

**RATHINAM COLLEGE OF ARTS AND SCIENCE
(AUTONOMOUS)**

Eachanari, Coimbatore – 641021

DEPARTMENT OF BIOTECHNOLOGY



Syllabus for

B.Sc. Biotechnology

(I, II, III & IV Semester)

2018 to 2019 Batch on wards

VISION AND MISSION OF THE INSTITUTION

VISION

A world renowned Industry Integrated Institution that imparts knowledge, skill and research culture in young men and women to suit emerging young India.

MISSION

To provide quality education at affordable cost and to maintain academic and research excellence with a keen focus on Industry Integrated Research and Education.

VISION AND MISSION OF THE DEPARTMENT

VISION

The Department to impart in-depth of knowledge in biotechnology to create a pool of scientific personnel with expertise in living system.

MISSION

The significant role being played by biotechnologists in industrial development and has sought to implement an integrated approach towards education and research.

PROGRAM EDUCATIONAL OBJECTIVE (PEO)

PEO 1: Scientific Knowledge – students will able to learn the strong foundation of fundamentals biological science to applied with living and non living things.

PEO 2: Technical Skill – Student will able exercise the recent and advanced techniques on biotechnology protocol to help the industrial process.

PEO 3: Analysis and understanding – The chances of Students will trouble shoot the technology based problems on their ideas through academic research

PEO 4: Scale up of requirements – The outcome of biotechnology graduates to meet the emerging needs for biotechnologists in India and abroad.

MAPPING OF INSTITUTE MISSION TO PEO

Institute Mission	PEO's
Imparting Knowledge and Skill	PEO1, PEO2
Research Culture	PEO3
Industry Collaboration	PEO2
Emerging young India	PEO4

MAPPING OF DEPARTMENT MISSION TO PEO

Department Mission	PEO's
Significant role of Biotechnologist	PEO1, PEO2
Implementation of Industrial Development	PEO3, PEO4
Integration of Education and research	PEO2, PEO3

PROGRAM OUTCOMES

PO1: Ability to gain the knowledge fundamental fields of biotechnology

PO2: Ability to apply the knowledge of chemistry, Mathematics and computer to biotechnology problem solving.

PO3: Ability to learn the technical knowledge to conduct the experiments

PO4: Ability to manage and solve the technical problems on experiments

PO5: Ability to apply their ideas on their own research like Mini Project.

PO6: Ability to join and share their scientific ideas.

PO7: Ability to locate the need for society

PO8: Ability to understand the Professional and ethical responsibility

CORRELATION BETWEEN THE POs AND THE PEOs

Program Outcomes	PEO1	PEO2	PEO3	PEO4
PO1	√			
PO2	√	√		
PO3		√	√	
PO4		√	√	
PO5			√	√
PO6				√
PO7	√		√	
PO8	√			√

Components considered for course delivery is listed below:

- 1.Class room Lecture - I
- 2.Laboratory class and demo - II
- 3.Assignments - III
- 4.Mini Project - IV
- 5.Project - V
- 6.Online Course - VI
- 7.External Participation - VII
- 8.Seminar - VIII
9. Internship - IX

**RATHINAM COLLEGE OF ARTS & SCIENCE
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Scheme of Curriculum for Biotechnology for the Batch admitted during 2018-2019 Onwards

Sem	Part	Type	Sub Code	Subject	Credit	Per Week	CIA	ESE	Total	Exam Hours
1	1	L1	17BGE11T	Language - I	3	5	40	60	100	3
1	2	E1	17BBT22E	English for Communication	3	5	40	60	100	3
1	3	C1	18BBT13A	Core - I Cell Biology	4	5	40	60	100	3
1	3	C2	18BBT13B	Core - II Bioinstrumentation	4	5	40	60	100	3
		CP1		Practical I: Lab in Cell Biology , Bioinstrumentation and Microbiology		3				
1	3	A1	18BBT1AA	Allied – I Chemistry I	4	5	40	60	100	3
1	4	AEC1	17BGE1FA	Ability Enhancement Compulsory Course-I –	2	2	50	0	50	3
1	6	VAC ₁	18BBC1VB	Value Added Course - I Good Lab Practice	2		100	0	100	3
2	1	L2	17BGE21T	Language - II	3	5	40	60	100	3
2	2	E2	17BGE22E	English for Computer Science	3	5	40	60	100	3
2	3	C3	18BBT23A	Core - III Microbiology	4	5	40	60	100	3
2	3	C4	18BBT23B	Core - IV Genetics	4	5	40	60	100	3
2	3	CP1	18BBT23P	Practical I: Lab in Cell Biology , Bioinstrumentation and Microbiology	4	3	40	60	100	3
2	3	A2	18BBT2AB	Allied – II Chemistry II	4	5	40	60	100	3
2	4	AEC2	17BGE2FB	Ability Enhancement Compulsory Course-II –	2	2	50	0	50	3
2	6	VAC ₂	VAC2	Value Added Course - II Food Adulteration	2		100	0	100	3
3	3	C5	18BBT33A	Core - V Biochemistry	4	6	40	60	100	3
3	3	C6	18BBT33B	Core - VI Plant Biotechnology	4	6	40	60	100	3
3	3	A3	18BBT3AC	Allied - III Fundamentals of Bionanotechnology	4	5	40	60	100	3
3	3	CP2	18BBT33P	Core Practical II: Lab in Biochemistry & Plant Biotechnology	4	5	40	60	100	3

3	4	S1	18BBT3ZA	Skill Enhancement Courses – I Human Anatomy & Physiology	3	4	40	60	100	3
3	4	AEC3	17BGE3FC	Ability Enhancement Compulsory Course-III –	2	2	50	0	50	3
3			18BBT33V	Core - IX Industrial Training Report %	3		50	0	50	
3	6	VAC3	VAC3	Value Added Course - III Analytical Instrumentation	2		100	0	100	3
3	6	IDL 1	IDC1	Inter Department Learning – I #	2	2	0	100	100	3
4	3	C7	18BBT43A	Core -VII Immunology & Immunotechnology	4	6	40	60	100	3
4	3	C8	18BBT43B	Core - IX Animal Biotechnology	4	6	40	60	100	3
4	3	CP3	18BBT43P	Core Practical III: Lab in Animal Biotechnology & Immunology	4	5	40	60	100	3
4	3	A4	18BBT4AD	Allied - IV Computational Biology	4	5	40	60	100	3
4	4	S2	18BBT4ZB	Skill Enhancement Courses – II Pharmaceutical Biotechnology	3	4	40	60	100	3
4	4	AEC4	17BGE4FD	Ability Enhancement Compulsory Course-IV –	2	2	50	0	50	3
4	6	VAC ₄	VAC4	Value Added Course - IV Waste Management System	2		100	0	100	3
4	6	IDL	IDC2	Inter Department Learning – II #	2	2	0	100	100	3
5	3	C9	18BBT53A	Core - IX - Genetic Engineering	4	6	40	60	100	3
5	3	C10	18BBT53B	Core - X - Molecular Biology	4	6	40	60	100	3
5	3	CP4	18BBT53P	Core Practical IV: Lab in Molecular Biology and Genetic Engineering	4	6	40	60	100	3
5	3	EL1	ELE1	Elective - I	4	5	40	60	100	3
5	4	S3	18BBT4ZC	Skill Enhancement Courses – III Introduction to Bioinformatics	3	5	40	60	100	3
5	3	C16	18BBT53V	Core - XVI - Mini Project %	3	2	40	60	100	

