

<b>D 3.4</b>	<p><b>Minutes of the meeting of the Board of Studies in Biotechnology held on 16/09/2016</b>  The Academic Council approved the minutes of the meeting of the Board of Studies in Biotechnology held on 16/9/2016 with the following observations:</p> <ol style="list-style-type: none"> <li>1. Renaming of the Course codes. To delete the letter 'T' and 'L' from the Course code to ensure uniformity in the pattern followed for other PG programs under the same Ordinance.</li> <li>2. Under Part F of the Agenda point e to be deleted.</li> <li>3. Expunge the names of the teachers/Examiners from the Panel for Scuba Diving Course.</li> <li>4. To follow similar procedure for all other courses.</li> <li>5. Course approved till B.Voc. is implemented.</li> </ol> <p style="text-align: center;"><b>(Action: AR-PG)</b></p>
<b>D 3.5</b>	<p><b>Minutes of the meeting of Board of Studies in Commerce (UG) held on 24/08/2016</b>  The Academic Council approved the Master Panel submitted by Board of Studies in Commerce (UG).</p> <p style="text-align: center;"><b>(Action: AR-PG)</b></p>
<b>D 3.6</b>	<p><b>Minutes of the meeting of Board of Studies in BBA(Financial Services) held on 15/09/2016</b>  The Academic Council approved the revised list of experts for the Academic Audit Committee for constitution of Academic Audit Committee in BBA (Financial Services). The Chairperson informed the House that the consent of the external examiners/experts needs to be obtained before proposing their names as most of the times the members do not attend the meetings of the Board. It was suggested that the external examiners/experts could be requested to give lectures/seminars when they come for BOS meetings.</p> <p>It was also suggested that the University should also explore the possibility of paying the External Members a sitting fee.</p> <p style="text-align: center;"><b>(Action: AR-PG)</b></p>
<b>D 3.7</b>	<p><b>Minutes of the meeting of Board of Studies in Surgery and Allied held on 23/08/2016</b>  The Academic Council approved the minutes of Board of Studies in Surgery and Allied held on 23/8/2016.</p> <p style="text-align: center;"><b>(Action: AR-PG)</b></p>
<b>D 3.8</b>	<p><b>Minutes of the meeting of Board of Studies in English, held on 23/09/2016</b>  The Academic Council approved the minutes of Board of Studies in English held on 23/9/2016 on the following observations:</p> <ol style="list-style-type: none"> <li>1. Names of journals to be in italics</li> <li>2. List of journals to be put in proper format.</li> </ol> <p style="text-align: center;"><b>(Action: AR-PG)</b></p>
<b>D 4</b>	<p><b>REPORTS OF AFFILIATION INQUIRY COMMITTEE</b>  The Chairperson informed the House that the University is required to comply with the UGC Regulations while granting Colleges/Institutes the recognition/affiliation as Research Centre.</p>

	<p>Chairperson at the meeting itself. <b>N.A.</b></p> <p>Date: 8/9/2016 Place: Goa University, Taleigao Plateau. <b>Part G.</b> The Remarks of the Dean of the Faculty</p> <ul style="list-style-type: none"> <li>i) The minutes are in order</li> <li>ii) The minutes may be placed before the Academic Council with remarks if any.</li> <li>iii) May be recommended for approval of Academic Council.</li> <li>iv) Special remarks if any. <b>Four letter course codes need to be discussed as it is not as per the present model.</b></li> </ul> <p>Date: 19/09/2016 Place: GU</p> <p style="text-align: right;">Sd/- Signature of the Chairperson</p> <p style="text-align: right;">Sd/- Signature of the Dean</p> <p style="text-align: right;"><a href="#">(Back to Index)</a></p>
<b>D 3.4</b>	<p><b>Minutes of the meeting of the Board of Studies in Biotechnology held on 16/09/2016</b></p> <p><b>Part A.</b></p> <ul style="list-style-type: none"> <li>i. Recommendations regarding courses of study in the subject or group of subjects at the undergraduate level: <b>NA</b></li> <li>ii. Recommendations regarding courses of study in the subject or group of subjects at the postgraduate level: <b>NA</b></li> </ul> <p><b>Part B</b></p> <ul style="list-style-type: none"> <li>i. Scheme of Examinations at undergraduate level: <b>NA</b></li> <li>ii. Panel of examiners for different examinations at the undergraduate level: <b>NA</b></li> <li>iii. Scheme of Examinations at postgraduate level: <b>NA</b></li> <li>iv. Panel of examiners for different examinations at post-graduate level:</li> </ul> <p><b>Mr. Venkatesh Charloo and Ms Karen Gregory were approved as instructors &amp; examiners for the Scuba diving course (MBMO-411). <a href="#">Annexure I</a> (refer page no 81)</b></p> <p><b>Part C.</b></p> <ul style="list-style-type: none"> <li>i. Recommendations regarding preparation and publication of selection of reading material in the subject or group of subjects and the names of the persons recommended for appointment to make the selection: <b>NA</b></li> </ul> <p><b>Part D</b></p> <ul style="list-style-type: none"> <li>i. Recommendation regarding general academic requirements in the Departments of University or affiliated colleges. <b>NA</b></li> </ul>

