
CO3	On completion of this course, students should be able to appreciate various privacy and security concerns on online Social media and understand the reporting procedure of inappropriate content, underlying legal aspects and best practices for the use of Social media platforms.

Contents	**30Hrs**
Module-I. Introduction to Cyber security: Defining Cyberspace and Overview of Computer and Web-technology, Architecture of cyberspace, Communication and web technology, Internet, World wide web, Advent of internet, Internet infrastructure for data transfer and governance, Internet society, Regulation of cyberspace, Concept ofcyber security, Issues and challenges of cyber security.	10
Module-II . Cyber crime and Cyber law:Classification of cyber crimes, Common cyber crimes- cyber crime targeting computers and mobiles, cyber crime against women and children, financial frauds, social engineering attacks, malware and ransomware attacks, zero day and zero click attacks, Cybercriminals modus-operandi, Reporting of cyber crimes, Remedial and mitigation measures, Legal perspective of cyber crime, IT Act 2000 and its amendments, Cyber crime and offences, Organisations dealing with Cyber crime and Cyber security in India, Case studies.	10
Module III. Social Media Overview and Security: Introduction to Social networks. Types of Social media, Social media platforms, Social media monitoring, Hashtag, Viral content, Social media marketing, Social media privacy, Challenges, opportunities and pitfalls in online social network, Security issues related to social media, Flagging and reporting of inappropriate content, Laws regarding posting of inappropriate content, Best practices for the use of Social media, Case studies.	10

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes

Course Out comes(COs) /Program Outcomes (POs)	**Program Outcomes (POs)**														
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
Quickly understand the given problem and come up with the correct answer															
Identify, construct and compute numerical situations by work with numbers															

Conceive and develop a methodology for analyzing data and solving a problem.														
Define, modify and apply critical thinking to real time situations.														

Pedagogy: Problem Solving

Formative Assessment for Theory	
Assessment Occasion/type	**Marks**
Internal Test1	30%
Assignment/Surprise Test	20%
Total	**25Marks**
Formative Assessment as per guidelines.	

Text/References	
1	Cyber Crime Impact in the New Millennium, by R. C Mishra , Auther Press. Edition 2010
2	Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives by Sumit Belapure and Nina Godbole, Wiley India Pvt. Ltd. (First Edition, 2011)
3	Security in the Digital Age: Social Media Security Threats and Vulnerabilities by Henry A. Oliver, Create Space Independent Publishing Platform. (Pearson , 13th November, 2001)
4	Cyber Laws: Intellectual Property & E-Commerce Security by Kumar K, Dominant Publishers.
5	Fundamentals of Network Security by E. Maiwald, McGraw Hill.
6	Network Security Bible, Eric Cole, Ronald Krutz, James W. Conley, 2nd Edition, Wiley India Pvt. Ltd.

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UNIVERSITY OF MYSORE

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No.AC2(S)/55/2024-25

Dated: 05.08.2024

Notification

Sub:-Syllabus and Scheme of Examinations of Constitutional Values with reference to Environmental Studies (UG) programme (I & II Semester) from the Academic year 2024-25.

Ref:- 1. Decision of Board of Studies in Environmental Science (CB) meeting held on 10.06.2024.

2. Orders of the Hon'ble Vice-Chancellor dated: 05.08.2024.

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The Board of Studies in Environmental Science (CB) which met on 10-06-2024 has resolved to recommend and approved the Syllabus and Scheme of examinations of Environmental Studies for UG programme (I & II Semester) with effect from the Academic year 2024-25.

Pending approval of the Academic Council meeting the above said Syllabus and Scheme of examinations are hereby notified.

The Syllabus and Scheme of Examinations content may be downloaded from the University Website i.e., www.uni-mysore.ac.in.

Draft approved by the Registrar

05/08

Deputy Registrar(Academic)

Deputy Registrar (Academic)
University of Mysore
Mysore-570 005

To;

1. All the Principal of affiliated Colleges of University of Mysore, Mysore.
2. The Registrar (Evaluation), University of Mysore, Mysuru.
3. The Chairman, BOS/DOS in Environmental Science, Manasagangothri, Mysore.
4. The Dean, Faculty of Science & Technology, DOS in Mathematics, MGM.
5. The Director, Distance Education Programme, Moulya Bhavan, Manasagangotri, Mysuru.
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8. The Deputy Registrar/Assistant Registrar/Superintendent, Administrative Branch and Examination Branch, University of Mysore, Mysuru.
9. The PA to Vice-Chancellor/ Registrar/ Registrar (Evaluation), University of Mysore, Mysuru.
10. Office Copy.

University of Mysore

Environmental Studies for degree courses
(I and II Semester)

Revised Syllabus
2024-2025 onwards

Department of Studies in Environmental Science
University of Mysore
Mysore – 570 005

2024-2025

Environmental Studies for Bachelor degree courses of University of Mysore
Compulsory course / Constitutional values
I/II Semester