5	6	VAC	VAC5	Value Added Course - V Mushroom Cultivation	2		100	0	100	3
6	3	C11	18BBT63A	Core - XI - Environmental Biotechnology	4	5	40	60	100	3
6	3	CP5	18BBT63P	Core Practical V: Lab in Industrial and Environmental Biotechnology	4	5	40	60	100	3
6	3	EL2	ELE2	Elective - II	4	5	40	60	100	3
6	3	EL3	ELE3	Elective - III	4	5	40	60	100	3
6	3	C19	18BBT63V	Core Project	8	5	80	120	200	3
6	4	S4	18BBT6ZD	Skill Enhancement Courses – IV Entrepreneur Development	3	5	40	60	100	3
6	5	EX	17BGE65A	Extension Activity- EX %	2		50	0	50	
TOTAL					154		2160	2240	4400	

Elective - I	Elective - II	Elective - III
Research Methodology	Industrial Biotechnology	Biosafety, Bioethics & IPR
Biodiversity	Bioprocess & Technology	Introduction to Genomics
Evolutionary Biology	Microbial Biotechnology	Fundamentals of Proteomics

Inter Department Learning Courses	
Semester-III	1.Modern Medical System
	2.Science and Technology for Society
	3.Alternative Medicine
	4.Disease and Natural Treatments
Semester-IV	1.Health through Nutrition
	2.Applications for Biostatistics in Life Science
	3. Introduction to Food Biotechnology
	4. Traditional Herbal Remedies for Primary Health Care

Mapping of Courses and POs **S-Strong Correlation** **M – Medium Correlation** **B-Blank**

Course Code	Course Name	Program Outcome							
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
	Core I - Cell Biology	S	B	S	S	M	M	M	S
	Core II - Bioinstrumentation	S	M	S	S	M	S	M	M
	Allied I: Chemistry I	B	S	M	M	M	S	S	M
	Core III – Microbiology	S	B	S	S	S	S	S	M
	Core IV - Genetics	M		M	M	S	M	S	S
	Practical I (Lab in Cell Biology , Bioinstrumentation and Microbiology)	S	S	S	S	S	S	S	S
	Allied II: Chemistry II	B	S	M	M	M	S	M	M
	Core V – Biochemistry	S	M	S	M	M	S	S	S
	Core VI – Plant Biotechnology	S	M	S	S	M	S	S	S
	Practical II (Lab in Biochemistry and Plant Biotechnology)	S	S	S	S	S	S	S	S
	Allied III: Bionanotechnology	B	S	S	M	M	S	M	M
	Skill Based Subject I – Human Anatomy & Physiology	M	M	M	M	S	S	S	S
	Core VII– Immunology & Immunotechnology	S	B	S	S	M	M	S	S
	Core VIII – Animal Biotechnology	S	S	S	S	S	S	S	S
	Core Practical III Lab in Immunology & Animal Biotechnology	S	S	S	S	S	S	S	S
	Allied IV: Computational Biology	B	S	S	S	B	B	M	M
	Skill Based subject II - Pharmaceutical Biotechnology	S	M	M	M	S	S	S	M
	Core IX- Genetic Engineering	S	M	S	S	M	M	S	S
	Core X- Molecular Biology	S	S	S	S	S	S	S	S
	Core Practical IV: Lab in Genetic engineering and Molecular Biology	S	S	S	S	S	M	S	M
	Elective I	S	M	B	B	M	M	S	M
	Elective II	S	M	B	B	M	M	S	M
	Industrial Training	S	S	S	S	S	S	S	S
	Skill Based subject III - Bioinformatics	S	S	M	M	S	S	M	M
	Core XI - Environmental Biotechnology	S	B	M	M	S	S	S	S
	Core Practical V Lab in Industrial& Environmental Biotechnology	S	S	S	S	S	S	S	S
	Elective III	S	S	S	S	S	S	S	S
	Core Project	S	S	S	S	S	S	S	S
	Skill Based Subject IV - Entrepreneur Development	S	M	M	M	S	S	M	M

Semester: I

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
17BGE11T	Part I Tamil	3	6	1	0	Theory / Practical

Introduction: பகுதி முதல் பாடமாக அமையும், தமிழ்பாடம் கவிதைகள், இலக்கணம், இலக்கிய வரலாறு ஆகியவைகள் கொண்டு அமைந்து உள்ளது. ஐந்து அலகுகளாக பகுக்கப்பட்டுள்ளது.

Course Outcome:

- CO1: தற்கால இலக்கியத்தில் பாரதியார், பாரதிதாசன் கவிதைகள் மானவர்கள் அறிந்து கொள்ளுவதால் தன்மைப்பிக்கையை வெளிக்கொணரும் வகையில் உள்ளது.
- CO2: நாட்டுப்பற்றும், கடமை உணர்வும் மற்றும் வாழ்வியல் கருத்துக்களைக் கூறும் வகையில் உள்ளது.
- CO3: அறம் எனப்படும் கட்டுரை வாழ்வியல் விழுபியங்கள் அறிய உதவுவனவாக உள்ளது.
- CO4: படைப்பிலக்கியம் மானவர்களின் படைப்புத்திறனை வெளிப்படுத்தும் விதமாக உள்ளது.
- CO5: சிறுகதை, புதுக்கவிதைகள் ஆகியவைகளின் வரலாறுகளை அறிந்து கொள்ளலாம். அதன் மூலம் வளர்ச்சி நிலைகள் தெரிந்து கொள்ளமுடிகிறது.

Unit I: [12 Periods]
பாரதியார் - கண்ணன் என் சேவகன், பாரதிதாசன் -தமிழியக்கம், வைரமுத்து-எப்போதோ பெய்த மழை, கண்ணதாசன்-எங்கே அவன், சிற்பி- இளந்தமிழே ஆகிய கவிதைகளின் விளக்கம் அளித்தல்

Unit II: [12 Periods]
முமேத்தா - மரங்கள், சல்மா- விலகிப்போதும் வாழ்க்கை, அப்துல் ரகுமான் - பாருக்குள்ளே நல்ல நாடு, கலாபரியா- வளர்ச்சி, மஹிய புத்திரன் - பயணற்றுப் போதும்போது ஆகிய கவிதைகளின் விளக்கம் அளித்தல்

Unit III: [12 Periods]
அறம் எனப்படுவது - 8 கட்டுரைகள் ஆசிரியர் (முனைவர் அமுதன்) - மானவர்களுக்கு அறிவுறுத்தும் கதைகள் கற்றுக்கொடுக்கப்படும்.