- ii. Recommendations of the Academic Audit Committee and status thereof:**NA**

**Part E.**

- i. Recommendations of the text books for the course of study at undergraduate level:**NA**
- ii. Recommendations of the text books for the course of study at post graduate level:  
**NA**

**Part F.**

Important points for consideration/ approval of Academic Council

- i. The important points/recommendations of BoS that require consideration/approval of Academic Council (points to be highlighted) as mentioned below:
- a) **Reformatting the course codes of the MSc.Biotechnology & MSc. Marine Biotechnology syllabi to a four letter :three digit code.**
- b) **Increasing the number of optional courses offered for both the programmes and options to be made available from December 2016 onwards.**
- c) **Implementation of OA-18: modification of practical courses to 15 practicals of two hours duration each.**
- d) **Modification of the practical syllabus of some courses.**
- e) **Introducing Dissertation as Optional and 8 credits to be implemented from December 2016 onwards and applicable for the present 2016-17(SEM I) students.**

The declaration by the chairman that the minutes were readout by the Chairman at the meeting itself.

Date:16/09/2016

Sd/-

Place: Department of Biotechnology,Goa Univ.

Signature of the Chairman

**Part G.** The Remarks of the Dean of the faculty

- i) The minutes are in order
- ii) The minutes may be placed before the Academic Council with remarks if any.
- iii) May be recommended for approval of Academic Council.
- iv) Special remarks if any.

Date:

Sd/-

Place.

Signature of the Dean

[\(Back to Index\)](#)

**D 3.4 Minutes of the meeting of the Board of Studies in Biotechnology held on 16/09/2016****Annexure I****M.Sc. Marine Biotechnology Syllabus Scheme  
CORE COURSES (2016-17)**

<b>Course Code</b>	<b>Name of the Course</b>	<b>No. of Credits</b>	<b>Course Level</b>
MBTC 103	ES OF GENETICS & MOLECULAR BIOLOGY	3	100
MBTC 107	PRINCIPLES OF OCEANOGRAPHY	2	100
MBTC 201	INTRODUCTORY IMMUNOLOGY	3	100
MBTC 202	CELL & DEVELOPMENTAL BIOLOGY	3	200
MBTC 205	THE MARINE ECOSYSTEM	2	100
MBTC 301	BIOPROCESS & INDUSTRIAL BIOTECHNOLOGY	3	200
MBTC 302	RECOMBINANT DNA TECHNOLOGY	3	200
MBTC 303	ANIMAL CELL CULTURE	2	200
MBTC 402	AQUACULTURE TECHNOLOGY & MARINE PHARMACOLOGY	3	200
MBTC 403	POTENTIAL APPLICATIONS OF MARINE ORGANISMS	3	300
MBLC 103	LAB IN MOLECULAR GENETICS	2	100
MBLC 201	LAB IN IMMUNOLOGY	2	100
MBLC 205	LAB IN MARINE BIOLOGY & CHEMISTRY	2	100
MBLC 301	LAB IN FERMENTATION TECHNOLOGY	2	200
MBLC 302	LAB IN RECOMBINANT DNA TECHNOLOGY	2	200
MBMC 204	SEMINAR PRESENTATIONS	1	100
MBMC 304	SUMMER TRAINING PRESENTATION & REPORT	1	200
MBMC 401	SEMINAR PRESENTATIONS	1	200
	<b>TOTAL CREDITS</b>	<b>40</b>	

**M.Sc. Marine Biotechnology (2016-17)  
OPTIONAL COURSES**

<b>Course Code</b>	<b>Name of the Course</b>	<b>No. of Credits</b>	<b>Course Level</b>
MBTO 101	FUNDAMENTALS OF GENERAL AND MARINEMICROBIOLOGY	3	100
MBTO 102	CONCEPTS IN BIOCHEMISTRY	3	100

