

DEPARTMENT OF BIOCHEMISTRY

VISION

To be recognized as a quality centre for excellence in Biochemistry for rural women that provides an atmosphere to acquire skills in identifying the link between biological and human resources and transform it to enhance the quality of life.

MISSION

- To nurture ample knowledge in concepts and principles of biochemistry to rural women
- To identify local and global issues that need intervention by a biochemist and develop intelligent strategies and biochemical approaches in problem solving situations
- To provide opportunities to get hands on experience in research oriented education in Biochemistry, Molecular Biology and Biotechnology, apprenticeship in industries and service agencies and entrepreneurship in Biochemistry-related areas

PROGRAMME EDUCATIONAL OBJECTIVES

- To transform and empower women graduates to meet global challenges through holistic education in terms of recent Teaching-Learning methodologies
- To groom the graduates towards excellence through building communication skills, handling leadership challenges and negotiating career pathways
- To heighten the conscious of the graduates on socio-economic concern and to inculcate moral and ethical values to chisel them as better human being
- To enhance the academic and personal transferable skills and also to gain experience in the methodology of research and development in Biochemistry using modern equipments
- To develop a mix of expertise and practical skills in research, teaching, industry, hospitals, clinical laboratories, medical transcription and medical coding fields

PROGRAMME OUTCOMES

The Programme aids the graduates to

PO 1	emerge with competency in the subject of biochemistry and apply knowledge to cater the needs of society / employer / institution / entrepreneur / enterprise.
PO 2	imbibe analytical/critical/logical/innovative thinking skills in the field of biochemistry.
PO 3	acquire distinct traits and ethics with high professionalism to gain a broader insight into the domain concerned for nation building.
PO 4	impart quality life sciences education to women students and to develop young women as outstanding scholars/teachers/entrepreneur/responsible persons especially in the field of biochemistry and to understand the basics of life with their organization, mechanism of action, diseases and syndromes and their significance.
PO 5	develop capability to function as efficient leader and to encourage the teamwork for managing the projects effectively and economically.

VELLALAR COLLEGE FOR WOMEN (Autonomous), ERODE – 12

BACHELOR OF SCIENCE IN BIOCHEMISTRY

(Applicable to students admitted during the academic year 2018 - 19 and onwards)

COURSE CONTENT AND SCHEME OF EXAMINATIONS (CBCS & OBE PATTERN)

Part	Study Component	Subject Code	Title of the Paper	Inst. Hrs./ Week	Exam. Dur. Hrs.	Max. Marks			Credits
						CIA	ESE	Total	
I	Language I	18TAMU101 / 18HINU101	Tamil /Hindi	6	3	25	75	100	3
II	Language II	18ENLU101/	English	6	3	25	75	100	3
		18ENHU101							
III	Core	18BCUC101	Biomolecules	6	3	25	75	100	3
		18BCUCP01	Core Biochemistry Practical I	3	3	40	60	100	4
	Allied I	18BCUA101	Basics of Biotechnology I	4	3	20	55	75	3
		18BCUAP01	Allied Practical I - Biotechnology	3	–	–	–	–	–
IV	Foundation Course A	18FOCU1ES	Environmental Studies	2	3	–	100	100	2
Total								575	18
I	Language I	18TAMU202/ 18HINU202	Tamil /Hindi	6	3	25	75	100	3
II	Language II	18ENLU202/	English	6	3	25	75	100	3
		18ENHU202							
III	Core	18BCUC202	Analytical techniques	6	3	25	75	100	3
		18BCUCP02	Core Biochemistry Practical II	3	3	40	60	100	4
	Allied I	18BCUA202	Basics of Biotechnology II	4	3	20	55	75	3
		18BCUAP01	Allied Practical I - Biotechnology	3	3	20	30	50	4
IV	Foundation Course B	18VEDU2HR	Value Education and Human Rights	2	3	-	100	100	2
Total								625	22