	Content of AECC – Environmental Studies 2 Credits with 03 Hours of Teaching per week	45 hours
Unit 1	**Introduction to Environmental Studies**	
	Multidisciplinary nature of environmental studies Scope and importance; Concept of sustainability andsustainable development.	02
Unit 2	**Ecosystems**	
	Ecosystem - Structure and function of ecosystem; Energy flow in an ecosystem: food chains, food webs and ecologicalsuccession. Case studies of the following ecosystems: a) Forest ecosystem, b) Grassland ecosystem, c) Desert ecosystem, Aquatic ecosystems (ponds, streams, lakes, rivers, oceans,estuaries)	06
Unit 3	**Natural Resources: Renewable and Non-RenewableResources**	
	Land resources and land-use change; Land degradation, soil erosion and desertification. Deforestation: Causes and impacts due to mining, dam building on environment, forests, biodiversity and tribalpopulations. Water: Use and over-exploitation of surface and ground water, floods, droughts, conflicts over water (international & inter-state). Energy resources: Renewable and non-renewable energy sources, use of alternate energy sources, growing energy needs, case studies.	07
Unit 4	**Biodiversity and Conservation**	08
	Levels of biological diversity: Genetic, species and ecosystem diversity; Biogeographic zonesof India;	
	Biodiversity patterns and global biodiversity hot spots. India as a mega-biodiversity nation; Endangered and endemic species of India. Threats to biodiversity: Habitat loss, poaching of wildlife, man-wildlife conflicts, biological invasions; Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity. Ecosystem and biodiversity services: Ecological, economic, social, ethical, aesthetic and Informational value.	

Unit 5	**Environmental Pollution**	07
	Environmental pollution: types, causes, effects and controls; Air, water, soil and noise pollution, Nuclear hazards and human health risks Solid waste management, Control measures of urban andindustrial waste Pollution case studies.	
Unit 6	**Environmental Policies & Practices**	**07**
	Climate change, global warming, ozone layer depletion, acid rain and impacts on human communities andagriculture. Environment Laws: Environment Protection Act; Air (Prevention & Control of Pollution) Act; Water (Prevention and control of Pollution) Act; Wildlife Protection Act; Forest Conservation Act. International agreements: Montreal and Kyoto protocols and Convention on Biological Diversity (CBD). Nature reserves, tribal populations and rights, and human wildlife conflicts in Indian context	
Unit 7	**Human Communities and the Environment**	06
	Human population growth: Impacts on environment,human health and welfare. Resettlement and rehabilitation of project affected persons;case studies. Disaster management: floods, earthquake, cyclones andlandslides. Environmental movements: Chipko, Silent valley, Bishnoisof Rajasthan Environmental ethics: Role of Indian and other religions and cultures in environmental conservation Environmental communication and public awareness, casestudies (e.g., CNG vehicles in Delhi).	
Unit 8	**Field work**	02

Reference:	1. Carson, R. (2002). Silent Spring. Houghton Mifflin Harcourt. 2. Gadgil, M., & Guha, R. (1993). This Fissured Land: An Ecological History of India. 3. Univ. of California Press. 4. Gleeson, B. and Low, N. (eds.) (1999). Global Ethics and Environment, London,Routledge. 5. Glejck, P. H. (1993). Water in Crisis. Pacific Institute for Studies in Dev., Environment & Security. Stockholm Env. Institute, Oxford Univ. Press. 6. Groom, Martha J., Gary K. Meffe, and Carl Ronald Carroll. (2006). Principles ofConservation Biology. Sunderland: Sinauer

Associates.

7. Grumbine, R. Edward, and Pandit, M.K. (2013). Threats from India's Himalayadams. Science, 339: 36-37.
8. McCully, P. (1996). Rivers no more: the environmental effects of dams (pp. 29-64). Zed Books.
9. McNeill, John R. (2000). Something New Under the Sun: An EnvironmentalHistory of the Twentieth Century.
10. Nandini, N. (2019). A text book on Environmental Studies (AECC). Sapna BookHouse, Bengaluru.
11. Odum, E.P., Odum, H.T. & Andrews, J. (1971). Fundamentals of Ecology. Philadelphia: Saunders.
12. Pepper, I.L, Gerba, C.P. & Brusseau, M.L. (2011). Environmental and PollutionScience. Academic Press.
13. Rao, M.N. & Datta, A.K. (1987). Waste Water Treatment. Oxford and IBHPublishing Co. Pvt. Ltd.
14. Raven, P.H., Hassenzahl, D.M. & Berg, L.R. (2012). Environment. 8th edition. JohnWiley & Sons.
15. Rosencranz, A., Divan, S., & Noble, M. L. (2001). Environmental law and policy inIndia. Tripathi 1992.
16. Sengupta, R. (2003). Ecology and economics: An approach to sustainabledevelopment. OUP.
17. Singh, J.S., Singh, S.P. and Gupta, S.R. (2014). Ecology, Environmental Science andConservation. S. Chand Publishing, New Delhi.
18. Sodhi, N.S., Gibson, L. & Raven, P.H. (eds). (2013). Conservation Biology: Voicesfrom the Tropics. John Wiley & Sons.
19. Thapar, V. (1998). Land of the Tiger: A Natural History of the Indian Subcontinent.Warren, C. E. (1971). Biology and Water Pollution Control. WBSaunders.
20. Wilson, E. O. (2006). The Creation: An appeal to save life on earth. New York:Norton.
21. World Commission on Environment and Development. (1987). Our CommonFuture. Oxford University Press.

(MODEL QUESTION PAPER 1st to 2nd semester)
ENVIRONMENTAL STUDIES
(MAX MARKS: 50 (C_1:5 + C_2:5 + C_3:40)

Time: 2 hrs **Max. Marks: 40**

Note: 1. Answer all questions
Draw neat-labeled diagrams and give examples wherever necessary

SECTION A

Answer all the questions **10X 1 =08 marks**

1. Answer in one word or a sentence

a.
b.
c.
d.
e.
f.
g.
h.