MBTO 104	BIOINSTRUMENTATION	2	100
MBTO 105	BIOSTATISTICS	2	100
MBTO 106	COMMUNICATION SKILLS & SCIENTIFIC WRITING	2	100
MBTO 203	ENVIRONMENTAL BIOTECH	3	200
MBTO 206	BIOINFORMATICS	2	100
MBTO 207	PLANT TISSUE CULTURE TECHNOLOGY	2	200
MBTO 307	ENZYMOLGY	3	200
MBTO 308	MOLECULAR IMMUNOLOGY	3	200
MBTO 406	BIOSAFETY & IPR	3	200
MBTO 408	APPLICATIONS OF RECOMBINANT DNA TECHNOLOGY	3	300
MBTO 409	GENOMICS AND PROTEOMICS	3	300
MBTO 410	CELLULAR BIOPHYSICS	3	100
MBLO 101	LAB IN MARINE MICROBIOLOGY	2	100
MBLO 102	LAB IN BIOCHEMISTRY	2	100
MBLO 206	LAB IN BIOINFORMATICS	2	100
MBLO 207	LAB IN PLANT TISSUE CULTURE	1	100
MBLO 303	LAB IN ANIMAL CELL CULTURE	1	100
MBLO 307	LAB IN ENZYME CHARACTERIZATION	2	200
MBMO 411	SCUBA DIVING	2	100
MBMO 412	DISSERTATION*	8	400
	<b>TOTAL CREDITS</b>	<b>57</b>	

\*Dissertation work is carried out through III<sup>rd</sup> and IV<sup>th</sup> semester.

#### **ANNEXURE 1.cont.**

#### **Semester wise Distribution of "Compulsory Courses" for M.Sc. Marine Biotechnology**

<b><i>Name of the Course</i></b>	<b>Course Code</b>	<b>No. of Credits</b>
<b>SEMESTER I</b>		
PRINCIPLES OF GENETICS & MOLECULAR BIOLOGY	MBTC 103	3
PRINCIPLES OF OCEANOGRAPHY	MBTC 104	2
LAB IN MOLECULAR GENETICS	MBLC 103	2
	<b>Total Credits</b>	<b>6</b>
<b>SEMESTER II</b>		
INTRODUCTORY IMMUNOLOGY	MBTC 201	3
CELL & DEVELOPMENTAL BIOLOGY	MBTC 202	3
THE MARINE ECOSYSTEM	MBTC 205	2
LAB IN MARINE BIOLOGY & CHEMISTRY	MBLC 205	2
LAB IN IMMUNOLOGY	MBLC 201	2

SEMINARS PRESENTATIONS	MBMC 204	1
	<b>Total Credits</b>	<b>13</b>
<b>SEMESTER III</b>		
BIOPROCESS & INDUSTRIAL BIOTECHNOLOGY	MBTC 301	3
RECOMBINANT DNA TECHNOLOGY	MBTC 302	3
ANIMAL CELL CULTURE	MBTC 303	2
LAB IN FERMENTATION TECHNOLOGY	MBLC 301	2
LAB IN RECOMBINANT DNA TECHNOLOGY	MBLC 302	2
SUMMER TRAINING	MBMC 304	1
	<b>Total Credits</b>	<b>13</b>
<b>SEMESTER IV</b>		
AQUACULTURE TECHNOLOGY & MARINE PHARMACOLOGY	MBTC 402	3
POTENTIAL APPLICATIONS OF MARINE ORGANISMS	MBTC 403	3
SEMINARS PRESENTATIONS	MBMC 401	1
	<b>Total Credits</b>	<b>7</b>

**ANNEXURE 2****MBLO 101: LAB IN MARINE MICROBIOLOGY**

1. Sterilization and disinfection
2. Preparation of solid & liquid media
3. Differential and Selective media
4. Enumeration: serial dilution methods, plating.
5. Isolation and maintenance of organisms.
6. Streaking, slants and stabs cultures, storage of microorganisms.
7. Isolation of bacteria from terrestrial/marine samples.
8. Study of morphology and cultural characteristics
9. Gram staining.
10. Motility
11. Cell inclusion studies: metachromatic granules
12. Spore staining
13. Biochemical characterization and identification of bacteria
14. Cultivation of fungi: Slide, chunk and coverslip techniques
15. Culture of anaerobes.