Bloom's Taxonomy Based Assessment Pattern

Components of CIA Marks for Theory - Core

Tests (I & II)	Assignment / Seminar / Subject Viva	Model Examination	Total
10	5	10	25

Components of CIA Marks for Theory - Allied

Tests (I & II)	Assignment / Seminar / Subject Viva	Model Examination	Total
8	4	8	20

CIA

Bloom's Category	Section	Choice	Marks	Total
K1	A	Compulsory	$2 \times 2 = 4$	30
K1, K2	B	Either / Or	$2 \times 5 = 10$	
K2, K3	C	Open Choice (2 out of 3)	$2 \times 8 = 16$	

Model and End Semester Examination

Bloom's Category	Section	Choice	Marks	Total
K1	A	Compulsory	$5 \times 2 = 10$	75
K1, K2	B	Either / Or	$5 \times 5 = 25$	
K2, K3	C	Open Choice (5 out of 8)	$5 \times 8 = 40$	

Components of CIA Marks for Practicals - Core

CIA (I & II)	Model Examination	Practical Skill	Record	Total
10/5	10/5	15/7	5/3	40/20

Components of CIA Marks for Practicals - Allied

CIA (I & II)	Model Examination	Practical Skill	Record	Total
10/5	10/5	15/7	5/3	40/20

SEMESTER I

CODE	COURSE TITLE						
18BCUC101	BIOMOLECULES						
	Category	CIA	ESE	L	T	P	Credit
	CORE	25	75	86	4	-	3

Preamble

An introduction to basic biomolecules of living organisms through the study of carbohydrates, proteins, lipids, nucleic acids and micro nutrients. The course will explain the classification, types, structural and functional details of the biomolecules. It also imparts the knowledge on the importance of biologically active macro and micro nutrients.

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Familiarize about the definition, occurrence, and types of various biomolecules.	K1 & K2
CO2	Recall and understand the classification, chemistry and functions of macro and micro nutrients.	K1 & K2
CO3	Imbibe and interpret the chemical reactions of monosaccharides, amino acids and structural organization of various biomolecules.	K2 & K3
CO4	Evolve the physiological functions and significance of macro and micro nutrients.	K2 & K3
CO5	Correlate the need of macro and micro nutrients with the metabolic and physiological functions of the human body.	K3

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	M	S	L
CO2	S	S	M	S	L
CO3	S	S	M	M	M
CO4	S	S	S	S	M
CO5	S	S	S	S	S

S- Strong; M-Medium; L-Low

Syllabus

UNIT-I

18Hrs.

Carbohydrates – classification, stereochemistry, cyclic structure, anomeric forms and Haworth projections. Structure, chemistry and functions of Monosaccharides - Reactions of monosaccharides - characteristics of aldehyde and ketone groups, action of acids and alkalies on sugars, reactions of sugars due to hydroxyl groups. Disaccharides - classification, structure and functions of sucrose, lactose and maltose. Polysaccharides – Definition and Types - Homo polysaccharides - structure and functions of starch, glycogen and cellulose. Heteropolysaccharides - structure and functions of hyaluronic acid and heparin.

UNIT-II

18Hrs.

Lipids – Definition and classification - simple, compound and derived lipids. Simple lipids - Physical and chemical properties of fats. Compound lipids - structure and functions of phospholipids, glycolipids and lipoproteins. Derived lipids - structure of saturated and unsaturated fatty acids. Essential fatty acids. Steroids – structure and functions of cholesterol.

UNIT-III

18Hrs.

Amino acids - Definition, amino acids as ampholytes. Structure and classification of amino acids based on side chain composition. Chemical reactions of amino acids due to carboxyl and amino groups. Protein - Definition and Classification. Structural organization of proteins - Primary, secondary, tertiary and quaternary structure based on amino acid sequences.

UNIT-IV

18Hrs.

Nucleic acids - structure of purine and pyrimidine, nucleosides and nucleotides. DNA - Double helical structure. Denaturation and renaturation of DNA. RNA – Types, structure and functions of mRNA, rRNA and tRNA.