Unit IV: [12 Periods]
படைப்பிலக்கியம், வல்லினம் மிதும், மிகா இடங்கள், கவிதை எழுதுதல், சிறுகதை எழுதுதல், பேச்சுத்திறன்

Unit V: [12 Periods]
உரைநடையின் தோற்றமும் வளர்ச்சியும், சிறுகதையின் தோற்றமும் வளர்ச்சியும், புதுக்கவிதையின் தோற்றமும் வளர்ச்சியும் ஆகியவைப் பற்றிக் கூறுதல்.

முதற்பருவம்

(மரபுக்கவிதை, புதுக்கவிதை, இலக்கணம், இலக்கியவரலாறு)

அலகு 1 தற்கால இலக்கியம்

1. பாரதியார் - கண்ணன் என் சேவகன்
2. பாரதிதாசன் - தமிழியக்கம்
3. வைரமுத்து - எப்போதோ பெய்தமழை
4. கண்ணதாசன் - எங்கே அவன்
5. சிற்பி - இளந்தமிழே

அலகு 2 தற்கால இலக்கியம்

1. மு.மேத்தா - மரங்கள்
2. சல்மா - விலகிப்போகும் வாழ்க்கை
3. அப்துல் ரகுமான் - பாருக்குள்ளே நல்ல நாடு
4. கலாப்ரியா - வளர்ச்சி
5. மனிய புத்திரன் - பயனற்றுப் போகும்போது

அலகு 3 உரைநடை

அறம் எனப்படுவது - 8 கட்டுரைகள் (முனைவர் அமுதன்)

அலகு 4 இலக்கணம் - படைப்பியிலக்கியம்

1. வல்லினம் மிகும், மிகா இடங்கள்
2. கவிதை எழுதுதல்
3. சிறுகதை எழுதுதல்
4. பேச்சுத்திறன்

அலகு 5 இலக்கிய வரலாறு

1. உரைநடையின் தோற்றமும் வளர்ச்சியும்
2. சிறுகதையின் தோற்றமும் வளர்ச்சியும்
3. புதுக்கவிதையின் தோற்றமும் வளர்ச்சியும்

பயிற்சிக்குரியன

மொழிபெயர்ப்பு

பார்வை நூல்கள் : இலக்கியவரலாறு - பாக்கியமேரி, இலக்கண நூல்,

Semester :I

Subject Code Subject title Credit Lecture Tutorial Practical Type

Core I –Cell Biology 4 5 1 0 Theory

Introduction: This course presents the types and structural details of the basic unit by which all the living things.

Course Outcome

CO1: To become skillful the basics of cell structure and classification.

CO2: To know the component and functions of cells.

CO3: To learn the functional activity of cells.

CO4: To become familiar with cell multiplication and action.

CO5: To learn the cell to cell communication and types.

Unit I:

[12 Hrs]

Cell as a basic unit: discovery of the cells, Classification of cell types, development of cell theory, early chemical investigation in cell biology. Prokaryotic and Eukaryotic cell organization.

Unit II:

[12 Hrs]

Cell transport phenomenon: Membrane architecture. Active, Passive, diffusion and osmosis.

Chemistry of carbohydrates, lipids, proteins and nucleic acid.

Unit III:

[12 Hrs]

Structure and functions of cytoplasmic components of the cell: Ribosome and protein synthesis, energy flow through mitochondrion, chloroplast and photosynthesis, Golgi apparatus, lysozymes and microbodies, endoplasmic reticulum, cytoskeleton, vacuoles, peroxysomes, lysosomes and Nuclear compartment. Heterochromatin and euchromatin, polytene chromosomes.

Unit IV:

[12 Hrs]

Cell division in prokaryotes and eukaryotes: Cell cycle, mitosis, meiosis, crossing over and characteristics of cancer. Apoptosis, Stem cell, Prions

Unit V:

[12Hrs]

Integrative and specialized cellular events: Cell – Cell signaling, Specialized cells – nerve cells, sperm cells, microfilaments, microtubules, muscle cells. Cells of Vision, Nucleo –cytoplasmic interaction, cell cloning.

Text Book:

1. Cell Biology by P S Verma and V K Agarwal, 2016

References:

1. Cell and molecular biology, 3rd edition, Philip Sheeler, Donal E Bianchi, John Wiley
2. Molecular biology of cell, Albert et al
3. Molecular cell biology, Lodish, Baltimore, Scientific American books, 1994

Mapping of Course outcomes with Program Outcomes

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	√	√			√	√		
CO2	√		√	√			√	
CO3	√	√	√		√			
CO4	√		√			√		
CO5	√			√		√	√	√

Semester :I

	Subject Code	Subject title	Credit	Lecture	Tutorial	Practical	Type
Core II –Bioinstrumentation	4	4	1	0			Theory

Introduction: This course presents study of Instruments of Biological Importance in the field of Biotechnology..

Course Outcome

CO1: To become skillful the operation of microbiological instruments.

CO2: To know the handling of Analytical instruments.

CO3: To learn the application of chromatographic techniques.

CO4: To become familiar with methods used in immunological assay.

CO5: To learn the applications of immunotechnology.

Unit I: [12 Periods]

pH Meter, Buffer of Biological importance, Centrifuge – Preparative, Analytical and ultra, Laminar Air flow, Autoclave, Hot Air oven and Incubator.

Unit II: [12 Periods]

Spectroscopic Technique: Colorimeter, Ultra violet and Visible, Infra red and Mass Spectroscopy

Unit III: [12 Periods]

Chromatographic Techniques: Paper, Thin Layer, Column, HPLC and GC. Electrophoresis Techniques: Starch, Gel, AGE, PAGE.

Unit IV: [12 Periods]

Immunological Methods: Precipitation reaction based assay. Radial Immuno Diffusion, Immunoelectrophoresis, Counter Current.

Unit V: [12 Periods]

Complement fixation Test, Radio Immuno Assay, ELISA, PCR, Immunoblotting and Hybridization, Autoradiography.

Text Book:

1. Bioanalytical techniques by SekharTallar (2009)- IK International Publishing House Pvt Ltd.
2. Practical Biochemistry- Wilson & Walker – Vth edition (2009)Cambridge University Press

Reference:

- 1.Immunology by Kuby.,J – 5th Edition
2. Introductory Practical Biochemistry – S.K.Sawhney and Randhir Singh. Narosa Publishing House
- 3.Principles of Applied Biomedical Instrumentation – Gedder A and L.E.Balsar, John Wiley and Sons.
4. Modern Experimental Biochemistry 2nd Edition – Boyer, Rodney F.Benjamin and Cummins.