SECTION B

II. Write short notes on any FOUR of the following: **4 X 3 = 12 Marks**

2.
3.
4.
5.
6.

SECTION C

III. Answer any TWO of the following: **2 x 10 = 20 Marks**

9.
10.
11.

References:

1. Anthony R.N., D.F. Hawkins and K.A. Merchant, *Accounting: Text and Cases* , McGraw Hill, 1999
2. Richard G. Schroeder, Myrtle W. Clark and Jack M. Cathey, *Financial Accounting Theory and Analysis: Text Readings and Cases*, John Wiley and Sons, 2005.
3. Ahmed RiahiBelkaoui, *Accounting Theory*, Quorm Books, 2000.
4. JawaharLal, *Accounting Theory and Practice*, Himalaya Publishing House, 2008.
5. L.S. Porwal, *Accounting Theory*, TMH, 2000.
6. Thomas R.Dyckman, Charles J Davis, Roland E.Dukes, *Intermidate Accounting*, Irwin McGraw-Hill.
7. Eldon S. Hendriksen, Accounting Theory.
8. www.iasb.org.
9. www.icai.org.
10. www.dca.gov.in

HC02: CORPORATE GOVERNANCE AND BUSINESS ETHICS

1. Course Description:

The course provides coverage of concept of corporate governance, ethics, Corporate Social Responsibility and corporate governance in India and reforming of BOD and different Committees

2. Course Objectives:

This subject aims to:

a) Enable the student to understand the concept of corporate governance;
b) Help students to know about corporate ethics and cultural influences;
c) Impart knowledge of corporate social responsibility and accountability; and
d) Give information about the corporate governance reforming committee reports in India.

3. Pedagogy:

The subject matter will be presented through lecture, class discussion, student presentation, Guest lectures and laboratory experiences.

4. Course Contents:

Module 1: Concept of Corporate Governance: Its importance, Principles of corporate governance, OECD Principles of corporate governance, Theories of corporate governance-Agency theory and stewardship theory, Models of corporate governance around the world, Need for good corporate governance, present scenario and case studies.

Module 2: Corporate Governance and Role of committees in India: Need and Importance of Committee Reports, Emergence of corporate governance, corporate governance committees-Cadbury Committee on corporate governance, 1992, Sarbanes-Oxley Act, 2002, Kumar Mangalam Birla Committee, 1999, Naresh Chandra Committee Report, 2002, Narayana Murthy committee Report, 2003, Dr. J. J. Irani Committee Report on Company Law, 2005, -case studies.

Module 3: Business Ethics: Concept and Importance, Nature and importance of Business ethics, Principles of Business ethics, Arguments for and against business ethics, benefits of

corporate ethics, techniques to improve ethical conduct of business, Ethics in functional areas of business marketing, HRM, Accounting and auditing, Finance, etc, ethics and Science and technology, philosophy and culture managing ethics and legal compliance case analysis.

Module 4: Corporate Social Responsibility: Corporate crimes-company and society relations, corporate social challenges-corporate accountability-business and ecology-case analysis.

References:

1. Business ethics by L.P. Hartman, Tata Mc Grawhill.
2. Business ethics by W.H.Shaw-(Thomson)7
3. Corporate management and Accountability by L.C. Gupta (Mc Millan Institute for FM and Research, Chennai-1974)
4. Strategic Management by Hill, Ireland and Horkisson (Thomson)
5. Business and society by Keith Davis (Mc Graw Hill)
6. Corporate Governance by Kenneth Kim, John R. Nofsinger, Derek J Mohr, 2010 3/E, Prentice Hall

HC03: FINANCIAL MANAGEMENT

1. Course description:

Financial decision making assumes greater importance in maximising value of an organisation. This course is designed to focus on the analysis of three crucial long term financial decisions- (1) Cash flow measurement, (2) Capital budgeting, (3) Cost of capital and, (4) Capital Structure. Risk analysis of capital budgeting decision is added as a special topic.

2. Course Objectives:

To equip students with necessary skills to evaluate capital projects with a focus on advanced capital budgeting techniques like MIRR (Modified IRR) and selection of projects under conditions of risk and uncertainty. To enable students analyse the leverage and dividend decisions based on theoretical and practical framework.

3. Pedagogy:

Students to work out detailed case studies involving the application of various criteria for project selection including risk analysis of capital projects. Analysis of leverage and dividend polices should be based on a sample of leading corporate organisations such as SENSEX companies, followed by seminar presentations and group discussions.

4. Course Contents:

Module 1: Cash Flow Measurement: Importance – Challenges dependence and independence of cash flows in evaluating projects, Measures of risk and returns. NCF estimation DCF Techniques NPV vs. IRR Conflicts, Fisher's rate of intersection, Multiple IRRs, MIRR, Capital Rationing

Module 2: Capital Budgeting: Inflation in capital budgeting, real vs. nominal discount rates. Risk Analysis in Capital Budgeting- Approaches to risk absorption- Expected Net Present Value (ENPV) - Payback method - Risk-Adjusted Discount rate - Use of Normal Distributions - Sensitivity analysis - Measurement of Project Risk- Risk analysis of Project Portfolios.

References:

1. Statistical Methods: S.P. Gupta
2. Statistics: Sanchetti and Kapoor
3. Statistics: Chandan
4. Econometrics: Wonnacott and Wonnacott Wiley Publications
5. Statistical Analysis for Decision Makin: Morris Hamber

SC03: ADVANCED AUDITING

1. Course Description:

This paper is to educate the present auditing practices, conceptual understanding, different terminologies, International Auditing practices, comparison with Indian Auditing practices. To know leading & Top Auditing Firms and its importance, to learn Auditing and Digitalisation, Indian Standards on Auditing (SA), major scams in India and its impact on economy of the Country.