UNIT-V

18Hrs.

Vitamins and minerals: Vitamins – Definition and classification Fat soluble vitamins - sources, structure, physiological functions and deficiency conditions. Water soluble vitamins - sources, structure, physiological functions and deficiency conditions. Minerals - essential macro and micro minerals - sources, functions and deficiency conditions.

Text Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	Ambika Shanmugam,	Fundamentals of Biochemistry for Medical Students	Lippincott Williams & Wilkins;	7 th edition, 2012
2.	Sathyanarayana.U	Biochemistry	Books and Allied(P) Ltd, Calcutta	5th edition, 2017
3.	Jain J.L	Fundamentals of Biochemistry	S.Chand & Company Ltd	Multi color Illustrative Edition. 2005.

Reference Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	Deb A.C., New	Fundamentals of Biochemistry,	Central Agency, Calcutta,	3 rd edition, 2004.

2.	Lehninger.A.L., Nelson.D.L., COX .M.M.,	Principles of Biochemistry	CBS publishers, New York	3 rd edition, 2003
3.	Stryer L	Biochemistry	Freeman and Company, New York	8 th edition, 2015.
4.	Voet and Voet, ,	Biochemistry	John Wiley and Sons publications, New York.	5 th edition. 2016.

Web Resources

1. wikipedia.org/wiki/Carbohydrate
2. www.phschool.com/science/biology_place/biocoach/.../lipids.html
3. www.youtube.com/watch?v=f4Gicf7ONGA
4. www.phschool.com/science/biology_place/biocoach/.../nucleic.html
5. wikieducator.org/Carbohydrates,_Proteins,_Vitamins_and_Minerals

Pedagogy

Lecture, PPT, Assignment, Models, Seminar.

SEMESTER I

CODE	COURSE TITLE
18BCUCP01	CORE BIOCHEMISTRY PRACTICAL – I

Category	CIA	ESE	L	T	P	Credit
CORE	40	60	-	-	45	4

Preamble

The practical course develops skills in the qualitative analysis of sugars, amino acids and to determine Acid and Iodine number of lipids. Practical also refines knowledge to differentiate the types of carbohydrates and amino acids depending on reaction mechanisms.

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Learn and understand the principles of reactions involved in the qualitative analysis of carbohydrates and amino acids	K1
CO2	Demonstrate the acid and iodine number of lipids	K2& K3
CO3	Analyze, interpret and identify the unknown carbohydrates and amino acids	K2& K3

Mapping with Programme

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	M	M
CO2	S	S	S	S	S
CO3	S	S	S	S	S

S- Strong; M-Medium; L-Low

Syllabus

1. Qualitative analysis of Carbohydrates:

- Monosaccharides – Glucose, Fructose, Xylose.
- Disaccharides – Sucrose, Lactose.
- Polysaccharides – Starch.

2. Qualitative analysis of Amino acids:

- Histidine
- Tyrosine
- Tryptophan
- Cysteine
- Arginine.

3. Lipid Analysis (Demonstration)

1. Determination of Acid number.
2. Determination of Iodine number.

Reference Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	David T. Plummer.	An introduction to Practical Biochemistry	Tata Mcgrew Hill	33 rd Reprint, 2008
2.	Pattabiraman.	Laboratory Manual in Biochemistry	All India Publishers & Distributors	4 th edition, 2015
3.	J.Jayaraman	Practical Biochemistry	New Age International Publishers Ltd. New Delhi.	4 th edition, 2010

SEMESTER I

CODE	COURSE TITLE
18BCUA101	BASICS OF BIOTECHNOLOGY - I

Category	CIA	ESE	L	T	P	Credit
ALLIED	20	55	56	4	-	3

Preamble

The subject presents the basics of biotechnology, plant and animal tissue culture methods. It provides information on plant tissue culture – methods and applications, animal tissue culture methods and assisted reproductive technology in humans.