Semester: I

Subject Code	Subject title	Credit	Lecture	Tutorial	Practical	Type
Allied I –Chemistry I		4	4	1	0	Theory

Introduction: To introduce the concepts which gives knowledge about industrial chemistry. On successful completion of this paper the students should gain the knowledge about bonding, Dye, Fertilizer, industrial Chemistry, Chromatography and Stereoisomerism.

Unit I: [12Hrs]

1. Molecular orbital theory, bonding, antibonding and non-bonding orbitals. Molecular orbitals. MO configuration of H_2, N_2, O_2, F_2 . Bond order. Diamagnetism and paramagnetism.
2. Diborane: Preparation and properties, structure, preparation and uses of $NaHB_4$, Borazole-Chemistry.
3. Interhalogen compounds: ICl, BrF_3, IF_3 - Preparation, properties, hybridization and structure, shape. Basic properties of iodine.
4. Sodium hydrosulphite, peracids of sulphur: preparation, properties and uses. Structure.

Unit II: [12Hrs]

1. Industrial Chemistry: Synthesis, properties and uses of silicones. Fuel gases: natural gas, water gas, semi water gas, carburetted water gas, producer gas, oil gas (manufacturing details not required).
2. Fertilizers: urea, ammonium sulphate, ammonium nitrate, potassium nitrate NPK fertilizer. Triple superphosphate. Pollution of air, water and soil-sources, remedies.

Unit III: [12Hrs]

1. Covalent bond: orbital overlap, hybridization, geometry of organic molecules- $CH_4, C_2H_4, C_2H_2, C_6H_6$. Inductive effect. Electrometric, mesomeric, hyperconjugative and steric effects. Effect in properties of compounds
2. Stereoisomerism Optical isomerism: symmetry, elements of symmetry. Cause of optical activity, tartaric acid, Racemisation, Resolution. Geometric isomerism of maleic and fumaric acids. Keto-enol tautomerism in Acetoacetic esters.

Unit IV [12Hrs]

1. Terms: chromophore, auxochrome, bathochromic shift, hypsochromic shift, hyperchromic effect, hypsochromic effect.
2. Dyes: azo and triphenylmethane dyes- Preparation one example.

Unit V: [12Hrs]

1. Solutions : Types. Liquid in Liquid. Raoult's law. Deviation from ideal behaviour. Binary liquid mixtures. Fractional distillation .
2. Kinetics: Rate, order, molecularity, pseudo first order, determination of order. Measurement of reaction. Effect of temperature on the rate. Energy of activation.
3. Chromatography: Principle and application of column, paper and thin layer chromatography.

Text Book

Dr. V. Veeraiyan., "Text book of Ancillary chemistry", Volume I, High mount Publishing house, Chennai-14, Edition-2008 (Unit-I to Unit-V)

References

P.L. Soni, "Text Book of Inorganic Chemistry", Sultan Chand & Sons, New Delhi, 2013
Puri and Sharma, "Text book of Inorganic Chemistry", Vishal publishing, 2014

Mapping of Course outcomes with Program Outcomes

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	√	√			√	√		
CO2	√		√	√			√	
CO3	√	√	√		√			
CO4	√		√			√		
CO5	√			√		√	√	√

Semester: I

Subject Code Subject title Credit Lecture Tutorial Practical Type

Environmental Studies 2 2 0 0 FC

Introduction: To gain knowledge on the importance of environmental education and ecosystem

Unit I: (2 Hrs)

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

Unit II : (5Hrs)

Ecosystems-Structure and function of an ecosystem, Producers, consumers and decomposers, Energy flow in the ecosystem, Food chains, food webs and ecological pyramids. Types of ecosystem Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Unit III : (6Hrs)

Environmental Pollution – Definition, Cause, effects and control measures of Air pollution, Water pollution, Soil pollution, Noise pollution, Nuclear hazards.Solid waste Management : Causes, effects and control measures of urban and industrial wastes. Disaster management : floods, earthquake, cyclone and landslides.

Unit IV : (5Hrs)

Social Issues and the Environment - Urban problems related to energy, Water conservation, rain water harvesting, watershed management, Environmental Issues in Coimbatore District (Noyyal River, Dye Industries and Agricultural issues). Environmental ethics : Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents. Environment Protection Act, Wildlife Protection Act, Forest Conservation Act, Issues involved in enforcement of environmental legislation.

Unit V : (4Hrs)

Human Population and the Environment - Population growth, variation among nations, Population explosion – Family Welfare Programme, Environment and human health, Human Rights Women and Child Welfare, Role of Information Technology in Environment and human health.

REFERENCE:

1. Textbook for Environmental Studies for Undergraduate Courses of all Branches of Higher Education ErachBharucha for University Grants Commission
2. Thangamani. A and Shymama. T, A Text Book of Environmental Studies, 2nd ed, DPH, New Delhi, 2006.
3. Environmental Studies for Undergraduate Course – Bharathiar University.

Semester :II

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
Core Paper III – Microbiology		4	5	0	0	Theory

Introduction: This course presents the Microbes classification, Identification and characterization.

Course Outcome

CO1: To become skillful the basics of Microscope principle and application

CO2: To know the component and functions of cells.

CO3: To learn the media preparation and microbe's isolation.

CO4: To become familiar with Physiology of microorganisms.

CO5: To learn the disease from microbes.

UNIT I:

(12 Hrs)

Definition - scope of microbiology - A general account on microbial diversity-Basic principles in microscopy - Types of microscopes - light - dark - phase contrast - fluorescent - electron microscope- TEM - SEM

UNIT II:

(12 Hrs)

A detailed account of General structure - growth - reproduction of Bacteria - fungi -Virus - Economic and industrial importance - yeast - moulds

UNIT III:

(12 Hrs)

Microbiological Media - Types, preparation - methods of sterilization - enumeration of microorganisms in soil - water - air - isolation of microorganisms from Environment - infected tissue - Techniques of pure culture - maintenance and Preservation - Staining - stains and types of staining;

UNIT IV:

(12 Hrs)

Physiology - biochemistry of microbes - Photoautotrophs - Chemo autotrophs - Parasitism -Saprophytism - Mutualism - Symbiosis - Commensalism - endozoic microbes

UNIT V:

(12 Hrs)

Nitrogen metabolism including - Nitrogen fixation (Symbiotic and asymbiotic) - Lipid metabolism - Secondary metabolism - microbial pathogens of plants - TMV - Gemini virus - animals Yersinia pestis - rabies - humans HIV - HSV - Role of microbes in biogeochemical cycles

REFERENCES:

1. Michael T. Madigan John M. Martin & Jack Parker, 1984, Biology of Microorganisms Prentice Hall International, Inc., London.
2. Edward A. Birge, 1992, Modern Microbiology – Principles and application. Wm.C. Brown Publishers, Inc. U.S.A.
3. Gerard J. Tortora, Berdell R. Funke, Christine & L. Case, 2001, Microbiology - An Introduction. Benjamin Cummings, U.S.A.
4. Danial Lim, 1998, Microbiology, McGraw-Hill Companies, New York.

