## SCHOOL OF BIO AND CHEMICAL ENGINEERING

## DEPARTMENT OF BIOTECHNOLOGY

### Board of Studies 2018-2019 (ODD SEM)

### Minutes of Meeting

Date : 1 June 2018 (Friday)                                          10.00am-12.00pm

Chair-person  :     **Dr. Ramesh kumar V, Prof and HOD**

Attendees                           **Dr. Parthiban.M.,** External Member

Professor and Head, Department of Animal Biotechnology,     Madras
Veterinary college, Chennai 600007

**Dr.P.Venkatachalam, External Member**
Professor and Head, SRMC

**Dr. Ramesh kumar V**, Internal member
**Dr. Valli Nachiyar C**, Internal member

**Dr. Jayshree Nellore**, Internal member

The HOD chaired the meeting and welcomed all the members and thereafter the agenda items were taken up for discussion

**Item 1:** To consider and approve the starting of three new programmes for B.Sc (Microbiology, Biotechnology and Biochemistry) from the academic year 2018-2019

The Head of the department explained the salient features contained in the syllabus and requested the members to consider and approve the regulations and syllabus. The regulations and syllabus for courses are available in the annexure-1.
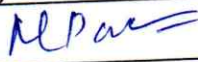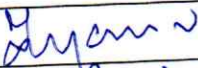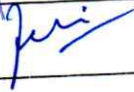
**Item 2:** To consider and approve the revision in the curriculum and syllabi of B.Tech. Biotechnology under Regulations 2015

The following new electives were introduced considering the latest technologies in the industry. The BOS members reviewed and has recommended the same for approval. The approved syllabus is in the annexure II

1. SBT 1610 GMP and Quality Concepts
2. SPR 1307 Resource Management Technique

**UNIVERSITY ELECTIVES**

1. SHS 1601 Life and Employability Skills
2. SHS 1602 Technical Writing for Scientists
3. SHS 1603 Professional Communication & Advanced Rhetoric
4. SCI 1619 Disaster Management
5. SBI 1101 Introduction to Bioinformatics
6. SBI 1207 PERL Programming
7. SBI 1605 Python
8. SBM 1304 Biomaterials
9. SBM 1404 Hospital Management
10. SBM 1606 BioMEMS and Nanotechnology
11. SBT1610 GMP and Quality Concepts
12. SBT 1611 Biology for Engineers
13. SCH 1616 Environmental Impact Assessment

Meeting ended with vote of thanks to the Chair.

| External Member | Signature |
|---|---|
| Dr. Parthiban.M | |
| Dr.P.Venkatachalam | |
| **Internal Member** | **Signature** |
| Dr. Jayshree Nellore | |
| Dr.Valli Nachiyar | |
| Dr. Karthick Raja Namasivayam | |

Dr.Ramesh Kumar
(Head of the Department)

# PROGRAMME: B.Sc. MICROBIOLOGY
## CURRICULUM

| SEMESTER I | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Sl. No | Course Code | Course Title | L | T | P | C | Marks CAE | Marks ESE | Page No. |
| 1. | STA1101 SFR1101 SHN1101 | Tamil - I French - I Hindi - I | 3 | 0 | 0 | 3 | 50 | 50 | 1 3 5 |
| 2. | SHS1109 | General English - I | 3 | 0 | 0 | 3 | 50 | 50 | 5 |
| 3. | SMB1101 | General Microbiology | 3 | 1 | 0 | 4 | 50 | 50 | 7 |
| 4. | SMB1102 | Basic Biochemistry | 3 | 1 | 0 | 4 | 50 | 50 | 8 |
| 5. | SBT1001 | Environmental Science | 3 | 0 | 0 | 3 | 50 | 50 | 9 |
| 6. | SMB4101 | General Microbiology Lab | 0 | 0 | 3 | 2 | 50 | 50 | 11 |
| 7. | SMB4102 | Basic Biochemistry Lab | 0 | 0 | 3 | 2 | 50 | 50 | 11 |
| Total Credits for Semester 1 – 21 | | | | | | | | | |
| Total Marks for Semester 1   – 700 | | | | | | | | | |

| SEMESTER II | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Sl. No | Course Code | Course Title | L | T | P | C | Marks CAE | Marks ESE | Page No. |
| 1. | STA 1102 SFR 1102 SHN1102 | Tamil – II French – II Hindi – II | 3 | 0 | 0 | 3 | 50 | 50 | 12 14 15 |
| 2 | SHS 110 | General English – II | 3 | 0 | 0 | 3 | 50 | 50 | 16 |
| 3. | SBB1101 | Cell Biology | 3 | 1 | 0 | 4 | 50 | 50 | 17 |
| 4. | SBB1201 | Immunology | 3 | 1 | 0 | 4 | 50 | 50 | 18 |
| 5. | SBB1202 | Intermediary Metabolism | 3 | 0 | 0 | 3 | 50 | 50 | 19 |
| 6. | SBB4201 | Cell Biology Lab | 0 | 0 | 3 | 2 | 50 | 50 | 20 |
| 7. | SBB4202 | Immunology Lab | 0 | 0 | 3 | 2 | 50 | 50 | 20 |
| Total Credits for Semester 2 – 21 | | | | | | | | | |
| Total Marks for Semester 2 – 700 | | | | | | | | | |

L - LECTURE HOURS, T – TUTORIAL HOURS, P – PRACTICAL HOURS, C – CREDITS

CAE – CONTINUOUS ASSESSMENT EXAMINATION,

ESE – END SEMESTER EXAMINATION

| SEMESTER III | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| S. No. | Course Code | Course Title | L | T | P | C | Marks | | Page No. |
| | | | | | | | CAE | ESE | |
| 1. | SBB2101 | Introduction to Molecular Biology &Genetics | 4 | 0 | 0 | 4 | 50 | 50 | 22 |
| 2. | SMB2101 | Microbial Ecology | 3 | 0 | 0 | 3 | 50 | 50 | 23 |
| 3. | SBB2103 | Concepts in Biotechnology | 3 | 1 | 0 | 4 | 50 | 50 | 24 |
| 4. | SMB2103 | Bioinstrumentation | 3 | 1 | 0 | 4 | 50 | 50 | 25 |
| 5. | | Elective | 3 | 0 | 0 | 3 | 50 | 50 | |
| 6. | SMB4301 | Molecular biology Lab | 0 | 0 | 3 | 2 | 50 | 50 | 26 |
| 7. | SMB4302 | Bioinstrumentation Lab | 0 | 0 | 3 | 2 | 50 | 50 | 26 |
| Total Credits for Semester 3 – 21 | | | | | | | | | |
| Total Marks for Semester 3  – 700 | | | | | | | | | |

| SEMESTER IV | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Sl. No. | Course Code | Course Title | L | T | P | C | Marks | | Page No. |
| | | | | | | | CAE | ESE | |
| 1. | SMB2201 | Soil & Agricultural Microbiology | 3 | 0 | 0 | 3 | 50 | 50 | 27 |
| 2. | SMB2202 | Food & Dairy Microbiology | 3 | 0 | 0 | 3 | 50 | 50 | 28 |
| 3. | SMB2203 | Air and Water Microbiology | 3 | 0 | 0 | 3 | 50 | 50 | 29 |
| 4. | SMB2204 | Industrial microbiology | 4 | 0 | 0 | 4 | 50 | 50 | 30 |
| 5. | | Elective | 3 | 0 | 0 | 3 | 50 | 50 | |
| 6. | SMB4401 | Soil & Agricultural Microbiology Lab | 0 | 0 | 3 | 2 | 50 | 50 | 31 |
| 7. | SMB4402 | Food microbiology Lab | 0 | 0 | 3 | 2 | 50 | 50 | 31 |
| Total Credits for Semester 4 – 21 | | | | | | | | | |
| Total Marks for Semester 4 – 700 | | | | | | | | | |

L - LECTURE HOURS, T – TUTORIAL HOURS, P – PRACTICAL HOURS, C – CREDITS

CAE – CONTINUOUS ASSESSMENT EXAMINATION,

ESE – END SEMESTER EXAMINATION

| SEMESTER V | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Sl. No. | Course Code | Course Title | L | T | P | C | Marks | | Page No. |
| | | | | | | | CAE | ESE | |
| 1. | SMB3101 | Medical Bacteriology | 3 | 1 | 0 | 4 | 50 | 50 | 32 |
| 2. | SMB3102 | Medical Virology | 3 | 0 | 0 | 3 | 50 | 50 | 33 |
| 3. | SMB3103 | Medical Mycology | 3 | 0 | 0 | 3 | 50 | 50 | 34 |
| 4. | SMB3104 | Phycology and Medical Parasitology | 3 | 1 | 0 | 4 | 50 | 50 | 35 |
| 5. | | Elective | 3 | 0 | 0 | 3 | 50 | 50 | |
| 6. | SMB4501 | Bacteriology and Virology Lab | 0 | 0 | 3 | 2 | 50 | 50 | 36 |
| 7. | SMB4502 | Mycology and Parasitology Lab | 0 | 0 | 3 | 2 | 50 | 50 | 36 |
| Total Credits for Semester 5 – 21 | | | | | | | | | |
| Total Marks for Semester 5 – 700 | | | | | | | | | |

| SEMESTER VI | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Sl. No. | Course Code | Course Title | L | T | P | C | Marks | | Page No. |
| | | | | | | | CAE | ESE | |
| 1. | SBT1002 | Research Methodology | 3 | 0 | 0 | 3 | 50 | 50 | 37 |
| 2. | SMB3201 | Clinical Microbiology | 3 | 0 | 0 | 3 | 50 | 50 | 38 |
| 3. | S30PROJ | Project | 0 | 0 | 30 | 15 | 50 | 50 | |
| Total Credits for Semester 6 – 21 | | | | | | | | | |
| Total Marks for Semester 6 – 300 | | | | | | | | | |

L - LECTURE HOURS, T – TUTORIAL HOURS, P – PRACTICAL HOURS, C – CREDITS

CAE – CONTINUOUS ASSESSMENT EXAMINATION,

ESE – END SEMESTER EXAMINATION,

| Semester | Theory courses (including elective courses) | | | Practical Courses (including Project) | | |
|---|---|---|---|---|---|---|
| | Total No. | Total Credits | Total Marks | Total No. | Total Credits | Total Marks |
| **1** | 5 | 17 | 500 | 2 | 4 | 200 |
| **2** | 5 | 17 | 500 | 2 | 4 | 200 |
| **3** | 5 | 17 | 500 | 2 | 4 | 200 |
| **4** | 5 | 17 | 500 | 2 | 4 | 200 |
| **5** | 5 | 17 | 500 | 2 | 4 | 200 |
| **6** | 2 | 6 | 500 | 1 | 15 | 100 |
| **Overall Total** | 27 | 91 | 3000 | 11 | 35 | 1100 |

| | |
|---|---|
| Overall total credits for B.Sc.(Microbiology) Programme | 126 |
| Overall total marks for B.Sc.(Microbiology) Programme | 4100 |

