



SATHYABAMA

INSTITUTE OF SCIENCE AND TECHNOLOGY
(DEEMED TO BE UNIVERSITY)

Accredited "A" Grade by NAAC | 12B Status by UGC | Approved by AICTE

www.sathyabama.ac.in

SCHOOL OF BIO AND CHEMICAL ENGINEERING

DEPARTMENT OF BIOTECHNOLOGY

Board of Studies 2017-2018 (ODD SEM)

Minutes of Meeting

Date :06-06-2017 (Tuesday)

10.00am-11.45am

- Chair-person : Dr. Valli Nachiyar C, Prof and HOD
- Attendees : Dr. Parthiban.M., External Member
Professor and Head, Department of Animal Biotechnology,
Madras Veterinary college, Chennai 600007
- Dr. Ramesh kumar V, Internal member
Dr. Jayshree Nellore, Internal member
Dr. Karthick Raja Namasivayam, Internal member

The Chair-person welcomed the members.

Agenda of the meeting; Syllabus revisions and implementation in 2017- 2018 even semester;

Following which discussions were held as follows,

B Tech Biotechnology

Dr Elizabeth Rani elaborated the need of implementation of food processing and packaging in Food biotechnology syllabus (SBT1602).

Dr Parthiban recommended the addition of topics include the significant role of microorganisms, food supplements in nutraceuticals in food industry in semester VII.

Major revisions in elective courses.



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M Tech Biotechnology

Dr Ramesh Kumar suggested the additions of topics in Marine Biotechnology syllabus in Semester III to keep up with current advances in the field.

Minor revisions in elective courses.

External Member	Signature
Dr.Prathiban M	
Internal Member	Signature
Dr. Jayshree Nellore	
Dr. Karthick Raja Namasivayam	
Dr. Ramesh kumar V	


Head of the Department/Chairperson

(Dr.Valli Nachiyar)

HEAD OF THE DEPARTMENT
DEPARTMENT OF BIOTECHNOLOGY
SATHYABAMA
INSTITUTE OF SCIENCE AND TECHNOLOGY
(DEEMED TO BE UNIVERSITY)
Jeppiaar Nagar, Rajiv Gandhi Salai
Chennai-600 119



SATHYABAMA

INSTITUTE OF SCIENCE AND TECHNOLOGY

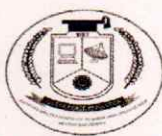
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B.Tech Biotechnology

S.No	Course code	Course name	Deleted topics	Added topics
1	SBT1602	Food Biotechnology		<p>Unit 1: History of Microorganisms in food, Historical Developments. The Role and significance of Microorganisms, Primary sources of Microorganisms found in foods. Microbial Intrinsic and Extrinsic parameters of foods.</p> <p>Unit 2: Microbiological role in food process operation and production: new protein foods: SCP; mushroom; food yeasts, algal proteins.</p> <p>Unit 3: Destruction of Microorganisms and Applications, Radappertization, Radicidation and Radurization of food, legal status of food irradiation</p>
			<p>UNITS APPLICATION OF ENZYMES IN FOOD PROCESSING De-oxygenating and de-sugaring by glucose oxidase, beer mashing, chill proofing- cheese making by proteases – operations, unit clarification of juices.</p>	<p>Unit 5: Introduction to Food Packaging, interaction of food material with packaging materials, preservation of food products. Genetically modified and transgenic food development, processing- nutritional and economic aspects.</p>



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M.Tech Biotechnology

S.No	Course code	Course name	Deleted topics	Added topics
1	SBT5609	Marine Biotechnology	NIL	Unit 1: Diversity & adaptation. Marine microbial diversity: Marinemicrobial habitats - Unit 2: Culture practices of marinefishes (seabass and cobia), Unit 3:Marine enzymes - HUFA,PUFA, Unit 5:Control of oil spills andbioremediation.

SBT1602	FOOD BIOTECHNOLOGY (OLD SYLLABUS)	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVE

- The course describes the interaction of the food and microorganisms, their negative impact and the methods of food preservation by modern biotechnological process.

UNIT1 INTRODUCTION

9Hrs

Microbiological quality testing of foods – enumeration and detection of food borne organisms - Culture, Microscopic and Sampling Methods, Conventional, SPC, Membrane Filters, Microscopic Colony Counts, Agar droplets, Dry films, MPN, DMC, Dye reduction, Roll Tubes, Microbiological Examination of surfaces and sampling, Metabolically Injured Organism, Enumeration and Detection of food borne organisms.