Mapping of Course outcomes with Program Outcomes

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	√	√			√	√		
CO2	√		√	√			√	
CO3	√	√	√		√			
CO4	√		√			√		
CO5	√			√		√	√	√

Semester II

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
	Core Paper IV – Genetics	4	5	0	0	Theory

Introduction: This course presents the Genetics of Chromosomes and Gene Interaction.

Course Outcome

CO1: To become skillful the basics of Mendelian Principles and History

CO2: To know the component and functions of Gene interaction.

CO3: To learn the Chromosomal variation in number.

CO4: To become familiar with Structure of chromosome.

CO5: To learn the Genetic control of Development in Drosophila.

UNIT I (12 Hrs)

History of Genetics -Mendelian Principles - Segregation - Independent Assortment - Dominance - Multiple alleles - Pseudo alleles - Incomplete dominance - Over dominance - co dominance - complementation test

UNIT II (12 Hrs)

Gene interaction - Epistasis - penetrance - expressivity - lethality and lethal genes - Sex determination - sex linkage in diploids - linkage - crossing over - gene mapping - Chromosomal theory of inheritance - maternal effects

UNIT III (12 Hrs)

Chromosomal variation in number - Changes in Chromosomal structure - Chromosomal aberrations - Genetics of Hemoglobin - Transposable elements - prokaryotes - eukaryotes

UNIT IV (12 Hrs)

Structure of chromosome - fine structure of Gene - cistron - recon - Structure of Eukaryotic gene - Experimental evidence for DNA as the genetic material - cytoplasmic genetic systems - mitochondria - chloroplast DNA

UNIT V (12 Hrs)

Genetic control of Development in Drosophila - Arabidopsis - Population genetics - calculating gene frequency - factors affecting gene frequency - Genetic drift - Shift - Pedigree analysis - genetic counseling

REFERENCES:

1. Basic genetics by D.L.Hartl, 1991, Jones and Bartlett public.
2. Friedfelder 1987, Microbial genetics, Jones and Bartlett public.
3. Molecular Biology of the genes 4th Ed. Watson et.,al, the Benjamin /Cummings coins 1987
4. Molecular by cell biology, 1994.Lodish, Baltimore scientific American books,Inc.

Semester II

Subject Code	Subject Title	Credit	Lecture	Tutorial	Practical	Type
	Allied Paper II – Chemistry II	4	4	0	0	Theory

Introduction: To introduce the concepts which gives knowledge about industrial chemistry. On successful completion of this paper the students should gain the knowledge Metals, Aromatic compounds, Amino acids and Law of thermodynamics.

Unit I: (8 Hrs)

Metals General methods of extraction of metals - Types of ores Methods of ore dressing - Reduction methods, electrical methods - types of refining Van Arkel Zone refining - Coordination chemistry Nomenclature - Theories of Werner, Pauling - Chelation examples. Hemoglobin, Chlorophyll - Applications of EDTA in qualitative and quantitative analysis

Unit II: (10 Hrs)

Aromatic compounds - Electrophilic substitution in benzene - Mechanism of nitration - halogenation, alkylation - acylation, sulphonation- Preparation and properties of naphthalene -Heterocyclics: Preparation uses - electrophilic substitution properties of furan -thiophene-pyrrole and pyridine

Unit III: (10 Hrs)

Amino Acids - Classification - preparation and properties - preparation of peptides - Classification of proteins by physical properties - biological functions -Carbohydrates: classification - preparation and properties of glucose - fructose - Discussion of open chain ring structures of glucose and fructose

Unit IV: (10 Hrs)

Energetics Definition of first law thermodynamics - Types of systems Reversible, irreversible - Isothermal and adiabatic processes - Spontaneous processes - Joule-Thomson effect - Enthalpy, bond energy - Need for the second law - Carnot cycle and Carnot theorem - Entropy and its significance - Free energy change

Unit V (10 Hrs)

EMF (Definition)-Theory of oxidation and reduction -Nomenclature of cell- Daniel cell -Reference electrode -Standard Hydrogen Electrode(SHE) -Saturated Calomel Electrode (SCE) - Determination of pH-Hydrogen -Quinhydrone and glass electrodes - Hydrogen-Oxygen fuel cell -Batteries-Lead-storage battery -Batteries of future Lithium ion batteries

Text Book

Dr. V. Veeraiyan., "Text book of Ancillary chemistry", Volume I, High mount Publishing house, Chennai-14, Edition-2008 (Unit-I to Unit-V)

References

P.L. Soni, "Text Book of Inorganic Chemistry", Sultan Chand & Sons, New Delhi, 2013
Puri and Sharma, "Text book of Inorganic Chemistry", Vishal publishing, 2014

Mapping of Course outcomes with Program Outcomes

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CO1	√	√			√	√		
CO2	√		√	√			√	
CO3	√	√	√		√			
CO4	√		√			√		
CO5	√			√		√	√	√

Semester :II

Subject Code	Subject title	Credit	Lecture	Tutorial	Practical	Type
	Core Practical I –	6	0	1	3	Practical

Lab in Cell Biology, Bioinstrumentation and Microbiology

1. Microscopy
2. Cell Type – Microbial, Animal and Plant cells
3. Mitosis in onion Root tip
4. Meiosis in Flower Buds of *Allium Cepa*
5. Buccal Epithelial Smear and Barr Body
6. Preparation of Buffer – Phosphate, Acetate, Tris
7. Media Preparation and Sterilization
8. Isolation of microorganism from soil, water and Air
9. Isolation of pure culture from mixed Population
10. Pure culture Techniques
11. Selective and Differential Media Preparation
12. Enumeration of microorganism
13. Measurement of Bacterial Growth
14. Staining of Microorganism
15. IMVIC test
16. Carbohydrate fermentation test, TSI, H₂S production test
17. Antibiotic sensitivity test
18. Permanent Slide preparation

References:

1. Laboratory Exercises in Microbiology by Harley and Prescott, 5th edition,
2. Laboratory Manual in General Microbiology by Benson, 8th edition

Semester :III

	Subject Code	Subject title	Credit	Lecture	Tutorial	Practical	Type
Core V –		Biochemistry	4	5	1	0	Theory

Introduction: This course presents the Basic structure and functions of Biomolecules and their Metabolic activities.

Course Outcome

CO1: To become skillful the basics structure and functions of Amino acids and Proteins.

CO2: To understand the enzyme classification and activities.

CO3: To learn the functional activity of Carbohydrates.

CO4: To become familiar with Metabolism of carbohydrates.

CO5: To learn about Nucleic acid structure and functions.

Unit I: (12Hrs)

Amino acids & Proteins: Structure & Function. Structure and properties of Amino acids, Types of proteins and their classification, Forces stabilizing protein structure and shape. different Level of structural organization of proteins. Fibrous and globular proteins.