## LIST OF ELECTIVES

| SI. No. | Course Code | Course Title | L | T | P | C | Marks | | Page No. |
|---|---|---|---|---|---|---|---|---|---|
| | | **ELECTIVE COURSES** | | | | | | | |
| | | | | | | | CAE | ESE | |
| 1 | SMB1601 | Advances in Microbiology | 3 | 0 | 0 | 3 | 50 | 50 | 39 |
| 2 | SMB1602 | Biofertilizers and Biopesticides | 3 | 0 | 0 | 3 | 50 | 50 | 40 |
| 3 | SMB1603 | Food Fermentation Techniques | 3 | 0 | 0 | 3 | 50 | 50 | 41 |
| 4 | SMB1604 | Management of Human Microbial Diseases | 3 | 0 | 0 | 3 | 50 | 50 | 42 |
| 5 | SBB1601 | Advanced instrumentation Techniques | 3 | 0 | 0 | 3 | 50 | 50 | 43 |
| 6 | SBB1605 | Computer Application in Biology | 3 | 0 | 0 | 3 | 50 | 50 | 44 |
| 7 | SMB1605 | Entrepreneurial Microbiology | 3 | 0 | 0 | 3 | 50 | 50 | 45 |
| 8 | SMB1606 | Microbial diversity | 3 | 0 | 0 | 3 | 50 | 50 | 46 |
| 9 | SBB1609 | Introduction to Bioinformatics | 3 | 0 | 0 | 3 | 50 | 50 | 47 |
| 10 | SMB1507 | Medical Laboratory techniques | 3 | 0 | 0 | 3 | 50 | 50 | 48 |
| 11 | SMB1608 | Human Physiology | 3 | 0 | 0 | 3 | 50 | 50 | 49 |
| 12 | SMB1609 | Marine microbiology | 3 | 0 | 0 | 3 | 50 | 50 | 50 |
| 13 | SBB3103 | Plant biotechnology | 3 | 0 | 0 | 3 | 50 | 50 | 51 |
| 14 | SBB1611 | Biostatistics | 3 | 0 | 0 | 3 | 50 | 50 | 52 |
| 15 | SBB1615 | Bioethics, Biosafety and IPR | 3 | 0 | 0 | 3 | 50 | 50 | 53 |
| 16 | SBB1616 | Nanobiotechnology | 3 | 0 | 0 | 3 | 50 | 50 | 54 |

L - LECTURE HOURS, T – TUTORIAL HOURS, P – PRACTICAL HOURS, C – CREDITS

CAE – CONTINUOUS ASSESSMENT EXAMINATION,

ESE – END SEMESTER EXAMINATION

| STA 1101 | தமிழ்–முதல் தாள் | L | T | P | Credits | Total Marks |
|---|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 | 100 |

**நோக்கம்:**

➢ மாணவர்களுக்குத் தமிழ் இலக்கியப்பரப்பை எடுத்துரைத்து சிற்றிலக்கியம், உரைநடை, புதினம், சிறுகதை, புதுக்கவிதை ஆகிய இலக்கியவகைமைகளை அறிமுகப்படுத்துதல்.

**பயன்**

• நெடிய தமிழ் இலக்கிய வரலாற்றில் சிற்றிலக்கியம், உரைநடை, புதினம், சிறுகதை, புதுக்கவிதைஆகியஇலக்கியவகைமைகளைஅறிதல்.
• பல்வேறு இலக்கிய ஆளுமைகளையும் அவர்தம் படைப்பு, மொழி நடை, மொழிப்பற்று ஆகியவற்றை உணர்ந்து கொள்ளுதல்.
• நவீன சிந்தனைகளோடு மாணவர்தம் கருத்தாக்கங்கள் உருப்பெறல்.
• படைப்பாக்க உத்திகளையும் திறன்களையும் அறிதல்.
• மாணவர்கள் இலக்கியபடைப்புகளை உருவாக்க அறிந்து கொள்ளுதல்.

**அலகு - ஒன்று: தமிழ்இலக்கியவரலாறு**
1. சிற்றிலக்கியம்–தோற்றமும்வளர்ச்சியும்
2. உரைநடை–தோற்றமும்வளர்ச்சியும்
3. புதினம்–தோற்றமும்வளர்ச்சியும்
4. சிறுகதை–தோற்றமும்வளர்ச்சியும்
5. புதுக்கவிதை–தோற்றமும்வளர்ச்சியும்

**அலகு - இரண்டு: சிற்றிலக்கியம்**
1. **கலிங்கத்துப்பரணி**–போர்பாடியது : 404 --- 408 பாடல்கள்
2. **குற்றாலக்குறவஞ்சி - மலைவளம்**
i.வானரங்கள்கனிகொடுத்து...எனத்தொடங்கும்பாடல்
ii.முழங்குதிரைப்புனலருவிகழங்கெனமுத்தாடும்...எனத்தொடங்கும்பாடல்

**அலகு - மூன்று: புதுக்கவிதைகள்**
1. பாரதியார் - **நெஞ்சுபொறுக்குதிலையே**...என்றுதொடங்கும்கவிதை.
2. பாரதிதாசன் - உலகஒற்றுமை –**தன்பெண்டுதன்பிள்ளை**...என்று தொடங்கும் கவிதை.
3. நா.காமராசன் – கருப்புமலர்கள் –காகிதப்பூக்கள் **காலமழைத்தூறலிலே...**என்று தொடங்கும்கவிதை
4. இன்குலாப்–மரங்களின்சுற்றம்
5. பாரதிபுத்திரன்–மாரிக்கால இரவுகள் - சிவகாசிச்சிசுக்கள்–**மகனே அன்றொருநாள்**.... என்று தொடங்கும் கவிதை

**அலகு - நான்கு : சிறுகதை மற்றும் புதினம்**
1. புதுமைப்பித்தன் சிறுகதைகள்
சாபவிமோசனம்
கடவுளும் கந்தசாமிப்பிள்ளையும்
அன்று இரவு
வாடாமல்லி
ஒரு நாள் கழிந்தது
2. புதினம்
வாடிவாசல்–சி.சு. செல்லப்பா

**அலகு - ஐந்து : உரைநடைப்பகுதி**
**பண்டைத்தமிழர் வாழ்வும் வழிபாடும்–கலாநிதிக . கைலாசபதி**

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**பார்வைநூல்கள்**

1. புதுக்கவிதை தோற்றமும் வளர்ச்சியும் – வல்லிக்கண்ணன்
2. தமிழில் சிறுகதை வரலாறும் வளர்ச்சியும் – சிட்டி, சிவபாதசுந்தரம்
3. தமிழ்நாவல் (புதினம்) தோற்றமும் வளர்ச்சியும் – சிட்டி, சிவபாதசுந்தரம்,
4. தமிழ்உரைநடைவரலாறு - வி.செல்வநாயகம்
5. நூற்றாண்டுதமிழ்உரைநடை – சு.சக்திவேல்
6. கலிங்கத்துப்பரணி – புலியூர்க்கேசிகன்உரை
7. குற்றாலக்குறவஞ்சி – புலியூர்க்கேசிகன்உரை
8. பாரதியார்கவிதைகள்
9. பாரதிதாசன்கவிதைகள்
10. மரங்களின்சுற்றம் - இன்குலாப்
11. கருப்புமலர்கள் – நா.காமராசன்
12. மாரிக்காலஇரவுகள் - பாரதிபுத்திரன்
13. புதுமைப்பித்தன் சிறுகதைகள்
14. வாடிவாசல்–சி.சு. செல்லப்பா
15. பண்டைத்தமிழர்வாழ்வும்வழிபாடும்–கலாநிதிக. கைலாசபதி

***

**பருவத் தேர்வு வினாத்தாள் அமைப்பு**

மொத்தமதிப்பெண்கள்: 100                                           காலம் : 3 மணி நேரம்.

பகுதி அ: 10 வினாக்களுக்குத்தலா 2 மதிப்பெண்கள்                    - 20 மதிப்பெண்கள்

பகுதி ஆ: 7 வினாக்களில் 5 வினாக்களுக்குத்தலா 7 மதிப்பெண்கள்        - 35 மதிப்பெண்கள்

பகுதி இ: 3 வினாக்களுக்குத்தலா 15 மதிப்பெண்கள்                     - 45மதிப்பெண்கள

| SFR1101 | FRENCH- I | L | T | P | Credits | Total Marks |
|---------|-----------|---|---|---|---------|-------------|
|         |           | 3 | 0 | 0 | 3       | 100         |

**Course objectives:**
- To teach basic skills in written and spoken French.
- To encourage students' oral and written mastery of the language.

**UNIT- I**                                                                                        **9Hrs**

Se présenter à des publics différents et saluer - Saluer et Prendre conge - La presentation. Pronoms, objets et sujets. Articles définis /indéfinis. Des cartes d'identité. Présenter quelqu'un. Les chiffres 1 à 50. Épreuves.

**UNIT- II**                                                                                      **12Hrs**

Exprimer ses goûts, ses preferences.  La negation. Les mois et les jours / le calendrier - Les verbes - L'interrogation avec intonation - Décrire un lieu, les noms des différentes salles - Les adjectifs - Les articles. Épreuves.

**UNIT- III**                                                                                     **12Hrs**

Donner des directions / localiser un lieu/ trouver un lieu-Les verbes aller et mettre.-L'article contracté et les prépositions de lieu - L'impératif- Les mots de caractérisation d'un lieu et les lieux urbains - Les transports. Épreuves.

**UNIT- IV**                                                                                      **12Hrs**

Discuter et acheter des produits - Les expressions de quantité-Les fruits, les légumes, les produits alimentaires-les produits propres aux pays différents.-La negation-le COD-Le conditionnel et les verbes-irréguliers - Épreuves.

**UNIT- V**                                                                                       **15Hrs**

Fixer un rendez-vous avec le médecin-L'heure et Les nombres de 51 à 100-L'interrogation avec est-ce que-Les parties du corps, avoir + les expressions et les-maladies communes-Les adjectifs possessifs – Le COI - L'entraînement DELF et épreuves.

                                                                                          **Max Hours.60**

**TEXT / REFERENCE BOOKS**
1. Panorama De La Langue Francaise: Level 1 by Jacky Girardet, Jean-Marie Cridlig, CLE International, 2004.
2. Krishnan, C &amp; Albert Adeline, Le Tramway Volant - I, Saraswathi House Pvt Ltd, India, 2011.
3. CAPELLE Guy; MENAND, Robert Taxi-1, Hachette, Paris, 2008.
4. MERIEUX , Régine; LOISEAU, Yves, Connexions-1, Didier, Paris , 2004.
5. MIQUEL, Claire,Vite et Bien-1, CLE International, Paris, 2009.
6. POISSON QUINTON, Sylvie, SIREJOLS, Evelyne, Amical -1, CLE International, Paris, 20011

**END SEMESTER EXAMINATION QUESTION PAPER PATTERN**

**Max. Marks : 100**                                                        **Exam Duration : 3 Hrs.**
**PART A :**6 Questions to be answered out of 8 questions and each question carries 5 Marks        **30 Marks**
**PART B:** 4 questions to be answered out of 8 questions and each question carries 10 Marks        **40 Marks**
**PART C**: 2 questions/Problems to be answered out of 4 questions each carries 15 marks        **30 Marks**

| SHN1101 | HINIDI - I | L | T | P | Credits | Total Marks |
|---------|-----------|---|---|---|---------|-------------|
| | | 3 | 0 | 0 | 3 | 100 |

## UNIT I ALPHABETS, VOWELS      10 hrs.

स्वर  अ से अ: तक – व्यंजन क से झ तक,
बारह खडी अनुस्वार – अनुनासिक व विसर्ग ,संयुक्ताक्षर

## UNIT II WHO, WHERE, HERE, THERE      10 hrs.

क्या ,कौन ,कहाँ ,वहाँ ,यहाँ । मैं हूँ । तुम हो । पढते हो।

## UNIT III ITS, HER, HIS, MINE      10 hrs.

का, के, की,  बडा, बडे, बडी ,मेरा, तुम्हारा, हमारा ,आउँगा ,आएगा, आओगे आएँगे ,किससे , किसपर ,किसको ,
था ,थे ,थी ,थीं ,आया ,आये, आयी, आयीं , खाया , खायी , खयीं आया है ,आया था ,रहा ,रहे ,रही

## UNIT IV      10 hrs.

प्रार्थना  2 पर्यटन  3 पालतु पशु  4 महाकवी तिरूवल्लुवर

## UNIT V      10 hrs.

Grammar प्रयोग काल  Tense कारक विभक्तियाँCase Endings का के की –
Possessive Case गिनती - Numbers(1-50)

## TEXT BOOK:

1, Hindi Parichaya Publisher: Dakshin Bharat Hindi Prachar Sabha
2. Central Hindi directorate – Certificate course material, MHRD.