2. Course Objectives:

After completion of the course the students should capable with:

a) To understand the conceptual ideology of auditing and its practices.
b) To know the importance of auditing with different accounting practices.
c) To compare the national auditing practices with international auditing principles.
d) To have a detailed knowledge on Auditing Standards and its uses.
e) To evaluate impact of auditing on the Indian & global economy and its contribution for the economic development.

3. Pedagogy:

The course content is covered class room lecture, students' interaction/seminar, case discussion, major scams and work out the practical insight of auditing issues, challenges as an auditor and also visiting companies for practical exposure. Practical Works: Auditing, Standards, Practice Manuals, Leading and pending cases on auditing issues, on-line auditing methods, proper scrutiny and verification of accounting for best auditing practices.

4. Course Contents:

Module 1: Introduction - Objectives of Auditing, Different Types of Auditing, Auditor - Qualification, Qualities, Rights and Duties, Computerised Environment, Auditing and Digitalisation, Audit Programme, Internal Check and Internal Control. Government Accounting, Professional Accounting, Auditing Boards - GAAS, CAG, PCAOB.

Module 2: Auditing Standards and Audit Procedures

Auditing Standards - Generally Accepted Auditing Standards, Introductory Matters SA 100-199, General Principles and Responsibilities SA 200-299, General Activities SA 1200, Auditor Communications SA 260, Quality Control for an Audit of Financial Statements, Statements SA 220 and Guidance Notes -Case studies.

Audit Procedures - Audit Planning and Risk Assessment SA 300-499, Auditing Internal Control Over Financial Reporting, Audit Procedures in Response to Risks—Nature, Timing, and Extent, Auditor's Responsibilities Regarding Supplemental and Other Information, Concluding Audit Procedures, Post-Audit Matters. Case Studies.

Module-3: Audit Reports - Auditor Reporting SA 700-799, Reporting on Audits of Financial Statements, Other Reporting Topics, Matters Relating to Filings Under Federal Securities Laws, Other Matters Associated with Audits (SA 6101, SA 6105, SA 6110, SA 6115). Standards on Quality Control (SQCs), Standards on Auditing (SAs), Audit Committee and Corporate Governance, Audit of Limited Companies Schedule III of Companies Act 2013

Environmental Auditing, Audit Data Analytics, Case Studies - Leading & Top Auditing Firms -Case studies.

Module: 4: Audit Regulation and Laws - CAG Recommendations, Hierarchy of Audit regulations in India, Investigation, Forensic Audit, Peer and Quality Review, Auditing Software - Winman, SAP, Audit related Penalties, Imprisonment and Prosecution, Rethinking of Audit, International Auditing Practices, Comparison with Indian Auditing practices. Indian Standards on Auditing (SA), Major Scams in India and its Impact on Economy of the Country, Case Studies- Kingston Cotton Mill Company 1896, Satyam Scandal/Scam 2008 and 2G Spectrum Scam 2010.

References:

1. A Hand Book of Practical Auditing – by B.N. Tandon, S. Sundharabahu & S Sudharsnam, Publisher: S.Chand Publishing, New Delhi.
2. Advanced Auditing and Professional Ethics – ICAI, https//www.icai.org/Auditing Standard
3. Internal Audit Practice from A to Z, Patrick Onwura Nzechukwu, Book Store, https://bookstore.theiia.org/
4. Advanced Auditing & Professional Ethics, By CA Panakj Garg,
5. Simplified Approach to Advanced Auditing and Professional Ethics by Vikas Oswal
6. https://www.cag.gov.in/content/audit-regulations
7. https://www.aicpa.org/research/standards/auditattest/sas.html
8. https://www.investopedia.com/terms/g/gaas.asp
9. https://www.dummies.com/business/accounting/auditing/generally-accepted-auditing-standards/

HC06: HUMAN RESOURCE MANAGEMENT

1. Course Description:

This course provides the coverage of concept of HRM, Human resources planning and procurement, human resource development and compensational and rewards system.

2. Course Objectives:

The objective of this course is to provide the student the knowledge about human resources, their significance and managing them in organisations.

3. Pedagogy:

Teaching method comprises of lecture sessions and tutorials. Lecture sessions focus on providing conceptual understanding and analytical setting for select aspects of the course content.

4. Course Contents:

Module 1: Human resource management-Meaning and definition – Objectives - Scope and functions-Operational Functions - Perspective of HRM: linking corporate strategies and policies with HRM department.

Module 2: Human Resources Planning and Procurement: Job analysis and evaluation- job description-job specification -job rotation and job enrichment. Human resource planning importance- objectives and problems. Recruitment-meaning-recruitment policy, sources – factors affecting selection decision-selection procedure Types of Interviews - Induction programmes. Human resource information system and e-recruitment.

Module 3: Human Resource development: Meaning-concepts of HRD-objectives of training-organisation of training programmes-methods-advantages and limitations of training. Evaluation of training programme - HRD for total quality management. Transfer policy Promotion policy-Demotion and Discipline- consequences of indiscipline –disciplinary procedure.

Module 4: Compensation management: Significance of compensation system in business organisation. Compensation system in practice-systems of promoting -factors determining employee compensation and rewards-dearness allowance, employee benefits-bonus-laws on wages, bonus and social security-managerial compensation. Performance Appraisal: concepts, objectives philosophy and types of performance appraisal- process of performance appraisal system- counseling.-career planning and management.

