PROCEEDINGS OF THE MEETING OF B.O.S. (UG) IN MICROBIOLOGY ANDBIOTECHNOLOGY

The meeting of the B.O.S. (UG) in Microbiology and Biotechnology was held on **18th June, 2014** in the Department of Microbiology and Biotechnology, Bangalore University, Bangalore. At the outset, the Chairman welcomed the members and initiated the proceedings.

Agenda-1

The Credit Based Semester Scheme for B.Sc. in Microbiology and Biotechnology, the Syllabus (theory and practical) and Scheme of examination for I, II, III & IV Semesters were finalized and approved.

Agenda-2

The panel of examiners for UG Microbiology and Biotechnology (both external and internal) was modified and approved for the year 2014-15.

Agenda-3

The B.O.S. approved the list for the formation of B.O.E. (UG) in Microbiology and Biotechnology for the year 2014-15.

The meeting concluded with the Chairman thanking all the members for their co-operation.

Members present:

- 1. Dr. Shastri P.S
- 2. Dr. Jyotsna B.S
- 3. Dr.Bharathi
- 4. Smt. Pushpalatha. T
- 5. Dr. Vijaya.B
- 6. Dr.ShanthiIyer
- 7. Dr. S.K.Sarangi

B.Sc. CREDIT BASED SEMESTER SCHEME BIOTECHNOLOGY (PART 2) SCHEME OF INSTRUCTIONS AND CREDITS

Paper No.	Title of the paper	Type of	Hours/	Duration	IA	Exam	Total	Credits
		paper	Week	of Exam			Marks	
				(Hours)				
I Semester								
BTT-101	Cell Biology & Genetics	Т	4	3	30	70	100	2
BTP-102	Cell Biology & Genetics	Р	3	3	15	35	50	1
Total Marks and Credits for I semester						150	3	

Paper No.	Title of the paper	Type of paper	Hours/ Week	Duration of Exam (Hours)	ΙΑ	Exam	Total Marks	Credits
II Semester								
BTT-201	General Microbiology & Biostatistics	Т	4	3	30	70	100	2
BTP-202	General Microbiology	Р	3	3	15	35	50	1
Total Marks and Credits for II semester						150	3	

Paper No.	Title of the paper	Type of	Hours/	Duration	IA	Exam	Total	Credits
		paper	Week	of Exam			Marks	
				(Hours)				
III Semester								
BTT-301	Biological chemistry	Т	4	3	30	70	100	2
BTP-302	Biological chemistry	Р	3	3	15	35	50	1
	Total Marks and	d Credits for	· III semes	ter	•		150	3
Paper No.	Title of the paper	Type of	Hours/	Duration	IA	Exam	Total	Credits
		paper	Week	of Exam			Marks	
				(Hours)				
IV Semester								
BTT-401	Molecular biology	Т	4	3	30	70	100	2
BTP-402	Molecular biology	Р	3	3	15	35	50	1

	Total Marks and Credits for IV semester						150	3
Paper No.	Title of the paper	Type of	Hours/	Duration	IA	Exam	Total	Credits
		paper	Week	of Exam			Marks	
				(Hours)				
		VS	Semester	•		•	•	
BTT-501	Genetic Engineering &	Т	4	3	30	70	100	2
	Environ. Biotechnology							
BTT-502	Immunology & Animal	Т	4	3	30	70	100	2
	Biotechnology							
BTP-503	Genetic Engineering &	Р	3	3	15	35	50	1
	Environ. Biotechnology							
BTP-504	Immunology & Animal	Р	3	3	15	35	50	1
	Biotechnology							
	Total Marks an	d Credits fo	r V semest	ter			300	6

Paper No.	Title of the paper	Type of paper	Hours/ Week	Duration of Exam (Hours)	IA	Exam	Total Marks	Credits
VI Semester								
BTT-601	Plant Biotechnology	Т	4	3	30	70	100	2
BTT-602	Industrial Biotechnology	Т	4	3	30	70	100	2
BTP-603	Plant Biotechnology	Р	3	3	15	35	50	1
BTP-604	Industrial Biotechnology	Р	3	3	15	35	50	1
Total Marks and Credits for VI semester						300	6	

Internal assessment:

Theory :(30)				
(a) Tests	10			
(b) Assignments	-15			
(c) Attendance	-05			
Practical : (15)				
(a) Tests	10			
(b) Class Records	-05			

V SEMESTER B.Sc

BTP 501- Genetic Engineering and Environmental Biotechnology

Total No of hours: 40

Part A- Genetic Engineering

Total hours: 22

Unit 1: Introduction to GE, tools for GE- DNA manipulative enzymes- Restriction enzymes-its discovery, nomenclature, types, properties and mechanism of action. DNA ligase - T4 DNA ligase and E. coli DNA ligase, its properties and mechanism of action. Gene cloning vectors- plasmids pBR322 and pUC 19, Bacteriophage as vectors and Cosmids.

5hrs

Unit 2: Invitro construction of Recombinant DNA molecules, creation of r-DNA, preparation of foreign DNA, Vector DNA, Restriction digestion and ligation of foreign DNA with vector DNA. Gene libraries: Construction of Genomic DNA library (Bacteriophage and cosmid library) and cDNA library (self priming and RNase H methods). **5hrs**

Unit 3: Transformation, screening and expression- transformation of rDNA molecules into target host organisms by CaC12 mediated, electroporation and microinjection methods. Screening and selection of recombinant host cells- immunological methods and colony hybridization methods. Expression of cloned DNA in E.coli 5hrs

Unit 4: Molecular biology techniques and Applications of rDNA technology in human health:

- a) Electrophoretic techniques- proteins and nucleic acids.
- b) Polymerase chain reaction (PCR).
- c) Nucleic acid sequencing- Sanger's method.
- d) Blotting techniques-Southern, Western and Northern.
- e) Production of insulin, recombinant vaccines Eg hepatitis B & Human. growth Hormone.

7hrs

Part B- Environmental Biotechnology

Total hours: 18 Unit 1: Renewable and nonrenewable resources of energy. Convention fuels and their environmental impact-firewood, plant, animal, water, coal and gas. Modern fuels and their environmental impact-Methanogenic baciteria, Biogas, Microbial H2 Production, conversion of sugar to alcohol and Gasohol.

5hrs

Unit 2: Biofertilizers and Biopesticides- Role of symbiotic and Asymbiotic N_2 fixing Bacteria in enrichment of soil. Algal and fungal biofertilizers (VAM and Trichoderma). Bioleaching-enrichment of ores by micro organisms (gold, copper and uranium). **5hrs**

Unit 3:

Environmental significance of GMO's- Plants, microbes and animals. Bioremediation of soil and water contaminated with oil spills, heavy metals and detergents. Biodegradation of lignin and Cellulose, Phytoremediation. Degradation of pesticides and other toxic chemicals by microorganisms - degradation of aromatic and chlorinated hydrocarbons and petroleum products. Treatment of municipal wastes and industrial effluents.

V SEMESTER B.Sc. Biotechnology Practical Examination BTP-502 Genetic Engineering & EBT

1. Isolate the genomic DNA from the given sample 'A' [animal or plant].07m2. Estimate the dissolved oxygen/total hardness in the given sample 'B'.06m3. Make a temporary preparation of sample 'C' (VAM / Rhizobium from root nodules).08m4. Identify and comment on the spotters D, E & F.09m5. VIVA VOCE05m6. Class records.35m

1	Principle& procedure	Scheme of evaluation
1.	Performance	4m
	Result	2m
2.	Performance	3m
	Principle	2m
	Calculation and results	2m
3.	Slide preparation	3m
	Sketch & Comment	2m

4. Spotters- Horizontal gel electro phoretic unit,

transilluminator / photograph, MPN tubes/photographs, Restriction digestion gel photograph, plasmid DNA photograph,