Protein Isolation & Quantification, Protein Purification & Separation.

Unit II: (12Hrs)

Enzymes: Nomenclature and classification of Enzymes, Holoenzyme, apoenzyme, Cofactors, coenzyme, prosthetic groups, metalloenzymes, monomeric & oligomeric enzymes, activation energy and transition state, enzyme activity, specific activity, common features of active sites, Role of: NAD⁺, NADP⁺, FMN/FAD, coenzymes A, Thiamine pyrophosphate, Pyridoxalphosphate, lipoic-acid, Biotin vitamin B12, Tetrahydrofolate and metallic ions.

Isolation of Industrial important enzymes Amylase & Protease.

Unit III: (12Hrs)

Carbohydrates: Structure, Function and properties of Monosaccharides, Disaccharides and Polysaccharides. Homo & Hetero Polysaccharides, Mucopolysaccharides, Bacterial cell wall polysaccharides, Glycoprotein's and their biological functions.

Lipids: Structure and functions –Classification, nomenclature and properties of fatty acids, essential fatty acids. Phospholipids, sphingolipids, glycolipids, cerebrosides, gangliosides, Prostaglandins, Cholesterol.

Qualitative and Quantitative methods of Carbohydrates and Sugars.

Unit IV: (12Hrs)

Carbohydrates Metabolism: Reactions, energetics and regulation. Glycolysis: Fate of pyruvate under aerobic and anaerobic conditions. Pentose phosphate pathway and its significance, Gluconeogenesis, Glycogenolysis and glycogen synthesis. TCA cycle, Electron Transport Chain, Oxidative phosphorylation. β -oxidation of fatty acids.

The effect of Physical and chemical factors of Extracellular Enzymes.

Unit V: (12Hrs)

Nucleic acids: Structure and functions: Physical & chemical properties of Nucleic acids, Nucleosides & Nucleotides, purines & pyrimidines,. Biologically important nucleotides, Double helical model of DNA structure and forces responsible for A, B & Z – DNA, denaturation and renaturation of DNA

Isolation, quantification and Identification of genomic DNA from Blood Sample.

Reference Book

1. Lehninger Principles of Biochemistry By: David L. Nelson and Cox
2. Harper's Biochemistry By: Robert K. Myrray
3. Enzymes By:Trevor Palmer
4. Principles of Biochemistry By: Donald J. Voet, Judith G.Voet, Charlotte W.Pratt
5. Principles and techniques of Biochemistry and Molecular Biology Edited By Keith Wilson and John Walker

Mapping of Course outcomes with Program Outcomes

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	√	√			√	√		
CO2	√		√	√			√	
CO3	√	√	√		√			
CO4	√		√			√		
CO5	√			√		√	√	√

Semester :III

Subject Code	Subject title	Credit	Lecture	Tutorial	Practical	Type
Core V –	Plant Biotechnology	4	5	1	0	Theory

Introduction: This course presents the Basics of Plant tissue culture and quality enhance the plant based products.

Course Outcome

CO1: To become familiar with plant tissue culture techniques and preparations.

CO2: To know the techniques for plant gene transformation and process.

CO3: To learn the functional activity of vectors for transformation.

CO4: To become familiar with transgenic plant with regulations.

CO5: To learn about Quality analysis of plant based products.

Unit I: (12Hrs)

Plant Tissue Culture: Introduction, Plasticity and totipotency, Culture environment, plant cell culture media, growth regulators. Culture types: Callus, Cell suspension culture, Protoplast, Root culture, Shoot tip and meristem culture, Embryo culture, Microscope culture. Plant regeneration – Somatic embryogenesis and Organogenesis.

Preparation of complex nutrient medium (Murashige&Skoog' s medium)

Unit II: (12Hrs)

Techniques for plant transformation: Introduction, Agrobacterium mediated gene transfer, Crown gall disease. Ti plasmid and T DNA, The process of T DNA transfer and integration. Practical applications of Agrobacterium mediated plant transformation. Methods of Transformations.

For selection, Prune, sterilize and prepare explants for culture.

Unit III: (12Hrs)

Vectors for Plant transformation: Introduction, Desirable features of Plasmid vector, Basic features of vector for plant transformation, promoters and terminators, Selectable Markers, Reporter genes, Arrangement of Gene in vectors.

Significance of growth hormones in culture medium

Unit IV: (12Hrs)

Transgenic Plants: Genetic manipulation of herbicide tolerance – Genetic manipulation of pest resistance – Plant disease resistant – engineering of stress tolerance – improvement of crop yield and quality – Regulations of GM crops in India, EU and USA.

Callus induction and regeneration of Endangered plant.

Unit V: (12Hrs)

Quality analysis of Plant and Plant Product: Extraction plant product – Phytochemical constituent – Antioxidant Properties – Antimicrobial Properties.

Semester :III

	Subject Code	Subject title	Credit	Lecture	Tutorial	Practical	Type
Allied III –		Fundamentals of Bionanotechnology	4	5	1	0	Theory

Introduction: This course presents the Basics of Nanotechnology, Nanoparticle preparations and Characterizations.

Course Outcome

CO1: To understand the History of Nanotechnology concept and applications.

CO2: To learn the biology of Nanoparticles synthesis and applications.

CO3: To know the techniques of Nanoparticle structure and preparations.

CO4: To become familiar with characterization of Nanoparticles.

CO5: To become know the applications of Nanobiotechnology.

Unit I: (12Hrs)

History of Nanotechnology: Early use of nanomaterials , concept and application. Nanoparticles – Size, Shape, Properties .

To find the nanomaterials for commercially available.

Unit II: (12Hrs)

Biological Nano objects – DNA, Protein and Lipids. Hot Nanoparticles – Quantum dot, synthesis, applications. Carbon quantum dots, synthesis and applications.

Interaction of Nanoparticles with biomolecules

Unit III: (12Hrs)

Nanoparticles structure and Preparation – Solvent Evaporaion, Nanoprecipitation, Emulsification Diffusion, Supercritical fluid Technology, Polymerization in Emulsion, Interfacial Polymerization, Liposomes, Cubosomes, Hexosomes.

Synthesis of Nanoparticles in aqueous extract

Unit IV: (12Hrs)

Nanoparticles Characterization Techniques – X-ray diffraction (XRD), Scanning Electron Microscope (SEM), Energy Dispersive X-ray Spectroscopy (EDX), Transmission Electron Microscope (TEM), Scanning probe microscopes (SPM), Atomic force microscopy (AFM), X-ray photoelectron spectroscopy (XPS), Fourier transform infrared spectroscopy (FTIR), Ultraviolet visible spectroscopy (UV-Vis).

Result analysis of characterized nanoparticles.

Unit V: (12Hrs)

Applications of Nanobiotechnology in Medicine, Drug Designing, and Cancer treatment.
Nanobiotechnology in Medical, Social and Ethical Consideration.
To demonstration of cancer treatment using Nanoparticles.