UNIT2 FOOD MICROBIOLOGY

11 Hrs

Food Fermentation method of preparing and preserving foods -pickling, alcoholic beverages and other products. Food additives: Need for food additives, types of food additives. Development of novel food and food ingredients; SCP, polysaccharides, low calorie sweeteners, naturally produced flavor modifier, food coloring agent, food supplements and Nutraceuticals. Genetically modified foods and consumer preference – prebiotic and probiotic foods.

UNIT3 STORAGE& PRESERVATION

9 Hrs

General principle of spoilage, factors affecting spoilage; Spoilage of fruits and Vegetables, Spoilage of Miscellaneous Foods. Food preservation- Characteristics of Radiations of Interest in Food Preservation. Storage and Stability of irradiated foods, Preservation: High and Low Temperature, Drying

UNIT4 FOOD PROCESSING

9Hrs

Mechanism of enzyme functions and reactions in process techniques: starch and sugar conversion process or baking by amylases; de-oxygenation and desugaring by glucose oxidase; beer mashing and chill- proofing and cheese making by proteases and various other enzymes, catalytic actions in food processing. Process wastes: whey; molasses; starch substances and other food wastes for bioconversion to useful products.

UNIT5 APPLICATION OF ENZYMES IN FOOD PROCESSING

7hrs

De-oxygenating and de-sugaring by glucose oxidase, beer mashing, chill proofing- cheese making by proteases – operations, unit clarification of juices.

Max.45 hrs

TEXT / REFERENCE BOOKS

- James. M. Jay, Martin J. Loessner and David A. Golden, Food Microbiology, Springer Publication, 7th Edition, 2005.
- Frazier, Food Microbiology, McGraw Hill Publication, 4th Edition, 2001
- Shetty K., G. Paliyath et al. – Food Biotechnology – 2nd Edition- Taylor and francis, 2006.
- Keshav Trehan, Biotechnology, New Age International (P) Ltd. Publishers, 2002.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks : 80 Exam

Duration : 3 Hrs.

PART A : 10 questions of 2 marks each - No choice

20 Marks

PART B : 2 questions from each unit of internal choice; each carrying 12 marks

60 Marks

SBT1602	FOOD BIOTECHNOLOGY (REVISED SYLLABUS)	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVE

- The course describes the interaction of the food and microorganisms, their negative impact and the methods of food preservation by modern biotechnological process.

UNIT1 INTRODUCTION 9Hrs

History of Microorganisms in food, Historical Developments. The Role and significance of Microorganisms, Primary sources of Microorganisms found in foods. Microbial Intrinsic and Extrinsic parameters of foods. Microbiological quality testing of foods – enumeration and detection of food borne organisms - Culture, Microscopic and Sampling Methods, Conventional, SPC, Membrane Filters, Microscopic Colony Counts, Agar droplets, Dry films, MPN, DMC, Dye reduction, Roll Tubes, Microbiological Examination of surfaces and sampling, Metabolically Injured Organism, Enumeration and Detection of food borne organisms.

UNIT2 FOOD MICROBIOLOGY 11 Hrs

Microbiological role in food process operation and production: new protein foods: SCP; mushroom; food yeasts, algal proteins. Food Fermentation method of preparing and preserving foods -pickling, alcoholic beverages and other products. Food additives: Need for food additives, types of food additives. Development of novel food and food ingredients; SCP, polysaccharides, low calorie sweeteners, naturally produced flavor modifier, food coloring agent, food supplements and Nutraceuticals. Genetically modified foods and consumer preference – prebiotic and probiotic foods.

UNIT3 STORAGE& PRESERVATION 9 Hrs

General principle of spoilage, factors affecting spoilage; Spoilage of fruits and Vegetables, Spoilage of Miscellaneous Foods. Food preservation- Characteristics of Radiations of Interest in Food Preservation, Destruction of Microorganisms and Applications, Radappertization, Radicidation and Radurization of food, legal status of food irradiation. Storage and Stability of irradiated foods, Preservation: High and Low Temperature, Drying

UNIT4 FOOD PROCESSING 9Hrs

Mechanism of enzyme functions and reactions in process techniques: starch and sugar conversion process or baking by amylases; de-oxygenation and desugaring by glucose oxidase; beer mashing and chill- proofing and cheese making by proteases and various other enzymes, catalytic actions in food processing. Process wastes: whey; molasses; starch substances and other food wastes for bioconversion to useful products.