Chemicals- APS/SDS, Biogas plant	t photograph.
Identification	lm

5. VIVA VOCE on GE and EBT theory and practicals only.

V SEMESTER B.Sc. Biotechnology Practical Examination BTP-504 Immunology & ABT

1.	Isolate the parenchymal cells from the given sample 'A' and stain.	07m
2.	Perform blood grouping/Differential count of WBC from the given sample 'B'.	05m
3.	Perform VDRL/WIDAL test with the given sample 'C'.	04m
4.	Identify and comment on the spotters D, E & F.	09m
5.	VIVAVOCE	05m
6.	Class records.	05m
		35m
	Scheme of evaluation	<u></u>
1.	Principle& procedure - 3m	
	Performance - 3m	
	Result 1m	
2.	Performance - 2m	
	Principle - 2m	
	Calculation and results Im	
3	Principle 2m	
5.	Result 2m	
4.	Spotters- serum sample, growth factors- EGF, FGF, PDGF, Roux bottle, roller flask,	
	stirrer flask, DOT ELISA strip, ODD, SRID, RIEP, MAB production, IgG, IgM, IgE	
	photographs.	
	Identification Im	
	Comment 02m	
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5. VIVA VOCE on Immunology and ABT theory and practicals only

SEMESTER V BTP 503 - Immunology and Animal Biotechnology

Total No of hours: 40

Part A- Immunology

Unit 1: History, and scope of immunology. Immunity- Innate and acquired immunity (active and assive), Humoral and cell mediated immunity. Cells and organs (primary and secondary lymphoid organs) of immune responses and their functions. 6hrs

Unit 2: Antigens- types, epitopes, haptens and factors that influence antigenicity. Antibodies-Structure, types, properties and functions of immunoglobulin, Production of antibodies. Blood cell components, ABO blood grouping Rh typing.Antigen-Antibody reaction - Precipitation, Immunoelectrophoresis, Heamagglutination, Labeled antibody (RIA, ELISA and Immunofluroescent techniques). 8hrs

Unit 3: Complement system- Structure, Components, Properties -and Functions. Hypersensitivity and Allergic reactions. 5hrs

Unit 4: Vaccines and Immunization-Passive and Active Immunization. Types of Vaccines Inactivate Attenuated and Recombinant Vaccines-Peptide and DNAVaccines.

PART-B: ANIMAL BIOTECHNOLOGY

Unit 1 : Culture Media- Simulating natural conditions for growth of animal cells. 1. Natural media-Plasma Clot, biological fluids tissue extract, embryo extract, Importance of Serum in media, Chemicaliy defined media. Growth factors-promoting proliferation of animal cells EGF, FGF, PDGF, IL-I, II, NG Fand Erythropoietin . **5hrs**

Unit 2 : Primary Culture:- Cell lines, and cloning desegregation of tissue, isolation of tissue, enzyme disaggregation, and mechanical disaggregation. Secondary Culture:- Transformed animal cells and continuous cell lines. 3hrs

Unit 3:Transfect ion of animal cell lines, HAT selection Selectable Markers and Transplantations of Cultured Cells. Expression of cloned proteins in animal cell-Expression vector , over production and downstream processing of the expressed proteins. **5hrs**

Unit 4: Applications of Animal Tissue Culture Production of vaccines in animal cells, Production and applications of monoclonal Transgenic Animals-Techniques and Applications and Transgenic mice and sheep. 5hrs

Total Hours: 18

3hrs

Total hours: 22

BTP 504- Immunology and Animal Biotechnology

Total	Units	:	15

2

1.	Blood grouping.	1 unit
2.	Differential Count of WBC.	2units
3.	Widal Test and VDRL Test.	2 unit
4.	Dot Elisa.	1 unit
5.	ELISA-Demonstration.	1 unit
6.	Oucterlony Double diffusion (ODD) & Single Radial Immunodiffusion.	
units		
7.	Isolation of liver parenchyma cells & assessment of viability by tryphan blue	e exclusion

		2 units
8.	Rocket Electrophoresis.	2 nits
9.	Separation of Serum from blood & precipitation of immunoglobulin.	2 units

Reference: IMMUNOLOGY

IWilliam, E. Paul, (1989) Fundamental immunology, 2nd Edition Raven Press, New York.

- 2. William, R. Clark (191) The Experimental Foundations of Modern Immunology (4th Edition), John Wiley, and Sons, New York.
- 3. Ivan, M. Roitt (194) Blackwell Scientific Publications, London.