Text Book

1. Text book of Nanotechnology by Dr.G.Dhamodharan, first edition, Umadevi Publication, India.
2. Nanotechnology Assessment and perspective by Professor H. Brune et al., Springer 2015.
3. The Handbook of Nanotechnology- Business, Policy and Intellectual Property law by John C. Miller et al., 2004.

Mapping of Course outcomes with Program Outcomes

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	√	√			√	√		
CO2	√		√	√			√	
CO3	√	√	√		√			
CO4	√		√			√		
CO5	√			√		√	√	√

Semester :III

	Subject Code	Subject title	Credit	Lecture	Tutorial	Practical	Type
Core SBC –		Human Anatomy & Physiology	4	5	1	0	Theory

Introduction: This course presents the Basics of Anatomy and Physiology of Human Structure.

Course Outcome

CO1: To understand the structure of Human Body.

CO2: To understand the tissue level of organization.

CO3: To learn the functional activity of Nervous tissue and system.

CO4: To become familiar with Cardiovascular system.

CO5: To learn about Organ and Structure of the Respiratory system.

Unit I: (12Hrs)

An Introduction to the Human Body: Overview of Anatomy and Physiology – Structural Organization of the Human Body – Functions of Human Life – Requirements of Human Life – Homeostasis.

Unit II: (12Hrs)

Tissue Level of Organization: Types of Tissues – Epithelial Tissues – Connective Tissue Supports and Protects – Muscle tissue and Motion – Nervous Tissue Mediates perception and Response – Tissue Injury and Aging.

Unit III: (12Hrs)

Nervous System and Nervous Tissue: Basic structure and Function of the Nervous System – Functional Divisions of the Nervous System – Nervous Tissue – Neurons – Parts of Neurons and types of Neurons – Glial Cells - Functions of the Nervous tissue.

Unit IV: (12Hrs)

The Cardiovascular System: Heart – Anatomy, Location, Shape and Size - Structure and Functions of Blood Vessels.

Unit V: (12Hrs)

Organs and Structure of the Respiratory System: Conducting Zone - Nose, Pharynx, Larynx, Trachea – Respiratory Zone – Gross Anatomy of the Lung. Digestive System – Overview of the Digestive System – Digestive system process and Regulation.

Reference:

J. Gordon Betts-“Human Anatomy and Physiology”, OpenStax, Rice University

Mapping of Course outcomes with Program Outcomes

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	√	√			√	√		
CO2	√		√	√			√	
CO3	√	√	√		√			
CO4	√		√			√		
CO5	√			√		√	√	√

Semester :III

	Subject Code	Subject title	Credit	Lecture	Tutorial	Practical	Type
Core II – and Plant Biotechnology	Lab in Biochemistry		4	0	0	3	Practical

Introduction: This course presents the Basic and advanced plant tissue culture techniques and enhance the plant based product.

1. Aqueous extraction of plant.
2. Quantification of carbohydrates and proteins.
3. Phytochemical analysis.
4. Antioxidant properties.
5. Isolation of protease/Rubisco from plant extract.
6. Partial purification of protease enzyme.
7. Compound separation from TLC.
8. Protein separation from SDS PAGE.
9. Identification of plant compounds using GCMS.
10. Preparation of complex nutrient medium (Murashige&Skoog' s medium).
11. To selection, Prune, sterilize and prepare explants for culture.
12. Significance of growth hormones in culture medium.
13. Callus induction and regeneration of plant.

References:

1. Plant genetic engineering, Dodds J.H.
2. Plant molecule biology, Grierson and S.V. Convey
3. Molecular biotechnology, Principle and applications of recombinant DNA technology, Bernard R Glick.

Semester :IV

Subject Code	Subject title	Credit	Lecture	Tutorial	Practical	Type
Core VII – Immunology & Immunotechnology	4	5	1	0	Theory	

Introduction: This course presents the Basics of Human Immune system and Antigen Antibody interaction.

Course Outcome

CO1: To understand the Immune system of Human Body.

CO2: To understand the Organs of the Immune system.

CO3: To learn the functional activity and Structure of antibodies.

CO4: To become familiar with Classes of hypersensitive reactions.

CO5: To learn about the Tumor immunology.

Unit I. [12 Hrs]

Introduction to immune system : Historical perspectives, early vaccination, innate immunity and acquired immunity humoral and cell mediated immunity. Cells of Immune System: Hematopoiesis, Lymphoid cells B & T lymphocytes. N. K. cells, phagocyte, mast cells, Dendritic cells.

Unit II. [12 Hrs]

Organs of the Immune system: Primary lymphoid organs: Thymus, Bone marrow, secondary lymphoid organs: lymph nodes, spleen, mucosa-associated lymphoid tissue. Antigens: Nature and Properties of antigens: foreigners, molecular size -epitopes : Immune response to Ag, adjuvants, Immune dosage, route of administration super antigens.

Unit III. [12 Hrs]

Antibodies: Structure of antibodies; classes of Immuno globular, hypervariable regions. Complementary determining regions. Framework regions. Isotype, allotype and idiotypic determinants, immunoglobulin superfamily. Antigen - Antibody interactions: Affinity avidity, measure of Ag-Ab binding, cross reactivity: application of Ag-Ab interactions: agglutination reaction: blood grouping, RID, Ouchterlony, RIA and Elisa, Western blotting.

Unit IV. [12 Hrs]

Hypersensitivity: Classes hypersensitive reactions. (type-1) IgE-mediated hypersensitivity - intracellular events in mast cell degranulation, pharmacological agents in type I reactions, type II, hypersensitivity - erythroblastosis fetalis type - III hypersensitivity - Immune complex mediated hypersensitivity -type IV- delayed - type hypersensitivity. Autoimmunity: Maintenance of tolerance, autoimmune diseases: organ specific - Hashimoto's thyroiditis, Grave's disease. Systemic autoimmune disease - multiple sclerosis, Rheumatoid arthritis.

Unit V: [12 Hrs]

Tumor immunology: Malignant transformation of cells, oncogenes and induction, tumor of immune system - tumor antigens chemically and virally induced tumor antigen, cancer immunotherapy - cytokine therapy - interferons. Tumor necrosis factors, monoclonal antibodies and immunotoxins. Monoclonal antibodies and vaccines: Active and passive immunisation, vaccine designs recombinant vector vaccines.

References

1. Immunology by Kuby (2007)
2. Cellular and Molecular Immunology Abul K. Abbas. A.H. Lichtman & Shiv Pillai (2007)
3. Immunobiology: The immune system in Health and Diseases Charles A. Janeway, Paul Travers, Mark Walport and J. Donald Copra

Mapping of Course outcomes with Program Outcomes

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	√	√			√	√		
CO2	√		√	√			√	
CO3	√	√	√		√			
CO4	√		√			√		
CO5	√			√		√	√	√

Semester :IV

Subject Code	Subject title	Credit	Lecture	Tutorial	Practical	Type
Core VIII –	Animal Biotechnology	4	5	1	0	Theory

Introduction: This course presents the Basics of Biology and characterization of cultures cells and Transgenic animals.