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Learn the basics of plant & animal tissue culture and assisted reproductive techniques in human.	K1
CO2	Understand the requirements of plant and animal tissue culture and characterization of stem cells.	K2
CO3	Illustrate and analyze the methods used in plant and animal tissue culture and assisted reproductive techniques in humans and stem cell characterization.	K2 & K3
CO4	Interpret and select the preeminent technology tissue culturing of plant cells and artificial reproduction in humans.	K2 & K3
CO5	Apply the tissue culture technology in various scientific cell level researches and stem cell therapy in medical field.	K3

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	M	M	M	L
CO2	S	M	M	S	S
CO3	S	S	S	M	S
CO4	S	S	S	S	M
CO5	S	S	S	S	S

S- Strong; M-Medium; L-Low

Syllabus

UNIT I

12 Hrs.

Plant tissue culture - Media composition, nutrients and growth regulators, MS medium and B₅ medium. Callus and suspension culture. Initiation and differentiation of PTC. Regeneration of plants from callus – Organogenesis and embryogenesis.

UNIT II

12 Hrs.

Micropropagation – Methods and applications. Somaclonal variation. Artificial seeds – Types, production and applications Cryopreservation – Techniques. Germplasm storage – Applications.

UNIT III

12Hrs.

Protoplast culture- isolation, fusion of protoplasts, selection and regeneration of plantlets. Gene transfer in to plant cells – Electroporation and Biolistics. Production of secondary metabolites.

UNIT IV

12 Hrs.

Animal Tissue Culture – Definition, Lab requirements for in vitro growth, Culture media - types & composition. Culture of explants, Basic steps in cell culture technique. Transgenic mice.

UNIT V

12 Hrs.

Assisted reproductive technology in humans - Artificial insemination, in vitro fertilization (IVF), GIFT, ICSI and embryo transfer. Stem cells – Types and characterization.

Text Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	Dubey. R.C	A textbook of Biotechnology,	S. Chand and company Ltd, New Delhi,	5 th edition, 2014.
2.	Kumaresan. V.,	Biotechnology	Saras Publication, Kanyakumari,	Revised edition, 2015
3.	Sathyanarayana.U.	Biotechnology,	Books & Allied Ltd	Revised edition, 2008

Reference Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	Balasubramanian. D.	Concepts in Biotechnology,	Universal press, India,	Revised edition, 2016
2.	Butterworth-Heinemann	Invitro Cultivation of animal cells	University of Greenwich, United Kingdom, London,	Reprint, 2004
3.	Singh B.D.	Biotechnology,	Kalyani Publishers, India,	4 th edition, 2015.

Web Resources

1. <http://www.phytotechlab.com/pdf/TissueCultureMediaComposition.pdf>
2. http://en.wikipedia.org/wiki/Somaclonal_variation
3. www.sciencepub.net/nature/0301/03-mahongbao.doc
4. http://en.wikipedia.org/wiki/Assisted_reproductive_technology 17
5. <http://stemcells.nih.gov/info/basics/pages/basics1.aspx>

Pedagogy

Lecture, PPT, Assignment, Field visit, Seminar.

SEMESTER I & II

CODE	COURSE TITLE
18BCUAP01	ALLIED PRACTICALS – I: BIOTECHNOLOGY

Category	CIA	ESE	L	T	P	Credit
ALLIED	20	30	-	-	90	4

Preamble

The practical course expands skills in microbial and plant cell culture techniques. It also unfolds the skills of identification of bacteria through staining techniques. It pursues knowledge about antibiotic sensitivity of bacteria, artificial seed preparation and Biometric analysis of plant growth.