## EVALUATION PATTERN
1. Exercises for written test
         Fill In The Blanks With Suitable Word
         Write The Number Names
         Write The Hindi Meanings
         Write The English Meanings
         Write The Opposites
         Write The Correct Word

| SHS1109 | GENERAL ENGLISH- I | L | T | P | Credits | Total Marks |
|---|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 | 100 |

**OBJECTIVES OF THE COURSE:**

➢ The paper provides opportunities for students to read and respond to representations of current issues through texts that present themes and topics that are familiar, insightful and informative. The thrust is on preparing students to effectively communicate by applying reflective thinking practices.

➢ Students will have an opportunity to improve their vocabulary related to immediate environment, practice speaking skills by discussing about issues based on reading texts, read texts that include everyday problems that provide opportunities to develop problem solving skills in cooperative learning situations, develop writing skills through writing paragraphs and letters based on prompts, of a poem, email and letters and composition of dialogues/paragraphs.

**UNIT 1 DRESS IN COMMUNICATION**                                                    **12 Hrs.**

Speaking - Rhetorical analysis and Group Discussion. Reading for details and Global Comprehension - Dress in communication,  I have a Dream Speech by Martin Luther King  and  The Justice Peace by Hilaire Belloc. Critical Thinking: Asking Questions, Analyzing Assumptions and Biases.  Vocabulary: Expressions and markers. Collocations – Identifying collocations by reading prose passages mentioned in the UNIT one. Language Focus: Determiners, Parts of Speech Writing: Paragraph writing based on hints given  on topics like 'My dream for my family/ country', 'importance of clothing for communication, 'social inequality in society', 'Judge the Book by its Cover- Can we judge people by their appearance?

**UNIT II: AN INCONVENIENT TRUTH**                                                    **12 Hrs.**

Speaking: Debate on the topics related to Environmental issues and Discrimination in Society,  Reading for details and Global Comprehension on An Inconvenient Truth, A Different History by Kamala Das and Sujata Bhatt. Critical Thinking: Identifying Facts and Opinions, Distinguish a main idea in text from a subordinate idea. Examine views on a controversial issue and consider one's own biases and personal interest. 'Vocabulary: Collocations, Useful words to express point of view. Language focus-  Tenses, Conjunctions and discourse markers Writing- Responding to Slogans, Campaign Leaflet and Writing Film Review ,  Letter writing

**UNIT 3   A SPEECH BY N R NARAYANA MURTHY**                                        **12 Hrs.**

Speaking: Giving Impromptu speeches- Welcome address and Vote of Thanks.    Reading for details and Global Comprehension- A Speech by NR Narayana Murthy and Digging by Seamus Heaney Critical Thinking: Asking ' wh ' questions Questions, Making informed decisions based on evidence, Examining Evidence by citing evidence from the textbook or lecture to support a position. Vocabulary - Word association, onomatopoeic words.  Language focus: Sentence Function and Sentence Kinds  Writing: Writing email , Writing Diary Entry

**UNIT 4   AFTER TWENTY YEARS**                                                      **12 Hrs.**

Listening: For details and Overall Idea , Speaking: Informal Speech, Reading for details and Global Comprehension- After Twenty Years by Jamila and After Twenty Years by O Henry Writing: Problem solving paragraph writing. Letter to the editor with solutions to current problems related to areas covered in the course Critical Thinking: Problem Solving selecting effective solutions for  overcoming obstacles or constraints by explaining why it is the most effective of the possible solutions. Vocabulary : Phrasal Verbs Language Focus Types of sentences -simple, compound and complex. Language Focus: Subject verb Agreement

**UNIT 5 I LOVE YOU MOM**                                                            **12 Hrs.**

Listening for details Speaking- Greeting , thanking , apologising, offering condolences by doing Role plays Reading for details and Global Comprehension- I Love you Mom by Joanna Fuchs and Prose passage on ' I Love You Mom'. Writing: Writing restaurant review, argumentative writing. Vocabulary: Phrasal Verbs , Synonyms and Antonyms  Critical Thinking : Argumentation  provides a well-articulated and detailed argument

**Max Hours.60**

**TEXT / REFERENCE BOOKS**

1. P Bhaskaran Nair,  C Radha Krishna Pillai, Geetha Rajeevan, CLN Prakash, Nadhini Nayar  Reflections - An Anthology of Prose, Poetry and Fiction (2015) Foundation Books, Chennai . Foundation Books. ISBN 978-93-85386-008
2. Sen S , Mahendra etal. ( 2015) Communication and Language Skills . Foundation books. Chennai

Reference Links  for teachers on Critical Thinking
https://designteachengage.wisc.edu/course-activities-learner-interaction/sdc-activity-types-active-learning/
https://www.uen.org/rubric/previewRubric.html?id=1219
https://www.diigo.com/profile/Teachonlineuw?query=%22Critical+Thinking%22+rubric

### END SEMESTER EXAMINATION QUESTION PAPER PATTERN

| | |
|---|---|
| **Max. Marks : 100** | **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 16 marks | **80 Marks** |

| SMB1101 | GENERAL MICROBIOLOGY | L | T | P | Credits | Total Marks |
|---|---|---|---|---|---|---|
| | | 3 | 1 | 0 | 4 | 100 |

## COURSE OBJECTIVES

➢ This course is aimed give an understanding about the basics of microbiology dealing types of microbes, classification & characterization

## UNIT 1  HISTORY AND CLASSIFICATION                                                            12 Hrs.

History and scope of Microbiology, Spontaneous generation - Biogenesis theory - Contribution ofLeeuwenhoek, Louis Pasteur, Robert Koch, Edward Jenner, Paul Ehrlich and Sir Alexander Flemming. Germ theory of disease. Binomial Nomenclature, Whittaker's five kingdom and Carl Woese's three kingdom classification systems and their utility. Difference between prokaryotic and eukaryotic microorganisms

## UNIT- 2  MICROSCOPY AND STAINING                                                           12 Hrs.

Microscope- Principles, working mechanism and application - Simple and compound microscope -Dark field -Phase contrast, Fluorescence, SEM and TEM. Structure and organization of bacterial cell, Gram positive and Gram negative bacterial cell wall. Types of Staining - Simple, Differential (Gram's, AFB), Special - Capsular staining (negative), Spore. LPCB, KOH mount

## UNIT- 3  SUBCELLULAR STRUCTURES                                                             9 Hrs

Microbial cell : Ultrastructure of bacteria, subcellular structures and cell envelope – slime, capsule, cell wall, pili, flagella, cell inclusions, biosynthesis of bacterial cell wall, cell membrane – Bio-membrane, liposomes – membrane transport – diffusion, active and passive transport and osmoregulation.

## UNIT- 4  STERILIZATION                                                                       12 Hrs.

Sterilization and Disinfection- principles -methods of sterilization- physical methods - Dry heat- Moistheat- Radiation. Filtration (Membrane and HEPA). Chemical sterilization- Chemical agents- mode of action- phenol coefficient test-sterility testing.

## UNIT- 5  MEDIA AND TECHNIQUES                                                               12 Hrs.

Culture and media preparation - solid and liquid. Types of media- Semi synthetic, Synthetic, Enriched, Enrichment, Selective and Differential media. Pure culture techniques – Tube dilution, Pour, Spread, Streak plate. Anaerobic culture technique Wright's Tube, Roll tube method, Anaerobic Jar.

## TEXT / REFERENCE BOOKS

1. Prescott, Harley, Klein. 2003. Microbiology. 5th Edition. McGraw Hill Publ.
2. Bernard R. Glick & Jack J. Pasternak. 2002. Molecular Biotechnology. Indian edition. Panima Publishing Corporation.
3. Pelzer, Chan and Kreig. 1986. Microbiology. 5th Edition. McGraw-Hill.
4. Tortora, G.J., Funke, B.R. and Case, C.L. 2012. Microbiology - An Introduction. 11th Edition. Pearson Education.
5. Stainer, Ingharam, Wheelis and Painter. 1987. General Microbiology. 5th Edition. Macmillan Education, London.
6. A.J. Salle. 1974. Fundamental Principles of Bacteriology. Tata McGraw – Hill Edition.

**Max Hours.60**

## END SEMESTER EXAMINATION QUESTION PAPER PATTERN

**Max. Marks : 100**                                                              **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 16 marks           **80 Marks**

| SMB1102 | BASIC BIOCHEMISTRY | L | T | P | Credits | Total Marks |
|---|---|---|---|---|---|---|
| | | 3 | 1 | 0 | 4 | 100 |

## COURSE OBJECTIVES
➢ This course is aimed give an understanding about the basics of biochemistry dealing carbohydrates, Amino acids, Lipids, nucleic acid and vitamins

**UNIT 1 CARBOHYDRATES**                                                                                    **12 Hrs.**
Carbohydrate – Definition, Classification, biological significance, structure of glucose, digestion and absorption of carbohydrates.

**UNIT 2   PROTEIN**                                                                                          **12 Hrs.**
Amino acids – structure, classification (Essential and non-essential, protein and non-protein amino acids). Proteins – definition, classification and structure (primary, secondary, tertiary and quaternary).

**UNIT 3   LIPIDS**                                                                                           **12 Hrs.**
Lipids – definition, classification and biological significance. Structure, properties and functions of fatty acids.

**UNIT 4   NUCLEIC ACIDS**                                                                                    **12 Hrs.**
Nucleic acids – Structure of DNA and its functions. Different forms of DNA. Different types of RNA and its functions.

**UNIT 5   VITAMINS**                                                                                         **12 Hrs.**
Vitamins – Source, biological function, daily requirement and deficiency symptoms of fat soluble vitamins (A, D, E and K) and water soluble vitamins (Ascorbic acid, thiamine, riboflavin, pyridoxine, niacin, pantothenic acid, lipoic acid, biotin, folic acid and vitamin B12).

**Max Hours.60**

## TEXT / REFERENCE BOOKS
1. Lehninger Principles of Biochemistry-David L. Nelson, Michael M. Cox, Macmillan Worth Publishers.
2. Harper─s Biochemistry-Rober K. Murray, Daryl K. Grammer, McGraw Hill, Lange Medical Books. 25th edition.
3. Fundamentals of Biochemistry-J.L. Jain, Sunjay Jain, Nitin Jain, S. Chand & Company.
4. Biochemistry-Dr. Amit Krishna De, S. Chand & Co., Ltd.