[\(Back to Index\)](#)  
[\(Back to Agenda\)](#)

**REFERENCES:**

1. Brock's Biology of microorganisms. (2006). Madigan, M., Martinko & Parker, J.
2. General Microbiology. (1987). Stanier, R.Y., Ingraham, Wheelis and Painter
3. Marie and Estuarine Microbiology Laboratory Manual. (1975). Colwell, R. et al.
4. Microbiology Methods. (1975). Collins, C.H. and Lyne, P.M.
5. Laboratory Methods in Microbiology. (1973). Harrigan, W.F. & McCance, M.E.
6. Source book of Experiment for the teaching of Microbiology. (1982). Primrose, B. and Wardlaw, A.C.

**MBLO 102: LAB IN BIOCHEMISTRY**

1. Principles of colorimetry and verification of the Beer-Lambert Law (Determination of the unknown concentration of a coloured solution, spectral characteristics of colored solutions)
2. Preparation of buffers
3. Titration curve and determination of isoelectric point of an acidic/basic amino acid
4. Estimation of proteins by the Biuret method
5. Estimation of proteins by the Lowry's method
6. Spectral characteristics of coloured solutions
7. UV absorption of proteins
8. Paper chromatography
9. Thin layer chromatography
10. Estimation of lipids
11. Estimation of reducing sugars
12. Protein fractionation by ammonium sulphate precipitation
13. Gel filtration
14. Affinity Chromatography
15. Protein molecular weight determination by SDS page.

**REFERENCES :**

1. Modern experimental Biochemistry (2003). Boyer, R.
2. Principles and Techniques of Biochemistry and Molecular Biology (2005). Wilson, K. & Walker, J.
3. An Introduction to Practical Biochemistry. (2005). Plummer, D.T.
4. Laboratory Manual of Biochemistry. (1998). Jayaraman, J.

**MBLC 103: LAB IN MOLECULAR GENETICS**

1. DNA isolation from bacteria
2. DNA isolation from Phage.
3. RNA isolation from bacterial cell.
4. Gel electrophoresis of DNA.

5. UV survival curve (light repair).
6. Chemical mutagenesis
7. Isolation of *auxotrophs* by replica plating.
8. Preparation of competent cell & transformation.
9. Conjugation
10. Transduction. ( 2 practicals)
11. Phage infection & titre determinations
12. Transposon mutagenesis.
13. Electrophoresis of RNA by agarose gel electrophoresis
14. UV survival ( dark repair)

#### **REFERENCES :**

1. Experiments in molecular Genetics (1972) Miller J.H.
2. Laboratory manual in Molecular Genetics (1979). Jayaraman, K & Jayaraman, R.

#### **MBLC 201: LAB IN IMMUNOLOGY**

1. Blood grouping
2. Standardization of Antigen & Antibody reactivity
3. Single immunodiffusion
4. Double immunodiffusion
5. Assessment of antigen similarity using Ouchterlony double diffusion test.
6. Determination of antibody titre using double diffusion
7. Estimation of concentration using radial immunodiffusion
8. Estimation of Antibody concentration using radial immunodiffusion
9. Quantitative precipitin assay Part-I
10. QPA-Part-II using radial immunodiffusion
11. DOT ELISA test
12. Immunoelectrophoresis
13. Latex Agglutination test
14. Counter current immunoelectrophoresis
15. Rocket immunoelectrophoresis

#### **REFERENCES:**

1. Practical Immunology (2003). 4<sup>th</sup> edition Frank, C. Hay & O.M.R. Westwood.

#### **MBLO 206: LAB IN BIOINFORMATICS**

1. Search engines for bibliographic search
2. Construction of plasmid map.
3. Database search engines (Entrez/SRS) and submission of DNA/protein sequence.
4. Exploring protein structure using RASMOL/Discovery studio/view
5. Designing PCR primers and probes.
6. Reconstruction of phylogenetic tree using molecular data (Distance-based method or Neighbor-joining).
7. Tools for Genomic Data Mining



8. Basic of Genome Annotation
9. Special tools for searching genomic data
10. Prediction of ORFs and Genes
11. Prediction of Signal sequences (Promoters, splice sites, UTRs etc. sequence
12. Browsing & viewing genome data
13. Drug designing.
14. Immunoinformatics
15. Prediction of B and T cell epitopes for vaccine drug design
16. Proteomics (Expassy) and Interprotein Scan- pattern/motiof detection in proteins

#### REFERENCES :

1. Practical Bioinformatics (2006) J. Bajnieci (Ed)
2. Bioinformatics (1995). A Practical guide to analysis of genes and protein.