Course Outcome

CO1: To understand the Animal cell organization and Animal cell culture.

CO2: To understand the Biology and characterization of cell cultures.

CO3: To learn the functional activity of Embryology.

CO4: To become familiar with Molecular techniques in cell culture.

CO5: To learn about the Transgenic animals, production and applications.

Unit I : [12 Hrs]

Animal cell organization, Animal cell culture – Introduction, equipments and materials for animal cell culture technology, Culture media: preparation, Types: Balanced salt solution and simple growth medium, physical, chemical and metabolic functions of different constituents of culture medium, growth factors, role of carbon dioxide, serum, serum free media and their applications.

Unit II [12 Hrs]

Biology and characterization of cultures cells, measurement of cell death, types of cell culture: primary and established culture, tissue culture & organ culture, Three dimensional culture, Feeder layer, Disaggregation of tissues and cell separation, cell synchronization, cryopreservation, Apoptosis and necrosis.

Unit III [12 Hrs]

Embryology – culture and preservation of embryos, Gametogenesis and fertilization in animals, Genetic regulation of embryonic development in Drosophila, Homeotic genes in development.

Unit IV: [12 Hrs]

Molecular techniques in cell culture: Manipulation of genes – cell cloning and micromanipulation, gene silencing and targeting, cell transformation – physical, chemical and biological methods, Hybridoma technology and applications.

Unit V: [12 Hrs]

Semester :IV

Subject Code	Subject title	Credit	Lecture	Tutorial	Practical	Type
Allied IV –	Computational Biology	4	5	1	0	Theory

Introduction: This course presents the Basics of Computer operation Word, Excel and Power point preparation.

Course Outcome

CO1: To understand the What is Computer and Basic components.

CO2: To understand the M S Word.

CO3: To learn the MS Excel.

CO4: To become familiar with MS Power point.

CO5: To learn about the Parts of an Access Window.

UNIT I - INTRODUCTION TO COMPUTER (12Hrs)

What is Computer – Evolution – Basic Components – Memory – Software Components - Input / Output Devices - External Storage Devices – Personal Computer – Work Station - Mainframes.

UNIT II - MS - WORD (12Hrs)

Introduction – User Interface – Themes and Quick Styles - Server Components

Word Basics: Parts of Word Window – Formatting Features – Menus, Commands, Toolbars and their Icons – MS Word menus in focus - Word Exercise I – Word Exercise II.

UNIT III - MS-EXCEL (12Hrs)

Introduction – Entering and Editing Text - Menus, Commands and Toolbars – MS Excel Menus in Focus - Excel Exercise-I – Alternate method - Entering formulas – Formatting Cells, Date Range – Inserting Headers & Footers – Saving a file and opening a file.

UNIT IV - MS-POWER POINT (12Hrs)

Creating a new presentation and new slide– Opening a presentation – Deleting a slide, Copying a slide – Numbering the Slides – Saving a presentation – Changing the default directory – Printing a presentation – Working with Power Point – MS Power Point Menus in focus – Formatting in Power Point.

UNIT V - MS-ACCESS (12Hrs)

Parts of an Access Window – MS Access Menus in Focus – Starting Microsoft Access – Creating a New Database – Creating Table using Table Wizard – Saving the Database - Creating Tables in design view – Query – Forms – Reports.

TEXT BOOK

1. Sanjay Saxena, “MS Office for Everyone”, Vikas Publishing House Pvt. Ltd., New Delhi, 2010, Reprinted 2010,.
2. Sinha P.K., “Computer Fundamentals”, BPB Publications, 6th Edition, New Delhi, 2004.

Mapping of Course outcomes with Program Outcomes

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	√	√			√	√		
CO2	√		√	√			√	
CO3	√	√	√		√			
CO4	√		√			√		
CO5	√			√		√	√	√

Semester :IV

	Subject Code	Subject title	Credit	Lecture	Tutorial	Practical	Type
SEC II –		Pharmaceutical Biotechnology4		5	1	0	Theory

Introduction: This course presents the Basics of Pharmacology and drug action.

Course Outcome

CO1: To understand the origin and History of Pharmacology.

CO2: To understand the Targets for drug action.

CO3: To learn the functional Mechanism of action of drugs.

CO4: To become familiar with Antimicrobial drugs.

CO5: To learn about the Thyroid and anti thyroid drugs.

UNIT I: [12 Hrs]

Pharmacology – origins and antecedents – Pharmacology in the 20th century – Drugs – Sources, dosage forms and routes of administration. Absorption, factors modifying drug absorption, distribution, metabolism – Phase I, II reactions, action of cytochrome P450

UNIT II: [12 Hrs]

Targets for drug action, receptor proteins, ion channel and drug targets, control of receptor expression, assay of drug potency: Chemical, bioassay and immunoassay-Drug tolerance and drug dependence. Principles of basic Pharmacokinetics, Adverse response to drugs, drug intolerance, drug allergy, tachyphylaxis, drug abuse, vaccination against infection, factors modifying drug action and effect.

UNIT III: [12 Hrs]

Mechanism of action of drugs used in therapy of Respiratory systems – cough, bronchial asthma, pulmonary tuberculosis Cancer chemotherapy

Unit IV: [12 Hrs]

Antimicrobial drugs – sulfonamide, trimethoprim, penicillins, aminoglycosides and bacterial resistance.

Unit V: [12 Hrs]

Thyroid and anti thyroid drugs, insulin and anti diabetic drugs, anti fertility and ovulation inducing drugs.

Semester :IV

	Subject Code	Subject title	Credit	Lecture	Tutorial	Practical	Type
Core III – and Immunology		Lab in Animal Biotechnology	4	0	0	3	Practical

Introduction: This course presents the Basic and advanced Animal tissue culture techniques and Immunology.

1. Method of immunization and bleeding
2. Preparation of Anti bodies
3. Antigen-anti body reactions
4. Immuno diffusion (Single radial, double and rocket)
5. Blood grouping
6. Preparation of serum from blood
7. WIDAL, ASO, CRP
8. ELISA- Demonstration
9. Washing, sterilization Techniques and Membrane filtration.
10. Preparation of complete ACC medium & of serum
11. Isolation of peripheral blood monolayer cells.
12. Preparation of primary culture from Chicken embryo.
13. Trypsinization
14. Cell Counting & Viability test
15. Cytotoxicity assay

References

1. Animal cell culture – a practical approach, 4th ED., Freshney. John Wiley Pub.
2. Mammalian Cell Biotechnology- A practical approach. ED Butler. Oxford UNI Press.
3. Methods in Cell Biology. VOL 57 Animal methods, ED Mather & Barnes, Academic Press.