## END SEMESTER EXAMINATION QUESTION PAPER PATTERN
**Max. Marks : 100**                                                                         **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 16 marks                       **80 Marks**

| SBT1001 | ENVIRONMENTAL SCIENCE | L | T | P | Credits | Total Marks |
|---------|----------------------|---|---|---|---------|-------------|
|         |                      | 3 | 0 | 0 | 3       | 100         |

## COURSE OBJECTIVES
➢ To impart knowledge on the issues related to environment and to emphasize the importance of a clean environment

## UNIT 1 MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES AND NATURAL RESOURCES 10 Hrs
Definition, scope and importance- Need for public awareness. Natural Resources : Renewable and non-renewable resources : Natural resources and associated problems. Forest resources : Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people. Water resources : Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems. Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies. Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources. Case studies. Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification. Role of an individual in conservation of natural resources. Equitable use of resources for sustainable lifestyles.

## UNIT 2 ECOSYSTEMS, BIODIVERSITY AND ITS CONSERVATION                    10 Hrs
Concept of an ecosystem. Structure and function of an ecosystem. Producers, consumers and decomposers. Energy flow in the ecosystem. Ecological succession. Food chains, food webs and ecological pyramids. Introduction, types, characteristic features, structure and function of the following ecosystem: - Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries). Biodiversity: Definition-genetic, species and ecosystem diversity. Biogeographical classification of India.Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values.Biodiversity at global, National and local levels. India as a mega- diversity nation.Hot-sports of biodiversity. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts. Endangered and endemic species of India. Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

## UNIT 3 ENVIRONMENTAL POLLUTION                    12 Hrs.
Definition -Cause, effects and control measures of: - Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, Nuclear hazards. Solid waste Management: Causes, effects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution. Pollution case studies. Disaster management: floods, earthquake, cyclone and landslides.

## UNIT 4 SOCIAL ISSUES AND THE ENVIRONMENT                    8 Hrs.
Idea of Sustainable development. Urban problems related to energy. Water conservation, rain water harvesting, watershed management. Resettlement and rehabilitation of people; its problems and concerns. Case Studies. Environmental ethics: Issues and possible solutions. Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies. Wasteland reclamation. Consumerism and waste products. Environment Protection Act. Air (Prevention and Control of Pollution) Act. Water (Prevention and control of Pollution) Act. Wildlife Protection Act. Forest Conservation Act. Issues involved in enforcement of environmental legislation. Public awareness.

**UNIT 5 HUMAN POPULATION AND THE ENVIRONMENT**                                    **8 Hrs.**

Population growth, variation among nations. Population explosion – Family Welfare Programme. Environment and human health. Human Rights. Value Education.HIV/AIDS. Women and Child Welfare. Role of Information Technology in Environment and human health. Case Studies.

Visit to a local area to document environmental assets-river/forest/grassland/hill/mountain
•Visit to a local polluted site-Urban/Rural/Industrial/Agricultural
•Study of common plants, insects, birds.
• Study of simple ecosystems-pond, river, hill slopes, etc.

**Max Hours.60**

**TEXT / REFERENCE BOOKS**
1. Erach Bharucha, Text Book of Environmental Studies, 2ndEdition ,University Press, Chennai, 2006
2. Meenakshi. P, Elements of Environmental Science and Engineering, 1st Edition, Prentice Hall of India, New Delhi, 2009.
3. Ravikrishnan. A, Environmental Science & Engineering, 3rd Edition, Sri Krishna Publications, Chennai, 2008.
4. Wrigh. R. T & Nebel B.J, Environmental science-towards a sustainable future by Richard 8th edition, Prentice Hall of India, NewDelhi,2006

**END SEMESTER EXAMINATION QUESTION PAPER PATTERN**

**Max. Marks : 100**                                                        **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 16 marks        **80 Marks**

| SMB4101 | GENERAL MICROBIOLOGY LAB | L | T | P | Credits | Total Marks |
|---------|--------------------------|---|---|---|---------|-------------|
|         |                          | 0 | 0 | 3 | 2       | 100         |

**SUGGESTED LIST OF EXPERIMENTS**

1. Handling of Instruments and Laboratory safety measures.
2. Handling and Maintenance of compound microscope.
3. Cleaning of Glassware and preparation of cleaning solutions.
4. Preparation of media: Simple media, Complex media-Nutrient agar, McConkey agar, EMB agar.
5. Simple staining
6. Gram's staining
7. Motility by hanging drop method
8. Negative staining
9. Acid fast staining-permanent slide only.
10. Capsule staining
11. Endospore staining.
12. Isolation of pure cultures of bacteria by streaking method.
13. Preservation of bacterial cultures by various techniques.
14. Estimation of CFU count by spread plate method/pour plate method.

| SMB4102 | BASIC BIOCHEMISTRY LAB | L | T | P | Credits | Total Marks |
|---------|------------------------|---|---|---|---------|-------------|
|         |                        | 0 | 0 | 3 | 2       | 100         |

**SUGGESTED LIST OF EXPERIMENTS**

1. Properties of water, Concept of pH and buffers, preparation of buffers and Numerical problems to explain the concepts
2. Estimation of Ascorbic acid.
3. Carbohydrates: Glucose, fructose,maltose andlactose.
4. Amino acids: Arginine, cysteine, tryptophan and tyrosine.
5. Colorimetric analysis (only for demonstration)
6. Estimation of protein by Lowry's method.
7. Estimation of DNA using diphenyl amine.
8. Estimation of glucose by O -Toluidine.

| STA 1102 | தமிழ்-இரண்டாம்தாள் | L | T | P | Credits | Total Marks |
|----------|---------------------|---|---|---|---------|-------------|
|          |                     | 3 | 0 | 0 | 3       | 100         |

**நோக்கம்**

மாணவர்களுக்குத்தமிழின்செவ்விலக்கியங்கள்மற்றும்காப்பியங்களைஅறிமுகப்படுத்துதல்.

**பயன்**

- ஈராயிரம்ஆண்டுகளுக்குமுந்தையதமிழின்செவ்விலக்கியங்களின்சிறப்பினைஉணர்தல்.
- பண்டையகாலத்தமிழ்மக்களின்அகமற்றும்புறவாழ்வியலையும்பண்பாட்டையும்அறிதல்.
- தமிழர்தம்அறச்சிந்தனைகளையும்அறவாழ்வியலைஅவர்கள்பேணியமுறையினையும்உணர்தல்.
- தமிழர்களுடையமெய்யியல்தத்துவங்களையும்கடவுள்பற்றியகோட்பாடுகளையும்உணர்தல்.
- நெடுங்கதைகளாகத்திகழும்காப்பியங்களின்வழிபலபண்பாட்டுச்செய்திகளைஅறிதல்.

**அலகு-ஒன்று : தமிழ்இலக்கியவரலாறு**

1. சங்க இலக்கியங்கள்
2. அற இலக்கியங்கள்
3. பக்தி இலக்கியம்
4. காப்பியங்கள்

**அலகு-இரண்டு : சங்கஇலக்கியம்**

1. '**முளிதயிர்பிசைந்த**' என்று தொடங்கும்குறுந் தொகைப்பாடல்                    (167)
2. '**நின்றசொல்லர்**' என்று தொடங்கும் நற்றிணைப்பாடல்                          (1)
3. '**மனைநடுவயலை வேழம் சுற்றும்** ' என்று தொடங்கும் ஐங்குறுநூற்றுபாடல்        (11)
4. '**எம்வெங்காமம்இயைவதுஆயின்**' என்று தொடங்கும் அகநாநூற்றுப்பாடல்         **(15)**
5. '**சுடர்தொடீஇகேளாய்**' என்று தொடங்கும் கலித்தொகைப்பாடல்                   **( 51)**
6. '**மண்டுஅமர்அட்ட**' என்று தொடங்கும் புறநானூற்றுப்பாடல்                     **(213)**
7. '**நறவுவாய்உறைக்கும்நாகுமுதிர்**'என்று தொடங்கும் சிறுபாணாற்றுப்படை பாடல் **(51 - 67)**

**அலகு-மூன்று : அறஇலக்கியங்கள்**

1. திருக்குறள்–நட்பாராய்தல், புலவிநுணுக்கம் (2 அதிகாரம்).
2. நாலடியார்-பொருட்பால்–மேன்மக்கள்– (5) பாடல்கள்

**அலகு-நான்கு : பக்திஇலக்கியங்கள்**
**சைவம்-பன்னிருதிருமுறைகள்**

1. திருஞானசம்பந்தர்தேவாரம்–முதலாம்திருமுறை
   '**காதல்ஆகி, கசிந்து**'என்றுதொடங்கும்பாடல்.
2. திருநாவுக்கரசர்தேவாரம்–ஐந்தாம்திருமுறை
   '**மாசில்வீணையும்மாலை**'என்றுதொடங்கும்பாடல்.
3. சுந்தரர்தேவாரம்–ஏழாம்திருமுறை
   '**பொன்னார்மேனியனே**' என்று தொடங்கும்பாடல்.

**வைணவம்-நாலாயிரத்திவ்யப்பிரபந்தம்**

1. பூதத்தாழ்வார்
   '**பெருகுமதவேழம்மாப்பிடிக்கு**'என்றுதொடங்கும்பாடல்.
2. குலசேகராழ்வார்
   '**ஆனாதசெல்வத்துஅரம்பையர்கள்தற்சூழ்**'என்றுதொடங்கும்பாடல்.

**அலகு-ஐந்து : காப்பியஇலக்கியங்கள்**

1. சிலப்பதிகாரம்
   மங்கலவாழ்த்துப்பாடல்முழுவதும்
2. சீவகசிந்தாமணி
   கோவிந்தையார்இலம்பகம்முழுவதும்
3. கம்பராமாயணம்
   திருவடித்தொழுதபடலம் (பாடல்எண் : 25 – 48)

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**பார்வைநூல்கள்**

1. தமிழ்இலக்கியவரலாறு–மு.வ.
2. தமிழ்இலக்கியவரலாறு–மது. ச. விமலானந்தம்
3. சங்கஇலக்கியம்–ஒளவைசு. துரைசாமிப்பிள்ளை
4. சங்கஇலக்கியம் – புலியூர்கேசிகன்
5. திருக்குறள் – பரிமேலழகர்உரை
6. திருக்குறள் – மு.வ. உரை
7. நாலடியார் – கு. மதுரைமுதலியார்
8. சைவத்திருமுறைகள்–வர்த்தமான்பதிப்பகம்
9. நாலாயிரதிவ்வியப்பிரபந்தம்–வர்த்தமான்பதிப்பகம
10. சிலக்கதிகாரம்–ஞா.மாணிக்கவாசகன்
11. சீவகசிந்தாமணி–துரைராசாராம்
12. கம்பராமாயணம்–கழகவெளியீடு.