#### **MBLO 207: LAB IN PLANT TISSUE CULTURE**

1. Sterilization of explants and callus induction.
2. Regeneration of plantlet from callus.
3. Single cell suspension and protoplast isolation.
4. Axenic culture & tissue culture of seaweeds.
5. Somatic embryogenesis.
6. *Agrobacterium* gene transfer.
7. *Protoplast isolation*.

#### REFERENCES:

1. Plant Biotechnology: methods in tissue culture and gene transfer (2006). R. Keshavachandra and K.V. Peter.
2. Plant tissue culture: theory and practice (revised editions). Bhojwani and M. Rajdan

#### **MBLC 301: LAB IN FERMENTATION TECHNOLOGY**

1. Microbial production of ethanol using yeast sp.
2. Estimating ethanol concentration by Cerric Ammonium nitrate method.
3. Microbial production of Citric acid using *Aspergillus* sp.
4. Measuring the total acidity by Titrimetry.
5. Qualitative estimation of Citric acid by spectropotometry
6. Qualitative estimation of organic acids using paper and thin layer chromatography.
7. Microbial production of antibiotics:Antibiogram.
8. Disc diffusion & well diffusion method.
9. Immobilization of microbial cells: use of alginate.
10. Preparing a microbial bioreactor using immobilized cells & fermentation.
11. Use of fermenter with special reference to scale-up operations.

12. Batch and continuous culture.
13. Mushroom cultivation.
14. Food Microbiology: Preparing an edible fermented product in the Lab.
15. Manufacture of ginger ale and estimation of alcohol content.

**REFERENCES:**

1. Practical Fermentation Technology (2008) Brian McNeil and Linda Harvey. Wiley

**MBLC 302: LAB IN RECOMBINANT DNA TECHNOLOGY**

1. Plasmid isolation by Alkaline lysis.
2. Plasmid isolation by boiling method.
3. Isolation of Plasmid by column chromatography.
4. Study of Plasmid profile by agarose gel electrophoresis
5. Restriction mapping of plasmid DNA.
6. Preparation of competent E.coli cells
7. Transformation of competent E.coli cells
8. Transfection of competent E.coli cells.
9. Restriction of plasmid and alkaline phosphatase treatment.
10. Ligation and cloning of insert in plasmid
11. Screening for recombinant.
12. PCR
13. RT-PCR
14. Southern blotting
15. Western blotting
16. Interpretation of DNA Sequencing gel.

**REFERENCES :**

- a. Molecular cloning (1989) Maniatis, T. *et al*
- b. Recombinant DNA methodology. (1985). Dillon, R.G., Nasim, A. & Nestmann. E.R.

**MBLC 205: LAB IN MARINE BIOLOGY & CHEMISTRY**

1. Samplers : water samplers, dredges, grabs, snappers.
2. Field trips

Identification of:

3. Phytoplankton,
4. Zooplanktons
5. Nektons
6. Benthos: Identification and collection using gears (2 Practicals)

Estimation from sea water:

7. Nitrites
8. Nitrate
9. Phosphate
10. Silicate

11. Dissolved oxygen
12. pH& alkalinity
13. Salinity
14. Chlorophyll
15. Primary productivity

**REFERENCES:**

1. Methods of Sea Water Analysis. (1995). Grasshoff, K., Ehrhardt, M. & Kremling, K.
2. Quantitative Ecology Ecology& Marine Biology. (1990). Bakus, G.J.
3. Methods of study of Marine Benthos. (1984). Holme, N.A. & McIntyre, A.D.
4. Methods in Marine Zooplankton Ecology. (1984). Omori, W& Ikeda, T.

**ANNEXURE 3**  
**M.Sc. Biotechnology syllabus Scheme (2016-17)**  
**CORE COURSES**

No. of credits	Name of the Course	No of Credits	Course Level
GBTC 101	FUNDAMENTALS OF MICROBIOLOGY	3	100
GBTC 102	CONCEPTS IN BIOCHEMISTRY	3	100
GBTC 103	PRINCIPLES OF GENETICS & MOLECULAR BIOLOGY	3	100
GBTC 104	BIOINSTRUMENTATION	2	100
GBTC 201	INTRODUCTORY IMMUNOLOGY	3	100
GBTC 202	CELL & DEVELOPMENTAL BIOLOGY	3	200
GBTC 203	ENVIRONMENTAL BIOTECHNOLOGY	2	200
GBTC 301	BIOPROCESS & INDUSTRIAL BIOTECHNOLOGY	3	200
GBTC 302	RECOMBINANT DNA TECHNOLOGY	3	200
GBTC 303	ANIMAL CELL CULTURE	2	200
GBLC 101	LAB IN MICROBIOLOGY	2	100
GBLC 102	LAB IN BIOCHEMISTRY	2	100
GBLC 103	LAB IN MOLECULAR GENETICS	2	100
GBLC 201	LAB IN IMMUNOLOGY	2	100
GBLC 302	LAB IN RECOMBINANT DNA TECHNOLOGY	2	200
GBMC 204	SEMINAR PRESENTATIONS	1	100
GBMC 304	FIELD TRIPS & REPORT	1	200
GBMC 401	SEMINAR PRESENTATIONS	1	200
	<b>TOTAL CREDITS</b>	<b>40</b>	