References:

1. Human Resource Management: Strategies and Action -Armstrong
2. Human Resource Management -Dr.Ashwathappa
3. Personnel and Human Resource Management -D.A. Deonz and F.P. Robins
4. Personnel Management - Edwin Phillip
5. Human Resources Management—L.M. Prasad

Name of the Program: Bachelor of Commerce (B.Com.)

Course Code: COM 5.3

Name of the Course: Principles and Practice of Auditing

Course Credits	No. of Hours per Week	Total No. of Teaching Hours
4 Credits	4 Hrs	60 Hrs

Pedagogy: Classrooms lecture, Case studies, Group discussion, Seminar & field work etc.,

Course Outcomes: On successful completion of the course, the students' will be able to

a) Understand the conceptual framework of auditing.
b) Examine the risk assessment and internal control in auditing
c) Comprehend the relevance of IT in audit and audit sampling for testing.
d) Examine the company audit and the procedure involved in the audit of different entities.
e) Gain knowledge on different aspect of audit reporting and conceptual framework applicable on professional accountants.

Syllabus:	**Hours**
Module No. 1: Introduction to Auditing	**10**
Introduction – Meaning and Definition – Objectives– Types of Audit– Merits and Demerits of Auditing – Relationship of audit with other disciplines. Preparation before commencement of new audit - Working Papers -Audit Note Book, Audit Programme Qualities of an Auditor – Audit planning – Audit strategy —Audit Engagement -Audit Documentation - Audit Evidence – Written Representation.	
Module No. 2: Risk Assessment and Internal Control	**12**
Introduction – Audit risk – Assessment of risk – Internal Control-Meaning and objectives– Internal check- Meaning, objectives and fundamental Principles. Internal check with regards to wage payment, cash sales, and cash purchases.	
Module No. 3: Verification and Valuation of Assets and Liabilities	**12**
Meaning and objectives of verification and valuation – Position of an auditor as regards the valuation of assets- Verification and Valuation of different items of Assets- Land and Building, Plant and Machinery, Goodwill, Investments, Stock in Trade. Liabilities-Bills payable, Sundry Creditors and Contingent liabilities.	
Module No. 4: Company Audit and Audit of other Entities	**13**
Company Auditor: appointment, Qualification, powers, duties and liabilities, professional ethics of an auditor. Other Entities: Audit Procedure of NGOs - Charitable institutions - Educational institutions – Government – Local Bodies – Cooperative societies – hotels – hospitals – clubs & Banks.	
Module 5: Audit Report & Professional Ethics	**13**
Introduction – Meaning – Elements of audit report –Types of audit report - Independent Auditor's report and their illustration; Professional Ethics: Code of Ethics - Professional Accountants in Public practices and business – Fundamental Principles of Professional Ethics.	

II Semester **Discipline Specific Course (DSC)**

Company Law

LTP: 4+0+0 **4 Hours per week**

OBJECTIVE:

- To enable the students to understand the types of companies incorporated in India and the promoters involved in forming a company and Company administration till its Liquidation.

OUTCOMES:

- The students will understand the frame work of Companies Act of 2013.
- Identify the stages of formation and documents involved in the formation of a company.
- Role of Managerial Personnel and procedure of conducting company meetings.

UNIT – I Introduction to Company: Meaning and Definition – Features of Companies Act of 2013 – Types of Companies –Private Company - Public Company - Company Limited by Shares – Company Limited by Guarantee – Unlimited Companies – One Person Company – Holding and Subsidiary Companies – Government Company - Associate Company.

UNIT – II Formation of Companies: Introduction – Steps involved in formation of a company – Position and Functions of Promoters – Meaning and contents of Prospectus, Memorandum of Association and Articles of Association – Alteration of MOA and AOA - Certificate of Commencement of Business – Formation of Global Companies – Features – Legal formalities.

UNIT – III Company Administration: Managerial Personnel – Managing director appointment, powers, duties and responsibilities – Whole time Director – Independent Director – Auditor's appointment: Qualification, duties and responsibilities – Company Secretary: Qualifications, Appointment, Rights, Duties, Liabilities and Removal.

UNIT – IV Company Meetings: Meaning – Types of company meetings – Importance — Requisites of a valid meeting – Notice – Quorum – Resolutions – Voting - Proxy – Role of a Company Secretary in convening the meetings.

UNIT – V Liquidation of Companies: Meaning – Modes of Liquidation – Consequence of Liquidation – Appointment of Official Liquidator – Duties and Responsibilities of Liquidator.

SKILL DEVELOPMENT

1. Collect the Prospectus, Memorandum of Association and Articles of Association of a Company.
2. Collect a notice of a meeting from any company.
3. List the names of Directors and Managing Director of any five companies.
4. List the names of full time company secretaries in India.
5. Name any five companies liquidated during last 2 years in India.

Books for Reference:

1. Company Law and Secretarial Practice by N.D. Kapoor, Sultan Chand and Sons
2. Company Law and Secretarial Practice by S.C. Kuchal
3. Elements of Corporate Law by S.N.Maheshwari, Himalaya Publication House
4. Corporate Administration by K.Venkataramana, SHBP
5. Business Law for Management by Balachandran, Himalaya Publishing House.