<center>**பருவத்தேர்வுவினாத்தாள்அமைப்பு**</center>

**மொத்தமதிப்பெண்கள்: 100**                                                    **காலம் : 3 மணிநேரம்.**

**பகுதிஅ:** 10 வினாக்களுக்குத்தலா 2 மதிப்பெண்கள்                    - 20 **மதிப்பெண்கள்**

**பகுதிஆ:** 7 வினாக்களில் 5 வினாக்களுக்குத்தலா 7 மதிப்பெண்கள்        - 35 **மதிப்பெண்கள்**

**பகுதிஇ:** 3 வினாக்களுக்குத்தலா 15 மதிப்பெண்கள்                    - 45 **மதிப்பெண்கள**

| SFR1102 | FRENCH- II | L | T | P | Credits | Total Marks |
|---------|------------|---|---|---|---------|-------------|
|         |            | 3 | 0 | 0 | 3       | 100         |

**COURSE OBJECTIVES:**
- ➤ To teach basic skills in written and spoken French.
- ➤ To encourage students' oral and written mastery of the language.

**UNIT I**
Acheterun billet-Les nombres au-delà de 100-Les différents types de places (fumeur, non fumeur, aller-retour) -Les adjectifs demonstratives -L'interrogation avec inversion - Les vêtements-L'entraînement DELF-Compréhension/Production écrite- Épreuves

**UNIT II**
Discuter les plats au restaurant -Les recettes, des plats et boissonsdifférents,-les formules de cuisine, des recettes simples-des différents pays-Le passé recent-Les pronomstoniques-Il faut + infinitif, Le pronomen-Faire des projets pour les vacances, décrire le temps-les lieuxtouristiques et le climat des différents pays-Le futurproche et les adverbes, le il -mpersonnel, le pronom y-Épreuves et entraînement DELF

**UNIT III**
Le passé compose-Les pronomsrelatifs (qui, que)-Québec et son histoire-Parler du passé et de soi-Compréhension/ production écrite- Entraînement DELF- Épreuves

**UNIT IV**
Les verbesréfléchis - Les pronomsrelatifs (dont, où)-L'impératif negative- Compréhension/ production écrite-Entraînement DELF-Épreuves

**UNIT V**
L'imparfait-La place des pronoms doubles-Décrire les mœurset les pays-La Réunion-Compréhension/ production écrite-Entraînement DELF-Épreuves

**Max Hours.60**

**Text books:**
- • Panorama De La Langue Francaise: Level 1 by Jacky Girardet, Jean-Marie Cridlig, CLE International, 2004.
- • Krishnan, C &amp; Albert Adeline, Le Tramway Volant - I, Saraswathi House Pvt Ltd, India, 2011.
- • CAPELLE Guy; MENAND, Robert Taxi-1, Hachette, Paris, 2008.

**Reference books:**
- • MERIEUX ,Régine; LOISEAU, Yves, Connexions-1, Didier, Paris , 2004.
- • MIQUEL, Claire,Vite et Bien-1, CLE International, Paris, 2009.
- • POISSON QUINTON, Sylvie, SIREJOLS, Evelyne, Amical -1, CLE International, Paris, 20011

**END SEMESTER EXAMINATION QUESTION PAPER PATTERN**

**Max. Marks : 100**                                                                 **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 16 marks              **80 Marks**

| SHN1102 | HINIDI -II | L | T | P | Credits | Total Marks |
|---------|------------|---|---|---|---------|-------------|
|         |            | 3 | 0 | 0 | 3       | 100         |

## Unit- I

(i)      पत्य – Poetry

(ii)     गत्य – Prose

(iii)    एकांकी एवं नाटक – One Act Play and Drama

(iv)     कहानी एवं उपन्यास – Story and Novel

## Unit -II

(v)      हिन्दी व्याकरण (Hindi Grammer)

1.सज्ं, 2. सर्वनाम, 3.विशेषन, 4.क्रिया-विशेषन, 5.काल, 6.लिंग, 7.वचन,  8.वाक्य-विचार, 9. शध्दद लेखन.

## Unit -III

(vi)     परिभाषिक शब्द – 250 आग्रेजी पारिभाषिक शब्दों को हिन्दी परिपाषिक शब्द

Translate from English to Hindi – 250 Official words.

(vii)    अनुवाद अभ्यास (Translation):

## Unit -IV

(viii)    निबंध लेखन(Essay):
गाँधी, नेहरु, अंबेडकर, बगत सिंह, अब्दुल कलाम

(ix)     पत्र लेखन(Letter Writing):
आवेदन पत्र, रासकीय पत्र, अर्धशासकीय पत्र, प्रत्यावेदन पत्र, प्रतिवेदन पत्र
Application letter, Official letter, Semi-Official letter, Government letter.

## Unit -V

(x)      संक्षेपण और विस्तारण (Comprehensions)

(xi)     लोकोक्तियाँ एवं मुहावरे (Proverbs)

| SHS1110 | GENERAL ENGILISH - II | L | T | P | Credits | Total Marks |
|---------|-----------------------|---|---|---|---------|-------------|
|         |                       | 3 | 0 | 0 | 3       | 100         |

**COURSE OBJECTIVES:**
- The paper provides opportunities for students to read and respond to representations of current issues through texts that present themes and topics that are familiar, insightful and informative. The thrust is on preparing students to effectively communicate by applying reflective thinking practices. Students will have an opportunity to improve their vocabulary related to immediate environment, practice speaking skills by discussing about issues based on reading texts, read texts that include everyday problems that provide opportunities to develop problem solving skills in cooperative learning situations, develop writing skills by summarising substance of a poems, letters and composition of dialogues and paragraphs.

**UNIT 1   UNITY OF MINDS - A P J ABDUL KALAM**                                   **(9Hrs)**
Listening for details, Speaking - making a presentation , Reading for details and Global Comprehension UNITy of Minds by APJ Abdul Kalam -Vocabulary Binomials Writing: Writing compare contrast paragraphs by representing data given in pie chart, Tables; Writing Speeches. Vocabulary : Binomials , Affixes Language Focus :  Active and Passive Voice , Punctuation. Critical Thinking : Comparing & Contrasting presenting information by including important characteristics on which the items should be compared or contrasted

**UNIT 2   LEAVE THIS CHANTING AND SINGING AND TELLING OF BEADS   BY RABINDRANATH TAGORE AND ENGINE TROUBLE BY R K NARAYANAN**                                   **12 Hrs.**
Listening for details Speaking: Giving impromptu speech based on topics given in the class for clarifying one's point of view. Reading for Comprehension and for overall idea -Leave this Chanting and Singing and Telling of Beads    by Rabindranath Tagore and Engine Trouble by R K Narayanan , Vocabulary : Archaic words , phrases Writing: Language Focus Imperatives. Writing: Writing Instructions and recommendations based on quotations given as prompts, writing an advertisement Critical Thinking: Expressing point of view

**UNIT 3 THE HAPPY PRINCE BY OSCAR WILDE**                                   **9Hrs**
Speaking Telephonic conversation, Drama In the class based on the story prescribed Reading for details and Global Comprehension The Happy Prince by Oscar Wilde Language Focus: Adjective- degrees of Comparison ,Functional and personal Nouns  Vocabulary :  positive and negative connotations. Writing: Letter writing- personal letters Critical Thinking Self-regulation: Continuing improvement in thinking, involving monitoring one's cognitive process and correcting errors and biases as needed.

**UNIT 4 TWO GENTLEMEN OF VERONA BY A J CRONIN**                                   **12 Hrs.**
Listening for Overall information of 'Anthem for Doomed Youth' by Wilfred Owen Speaking: Making requests and suggestions.  Reading for details Two Gentlemen of Verona by A J Cronin, Vocabulary: Simile, metaphor , adjectives to describe people  and their personalities.  Idioms. Writing: Writing recommendations; Narratives based on prompts on plot and characters.  Critical Thinking: identifying  the subject of the investigation and presenting  a well-articulated solution to the confusions or contradictions associated with the situation based on listening speaking tasks in the class. Creative writing -  stories and poems  Language Focus: Reported Speech

**UNIT 5 THE AVENGER BY ANTON CHEKHOV**                                   **12 Hrs.**
Listening for specific details Speaking  using imagination . Reading to identify factual and inferential information Writing: Imaginative writing by predicting. Vocabulary : Countable forms and meaning, foreign nouns and framing of plurals. Language focus: Modal verbs, use of would. Critical Thinking: Deductive reasoning- generating  a valid prediction or conclusion by articulating the relationship between the prediction or conclusion

**Max Hours.60**

**TEXT / REFERENCE BOOK**
P Bhaskaran Nair,  C Radha Krishna Pillai, Geetha Rajeevan, CLN Prakash, Nadhini Nayar  Reflections - An Anthology of Prose, Poetry and Fiction (2015) Foundation Books, Chennai . Foundation Books. ISBN 978-93-85386-008

Sen S , Mahendra etal. ( 2015) Communication and Language Skills . Foundation books. Chennai
https://designteachengage.wisc.edu/course-activities-learner-interaction/sdc-activity-types-active-learning/
https://www.uen.org/rubric/previewRubric.html?id=1219
https://www.diigo.com/profile/Teachonlineuw?query=%22Critical+Thinking%22+rubric

| SBB1101 | CELL BIOLOGY | L | T | P | Credits | Total Marks |
|---------|--------------|---|---|---|---------|-------------|
|         |              | 3 | 1 | 0 | 4       | 100         |

## COURSE OBJECTIVES

➢ Cell biology is the study of the structure and function of prokaryotic and eukaryotic cells. In this course the students will learn different areas of cellular biology including the structure and functions of cell, its organelles, synthesis and function of macromolecules such as carbohydrate, protein, lipid, DNA & RNA; membrane structure and function; bioenergetics; cellular communication; and microscopic techniques to understand the cell structure.

**UNIT 1 FUNDAMENTALS OF CELL STRUCTURE**                                    **12 Hrs.**
Discovery of cells; Basic properties of cells; Different classes of cells – Prokaryotic and eukaryotic cells. Cell division: Cell cycle; mitosis; meiosis, binary fission.

**UNIT 2 CELLULAR MEMBRANES AND MATRICES**                                   **12 Hrs.**
Chemical composition and fluidity of membranes; dynamic nature of membranes; transportation across cell membrane; membrane potentials; extracellular matrices – structure and function; cytoskeleton – structure and function.

**UNIT 3 CELLULAR ORGANELLES IN ENERGY METABOLISM**                          **12 Hrs.**
Mitochondria – structure and function; Chloroplast – structure and function. Structure of nucleus – nuclear membrane, nucleolus, chromatin, structure of nucleic acids

**UNIT 4 CELLULAR ORGANELLES IN METABOLISM**                                 **12 Hrs.**
Endoplasmic reticulum – smooth & rough; function of endoplasmic reticulum; Golgi complex – structure and function; Ribosomes – Types, structure and function; Morphology and functions of peroxisomes and glyoxisomes; Plant cell vacuoles.

**UNIT 5 TRANSPORT ACROSS CELL MEMBRANE**                                    **12 Hrs.**
Passive and active transports, Permeases, Sodium -potassium pumps, Ca 2+ ATPase pump, ATP dependant proton pumps, co-transport, symport, antiport, Endocytosis and Exocytosis. Introduction to intra and extra cellular products of medicinal use.