[\(Back to Index\)](#)[\(Back to Agenda\)](#)

**M.Sc. Biotechnology (2016-17)**  
**OPTIONAL COURSES**

No. of credits	Name of the Course	No of Credits	Course Level
GBTO 105	BIOSTATISTICS	2	100
GBTO 106	COMMUNICATION SKILLS AND SCIENTIFIC WRITING	2	100
GBTO 107	PRINCIPLES OF OCEANOGRAPHY	2	100
GBTO205	MARINE ECOSYSTEMS	2	100
GBTO 206	BIOINFORMATICS	2	100
GBTO 207	PLANT TISSUE CULTURE TECHNOLOGY	2	200
GBTO 305	NANOBIOTECHNOLOGY	2	100
GBTO 306	FOOD BIOTECHNOLOGY	2	200
GBTO 307	ENZYMOLGY	3	200
GBTO 308	MOLECULAR IMMUNOLOGY	3	200
GBTO 402	AQUACULTURE & MARINE PHARMACOLOGY	3	200
GBTO 403	POTENTIAL OF MARINE ORGANISMS	3	200
GBTO 404	BIOENTREPRENEURSHIP	2	100
GBTO 405	BIOSAFETY & IPR	3	200
GBTO 406	ADVANCES IN PLANT BIOTECHNOLOGY	3	300
GBTO 407	ADVANCES IN ANIMAL BIOTECHNOLOGY	3	300
GBLO 205	LAB IN MARINE BIOLOGY & CHEMISTRY	2	100
GBLO 206	LAB IN BIOINFORMATICS	2	100
GBLO207	LAB IN PLANT TISSUE CULTURE	1	100
GBLO 301	LAB IN FERMENTATION TECHNOLOGY	2	200
GBLO 303	LAB IN ANIMAL CELL CULTURE	1	100
GBLO 307	LAB IN ENZYME CHARACTERIZATION	2	200
GBMO 412	DISSERTATION*	8	400
	<b>TOTAL CREDITS</b>	<b>57</b>	

\*Dissertation work will be carried out through III<sup>rd</sup> and IV<sup>th</sup> semester.

**Semester-wise Distribution of “Compulsory courses” for M.Sc. Biotechnology**

Name of the Course	Course Code	No of Credits
<b>SEMESTER I</b>		
Fundamentals of Microbiology	GBTC 101	3
Concepts in Biochemistry	GBTC 102	3
Principles of Genetics & Molecular Biology	GBTC 103	3
Bioinstrumentation	GBTC104	2
Lab in Microbiology	GBLC 101	2
Lab in Biochemistry	GBLC 102	2
Lab in Molecular Genetics	GBLC 103	2
	<b>Total credits</b>	<b>17</b>
<b>SEMESTER II</b>		
Introductory Immunology	GBTC 201	3
Cell & Developmental Biology	GBTC 202	3
Lab in Immunology	GBLC 201	2
Seminar Presentations	GBMC 204	1
	<b>Total credits</b>	<b>9</b>
<b>SEMESTER III</b>		
Bioprocess & Industrial Biotechnology	GBTC 301	3
Recombinant DNA Technology	GBTC 302	3
Animal Cell Culture	GBTC 303	2
Lab in Recombinant DNA Technology	GBLC 302	2
Field Trips & Report	GBMC 304	1
	<b>Total Credits</b>	<b>11</b>
<b>SEMESTER IV</b>		
Environmental Biotechnology	GBTC 203	2
Seminar Presentations	GBMC 401	1
	<b>Total Credits</b>	<b>3</b>

**GBLC 101: LAB IN MICROBIOLOGY**

16. Sterilization and Disinfection.
17. Preparation of solid & liquid media.
18. Differential and Selective media.
19. Enumeration: serial dilution methods, plating.
20. Isolation and maintenance of organism.
21. Streaking, slants and stabs cultures, storage of microorganisms.
22. Isolation of bacteria from terrestrial/marine samples.
23. Study of morphology and cultural characteristics
24. Gram staining.
25. Motility
26. Cell inclusion studies: metachromatic granules
27. Spore staining

28. Biochemical characterization and identification of bacteria
29. Cultivation of fungi: Slide, chunk and coverslip techniques
30. Culture of anaerobes.