ANIMAL CELL BIOTECHNOLGY

- 1. Ian Freshncy (4th Edition)
- 2. Buttler.
- 3. Elements of Biotechnology—P.K. Gupta (1st Edition-200) Rastogi Publications

SEMESTER VI BTP 601- Plant Biotechnology

Total Hours : 40hrs

Unit 1: In-vitro methods in plant tissue culture, Aseptic Techniques, Nutrient media, and use of growth regulators (auxins, cytokines and gibberellins). 5hrs

Unit 2: Clonal propagation of elite species (Micro propagation) & In-vitro production of secondary metabolites, techniques and significance. 7hrs

Unit 3: Organ Culture-Ovary, Ovule, Anther, Embryo and Endosperm culture and their applications. Organogenesis and Somatic Embryogenesis-Techniques and applications. Somaclonal variation and their significance. **8hrs**

Unit 4: Protoplast Culture-Isolation, regeneration and viability test, somatic hybridization, methods of protoplast fusion-Chemical and electro fusion. Practical application of somatic hybridization and cybridization. 6hrs

Unit 5: Transgenic Plants: Technique of transformation-Agrobacterium mediated and physical methods (Micro projectile and electroporation), Application of transgenic plants.

5hrs

Unit 6: Role of tissue culture in agriculture, horticulture and forestry. Edible Vaccines from Plants — Banana, Watermelon. 5hrs

Unit 7: Biotechnology and Intellectual property rights. Patents, trade secrets, copyright, trademark, Choice of Intellectual property (IPR) and Plant genetic resources (PGR), GAAT and TRIPS.

4hrs

SEMESTER VI Practical BTP 602 - Plant Biotechnology

Total Units -15

Preparation of plant culture media-MS (1962) Nitsch (1969) and White's 1. 2 Units 2. Production of Callus and Suspension culture. 2 Units 3. Plant protoplast Isolation. 2 Units Plant propagation through Tissue culture (shoot tip and Nodal culture). 4. 3 Units Preparation of Synthetic Seeds. 5. 1 Unit 6. Anther Culture. 2 Units Isolation of chloroplasts and its quantification. 7. 2 units 8. Demonstration of hardening of plants. 1 unit

be in Demonstration of nardening of plants

Reference: PLANT BIOTECHNOLOY

- 1. Ravishankar G.A. and Venkataraman L. V. (197) Biotechnolgy Applications of plant tissue culture. Oxford & IBH Publishing Co, Pvt. Ltd.
- 2. Bhan (1998) Tissue Culture, Mittal Publications, New Delhi.
- 3. Islan A.0 (1996), Plant Tissue Culture, Oxford & IBH Publishing Co. Pvt. Ltd.
- 4. Lydiane Kyte & John Kelyn (1996), Plants from test tubes. An introduction to Micropropogation) Timber Press, Portland.
- 5. Kumar H.D. (1991) A text book on Biotechnology (2nd Edition) Affiliated East West Press Private Ltd. New Delhi.
- 6. Chrispcel M.J. & Sdava D.E. (1994) Plants, Genes & Agriculture. Jones & Barlett, Publisher Boton.
- 7. Reinert J. and Bajaj Y.P.S. (197) Applied and Fundamental Aspects of Plant Cell, Tissue and Organ Culture, Narosa Publishing House.

SEMESTER VI BTP 603 - Industrial Biotechnology

Total No of hours: 40

Unit 1: Introduction to industrial biotechnology, basic principles of fermentation technology, Screening and Isolation of Microorganisms, maintenance of strains, strain improvement (Mutant Selection, Recombinant DNA methods). 3hrs

Unit 2 : Upstream Processing (USP): Types of Fermenters -Typical, Airlift, Tower and Bubble-up Fermenter. Solid State, Submerged, continuous fermention & shake flask fermentation. Fermentation Media-Natural and Synthetic Media, Sterilization techniques-Heat, Radiation and Filtration methods. Process of Aeration, Agitation, Temperature regulation and Foam control. Immobilized enzyme and cell bioreactors. **10 hrs**

Unit 3: Downstream Processing (DSP): Disintegration of cells, separation, extraction, concentration and purification of products. 3 hrs

Unit 4: Production of Microbial products Brief account of the following products obtained by industrial microbiological fermentation Alcohol Alcoholic Beverage-Bee Organic acid-Citric acid Antibiotic-Penicillin Amino acids - Glutamic acid' Vitamin-B12 Brief account of steroid biotrans formation. **9hrs**

Unit 5: Enzyme biotechnology: Characteristics of enzymes, Industrially produced enzymesamylases. Industrially uses of enzymes-Detergents, Leather, Beverage, food and pharmaceutical Bioreactors for enzyme production-stirred tank, membrane reactors & continuous flow reactors.