**Max Hours.60**

### Text Books
1. Freifelder D. 1985. Molecular Biology, Narosa Publishing House. New Delhi.
2. Lewin B. 2007. Genes IX. Oxford University Press, London.
3. Ajoy Paul. 2011. Textbook of Cell and Molecular Biology. Books and Allied Ltd.
4. Bruce Alberts, Alexander Johnson, Julian Lewis, Martin Raff, Keith Roberts, and Peter Walter. 2008. Molecular Biology of Cell. 6th Edition. Garland Science, Taylor & Francis group Publishers.
5. Harvey Lodish, Arnold Berk, S Lawrence Zipursky, Paul Matsudaira, David Baltimore, and James Darnell. 1995. Molecular Cell Biology. 3rd Edition. W.H. Freeman Publishers.

## END SEMESTER EXAMINATION QUESTION PAPER PATTERN
**Max. Marks : 100**                                                    **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 16 marks    **80 Marks**

| SBB1201 | **IMMUNOLOGY** | **L** | **T** | **P** | **Credits** | **Total Marks** |
|---------|----------------|-------|-------|-------|-------------|-----------------|
|         |                | **3** | **1** | **0** | **4**       | **100**         |

## COURSE OBJECTIVES
 ➢ To know the fundamentals of innate and acquired Immunity .To understand how immune system fights and combats the infection and diseases. To get an insight about the principle mechanism of Immunity.

## UNIT 1 IMMUNITY
History of Immunology – Host-parasite relationship – Immunity – Innate and acquired Immunity – Humoral and Cell-mediated Immunity .

## UNIT 2  IMMUNE CELLS
Structure, Functions and Properties of: Immune Cells – Stem cell, T cell, B cell, NK cell, Macrophage, Neutrophil, Eosinophil, Basophil, Mast cell, Dendritic cell; and Immune Organs – BoneMarrow, Thymus, Lymph Node, Spleen, GALT, MALT, CALT

## UNIT 3 ANTIGENS
Antigens – Types, properties – Immunoglobulins – Structure,types and Functions, Antigenic determinants on antibodies(Isotypic, allotypic, idiotypic); VDJ rearrangements;  Complement – Classical and alternativepathways.

## UNIT 4  ANTIBODY
Monoclonal antibodies, Antigen – Antibody reactions:Agglutination – Precipitation –Complement fixation – Immunofluorescence – ELISA, RIA.

## UNIT 5  AUTOIMMUNITY, HYPERSENTIVITY AND TRANSPLANTATION
AutoImmunity : Hypersensitivity reactions – Antibody mediated – Type I, Type II and Type III – cell mediated - Type IV; Transplantation immunology; Tumor immunology

**Max Hours.60**

## TEXT / REFERENCE BOOKS
1. Zeev Pancer and Max D. Cooper, (2006), The Evolution of Adaptive Immunity , Ann. Rev.Immunol., 24: 497–518
2. Roitt Evan, Brostoff J. Male D. (1993) Immunology 6th Ed., Mosby & Co. London.
3. Roitt I. M. (1988) Essentials of Immunology, ELBS, London.
4. Roitt M. (1984) Essentials of Immunology, P. G. Publishers Pvt. Ltd., New Delhi.
5. Stites D. P., Stobo J. D., Fudenberg H. H. and Wells J. V., (1982), Basic and ClinicalImmunology, 4th Ed., Lange Medical Publications, Maruzen Asia Pvt. Ltd., Singapore
6. Janeway Charles A., Paul Travers, Mark Walport, Mark Shlomchik. Immunobiologyinteractive. 2005. Garland Science Publishing. USA.

## END SEMESTER EXAMINATION QUESTION PAPER PATTERN
**Max. Marks : 100**                                                                            **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 16 marks               **80 Marks**

| SBB1202 | INTERMEDIARY METABOLISM | L | T | P | Credits | Total Marks |
|---------|-------------------------|---|---|---|---------|-------------|
|         |                         | 3 | 0 | 0 | 3       | 100         |

## COURSE OBJECTIVES

➢ This course aims at understanding the essential metabolic functions of the organism as well as consumption and storage of energy intermediary metabolism of main biomolecules and its regulatory mechanisms.

## UNIT 1   BASIC THERMODYNAMICS                                                              12 Hrs.
Anabolism – catabolism,  Enthaphy enthopy free energy, forward and reverse reaction equilibrium state

## UNIT 2   CARBOHYDRATE METABOLISM                                                     12 Hrs.
Glycolysis, TCA cycle and its energy production. Glycogen metabolism: Glycogenesis and Glycogenolysis, Alternative pathways: HMP pathway, gluconeogenesis

## UNIT 3   LIPID METABOLISM                                                                     12 Hrs.
Fatty acid oxidation – α, β, ω oxidation. Biosynthesis of saturated and unsaturated fatty acids. Metabolism of cholesterol, triglycerides.

## UNIT 4   PROTEIN METABOLISM                                                                12 Hrs.
Ketogenic and Glucogenic amino acids metabolism. Deamination, Transamination and Decarboxylation, Urea cycle.

## UNIT 5   NUCLEIC ACID METABOLISM & ENERGY PRODUCTION                  12 Hrs.
Biosynthesis and degradation of purine and pyrimidine nucleotides. Mitochondrial Electron Transport Chain: Oxidative phosphorylation

**Max Hours.60**

## TEXT / REFERENCE BOOKS
1. Fundamentals of Biochemistry, J.L. Jain, S.Chand publications, 2004.
2. Lehninger's Principles of Biochemistry (2000) by Nelson, David I. and Cox, M.M. Macmillan /Worth, NY.
3. Harper's Biochemistry Robert K. Murray, Daryl K. Granner, Peter A. Mayes, Victor W. Rodwell, 24thedition, Prentice Hall International. Inc.
4. Principles of Biochemistry, Geoffrey L. Zubay, 3rd edition William W. Parson, Dennis E. Vance, W.C. Brown Publishers, 1995.
5. Principles of Biochemistry, David L. Nelson, Michael M.Cox, Lehninger, 4th edition, W.H. Freeman and company.
6. Biochemistry, Lubert Stryer, 4th edition, W.H. Freeman & Co, 1995.
7. Fundamentals of Biochemistry (1999) by Donald Voet, Judith G.Voet and Charlotte W Pratt, John Wiley & Sons, NY.

## END SEMESTER EXAMINATION QUESTION PAPER PATTERN
**Max. Marks : 100**                                                                        **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 16 marks      **80 Marks**

| SBB4101 | CELL BIOLOGY LAB | L | T | P | Credits | Total Marks |
|---------|------------------|---|---|---|---------|-------------|
|         |                  | 0 | 0 | 3 | 2       | 100         |

**SUGGESTED LIST OF EXPERIMENT**

1. Light Microscopy
2. Simple staining
3. Studying algal cell
4. Studying fungal cell
5. Studying plant cell (Onion cells)
6. Studying animal cell (Human cheek cells)
7. Studying mitotic cell division in root tips of *Allium cepa*
8. Identifying meiotic cell division

| SBB4201 | IMMUNOLOGY LAB | L | T | P | Credits | Total Marks |
|---------|----------------|---|---|---|---------|-------------|
|         |                | 0 | 0 | 3 | 2       | 100         |

**SUGGESTED LIST OF EXPERIMENT**

1. Identification of human blood groups.
2. To perform Total Leukocyte Count of the given blood sample.
3. To perform Differential Leukocyte Count of the given blood sample.
4. Agglutination reaction
   i) Widal test
   ii) ASO test
   iii) RA test
   iv) CRP test
   v) Pregnancy test (Direct/Indirect)
5. To perform immunodiffusion by
      i. Single Radial Immunodiffusion
      ii. Ouchterlony double diffusion.
6. To perform DOT ELISA.
7. To perform immunoelectrophoresis.

| SBB2101 | INTRODUCTION TO MOLECULAR BIOLOGY &GENETICS | L | T | P | Credits | Total Marks |
|---------|---------------------------------------------|---|---|---|---------|-------------|
|         |                                             | 3 | 1 | 0 | 4       | 100         |

## COURSE OBJECTIVES
➢ This course provides you with further knowledge associated with molecular biology and inheritance at the molecular, cellular and phenotypic levels.

### UNIT 1 INTRODUCTION                                                                 12 Hrs.
Introduction and History of Microbial Genetics. DNA as a Genetic material. Physical structure and Chemical composition of DNA – RNA and its types RNA as a Genetic material. DNA Replication – Types and Experimental proof of replication – Enzymes involved in DNA replication

### UNIT 2 CENTRAL DOGMA                                                               12 Hrs.
Prokaryotic Transcription, Translation. Genetic code – Regulation of gene expression in prokaryotes – lac Operon. Gene transfer mechanisms – Transformation, conjugation and Transduction. Plasmid – Characteristics and types.
.
### UNIT 3 MENDELIAN GENETICS                                                          12 Hrs.
Mendel's work on transmission of traits, Genetic Variation, Molecular basis of Genetic Information. Interrelation between the cell structure and the genetics function, Mitosis, Meiosis (explaining Mendel's ratios).

### UNIT 4 INHERITANCE                                                                 12 Hrs.
Principles of Inheritance, Chromosome theory of inheritance, Laws of Probability, Pedigree analysis, Incomplete dominance and codominance, Multiple alleles, Lethal alleles, Epistasis, Pleiotropy, Environmental effects on phenotypic expression, sex-linked inheritance. Linkage and crossing over, Cytological basis of crossing over, Molecular mechanism of crossing over, Recombination frequency as a measure of linkage intensity, two factor and three factor crosses, Interference and coincidence, Somatic cell genetics –an alternative approach to gene mapping.

### UNIT 5 MUTATION                                                                    12 Hrs.
Mutation – types of mutation – Molecular basis of mutation –Mutagenesis, Detection of mutants – Ames test, DNA repair mechanisms. Molecular basis of Mutations in relation to UV light and chemical mutagens, Detection of mutations: CLB method, Attached X method, DNA repair mechanisms.

**Max Hours.60**

## TEXT / REFERENCE BOOKS
1. David Freifelder (1995). Molecular Biology. Narosa Publishing House, NewDelhi.
2. Peter Snustad D and Michael J Simmons (2003). Principles of Genetics. 3rdEdition, John Wiley & Sons, Inc., Publication, New Delhi.
3. Peter J Russel (2002). Genetics. Benjamin Cummings.
4. Robert H Tamarin (2002). Principles of Genetics. 7th Edition, Tata Mc GrawHill Publication, New Delhi.

## END SEMESTER EXAMINATION QUESTION PAPER PATTERN
**Max. Marks : 100**                                                          **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 16 marks      **80 Marks**

| SMB2101 | MICROBIAL ECOLOGY | L | T | P | Credits | Total Marks |
|---------|-------------------|---|---|---|---------|-------------|
|         |                   | 3 | 0 | 0 | 3       | 100         |

## COURSE OBJECTIVES

> ➢ This course will introduce students about the interactions of these organisms with both the biotic and abiotic worlds will be discussed. Topics will include the roles of microorganisms in host-pathogen interactions in disease, the beneficial aspects of microorganisms in bioremediation and food production, and their application in biotechnology

**UNIT 1**                                                                                                **12 Hrs.**

Microorganisms habitat and their role in biogeochemical cycles and succession pattern Terrestrial Environment: Soil microflora. Aquatic Environment: Stratification & Microflora of Freshwater & Marine habitats. Atmosphere: Stratification of the Atmosphere, Aeromicroflora, Dispersal of Microbes .Animal Environment: Microbes in/on human body (Microbiomics) & animal (ruminants) body.  Extreme Habitats: Extremophiles: Microbes thriving at high & low temperatures, pH, high hydrostatic & osmotic pressures, salinity, & low nutrient levels.