UNIT5 PACKAGING 7 hrs

Introduction to Food Packaging, interaction of food material with packaging materials, preservation of food products. Genetically modified and transgenic food development, processing- nutritional and economic aspects.

Max.45 hrs

TEXT / REFERENCE BOOKS

- James. M. Jay, Martin J. Loessner and David A. Golden, Food Microbiology, Springer Publication, 7th Edition, 2005.
- Frazier, Food Microbiology, McGraw Hill Publication, 4th Edition, 2001
- Shetty K., G. Paliyath et al. – Food Biotechnology – 2nd Edition- Taylor and francis, 2006.
- Keshav Trehan, Biotechnology, New Age International (P) Ltd. Publishers, 2002.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks : 80 Exam

Duration : 3 Hrs.

PART A : 10 questions of 2 marks each - No choice

20 Marks

PART B : 2 questions from each unit of internal choice; each carrying 12 marks

60 Marks

SBT5609	MARINE BIOTECHNOLOGY (OLD SYLLABUS)	L	T	P	Credits	TotalMarks
		3	1	0	4	100

COURSE OBJECTIVE

- The course gives an introduction on the micro, macroflora and fauna of the marine environment. The following section emphasis the aquaculturing and the production of marine products

UNIT1 INTRODUCTION TO MARINE ENVIRONMENT AND BIODIVERSITY 12Hrs.

Physical and chemical properties of sea water. Zonation of sea: Euphotic – mesopelagic – bathopelagic-benthos - deep sea. Marine ecosystems and biodiversity: Microbial distribution in the oceans - Factors that impact marine microbial diversity – Interactions between marine microbes and macroorganisms-Symbiotic relationship with marine invertebrates-Marine viruses.

UNIT2 AQUACULTURE 12Hrs.

Aquaculture: Definition - Importance of aquaculture-Criteria of selection of species for aquaculture. Types of culture: Monoculture, polyculture, composite fish culture and integrated fish farming., Pacific white shrimp (*Litopenaeus vannamei*), Freshwater prawn (*Macrobrachium rosenbergi*), crab, lobsters, edible oyster, pearl oyster, mussel, and Seaweeds.

UNIT3 FISH GENETICS AND BIOMEDICAL IMPORTANCE OF MARINE ORGANISMS 12Hrs.

Fish genetics: Gynogenesis, androgenesis, polyploidy, control of sex, artificial insemination, eye stalk ablation. Transgenesis and DNA Vaccine development for aquacultured fish, cryopreservation. Live feed culture: Microalgae and Artemia - Biofuel production by marine plankton- Omega-3 Fatty acid from marine organisms. New antibiotics and medicines from marine organisms. Secondary metabolites from marine cyanobacteria, actinomycetes and endophytic fungi-Probiotics.

UNIT4 MARINE VALUE-ADDED PRODUCTS 12Hrs.

Fishmeal, Fish sausages, Isinglass, Fish glue, Fish silage, Fin rays, Chitosan, Chitin, Pearl Essence, agar, Alginates, Carrageenan and Heparin. Useful products from Trash fish.

UNIT5 ENVIRONMENTAL IMPACTS OF AQUATIC BIOTECHNOLOGY 12Hrs.

Human impacts on marine microbial diversity-microbial mediated equilibria that impact environmental and human health-Using Marine Microbes to ameliorate environmental deterioration. Environmental issues: Effects of bio-fouling and bio-deterioration on marine structures. Protection methods against corrosion and fouling. Red tides: Causative factors and effects on the organisms of marine environment.

Max.60Hours

TEXT/REFERENCEBOOKS

- Pillay, T.V.R. Aquaculture Principles & Practices. Fishing News(Books)Limited, London,1990.
- Santhanam R.N. Ramanathan and G. Jegatheesan. Coastal Aquaculture in India, CBS publishers,1990.
- Le Gal, Y., Ulber, R Marine Biotechnology: Advances in Biochemical Engineering/Biotechnology (Series editor: T. Scheper) Springer-VerlagBerlinHeidelberg.Vol.96. pp. 287,2005
- Le Gal, Y., Ulber, R, Marine Biotechnology: Advances in Biochemical Engineering/Biotechnology (Series editor: T. Scheper)Springer-VerlagBerlinHeidelberg.Vol.97.pp.261,2005.
- Jennie Hunter-Cevera, David Karl and Merry Buckley, Marine microbial diversity: The key to earth's habitability: A Report from the American academy of microbiology, Published by American Academy of Microbiology, held (April8-10, 2005) in San Francisco, California.pp.28, 2005.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max.Marks:80

ExamDuration:3Hrs.