5hrs

Unit 6: Fermented Foods : Yoghurt, Buttermilk, Idli, Cheese, Tempeh. Microbial Foods : Single cell proteins (SCP), Single cell, oils (SCO) 5 hrs

Unit 10 : Plantcellsuspensionculturefortheproductionoffoodadditives-Saffronand Capsaicin, mass culture of Algae-Spirulina, microbial polysaccharides and polyesters; production of xanthan gum and polyhydroxyalkanoates (PHA). 5 hrs

BTP 604 - Industrial Biotechnology

Total Hours: 15 units

- Algal and fungal culture-Spiraling, Agarics, Yeast and Aspergillums. 4Unit 1. Production & estimation of citric acid from Aspergillus Culture. 2. 2Unit Estimation of lactic acid and lactose. 3. 3Unit Solid state fermentation using Aspergillus spp. 4. lUnit Preparation of wine. 2tinit 5. Estimation of Alcohol by Specific gravity method. 1 Unit 6.
- Immobilization of enzymes (Invert a secan be obtained from yeast cells and observed for 7. glucose production). 2 Units
- Visit to research institutes/centres/industries and submission of report on the same. 8.

Reference: INDUSTRIALBIOTECHNOLOGY

- Sullia S.B & Shantharam S.(198) General Microbiology Oxford & IBH Publishing Co. Pvt. 1.
- Bisen P.S (1994) Frontiersin Microbial Technolgoy, ^{1St} Edition, CBS Publshers. 2.
- Glazer A.N. & N Ikaido. H (1995) Microbial Bitechnology, W.H. Freeman & Co. 3.
- Prescott & Diim(1 987) Industrial Microbiology 4th Edition, CBS Publishers & Distrbutiors, 4.
- Prescott & Dum (2002) Industrial Micrbiology, Agrabios (India) Publishers 5.
- Creueger W. & Crueger A (2000) A Text of Industrial Microbiology, 2rd Edition, Panima 6. Publishers corp.
- 7. Stan/nay P.F, Whitaker H Hall S.J. (19978) Principle of Fermentation Technology Aditya Book Ltd.

VI SEMESTER B.Sc. Biotechnology Practical Examination BTP-602 Plant Biotechnology

- 07m Isolate the protoplast/chloroplast from the given sample A and stain. 1.
- 2. Encapsulate the given sample B and prepare synthetic seeds. 04m
- Demonstrate the procedure of surface sterilization of explants given /inoculation of 3.

		explants
		given.
		05m
4.	Identify and comment on the spotters C, D & E.	09m
5.	VIVA VOCE	05m
6.	Class records.	05m
		35 m

Scheme of evaluation

1.	Principle& procedure Performance Result	- -	3m 3m lm
2.	Performance Principle	-	2m 1 in

- Results lm 3. Demonstration 5 m
- (Explants for this may be any one for : shoot tip culture/ nodal culture / anther culture. **Spotters:-** Identification lm
- 4.

02m

Comment

Any one of the following : Micro projectile (photo), IAA, BAP, 2.4D, Kinetin, NAA, Any two of the following : Photograph of callus/culture tubes, suspension culture/photo, another culture/photo, photographs of stages of embryo development, somaticembryogeneis, another culture, somaclonal variations (charts/photographs).

5. VIVA VOCE related to PTC theory & practical only.

VI SEMESTER B.Sc. Biotechnology Practical Examination BTP-604 Industrial Biotechnology

- 1. Estimate the amount of Citric Acid/Lactic acid from the given sample A. 07m
- 2. Estimate the amount of alcohol in the given sample B by specific gravity method. 07m

3.	Identify the spotters C & D.	06m
4.	VIVA VOCE.	05m
5.	Industrial tour report	05 m
6.	Class records.	05m
		35m

Scheme of evaluation

1.	Experiment	3m
	Principle & procedure	2m
	Result & calculation	2m
2.	Experiment	3m
	Principle	2m
	Results& calculation	2m
3.	Spotters.	
	Identification	lm
	Comment	2m
4.	VIVA VOCE to IBT theory	& practical only05m