**REFERENCES:**

1. Brock's Biology of microorganisms. (2006). Madigan, M., Martinko & Parker, J.
2. General Microbiology. (1987). Stanier, R.Y., Ingraham, Wheelis and Painter
3. Marie and Estuarine Microbiology Laboratory Manual. (1975). Colwell, R. et al.
4. Microbiology Methods. (1975). Collins, C.H. and Lyne, P.M.
5. Laboratory Methods in Microbiology. (1973). Harrigan, W.F. & McCance, M.E.
6. Source book of Experiment for the teaching of Microbiology. (1982). Primrose, B. and Wardlaw, A.C.

**GBLC 102: LAB IN BIOCHEMISTRY**

16. Principles of colorimetry and verification of the Beer-Lambert Law (Determination of the unknown concentration of a coloured solution, spectral characteristics of colored solutions)
17. Preparation of buffers
18. Titration curve and determination of isoelectric point of an acidic/basic amino acid
19. Estimation of proteins by the Biuret method
20. Estimation of proteins by the Lowry's method
21. Spectral characteristics of coloured solutions
22. UV absorption of proteins
23. Paper chromatography
24. Thin layer chromatography
25. Estimation of lipids
26. Estimation of reducing sugars
27. Protein fractionation by ammonium sulphate precipitation
28. Gel filtration
29. Affinity Chromatography
30. Protein molecular weight determination by SDS page.

**REFERENCES :**

5. Modern experimental Biochemistry (2003). Boyer, R.
6. Principles and Techniques of Biochemistry and Molecular Biology (2005). Wilson, K. & Walker, J.
7. An Introduction to Practical Biochemistry. (2005). Plummer, D.T.
8. Laboratory Manual of Biochemistry. (1998). Jayaraman, J.

**GBLC 103: LAB IN MOLECULAR GENETICS**

15. DNA isolation from bacteria
16. DNA isolation from Phage.
17. RNA isolation from bacterial cell.

18. Gel electrophoresis of DNA.
19. UV survival curve (light repair).
20. Chemical mutagenesis
21. Isolation of *auxotrophs* by replica plating.
22. Preparation of competent cell & transformation.
23. Conjugation
24. Transduction. ( 2 practicals)
25. Phage infection & titre determinations
26. Transposon mutagenesis.

[\(Back to Index\)](#) [\(Back to Agenda\)](#)

27. Electrophoresis of RNA by agarose gel electrophoresis
28. UV survival ( dark repair)

#### REFERENCES :

3. Experiments in molecular Genetics (1972) Miller J.H.
4. Laboratory manual in Molecular Genetics (1979). Jayaraman, K & Jayaraman, R.

#### GBLC 201: LAB IN IMMUNOLOGY

16. Blood grouping
17. Standardization of Antigen & Antibody reactivity
18. Single immunodiffusion
19. Double immunodiffusion
20. Assessment of antigen similarity using Ouchterlony double diffusion test.
21. Determination of antibody titre using double diffusion
22. Estimation of concentration using radial immunodiffusion
23. Estimation of Antibody concentration using radial immunodiffusion
24. Quantitative precipitin assay Part-I
25. QPA-Part-II using radial immunodiffusion
26. DOT ELISA test
27. Immunoelectrophoresis
28. Latex Agglutination test
29. Counter current immunoelectrophoresis
30. Rocket immunoelectrophoresis

#### REFERENCES:

2. Practical Immunology (2003). 4<sup>th</sup> edition Frank, C. Hay & O.M.R. Westwood.

#### GBLO 206: LAB IN BIOINFORMATICS

17. Search engines for bibliographic search
18. Construction of plasmid map.

19. Database search engines (Entrez/SRS) and submission of DNA/protein sequence.
  20. Exploring protein structure using RASMOL/Discovery studio/view
  21. Designing PCR primers and probes.
  22. Reconstruction of phylogenetic tree using molecular data (Distance-based method or Neighbor-joining).
  23. Tools for Genomic Data Mining
  24. Basic of Genome Annotation
  25. Special tools for searching genomic data
  26. Prediction of ORFs and Genes
  27. Prediction of Signal sequences (Promoters, splice sites, UTRs etc. sequence
  28. Browsing & viewing genome data
- Drug designing. [\(Back to Index\)](#)[\(Back to Agenda\)](#)

29. Immunoinformatics
30. Prediction of B and T cell epitopes for vaccine drug design
31. Proteomics (ExPasy) and Interprotein Scan- pattern/motif detection in proteins

#### REFERENCES :

3. Practical Bioinformatics (2006) J. Bajnieci (Ed)
4. Bioinformatics (1995). A Practical guide to analysis of genes and protein.