PARTA: 6 Questions of 5 Marks each-No Choice

30Marks

PARTB: 2 Questions from each unit of internal choice, carrying 10Marks each

50Marks

SBT5609	MARINE BIOTECHNOLOGY (REVISED SYLLABUS)	L	T	P	Credits	TotalMarks
		3	1	0	4	100

COURSE OBJECTIVE

- The course gives an introduction on the micro, macroflora and fauna of the marine environment. The following section emphasis the aquaculturing and the production of marine products

UNIT1 INTRODUCTION TO MARINE ENVIRONMENT AND BIODIVERSITY 12Hrs.

Physical and chemical properties of sea water. Zonation of sea: Euphotic – mesopelagic – bathopelagic-benthos - deep sea. Marine ecosystems and biodiversity: Diversity & adaptation. Marine microbial diversity: Marine microbial habitats - Microbial distribution in the oceans - Factors that impact marine microbial diversity – Interactions between marine microbes and macroorganisms-Symbiotic relationship with marine invertebrates-Marineviruses.

UNIT2 AQUACULTURE 12Hrs.

Aquaculture: Definition - Importance of aquaculture-Criteria of selection of species for aquaculture. Types of culture: Monoculture, polyculture, composite fish culture and integrated fish farming. Culture practices of marine fishes (seabass and cobia), Pacific white shrimp (*Litopenaeusvannamei*), Freshwater prawn (*Macrobrachiumrosenbergi*), crab, lobsters, edible oyster, pearl oyster, mussel, and Seaweeds.

UNIT3 FISH GENETICS AND BIOMEDICAL IMPORTANCE OF MARINE ORGANISMS 12Hrs.

Fish genetics: Gynogenesis, androgenesis, polyploidy, control of sex, artificial insemination, eye stalk ablation. Transgenesis and DNA Vaccine development for aquacultured fish, cryopreservation. Live feed culture: Microalgae and Artemia - Biofuel production by marine plankton- Marine enzymes - HUFA, PUFA, and Omega-3 Fatty acid from marine organisms. New antibiotics and medicines from marine organisms. Secondary metabolites from marine cyanobacteria, actinomycetes and endophytic fungi-Probiotics.

UNIT4 MARINE VALUE ADDED PRODUCTS 12Hrs.

Fishmeal, Fishsausages, Isinglass, Fishglue, Fishsilage, Finrays, Chitosan, Chitin, Pearl Essence, agar, Alginates, Carrageenan and Heparin. Useful products from Trashfish.

UNIT5 ENVIRONMENTAL IMPACTS OF AQUATIC BIOTECHNOLOGY 12Hrs.

Human impacts on marine microbial diversity-microbial mediated equilibria that impact environmental and human health-Using Marine Microbes to ameliorate environmental deterioration. Control of oil spills and bioremediation. Environmental issues: Effects of bio-fouling and bio-deterioration on marine structures. Protectionmethods against corrosion and fouling. Red tides: Causative factors and effects on the organisms of marineenvironment.

Max.60Hours

TEXT/REFERENCEBOOKS

- Pillay, T.V.R. Aquaculture Principles & Practices. Fishing News(Books)Limited, London, 1990.
- Santhanam R.N. Ramanathan and G. Jegatheesan. Coastal Aquaculture in India, CBS publishers, 1990.
- Le Gal, Y., Ulber, R Marine Biotechnology: Advances in Biochemical Engineering/Biotechnology (Series editor: T. Scheper) Springer-VerlagBerlinHeidelberg.Vol.96. pp. 287,2005
- Le Gal, Y., Ulber, R, Marine Biotechnology: Advances in Biochemical Engineering/Biotechnology (Series editor: T. Scheper)Springer-VerlagBerlinHeidelberg.Vol.97.pp.261,2005.
- Jennie Hunter-Cevera, David Karl and Merry Buckley, Marine microbial diversity: The key to earth's habitability: A Report from the American academy of microbiology, Published by American Academy of Microbiology, held (April8-10, 2005) in San Francisco, California.pp.28, 2005.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max.Marks:80

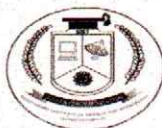
ExamDuration:3Hrs.