**UNIT- 2**                                                                                               **12 Hrs.**

Carbon cycle: Nitrogen cycle Ammonification, nitrification, denitrification & nitrate reduction. Phosphorous cycle: Phosphate immobilization and phosphate solubilization. Sulphur Cycle Microbes involved in sulphur cycle. Succession of microbial communities in the decomposition of plant organic matter

**UNIT- 3**                                                                                               **12 Hrs.**

Microbe–Microbe Interactions Mutualism, Synergism, Commensalism, Competition, Amensalism, Parasitism, Predation, Biocontrol agents. Microbe–Plant Interactions:  Roots, Aerial Plant surfaces, Biological Nitrogen fixation (symbiotic/nonsymbiotic- biofertilizers) Microbe–Animal Interactions : Role of Microbes in Ruminants, Nematophagus fungi, Luminescent bacteria as symbiont

**UNIT- 4**                                                                                               **12 Hrs.**

Microbial Pathogenicity: Virulence factors of pathogens: enzymes, toxins (host specific and non specific) growth regulators, virulence factors in viruses (replicase, coat protein, silencing suppressors) in disease development.Effects of pathogens on host physiological processes (photosynthesis, respiration, cell membrane permeability, translocation of water and nutrients, plant growth and reproduction).

**UNIT- 5**                                                                                               **12 Hrs.**

Concept of plant disease- microbial plant diseases, types of plant pathogens, pathogenicity, symptoms, economic losses. Principles & practices involved in the management of plant diseases by different methods.

**Max Hours.60**

## TEXT / REFERENCE BOOKS

1. Atlas RM and Bartha R. (2000). Microbial Ecology: Fundamentals & Applications. 4th edition. Benjamin/Cummings Science Publishing, USA.
2. Atlas RM. (1989). Microbiology: Fundamentals and Applications. 2nd Edition, MacMillan Publishing Company, New York.
3. Madigan MT, Martinko JM and Parker J. (2009). Brock Biology of Microorganisms. 12th edition. Pearson/ Benjamin Cummings
4. Agrios GN. (2006). Plant Pathology. 5th edition. Academic press, San Diego,
5. Lucas JA. (1998). Plant Pathology and Plant Pathogens. 3rd edition. Blackwell Science, Oxford.

### END SEMESTER EXAMINATION QUESTION PAPER PATTERN

**Max. Marks : 100**                                                                            **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 16 marks              **80 Marks**

| | L | T | P | Credits | Total Marks |
|---|---|---|---|---|---|
| SBB2103 | **CONCEPTS IN BIOTECHNOLOGY** | | | | |
| | 3 | 1 | 0 | 4 | 100 |

**COURSE OBJECTIVE**
- Explain the current scenario about biotechnology
- Describes the biotechnological methods in crop development and transgenic animal production
- Highlighting the application of industrial biotechnology
- Demonstrate the healthcare application of biotechnology
- Implementation of biotechnology in the protection of environment
- Discuss the ethical issues of biotechnology

**UNIT 1  BIOTECHNOLOGY: AN OVERVIEW**                                    **12 Hrs.**
What is Biotechnology? – an interdisciplinary pursuit, old Vs new biotechnology, scope and importance, commercial potential, public perception of Biotechnology, Biotechnology in India and Global. Branches of biotechnology.

**UNIT 2   ANIMAL & PLANT BIOTECHNOLOGY**                                 **12 Hrs.**
Biotechnology methods of crop improvement- plant tissue culture. Transgenic plants, applications of transgenic plants, transgenesis, transgenic animals,

**UNIT 3 INDUSTRIAL BIOTECHNOLOGY**                                       **12 Hrs.**
Isolation and screening of micro-organisms, Bioreactors, food and beverage fermentation, production of antibiotics (ß-lactum antibiotic), vitamin B12, Enzyme- amylase, protease, Biotransformation, SCP and its economical implications.

**UNIT 4 MEDICAL BIOTECNOLOGY**                                          **12 Hrs.**
Conventional vaccines, recombinant vaccines, DNA vaccines, monoclonal antibodies and their applications, interferons, drug designing, genetherapy, forensic medicine applications in human genetic research.

**UNIT 5 ENVIRONMENTENAL BIOTECHNOLOGY AND BIOETHICS**                    **12 Hrs.**
Novel and better bioinsecticides. Biofertilizers, Biodegradation of Xenobiotic compounds.Legal aspects genetically manipulated organisms and environment, biosafety, Social, moral and Ethical Considerations, IPR.

                                                                        **Max Hours.60**

**TEXT / REFERENCE BOOKS**
1. Satyanarayana. U.Biotechnology Books And Allied (p) Limited, 2013.
2. H.D. Kumar, Modern Concepts of Biotechnology, Vikas Publishing House Pvt Ltd, 1998.
3. P.K. Gupta, Elements of Biotechnology, Rastog Publications, 2003.
4. A.H. Patel, Industrial Microbiology, Macmillan Publishers, 1984

**END SEMESTER EXAMINATION QUESTION PAPER PATTERN**
**Max. Marks : 100**                                          **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 16 marks    **80 Marks**

| SMB2103 | BIOINSTRUMENTATION | L | T | P | Credits | Total Marks |
|---------|--------------------|---|---|---|---------|-------------|
|         |                    | 3 | 1 | 0 | 4       | 100         |

## COURSE OBJECTIVES

➢ This course aims at understanding the principle and application of various instruments used in Biotechnology industries.

## UNIT 1  MICROSCOPY                                                                          12 Hrs.

Bright field and dark field microscopy, Fluorescence Microscopy, Phase contrast Microscopy, Confocal Microscopy, Electron Microscopy (Scanning and Transmission Electron Microscopy) and Micrometry.

## UNIT 2  LAB EQUIPMENT                                                                       12 Hrs.

Autoclave , Hot air oven , Incubator , Water Bath , Laminar air flow, BOD incubator, Centrifuges – Bench top , High speed , Ultra centrifuge, density gradient centrifugation . pH meter , Conductivity meter, Lyophilizer , McIntosh anaerobic jar , Biosensor, Metabolic shaker.

## UNIT 3  CHROMATOGRAPHY AND ELECTROPHOESIS                                       12 Hrs.

Principles and applications of Chromatography – Paper, Thin layer, Column, Ion-exchange, Gas and HPLC – Principle and applications of native polyacrylamide gel electrophoresis, SDS- polyacrylamide gelelectrophoresis, 2D gel electrophoresis, Isoelectric focusing, Zymogram preparation and Agarose gelelectrophoresis..

## UNIT –IV PHOTOMETRY                                                                        12 Hrs.

Colorimetry, Turbidometry, Spectrometry – UV & Visible spectrophotometer. Flame photometry- Micronutrient analysis.

## UNIT BIOCHEMISTRY ANALYSIS                                                               12 Hrs.

Biochemical calculations-preparations of Molar solutions - Buffers- Phosphate, Acetate, TE, TAE- calculation of Normality ,PPM- Ammonium sulphate precipitation.

**Max Hours.60**

## TEXT / REFERENCE BOOKS

1. Gedder , A. and L. E. Balser, John Wiley and Sons , Principles of applied Biomedicalinstrumentation.
2. Dean, Willard and Merrit , Instrumental Methods of analysis Asian Ed.
3. Fritschen, L. J and L. W . Gay, Springer, Verlag, Environmental Instrumentation, 1979,New York.
4. Boyer, Rodney, F. Benjamin and Cummins, Modern Experimental Biochemistry 2ndEdition.
5. E.Padmini.,Biochemical Calculations and Biostatistics(2007) Books and Allied(P)Ltd.,FirstEdtn

## END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks : 100                                                                          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 16 marks            **80 Marks**

| SBB4301 | MOLECULAR BIOLOGY LAB | L | T | P | Credits | Total Marks |
|---------|----------------------|---|---|---|---------|-------------|
|         |                      | 0 | 0 | 3 | 2       | 100         |

**SUGGESTED LIST OF EXPERIMENT**

1. Isolation of DNA from E. coli/ liver/ plant
2. Agarose gel electrophoresis of DNA
3. Restriction digests of DNA.
4. Isolation of plasmid
5. Separation of serum protein by SDS -PAGE
6. Western blotting

| SBB4302 | BIOINSTRUMENTATION LAB | L | T | P | Credits | Total Marks |
|---------|------------------------|---|---|---|---------|-------------|
|         |                        | 0 | 0 | 3 | 2       | 100         |

**SUGGESTED LIST OF EXPERIMENT**

1. Sterilization: principles & operations – Autoclave, Hot Air Oven, Filtration, Laminar Air Flow
2. Principles & operations of Incubators & Shakers
3. Principle & operation of Centrifuge
4. Principle & operation of pH meter
5. Principle & operation of Colorimeter
6. Principle &operation of Spectrophotometer
7. Electrophoresis techniques

| SMB2201 | SOIL & AGRICULTURAL MICROBIOLOGY | L | T | P | Credits | Total Marks |
|---------|----------------------------------|---|---|---|---------|-------------|
|         |                                  | 3 | 0 | 0 | 3 | 100 |

### COURSE OBJECTIVES

➢ The purpose of this course is to introduce students to scientific foundation of microorganisms and their relationship to agriculture and environment. The course will appraise the students about application/control of microbes for agriculture and how to design approaches to mitigate environmental pollutants

### UNIT 1   SOIL MICROBES ASSOCIATION                                            12 Hrs.

Distribution of microorganisms in nature – Microbial communities in soil- factors influencing the microbial density in soil- zymogenous and autochthonous flora in Soil- Microbial associations – symbiotic proto cooperation, ammensalism, Commensalism, syntropism, parasitism and predation with suitable examples.

### UNIT 2   DECOMPOSITION                                                        12 Hrs.

Microbial decomposition; cellulose, Hemi cellulose, lignin, pectin and chitin. –Factors influencing degradation- acetate utilization -bioconversion of organic wastes- sugarcane wastes- coir pith composition- composting, principles and Applications- conversion process

### UNIT 3   DISEASES                                                             12 Hrs.

Role of enzymes and toxins in pathogenesis. Fungal diseases of plants: Rusts of wheat, linseeds; late blight of potato; red rot of sugarcane. Bacterial diseases of plants: Citrus canker, blight of rice. Viral diseases of plants: Leaf curl of Papaya, vein clearing of lady's finger

### UNIT 4   APPLICATIONS                                                         12 Hrs.

Microorganisms in the decomposition of organic matter- carbon cycle – nitrogen Cycle- nitrogen fixing microorganisms- root nodule bacteria – non-symbiotic Nitrogen fixers – biofertilizers in agriculture- Rhizobium and phosphate solubilisers- Mycorrhizial association – phosphorous cycle

### UNIT 5 BIOFERTILIZERS                                                         12 Hrs.

Bio fertilizers: Types, production and application - Mycorryzae : Types and their application in agriculture and forestry. – Vermicomposting - Reclamation of waste agricultural land by microorganisms

**Max Hours.60**

### TEXT / REFERENCE BOOKS

1. Soil Microbiology by Prof. N.S. Subba Rao, Fourth edition, Oxford and IBH Publishing CO. PVT., LTD., New Delhi
2. Introduction to soil microbiology. Alexander M. (1977) John Wiley & Sons, Inc., New York.
3. Modern Soil Microbiology, Dirk J, Elas V, Trevors JT, Wellington, EMH (1997) Marcel Dekker INC, New York.