Course Outcomes

On the successful completion of the course, students will be able

CO Number	CO Statement	Knowledge Level
CO1	To ascertain the composition of microbial cell culture and plant tissue culture media , Handling of microscope and glassware of Plant tissue culture.	K1
CO2	To demonstrate the Hanging drop technique, Biometric measurements of Organic plants, sterilization of materials required for microbial cell culture and plant tissue culture.	K2 & K3
CO3	To isolate and analyze bacteria present in curd by Serial dilution and staining methods.To analyze and evaluate antibiotic sensitivityTo isolate genomic DNA of plant and animal cell	K2 & K3

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	M	S	M	S
CO2	S	S	S	S	S
CO3	S	S	S	S	S

S- Strong; M-Medium; L-Low

Syllabus

EXPERIMENTS I

- 1) Sterilization
 - a) Physical Sterilization
 - b) Chemical Sterilization
- 2) Media preparation & methods of streaking.
- 3) Isolation of bacteria from curd.
- 4) Staining methods
 - i) Simple staining
 - ii) Gram's staining
 - iii) Negative staining
- 5) Sterilization of culture rooms, glass wares, equipments.
- 6) Antibiotic sensitivity test.

EXPERIMENTS II

- 1) Preparation of MS medium.
- 2) Collection of Explant, surface sterilization, Inoculation of explants.
- 3) Isolation of genomic DNA from plant tissue.
- 4) Isolation of genomic DNA from animal cell.
- 5) Preparation of artificial seed.

DEMONSTRATION EXPERIMENTS:

- 1) Hanging drop technique.
- 2) Biometric measurements of plants grown in the presence of biofertilizers :
 - i) Root length
 - ii) Shoot length
 - iii) Fresh weight
 - iv) Dry weight

Reference Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	Dubey.R.C and Maheshwari.D.K.	Practical Microbiology	S.Chand & Company LTD, New Delhi	First Edition, 2010
2.	Abhijit Dutta	Experimental Biology: A Laboratory Manual Narosa New Delhi	Narosa, New Delhi / Alpha Publisher, Oxford	First Edition, 2009
3.	Dr.S.R.Madhan Sankar and Dr.E.M.Rajesh	A practical manual on basic techniques in Biotechnology and Nanotechnology	International E-Publication, Indore	First Edition, 2013

SEMESTER II

CODE	COURSE TITLE
18BCUC202	ANALYTICAL TECHNIQUES

Category	CIA	ESE	L	T	P	Credit
CORE	25	75	86	4	-	3

Preamble

On successful completion of the course the students would have learnt the principles and applications of the instruments.

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Apprehend the basics of instruments used in biochemical analysis and reagent preparation.	K1 & K2
CO2	Cognize the principles of the various analytical instruments used in biochemistry research laboratories.	K2
CO3	Explore the various separation and quantifying techniques used to isolate and measure the biological samples.	K3
CO4	Compare and sort out the suitable techniques used for the analysis of biological samples chosen.	K2 & K3
CO5	Solicit the analytical techniques in clinical, food and chemical industries.	K3

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	M	S	S	L
CO2	S	S	S	M	M
CO3	S	S	S	S	S
CO4	S	S	S	S	S
CO5	S	S	S	S	S

S- Strong; M-Medium; L-Low

Syllabus

UNIT I **18 Hrs.**
pH scale - methods of calculating pH from Henderson's equation, buffer solutions, buffer systems of blood - protein, bicarbonate and phosphate buffer system. Various ways of expressing the concentrations of solutions - molality, molarity, normality, mole fraction and % solution. Simple problems to be worked out.

UNIT II **18 Hrs.**
Chromatography - principle, instrumentation and applications - Paper chromatography, Thin layer chromatography, Adsorption chromatography, GLC, Ion exchange chromatography, Affinity chromatography and Molecular sieve chromatography.

UNIT III **18 Hrs.**
Electrophoresis - principle, instrumentation and applications of Paper electrophoresis, Agarose gel, SDS-PAGE and Isoelectric focusing . Ultracentrifuge- principle and description of Analytical centrifuge, Sedimentation equilibrium density gradient centrifugation, separation of cell organelles by Differential centrifugation.

UNIT IV **18 Hrs.**
Colorimetry - colour and absorption spectra, Beer and Lambert's law , working of a Single cell photoelectric colorimeter, measurement of extinction coefficient, calibration curve. Spectrophotometry - instrumentation, applications of photometry, comparison and advantage of spectrophotometer over colorimeter. Fluorimetry – principle and applications - determination of Thiamine and Riboflavin. Flame photometer - principle and applications.