PARTA: 6 Questions of 5 Marks each-No Choice

30Marks

PARTB: 2 Questions from each unit of internal choice, carrying 10Marks each

50Marks



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Board of Studies 2017-2018 (EVEN SEM)

Minutes of Meeting

Date :9-01-2018 (Tuesday)

11.00am-12.15pm

Chair-person : Dr. Valli Nachiyar C, Prof and HOD

Attendees : Dr.Parthiban.M., External Member
Professor and Head, Department of Animal Biotechnology,
Madras Veterinary college, Chennai 600007

Dr. Ramesh kumar V, Internal member

Dr. Jayshree Nellore, Internal member

Dr. Karthick Raja Namasivayam, Internal member

The Chair-person welcomed the members to table the agenda.

Agenda of the meeting; Syllabus revisions and implementation in 2017- 2018 even semester;

Following which discussions were held as follows,

B Tech Biotechnology

The Chairperson abridged the members that, as per AICTE norms the implementation of Neuroscience as an elective course for even semester.

Dr. Parthiban suggested the introduction of Aqua culture as an elective in Semester VI to explore the basic concepts in marine technology.



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Dr.Valli Nachiyar recommended the addition of topics include tissue culture techniques and plant transformation in Agricultural biotechnology elective course for Semester VI.

The Board considered and approved the syllabi for SBT1608 Aquaculture, SBT1603 Agriculture Biotechnology for B.Tech Biotechnology .

M.Tech Biotechnology

Dr.Ramesh Kumar recommended the addition of topics include Biofilters and Bioscrubbers, Anaerobic & Aerobic - Drinking-water treatment, e-waste, Role of GEM in bioremediation of oil spills, Bioelectricity through microbial fuel cells, energy management and safety in Environmental biotechnology

The Board considered and approved the same

The meeting ended with a vote of thanks to the Chair.

External Member	Signature
Dr.Prathiban M	
Internal Member	Signature
Dr. Jayshree Nellore	
Dr. Karthick Raja Namasivayam	
Dr. Ramesh kumar V	

Head of the Department/Chairperson

(Dr.Valli Nachiyar)



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B.Tech Biotechnology

S.No	Course code	Course name	Deleted topics	Added topics
1	SBT1603	Agriculture Biotechnology	NIL	Unit 2: Micropropagation with shoot apex and nodal cultures, Production of haploid plant through Androgenesis and Gynogenesis Unit 4: production of transplatomics Unit 5 :therapeutic protein (Plantibodies, Plantigens, Edible Vaccines),

M.Tech Biotechnology

S.No	Course code	Course name	Deleted topics	Added topics
1	SBT5608	Environmental Biotechnology	NIL	Unit 1: Biofilters and Bioscrubbers Unit 2: Anaerobic & Aerobic - Drinking-water treatment Unit 3: E-waste Unit 4: Role of GEM in bioremediation of oil spills. Unit 5 : Bioelectricity through microbial fuel cell, energy management and safety.

SBT1608	AQUACULTURE (NEW ELECTIVE)	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES

- To provide knowledge on the basics of aquaculture and hatcheries
- To understand the chromosomal manipulations and their effects

UNIT1 INTRODUCTION TO AQUACULTURE: 9 Hrs.

Aquaculture: Definition-Site selection, design and construction of aquaculture pond - Criteria for selecting the candidate species for aquaculture - Types and methods: Extensive, semi-intensive and intensive culture - Composite fish culture and integrated fish farming - Types of culture systems: pen culture, Cage culture, raft culture and Pond culture.

UNIT2 HATCHERY AND GROW-OUT PRODUCTION OF AQUATIC ORGANISMS 9Hrs.

Design and construction of a fish hatchery - Types of hatcheries and management practices - Live feed culture: culture of microalgae, rotifers and crustaceans (Artemia) - Selection of brooder, nutrition, gonadal changes, hormonal regulation - Culture of economically important marine species: Litopenaeus vannamei (shrimp), Lates calcarifer (seabass), Lobster, seaweeds - Culture practices of freshwater species: Prawns, carps, catfish, murels and ornamental fishes.

UNIT3 POND MANAGEMENT AND POST HARVEST TECHNOLOGY 9 Hrs.

Pond management: Nursery and grow-out pond maintenance, pond fertilization. Water quality management: Dissolved Oxygen, CO₂, Ammonia, pH, salinity, temperature and turbidity. Harvest and post-harvest technology: Types of harvest, sorting, cleaning, packing, transportation of live organisms and preservation. Fish processing: Types of processing and canning, Quality assurance: Standards of sanitation and hygiene. Implementation of HACCP (Hazard Analysis and Critical Control Point) concept and food safety in fish industry.