Name of the Program: Bachelor of Commerce (B.Com.)
Course Code: B.Com. 4.6 (OEC)
Name of the Course: Corporate Governance

Course Credits	No. of Hours per Week	Total No. of Teaching Hours
3 Credits	3 Hrs	42 Hrs

Pedagogy: Classroom lectures, Case studies, Group discussion & Seminar etc.,

Course Outcomes: On successful completion of the course, the Students will be able to

a) Identify the importance of corporate governance.
b) Know the rights, duties and responsibilities of Directors.
c) Analyse the legal & regulatory framework of corporate governance.
d) Outline the importance and role of board committee.
e) Understand the major expert committees' Reports on corporate governance.

Syllabus:	**Hours**
Module No. 1: Corporate Governance	10

Introduction, Its importance, Principles of corporate governance, OECD Principles of corporate governance, Theories of corporate governance-Agency theory and stewardship theory, Models of corporate governance around the world, Need for good corporate governance - Evolution of Corporate Governance – Ancient and Modern Concept - Concept of Corporate Governance, Generation of Value from Performance - Principles of Corporate Governance.

Module No. 2: Corporate and Board Management	10

Corporate Business Ownership Structure - Board of Directors – Role, Composition, Systems and Procedures - Fiduciary relationship - Types of Directors- Promoter/Nominee/Shareholder/Independent - Rights, Duties and Responsibilities of Directors; Role of Directors and Executives – Responsibility for Leadership, Harmony between Directors and Executives -Training of Directors- need, objective, methodology - Scope and Responsibilities and competencies for directors - Executive Management Process, Executive Remuneration - Functional Committees of Board - Rights and Relationship of Shareholders and Other Stakeholders.

Module No. 3: Legal and Regulatory Framework of Corporate Governance	08

Need for Legislation of Corporate Governance - Legislative Provisions of Corporate Governance in Companies Act 1956, Securities (Contracts and Regulations) Act, 1956 (SCRA), Depositories Act 1996, Securities and Exchange Board of India Act 1992, Listing Agreement, Banking Regulation Act, 1949 and Other Corporate Laws - Legal Provisions relating to Investor Protection.

Module No. 4: Board Committees and Role of Professionals	08
Board Committees - Audit Committee, Remuneration Committee, Shareholders' Grievance Committee, other committees - Need, Functions and Advantages of Committee Management -Constitution and Scope of Board Committees - Board Committees' Charter - Terms of Reference and Accountability and Performance Appraisals - Attendance and participation in committee meetings - Independence of Members of Board Committees - Disclosures in Annual Report; Integrity of Financial Reporting Systems - Role of Professionals in Board Committees - Role of Company Secretaries in compliance of Corporate Governance.	
Module No. 5: Corporate Governance - Codes and Practices	06
Introduction - Major Expert Committees' Reports of India - Study of Codes of Corporate Governance - Best Practices of Corporate Governance - Value Creation through Corporate Governance - Corporate Governance Ratings.	

Skill Development Activities:

1. Collect the annual reports of any two companies, find out the corporategovernance aspects in the reports.
2. Collect any two companies Board of Directors names and find out theirnature ofdirectorship.
3. Prepare report on the applicability of different models of Corporate Governance.
4. Critically compare the recommendations of various corporate governancecommittee.
5. Any other activities, which are relevant to the course.

Text Books:

1. Bairs N. and D Band, Winning Ways through Corporate Governance, MacmillanLondon.
2. Charkham J, Keeping Good Company: A Study of Corporate Governance in FiveCountries, Oxford University Press, London.
3. Subhash Chandra Das, Corporate Governance in India – An Evaluation (Third edition), PHI Learning Private Limited.
4. Clark T. and E Monk House, Rethinking the Company, Pitman, London.
5. Fernando A.C, Corporate Governance, Pearson Education.
6. Prentice D.D. and PRJ Holland, Contemporary Issues in Governance, ClarendonPress.
7. Report of the Cadbury Committee on Financial Aspects of CorporateGovernance, London Stock Exchange, London.
8. Report on Corporate Governance, Confederation of India Industries and Bombay.

Note: Latest edition of text books may be used.

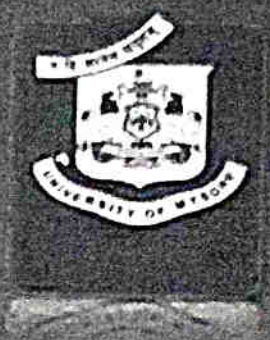
CHOICE BASED CREDIT SYSTEM
CONTINUOUS ASSESSMENT GRADING PATTERN (CBCS-CAGP)

VERSION - IV

UNIVERSITY OF MYSORE

Department of Studies in Chemistry

Manasagangotri Mysuru –570 006



REVISED SYLLABUS FOR M. Sc. DEGREE PROGRAMME

2019-20

GUIDELINES AND REGULATIONS LEADING TO MASTER OF SCIENCE IN CHEMISTRY (TWO YEARS - SEMESTER SCHEME UNDER CBCS-CAGP)

Programme details

Name of the Department	: Department of Studies in Chemistry
Subject	: Chemistry
Faculty	: Science and Technology
Name of the Programme	: Master of Science (M. Sc.)
Duration of the Programme	: 2 years- divided into 4 semesters

Programme objectives

- To provide the latest subject matter both theory as well as practicals in such a way to foster their core competency and discovery learning. A chemistry post graduate as envisioned in this framework would be sufficiently competent in the field to understand further discipline specific studies as well as to begin domine related employment.
- To mould a responsible citizen who is aware of most basic domain-independent knowledge including critical thinking and communication.
- Enable the graduate to prepare for national as well as international competitive examinations, especially UGC-CSIR NET and UPSC civil service examinations.