UNIT V **18 Hrs.**
Tracer and other techniques - Radioactive decay, units of radioactivity, $t_{1/2}$, detection and measurement of radioactivity, G.M counter, Scintillation counters, Auto radiography. Applications of radioisotopes in biological and medical sciences. Hazards and safety aspects of radioactivity.

Text Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	Dr. Asokan.P.	Analytical biochemistry	Chinnaa Publications, Vellore	2 nd edition. 2006.
2.	Khandpur.R.S.	Hand book of biomedical instrumentation	TATA McGraw Hill, New Delhi,	3 rd edition 2014.
3.	Upadhyay.A et al.,	Biophysical Chemistry – Principles and techniques,	Himalaya Publising House, Mumbai,	4th edition., 2016.

Reference Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	David T. Plummer.	An introduction to practical Biochemistry,	Tata McGraw-Hill Publications, New Delhi,	33 rd Reprint, 2008.
2.	Keith Wilson, Keneth, H., Goulding,	A Biologist's Guide to principles and techniques of practical biochemistry	Cambridge University Press, UK,	3 rd edition, 1992.
3.	Keith Wilson and Walker, J.,	Principles and techniques of practical biochemistry,	Cambridge University Press, UK,	4 th edition, 1995.
4.	Sharma B.K.	Instrumental Methods of Chemical Analysis	Krishna Prakashan Media p Ltd;	1/e edition 2011

Web Resources

1. www.merckmanuals.com
2. www.chemguide.co.uk/analysis/chromatography/gas.html
3. biotechniquesden.blogspot.com/.../what-is-principle-procedure-and.html
4. www.chm.davidson.edu/vce/spectrophotometry/Spectrophotometry.html
5. eesc.columbia.edu/courses/ees/lithosphere/.../radioisotope_tutorial.html

Pedagogy

Lecture, PPT, Assignment, Seminar

SEMESTER II

CODE	COURSE TITLE
18BCUCP02	CORE BIOCHEMISTRY PRACTICAL – II

Category	CIA	ESE	L	T	P	Credit
CORE	40	60	-	-	45	4

Preamble

The practical course imparts knowledge about the colorimetric and spectrophotometric principles and estimation of biomolecules. It also demonstrates the separation of molecules using electrophoresis and chromatography.

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Imbibe the usage of paper chromatography, TLC, SDS- PAGE, colorimeter and spectrophotometer.	K1
CO2	Comprehend the principles involved in the estimation of glucose, phosphorous, urea, uric acid, creatinine and protein.	K2
CO3	Analyze and interpret the results of estimation of glucose, phosphorous, urea, uric acid, creatinine and protein.	K3

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	M	S	M	M
CO2	S	S	S	S	S
CO3	S	S	S	S	S

S- Strong; M-Medium; L-Low

Syllabus

I. COLORIMETRY:

1. Estimation of Glucose – O - Toluidine method.
2. Estimation of Phosphorus – Fiske and Subbarow method.

3. Estimation of Urea – DAM-TSC method.
4. Estimation of Uric acid – Caraway method.
5. Estimation of Creatinine – Picric acid method.
6. Estimation of Protein – Lowry's method

II. SPOTTERS:

1. Paper chromatogram
2. TLC
3. SDS – PAGE
4. Colorimeter
5. Spectrophotometer
6. Centrifuge
7. pH meter

Reference Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	Ritu Mahajan	Practical Biochemistry	Vayu Education of India	1 st edition, 2009.
2.	Alan H. Gowenlock	Varley's Practical clinical Biochemistry	CBS Publisher	Subsequent edition, 2002
3.	Shivaraja Sankara .Y.M	Laboratory Manual for practical Biochemistry	Jaypee publishers	2 nd edition, 2008

SEMESTER II

CODE	COURSE TITLE
18BCUA202	BASICS OF BIOTECHNOLOGY - II

Category	CIA	ESE	L	T	P	Credit
ALLIED	20	55	56	4	-	3

Preamble

The subject presents the applications of biotechnology, and an introduction to fermentation biotechnology. It provides information on the basic applications of biotechnology like biofertilizers and biopesticides, bioprocess technology, biofuels, biological waste treatment & reuse.