UNIT4 CHROMOSOME MANIPULATION AND FISH BIOTECHNOLOGY 9 Hrs.

Genetic improvement: Inbreeding and cross breeding; Hybridization, Genetic manipulation: Sex-reversal and sex control; role of steroids in sex reversal, chromosomal manipulation, polyploidy, androgenesis and gynogenesis; cryopreservation of gametes. Fish Biotechnology: Production of transgenic fishes, micro injection technique, Cloning and expression of GnRH.

UNIT5 FISH DISEASES AND CONTROL MEASURES 9 Hrs.

Disease diagnosis: Principles of disease diagnosis in finfish and shell fish. Microbial diseases: Diseases caused by bacteria (Vibriosis) - Fungi and viruses (WSSV). Parasitic diseases: Diseases caused by protozoa and metazoa (crustaceans, helminthes). Non-infectious diseases: Nutritional and environmental diseases. Aquafarm pollutants. Prevention and control of diseases: Symptoms, prevention, control and treatments (prophylactic and therapeutic).

Max.45Hours

TEXT / REFERENCE BOOKS

- Pillay, T.V.R., Aquaculture Principles & Practices, Fishing News (Books) Limited, London, 1990
- Santhanam R. N. Ramanathan and G. Jegatheesan, Coastal Aquaculture in India, CBS publishers, 1990
- V. Sundararaj, M.J. Prince Jeyaseelan and S. Felix, Shrimp health Management, Mala Publishers, Chennai. 1993
- T.V.R. Pillay, Coastal Aquaculture in the Indo-Pacific region, FAO, Rome, Italy. 1962
- Donald R. Swift, Aquaculture training manual, Fishing News Books Ltd. 1993
- Hand Book on aqua farming by MPEDA, Cochin. 2005

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks : 80

Exam Duration : 3 Hrs.

PART A : 10 questions of 2 marks each - No choice

20 Marks

PART B : 2 questions from each unit of internal choice; each carrying 12 marks

60 Marks

SBT1603	AGRICULTURE BIOTECHNOLOGY (OLD SYLLABUS)	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES

- To understand the organization of plant genome
- To provide an insight into the applications of tissue culture and transformation

UNIT1	INTRODUCTION	9 Hrs.
History, Definition, Structure and organization of plant genome, Chloroplast and Mitochondrial genome, Totipotency, Plasticity and cytodifferentiation, Culture environment, Plant Tissue culture media and their components, Methods of sterilization, Different types of culture, Factors affecting in vitro culture.		
UNIT2	TISSUE CULTURE TECHNIQUES	9 Hrs.
Regeneration of plants, Organogenesis, Somatic embryogenesis and synthetic seeds, Embryo culture and embryo rescue method, In vitro pollination and fertilization.		
UNIT3	TISSUE CULTURE APPLICATION	9 Hrs.
Isolation and culture of protoplasts, protoplast fusion and somatic hybridization, Selection systems for somatic hybrids / cybrids and their characterization, Somoclonal variations, Production of secondary metabolites by plant cell cultures, Germplasm conservation and cryopreservation.		
UNIT4	PLANT TRANSFORMATION	9 Hrs.
Genetic Transformation methods for production of transgenic plants (Direct, Indirect), Direct Gene Transfer (DGT) methods, Agrobacterium mediated genetic transformation (Indirect), Chloroplast transformation		
UNIT5	APPLICATION AND SAFETY REGULATIONS	9 Hrs.
Production of genetically modified plants for herbicide and pest resistant, transgenic plants for quality traits, Industrial enzymes, Safety regulation for transgenic plants, Current issues related to transgenic plants.		

Max.45Hours

TEXT/REFERENCEBOOKS

1. Adrian Slater, Nigel Scott, and Mark Fowler, Plant Biotechnology, Oxford University Press, NewYork, 2008.
2. Old R.W. and Primrose S.B., An Introduction to Genetic Engineering, University of California press, 1980.
3. Satyanarayana, U. Biotechnology, Allied Pvt. Ltd. Kolkata, 2007.
4. Purohit S.S., Agricultural Biotechnology, Agrobios Indi., Jodhpur, 2002.
5. Chawla H.S., Introduction to Plant Biotechnology, 2nd Edition, Oxford and IBH Press, 2003.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max.Marks:80

PARTA:10 questions of 2 marks each- No choice

PARTB: 2 questions from each unit of internal choice; each carrying 12marks.