Programme outcome

- Students will have a strong foundation in the fundamentals and applications of current theoretical and practical chemistry including those in Analytical, Inorganic, Organic and Physical Chemistry.
- Students will be able to design and carry out scientific experiments and accurately record and analyze the results of the experiments.
- Students will be skilled in problem solving, critical thinking and analytical reasoning as applied to scientific problems.
- Students will be able to explore new areas of research in both chemistry and allied fields such as Biochemistry, Material Chemistry, Pharmaceutical chemistry and chemical biology and related technology.
- Students will understand the central role of chemistry to our society which includes understanding of safe handling of chemicals, environmental issues and key issues facing our society in energy, health and medicine.

GENERAL SCHEME WITH RESPECT TO ASSESSMENT OF CREDITS

Semester	Hard Core		Soft Core			Open Elective
	Theory			Theory	Practicals	
I	I	3 + 0 + 0 = 3	A	2 + 0 + 0 = 2*	0 + 0 + 4 = 4[a]	-
	O	3 + 0 + 0 = 3	I	2 + 0 + 0 = 2*	0 + 0 + 4 = 4[a]	
	P	3 + 0 + 0 = 3	O	2 + 0 + 0 = 2*	0 + 0 + 4 = 4[a]	
	A	3 + 0 + 0 = 3	P	2 + 0 + 0 = 2*	0 + 0 + 4 = 4[a]	
II	I	3 + 0 + 0 = 3	A	2 + 0 + 0 = 2*	0 + 0 + 4 = 4[a]	4 + 0 + 0 = 4[c]
	O	3 + 0 + 0 = 3	I	2 + 0 + 0 = 2*	0 + 0 + 4 = 4[a]	
	P	3 + 0 + 0 = 3	O	2 + 0 + 0 = 2*	0 + 0 + 4 = 4[a]	
	G	3 + 0 + 0 = 3	P	2 + 0 + 0 = 2*	0 + 0 + 4 = 4[a]	
III	I	3 + 0 + 0 = 3	A	2 + 0 + 0 = 2	0 + 0 + 2 = 2[ab]	4 + 0 + 0 = 4[c]
	O	3 + 0 + 0 = 3	I	2 + 0 + 0 = 2	0 + 0 + 2 = 2[ab]	
	P	3 + 0 + 0 = 3	O	2 + 0 + 0 = 2	0 + 0 + 2 = 2[ab]	
	G	3 + 0 + 0 = 3	P	2 + 0 + 0 = 2	0 + 0 + 2 = 2[ab]	
IV	I	3 + 0 + 0 = 3	A	2 + 0 + 0 = 2	0 + 0 + 2 = 2[ab]	-
	O	3 + 0 + 0 = 3	I	2 + 0 + 0 = 2	0 + 0 + 2 = 2[ab]	
	P	3 + 0 + 0 = 3	O	2 + 0 + 0 = 2	0 + 0 + 2 = 2[ab]	
	A	3 + 0 + 0 = 3	P	2 + 0 + 0 = 2	0 + 0 + 2 = 2[ab]	
Total Credits	48		24 (48)			04

NOTE

A–Analytical; I–Inorganic; O–Organic; P–Physical; G - Spectroscopy; (L+T+P) - Theory + Tutorial + Practical

*Courses are compulsory for chemistry students in first and second semesters.

[a] 50% of the students will attend Analytical/Inorganic Practicals and remaining 50% students will attend Organic/Physical Practicals in I or III Semesters and vice-versa during II or IV Semesters.

[b] Practicals are only for Chemistry students which are compulsory papers.

[c] Courses are common for both II and III Semesters and the candidate can opt either in II or III semester

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UNIVERSITY OF MYSORE
Estd 1916

Vishwavidyanilaya Karyasoudha
Crawford Hall, Mysuru- 570 005

No.AC6/153/2020-21

Dated: 03-02-2022

Notification

Sub:- Revision of Syllabus, Project work, Dissertation are for M.Com Program for the academic year 2021-22.

Ref:- 1. BOS in Commerce meeting held on 23-11-2021
2. Decision of the Faculty meeting held on 30-11-2021.
3. Decision of the AC meeting held on 23-12-2021.

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The Board of studies in Commerce (PG) which met on 23-11-2021 has decided and recommended to revision of Syllabus, Project work, Dissertation for M.Com program from the Academic year 2021-22.

The Faculty of Commerce and Academic Council at their meetings held on 30-11-2021 and 23-12-2021 respectively have also approved the above said decision, hence it is hereby notified.

The syllabus and Examination pattern is annexed herewith and the contents may be downloaded from the University Website i.e., www.uni-mysore.ac.in

Draft approved by the Registrar

03/02
Deputy Registrar(Academic)
Deputy Registrar (Academic)
University of Mysore
Mysore 570 005

To:-

1. All the Principal of affiliated Colleges of University of Mysore, Mysore. Those who are running M.Com Courses.
2. The Registrar (Evaluation), University of Mysore, Mysuru.
3. The Chairman, BOS/DOS, in Commerce, Manasagangothri, Mysore.
4. The Dean, Faculty of Commerce, DOS in Commerce, Manasagangotri, Mysuru.
5. The Director, Distance Education Programme, Moulya Bhavan, Manasagangotri. Mysuru.