Course Outcomes

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

CO Number	CO Statement	Knowledge Level
CO1	Assimilate the elemental knowledge about the role of micro organisms in organic farming, fermentation and renewable energy resources and waste degradation.	K1
CO2	Comprehend the fermentation process using fermentor at optimum laboratory conditions.	K2
CO3	Study the technologies used for fermentation and production of biofertilizer, biofuels, biogas and compost.	K2 & K3
CO4	Analyze and evaluate the differences between bioremediation, biodegradation and biomining.	K2 & K3
CO5	Interpret the application of biotechnology techniques in sewage treatment and in the production of amino acids, antibiotics and SCP.	K3

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	M	S	M	M
CO2	S	S	S	M	L
CO3	S	S	S	S	M
CO4	S	S	S	S	M
CO5	S	S	S	S	S

S- Strong; M-Medium; L-Low

Syllabus

UNIT I

12 Hrs.

Biofertilizers - Rhizobium – Production and applications. Blue Green Algae - Production and applications. Biopesticides - Biological control of crop pests:- Predators: Birds, Insects –Asian red weaver ant, Parasitoids: Proropsa nasuta, Bacterial Pesticides: BT, Fungal Pesticides : Beauveria bassiana, Viral pesticides: GV, Nematodes.

UNIT II

12 Hrs.

Bioprocess technology – fermentation, design of a commercial fermenter, Solid substrate fermentation, Media for industrial fermentations Batch culture and fed - batch culture. Down - stream processing. Production of Amino acids and SCP.

UNIT III

12 Hrs.

Biofuels:- Definition. Ethanol:- Production and applications. Biogas:- Production and applications. Biological Hydrogen Production:- Photo production of Hydrogen, cell-free ‘H’ production, ‘H’ production from marine organisms & Microbial production of ‘H’, uses of ‘H’ producing technology.

UNIT IV

12 Hrs.

Biological waste Treatment:- Definition. Sewage Treatment – methodology & reuse of sewage. Reuse of waste as raw material. Compost- Definition, Methods of composting:- Indore method & Bangalore method Vermi composting and its advantages.

UNIT V

12 Hrs.

Bioremediation:- Definition, insitu bioremediation, Digestion in above ground reactors. Biodegradation:- Definition, xenobiotics, Biodegrading agents, modification of Bacterial strain, Advantages of Biodegradation. Biomining:- Definition, Leaching, micro organisms involved in bioleaching, Advantages of Biomining.

Text Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	Dubey. R.C	A textbook of Biotechnology,	S. Chand and company Ltd, New Delhi,	5 th edition, 2014.
2.	Kumaresan. V.,	Biotechnology	Saras Publication, Kanyakumari,	Revised edition, 2015
3.	Sathyanarayana .U	Biotechnology	Books & Allied Ltd	Revised edition,2008

Reference Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	Balasubramanian.D.,	Concepts in Biotechnology,	Universal press, India,	Revised edition,2016
2.	Butterworth-Heinemann,	Invitro Cultivation of animal cells	University of Greenwich,United Kingdom,London,	Reprint,2004.

3.	Singh B.D.,	Biotechnology,	Kalyani Publishers, India,	4th edition, 2015.
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Web Resources

1. http://www.eplantscience.com/index/biotechnology/plant_biotechnology/biofertilizers
2. <http://www.slideshare.net/FIRDOUS88/single-cell-protein>
3. http://www.wte-ltd.co.uk/sewage_treatment_options.html
4. <http://en.wikipedia.org/wiki/Biodegradation>
5. http://www.learner.org/courses/biology/textbook/microb/microb_14.html

Pedagogy

Lecture, PPT, Assignment, Field visit, Seminar