ExamDuration:3 Hrs.

20 Marks

60 Marks

SBT1603	AGRICULTURE BIOTECHNOLOGY (REVISED SYLLABUS)	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES

- To understand the organization of plant genome
- To provide an insight into the applications of tissue culture and transformation

UNIT1 INTRODUCTION

9 Hrs.

History, Definition, Structure and organization of plant genome, Chloroplast and Mitochondrial genome, Totipotency, Plasticity and cytodifferentiation, Culture environment, Plant Tissue culture media and their components, Methods of sterilization, Different types of culture, Factors affecting in vitro culture.

UNIT2 TISSUE CULTURE TECHNIQUES

9 Hrs.

Regeneration of plants, Organogenesis, Micropropagation with shoot apex and nodal cultures (Clonal Propagation), Somatic embryogenesis and synthetic seeds, Embryo culture and embryo rescue method, in vitro pollination and fertilization, Production of haploid plant through Androgenesis and Gynogenesis.

UNIT3 TISSUE CULTURE APPLICATION

9 Hrs.

Isolation and culture of protoplasts, protoplast fusion and somatic hybridization, Selection systems for somatic hybrids / cybrids and their characterization, Somoclonal variations, Production of secondary metabolites by plant cell cultures, Germplasm conservation and cryopreservation.

UNIT4 PLANT TRANSFORMATION

9 Hrs.

Genetic Transformation methods for production of transgenic plants (Direct, Indirect), Direct Gene Transfer (DGT) methods, Agrobacterium mediated genetic transformation (Indirect), Chloroplast transformation and production of transplastomics.

UNIT5 APPLICATION AND SAFETY REGULATIONS

9 Hrs.

Production of genetically modified plants for herbicide and pest resistant, transgenic plants for quality traits, Industrial enzymes, Molecular farming for therapeutic protein (Plantibodies, Plantigens, Edible Vaccines), Safety regulation for transgenic plants, Current issues related to transgenic plants.

Max.45Hours

TEXT/REFERENCEBOOKS

6. Adrian Slater, Nigel Scott, and Mark Fowler, Plant Biotechnology, Oxford University Press, NewYork, 2008.
7. Old R.W. and Primrose S.B., An Introduction to Genetic Engineering, University of California press, 1980.
8. Satyanarayana, U. Biotechnology, Allied Pvt. Ltd. Kolkata, 2007.
9. Purohit S.S., Agricultural Biotechnology, Agrobios Indi., Jodhpur, 2002.
10. Chawla H.S., Introduction to Plant Biotechnology, 2nd Edition, Oxford and IBH Press, 2003.

ENDSEMESTEREXAMINATIONQUESTIONPAPERPATTERN

Max.Marks:80

PARTA:10 questions of 2 marks each- No choice

PARTB: 2 questions from each unit of internal choice; each carrying 12marks

ExamDuration:3 Hrs.

20 Marks

60 Marks

SBT5608	ENVIRONMENTAL BIOTECHNOLOGY (OLD SYLLABUS)	L	T	P	Credits	Total Marks
		3	1	0	4	100

COURSE OBJECTIVE

- Discusses on the various types of pollution and their treatment methods. Also briefs on the remediation technologies and bioenergy production

UNIT1 INTRODUCTION TO ENVIRONMENTAL POLLUTION 12Hrs.

Air, Water and Soil pollution- common effects and control measures. Air Pollution Treatment: Treatment technologies, Microbial flora of soil, Ecological adaptations, Interactions among soil microorganisms, biogeochemical role of soil microorganisms.

UNIT2 BIOLOGICAL TREATMENT METHODS FORWASTEWATER 12 Hrs.

Aerobic digestion, Anaerobic digestion, Denitrification, Anoxic digestion, the activated sludge process, Design and modeling of activated sludge processes, Aerobic digestion, Design of a trickling biological filter, Design of anaerobic digester.

UNIT3 INDUSTRIALWASTEMANAGEMENT 12 Hrs.

Dairy, Paper & Pulp, Textile, leather, hospital and pharmaceutical industrial waste management, radioactive and nuclear power waste management- Solid waste management

UNIT4 BIOREMEDIATION 12Hrs.