DOS IN COMMERECE, MANASAGANGOTRI, MYSORE

CHOICE BASED CREDIT SYSTEM

M.COM. COURSE STRUCTURE AND SYLLABUS - from 2021-2022 BATCH

CREDIT PATTERN FOR M.COM DEGREE PROGRAMME

MINIMUM CREDITS REQUIRED FOR M.COM. DEGREE PROGRAMME

I to IV Semesters	Hard Core Course		Soft Core Course		Open Elective Course		Total	
	Numbers	Credits	Numbers	Credits	Numbers	Credits	Numbers	Credits
	11	48	7	28	1	4	19*	80

MINIMUM CREDITS TO BE REGISTERED BY A STUDENT IN A CBCS SCHEME TO SUCESSFULLY COMPLETE M.COM. DEGREE IN FOUR SEMESTERS

Semesters	Hard Core Course		Soft Core Course		Open Elective Course		Total	
	Numbers	Credits	Numbers	Credits	Numbers	Credits	Numbers	Credits
I	4	16	1	4	-	-	5	20
II	3	12	1	4	1	4	5	20
III	2	08	3	12	-	-	5	20
IV	2	12	2	08	-	-	4*	20
TOTAL	11	44	8	32	1	4	19	80

1 SEMESTER

Sl. No.	Title of the Course	Credits			
		L	T	P	Total
Hard Core Papers					
HC01	Accounting Theory	3	1	0	4
HC02	Corporate Governance and Business Ethics	3	1	0	4
HC03	Financial Management	3	1	0	4
HC04	Marketing Management	3	1	0	4
Soft Core Papers					
SC01	Business Policy and Environment*	3	1	0	4
SC02	Statistics for Business Decisions*	3	1	0	4
SC03	Advanced Auditing*	3	1	0	4

*A student should opt **one** soft-core paper from SC01 or SC02 or SC03

Credits earned: Hard core: 16 Soft core: 4=20

II SEMESTER

Sl. No.	Title of the Course	Credits			
		L	T	P	Total
Hard Core Papers					
HC05	Capital Market Instruments	3	1	0	4
HC06	Human Resource Management	3	1	0	4
HC07	Organizational Behavior	3	1	0	4
Soft Core Papers					
SC04	Computer Applications in Commerce*	3	1	0	4
SC05	Strategic Management*	3	1	0	4
SC06	Foreign Exchange Management*	3	1	0	4
Open	**Open Elective Paper**				
OE01	Stock Markets and Investment Decisions	3	1	0	4

*A student should opt **one** soft-core paper from SC04 or SC05 or SC06

Credits earned: Hard core: 12 +Soft Core: 4+ OE: 4=20

III SEMESTER

Sl. No.	Title of the Course	Number of Credits			
		L	T	P	Total
Hard Core Papers					
HC08	Business Research Methods	3	1	0	4
HC09	International Business	3	1	0	4
Soft Core Papers					
SC07	Management of Social Enterprises*	3	1	0	4
SC08	Portfolio Management*	3	1	0	4
SC09	Entrepreneurship Development*	3	1	0	4
SC10	International Financial Management*	3	1	0	4
SC11	Elective Group A: Business Taxation Paper 1: Indirect Tax Law and Practice**	3	1	0	4
SC12	Elective Group B: Financial Accounting Paper 1:Contemporary Areas of Financial Accounting**	3	1	0	4
SC13	Elective Group C: Financial Management Paper 1: Strategic Financial Management **	3	1	0	4
SC014	Elective Group D: Human Resource Management Paper 1: Strategic Management of Human Resources**	3	1	0	4
SC15	Elective Group E: Management Accounting Paper 1:Marginal Costing and Decision Making**	3	1	0	4

*A student should opt **one** Soft core paper SC07 or SC08 or SC09 or SC10

A student should opt **two Elective group from Elective Group A, B, C, D & E

Credits earned: Hard core: 8 Soft Core: 12 =20 (8+4+8)

Sl. No.	Title of the Course	Number of Credits			
		L	T	P	Total
Hard Core Papers					
HC10	International Accounting	3	1	0	4
HC11	Dissertation	0	2	6	8
Soft Core Papers					
SC16	Elective Group A: Business Taxation Paper 2: Corporate Tax Law and Planning	3	1	0	4
SC17	Elective Group B: Financial Accounting Paper 2: International Financial Reporting Standards	3	1	0	4
SC18	Elective Group C: Financial Management Paper 2: Financial Derivatives	3	1	0	4
SC19	Elective Group D: Human Resource Management Paper2: International Human Resource Management	3	1	0	4
SC20	Elective Group E: Management Accounting Paper 2: Cost Management	3	1	0	4

Credits earned: Hard core: 12 Soft Cores: 08

DISSERTATION

A student in the fourth semester shall register for a Dissertation Work which carries 8 credits. Work load for Dissertation Work - Tutorial class is for 2 hour per batch of 8 students per week per teacher. The student shall do field work and library work in the remaining 6 hours per week. Continuous assessment criteria for Dissertation work include:

Component-I(C 1): Presentation of synopsis and Periodic Progress Reports – 40 Marks

Component- II (C 2): Final Viva-voce (Board of Examiners) – 40 Marks

Component-III (C3): Dissertation Evaluation - 120 Marks.

Total -200 Marks

The Dissertation shall be prepared as per the broad guidelines given below:

a) Dissertation shall be typed in Times New Roman with one and half line spacing in 12 Font Size.
b) The size of the Dissertation shall be with a minimum of 40,000 words and a maximum of 50,000 words.
c) Dissertation shall be printed on both sides of the paper.
d) The Dissertation shall be Normal/ spiral bounded.