#### GBLO 207: LAB IN PLANT TISSUE CULTURE

1. Sterilization of explants and callus induction.
2. Regeneration of plantlet from callus.
3. Single cell suspension and protoplast isolation.
4. Axenic culture & tissue culture of seaweeds.
5. Somatic embryogenesis.
6. *Agrobacterium* gene transfer.
7. *Protoplast isolation*.

#### REFERENCES:

1. Plant Biotechnology: methods in tissue culture and gene transfer (2006). R. Keshavachandra and K.V. Peter.
2. Plant tissue culture: theory and practice (revised editions). Bhojwani and M. Rajdan

#### GBLO 301: LAB IN FERMENTATION TECHNOLOGY

16. Microbial production of ethanol using yeast sp.
17. Estimating ethanol concentration by Ceric Ammonium nitrate method.
18. Microbial production of Citric acid using *Aspergillus* sp.
19. Measuring the total acidity by Titrimetry.
20. Qualitative estimation of Citric acid by spectrophotometry
21. Qualitative estimation of organic acids using paper and thin layer chromatography.



22. Microbial production of antibiotics. Antibigram.
23. Disc diffusion & well diffusion method.
24. Immobilization of microbial cells: use of alginate.
25. Preparing a microbial bioreactor using immobilized cells & fermentation.
26. Use of fermenter with special reference to scale-up operations.
27. Batch and continuous culture.
28. Mushroom cultivation.
29. Food Microbiology: Preparing an edible fermented product in the Lab.
30. Manufacture of ginger ale & estimating the alcohol content

[\(Back to Index\)](#)  
[\(Back to Agenda\)](#)

#### REFERENCES:

1. Practical Fermentation Technology (2008) Brian McNeil and Linda Harvey. Wiley

#### **GBLC 302: LAB IN RECOMBINANT DNA TECHNOLOGY**

1. Plasmid isolation by Alkaline lysis.
2. Plasmid isolation by boiling method.
3. Isolation of Plasmid by column chromatography.
4. Study of Plasmid profile by agarose gel electrophoresis
5. Restriction mapping of plasmid DNA.
6. Preparation of competent E.colicells
7. Transformation of competent E.coli cells
8. Transfection of competent E.coli; cells.
9. Restriction of plasmid and alkaline phosphatase treatment.
10. Ligation and cloning of insert in plasmid
11. Screening for recombinant.
12. PCR
13. RT-PCR
14. Southern blotting
15. Western blotting
16. Interpretation of DNA Sequencing gel.

#### REFERENCES :

- a. Molecular cloning (1989) Maniatis, T. *et al*
- b. Recombinant DNA methodology. (1985). Dillon, R.G., Nasim, A. & Nestmann. E.R.

#### **GBLO 205: LAB IN MARINE BIOLOGY & CHEMISTRY**

1. Samplers: water samplers, dredges, grabs, snappers.
2. Field trips

Identification of:

3. Phytoplankton,
4. Zooplanktons
5. Nektons
6. Benthos: Identification and collection using gears (2 Practicals)

Estimation from sea water:

7. Nutrients
8. Nitrate
9. Phosphate
10. Silicate
11. Dissolved oxygen
12. pH& alkalinity
13. Salinity
14. Chlorophyll
15. Primary productivity

[\(Back to Index\)](#)

[\(Back to Agenda\)](#)

#### REFERENCES:

5. Methods of Sea Water Analysis. (1995). Grasshoff, K., Ehrhardt, M. & Kremling, K.
6. Quantitative Ecology Ecology& Marine Biology. (1990). Bakus, G.J.
7. Methods of study of Marine Benthos. (1984). Holme, N.A. & McIntyre, A.D.
8. Methods in Marine Zooplankton Ecology. (1984). Omori, W& Ikeda, T.

[\(Back to Index\)](#)

[\(Back to Agenda\)](#)