Types of Bioremediation, Microbiology of degradation and its mechanism, Bioaugmentation, Biosorption, Bioleaching, Metabolic pathways for Biodegradation for specific organic pollutants. Heavy metals- phytoremediation.

UNIT5 BIOENERGY 12Hrs.

Alternate Source of Energy-Biocomposting, Vermiculture, Biofertilizers, Organic farming, Biofuels, Biomineralization, Bioethanol and Biohydrogen,

Max. 60 Hours

COURSE OUTCOMES

On completion of the course, student will be able to

- CO1 - Introduces pollution and its effects.
- CO2 - Provides information about the role of microorganisms in the environment.
- CO3 - Exposes the students to various pollution control technologies available.
- CO4 - Explains Bioremediation and biodegradation in detail.
- CO5 - Elucidates biodegradation process and mechanism.
- CO6 - Discusses different alternate source of energy.

TEXT / REFERENCE BOOKS

- Alan and Scragg, Environmental Biotechnology . Pearson Education Ltd. England1999.
- Jogdand, Environmental Biotechnology, Himalaya Publishing House Bombay1995.
- John. T. cookson,Jr. Bioremediation engineering; design and application Mc Graw Hill, Inc.1995
- Chakrabarty K.D., Omen G.S., Biotechnology And Biodegradation, Advances In Applied Biotechnology Series , Vol.1, Gulf Publications Co., London,1989
- Metcalf and Eddy, Waste Water Engineering – Treatment, Disposal and reuse. Inc., Tata McGraw Hill, New Delhi2000.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks:80

Exam Duration : 3Hrs.

PART A : 6 Questions of 5 Marks each –NoChoice

30Marks

PART B : 2 Questions from each unit of internal choice, carrying 10Markseach

50Marks

SBT5608	ENVIRONMENTAL BIOTECHNOLOGY (REVISED SYLLABUS)	L	T	P	Credits	Total Marks
		3	1	0	4	100

COURSE OBJECTIVE

- Discusses on the various types of pollution and their treatment methods. Also briefs on the remediation technologies and bioenergy production

UNIT1 INTRODUCTION TO ENVIRONMENTAL POLLUTION 12Hrs.

Air, Water and Soil pollution- common effects and control measures. Air Pollution Treatment: Treatment technologies, Biofilters and Bioscrubbers for treatment of industrial waste. Microbial flora of soil, Ecological adaptations, Interactions among soil microorganisms, biogeochemical role of soil microorganisms.

UNIT2 BIOLOGICAL TREATMENT METHODS FOR WASTEWATER 12 Hrs.

Aerobic digestion, Anaerobic digestion, Denitrification, Anoxic digestion, the activated sludge process, Design and modeling of activated sludge processes, Aerobic digestion, Design of a trickling biological filter, Design of an anaerobic digester. Anaerobic & Aerobic - Drinking-water treatment

UNIT3 INDUSTRIAL WASTE MANAGEMENT 12 Hrs.

Dairy, Paper & Pulp, Textile, leather, hospital and pharmaceutical industrial waste management, e-waste- radioactive and nuclear power waste management- Solid waste management

UNIT4 BIOREMEDIATION 12Hrs.

Types of Bioremediation, Microbiology of degradation and its mechanism, Bioaugmentation, Biosorption, Bioleaching, Metabolic pathways for Biodegradation for specific organic pollutants. Heavy metals- phytoremediation. Role of GEM in bioremediation of oil spills.

UNIT5 BIOENERGY 12Hrs.

Alternate Source of Energy-Bio composting, Vermiculture, Biofertilizers, Organic farming, Biofuels, Biomining, Bioethanol and Biohydrogen, Bioelectricity through microbial fuel cell, energy management and safety.

Max. 60 Hours

COURSE OUTCOMES

On completion of the course, student will be able to

- CO1 - Introduces pollution and its effects.
- CO2 - Provides information about the role of microorganisms in the environment.
- CO3 - Exposes the students to various pollution control technologies available.
- CO4 - Explains Bioremediation and biodegradation in detail.
- CO5 - Elucidates biodegradation process and mechanism.
- CO6 - Discusses different alternate source of energy.

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3. John. T. Cookson, Jr. Bioremediation engineering; design and application Mc Graw Hill, Inc. 1995
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END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks:80

Exam Duration : 3Hrs.

PART A : 6 Questions of 5 Marks each –NoChoice

30Marks

PART B : 2 Questions from each unit of internal choice, carrying 10Markseach

50Marks