### END SEMESTER EXAMINATION QUESTION PAPER PATTERN

**Max. Marks : 100**                                                    **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 16 marks          **80 Marks**

| SMB2202 | FOOD & DAIRY MICROBIOLOGY | L | T | P | Credits | Total Marks |
|---------|---------------------------|---|---|---|---------|-------------|
|         |                           | 3 | 0 | 0 | 3       | 100         |

## COURSE OBJECTIVES
- ➢ This course aims on studying interaction of microorganisms and food in relation to food-borne diseases, food spoilage and bioprocessing of food and dairy products.
- ➢ To make students learn about technologies to render foods and dairy products safe and analytical techniques for monitoring of food biological safety.

**UNIT 1  FACTORS**                                                                 **12 Hrs.**
Intrinsic and extrinsic factors that affect growth and survival of microbes in foods, natural flora and source of contamination of foods in general.

**UNIT 2  SPOILAGE**                                                                **12 Hrs.**
Principles, Spoilage of vegetables, fruits, meat, eggs, milk and butter, bread, canned Foods

**UNIT 3  PRESERVATION**                                                            **12 Hrs.**
Principles, physical methods of food preservation: temperature (low, high, canning, drying),irradiation, hydrostatic pressure, high voltage pulse, microwave processing and aseptic packaging, chemical methods of food preservation: salt, sugar, organic acids, SO2, nitrite and nitrates, ethylene oxide, antibiotics and bacteriocins

**UNIT 4  FERMENTATION**                                                            **12 Hrs.**
Dairy starter cultures, fermented dairy products: yogurt, acidophilus milk, kumiss, kefir, dahi andcheese, other fermented foods: dosa, sauerkraut, soy sauce and tampeh, Probiotics: Health benefits,types of microorganisms used, probiotic foods available in market.

**UNIT 5  MICROBIAL DISEASES**                                                      **12 Hrs.**
Food intoxications: *Staphylococcus aureus*, *Clostridium botulinum* and mycotoxins; Food infections: *Bacillus cereus*, *Vibrio parahaemolyticus*, *Escherichia coli*, Salmonellosis, Shigellosis, *Yersinia enterocolitica*, *Listeria monocytogenes* and *Campylobacter jejuni*.
HACCP, Indices of food sanitary quality and sanitizers

**Max Hours.60**

## TEXT / REFERENCE BOOKS
1. Adams MR and Moss MO. (1995). Food Microbiology. 4th edition, New Age International (P) Limited Publishers, New Delhi, India.
2. Banwart JM. (1987). Basic Food Microbiology. 1st edition. CBS Publishers and Distributors, Delhi, India.
3. Davidson PM and Brannen AL. (1993). Antimicrobials in Foods. Marcel Dekker, New York.
4. Dillion VM and Board RG. (1996). Natural Antimicrobial Systems and Food Preservation. CAB International, Wallingford, Oxon.

### END SEMESTER EXAMINATION QUESTION PAPER PATTERN
**Max. Marks : 100**                                                      **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 16 marks **80 Marks**

| SMB2203 | AIR AND WATER MICROBIOLOGY | L | T | P | Credits | Total Marks |
|---------|---------------------------|---|---|---|---------|-------------|
|         |                           | 3 | 0 | 0 | 3       | 100         |

**COURSE OBJECTIVES**
➤ This course prepares students to apply microbiological techniques to monitor water and air quality, domestic and industrial water and wastewater treatment systems and site remediation project

**UNIT 1  AEROMICROBIOLOGY**                                                                 **12 Hrs.**
Aeromicrobiology  - Bioaerosols, Air borne microorganisms (bacteria, Viruses, fungi) and their impact on human health and environment, significance in food and pharma industries and operation theatres, allergens Air flora Droplet, droplet nuclei, and aerosols Air pollution: Chemical pollutants, their sources in air and effects on human health.

**UNIT 2  AIR SAMPLE ANALYSIS**                                                              **12 Hrs.**
Air sample collection and analysis Bioaerosol sampling, air samplers, methods of analysis Identification characteristics Methods of Air sampling and types of air samplers - A. Impact on solids, B. Impingement in liquid, C. Sedimentation D. Centrifugation, E. Precipitation F. Thermal Precipitation, CFU, culture media for bacteria and fungi.

**UNIT 3  CONTROL**                                                                          **12 Hrs.**
Control measures Fate of bioaerosols, inactivation mechanisms – UV light, HEPA filters, desiccation, Incineration Air sanitation: Physical and chemical methodsAir borne infections

**UNIT 4  WATER MICROBIOLOGY**                                                               **12 Hrs.**
Water Microbiology, Water borne pathogens, water borne diseases

**UNIT 5  WATER ANALYSIS**                                                                   **12 Hrs.**
Microbiological analysis of water Sample Collection, Treatment and safety of drinking (potable) water, methods to detect potability of water samples: (a) standard qualitative procedure: presumptive test/MPN test, confirmed and completed tests for faecal coliforms (b) Membrane filter technique and (c) Presence/absence tests Precipitation, chemical disinfection, filtration, high temperature, UV light

**Max Hours.60**

**TEXT / REFERENCE BOOKS**
1. da Silva N, Taniwaki MH, Junqueira VC, Silveira N, Nascimento MS, Gomes RAR (2012) Microbiological Examination Methods of Food and WaterA Laboratory Manual, CRC Press
2. Atlas RM and Bartha R. (2000). Microbial Ecology: Fundamentals & Applications. 4th edition. Benjamin/Cummings Science Publishing, USA
3. Maier RM, Pepper IL and Gerba CP. (2009). Environmental Microbiology. 2nd edition, Academic Press
4. Hurst CJ, Crawford RL, Garland JL, Lipson DA (2007) Manual of Environmental Microbiology, 3rd edition, ASM press

**END SEMESTER EXAMINATION QUESTION PAPER PATTERN**
**Max. Marks : 100**                                                      **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 16 marks      **80 Marks**

| SMB2204 | INDUSTRIAL MICROBIOLOGY | L | T | P | Credits | Total Marks |
|---------|-------------------------|---|---|---|---------|-------------|
|         |                         | 3 | 1 | 0 | 4       | 100         |

## COURSE OBJECTIVES

➢ The objective of this course to enable students to correlate metabolic aspects of industrially relevant microorganisms with the corresponding biotechnological products, and learn the basics of simple strategies for strain improvements encompassing both classical and metabolic engineering methods, design medium and downstream processing.

## UNIT 1  HISTORY                                                                                    12 Hrs.

Brief history and developments in industrial microbiology Types of fermentation processes - Solid-state and liquid-state (stationary and submerged) fermentations; batch, fed-batch (Eg. Baker's yeast) and continuous fermentations

## UNIT 2  BIO-REACTOR                                                                            12 Hrs.

Components of a typical bio-reactor, Types of bioreactors-Laboratory, pilot- scale and production fermenters, constantly stirred tank and air-lift fermenters, Measurement and control of fermentation parameters - pH, temperature, dissolved oxygen, foaming and aeration

## UNIT 3  UPSTREAM PROCESSING                                                          12 Hrs.

Sources of industrially important microbes and methods for their isolation, preservation and maintenance of industrial strains, strain improvement, Crude and synthetic media; molasses, corn steep liquor, sulphite waste liquor, whey, yeast extract and protein hydrolysates

## UNIT 4  DOWNSTREAM PROCESSING                                                   12 Hrs.

Cell disruption, filtration, centrifugation, solvent extraction, precipitation, lyophilization and spray drying. Citric acid, ethanol, penicillin, glutamic acid, Vitamin B12 Enzymes (amylase, protease, lipase)
Wine, beer

## UNIT 5  IMMOBILIZATION                                                                     12 Hrs.

Methods of immobilization, advantages and applications of immobilization, large scale applications of immobilized enzymes (glucose isomerase and penicillin acylase)

**Max Hours.60**

## TEXT / REFERENCE BOOKS

1. Patel A.H. (1996). Industrial Microbiology. 1st edition, Macmillan India Limited
2. Okafor N. (2007). Modern Industrial Microbiology and Biotechnology. 1st edition. Bios Scientific Publishers Limited. USA
3. Waites M.J., Morgan N.L., Rockey J.S. and Higton G. (2001). Industrial Microbiology: An Introduction. 1st edition. Wiley – Blackwell
4. Glaze A.N. and Nikaido H. (1995). Microbial Biotechnology: Fundamentals of Applied Microbiology. 1st edition. W.H. Freeman and Company
5. Casida LE. (1991). Industrial Microbiology. 1st edition. Wiley Eastern Limited.
6. Crueger W and Crueger A. (2000). Biotechnology: A textbook of Industrial Microbiology. 2nd edition. Panima Publishing Co. New Delhi.
7. 7. Stanbury PF, Whitaker A and Hall SJ. (2006). Principles of Fermentation Technology. 2nd edition, Elsevier Science Ltd..

## END SEMESTER EXAMINATION QUESTION PAPER PATTERN

**Max. Marks : 100**                                                                            **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 16 marks          **80 Marks**

| SMB4401 | SOIL & AGRICULTURAL MICROBIOLOGY LAB | L | T | P | Credits | Total Marks |
|---------|--------------------------------------|---|---|---|---------|-------------|
|         |                                      | 0 | 0 | 3 | 2       | 100         |

**SUGGESTED LIST OF EXPERIMENTS**

1. Study soil profile
2. Study microflora of different types of soils/ rhizosphere
3. Rhizobium as soil inoculants characteristics and field application
4. Azotobacter as soil inoculants characteristics and field applications
5. Isolation of cellulose degrading organisms
6. To study viral diseases in plants
7. To study bacterial and fungal diseases in plants
8. Isolation of rhizobia from root nodules of leguminous plants
9. Testing of nodulation ability of rhizobia.
10. Inoculation of seeds with rhizobia.
11. To study pesticidal activity of Bacillus thuringiensis.

| SMB4402 | FOOD MICROBIOLOGY LAB | L | T | P | Credits | Total Marks |
|---------|-----------------------|---|---|---|---------|-------------|
|         |                       | 0 | 0 | 3 | 2       | 100         |

**SUGGESTED LIST OF EXPERIMENTS**

1. Detection of adulterants in spices, pulses, sugar, tea.milk and milk products
2. Detection of arsenic by microbiological methods
3. Detection of nicotinic acid by bioassay
4. Detection of number of bacteria in milk by SPC
5. Determination of quality of milk sample by methylene blue reductase test.
6. To demonstrate role of yeast in bread-making
7. Isolation of spoilage microorganisms from food
8. Isolation of pathogenic microorganisms from food

| SMB3101 | MEDICAL BACTERIOLOGY | L | T | P | Credits | Total Marks |
|---------|----------------------|---|---|---|---------|-------------|
|         |                      | 3 | 1 | 0 | 4       | 100         |

**COURSE OBJECTIVES**
➢ This course aims at understanding important medically important bacteria its mode of infection, pathogenesis prophylaxis and treatment.

**UNIT 1  INFECTION**                                                                 **12 Hrs.**
Infection-Sources of infection, method of transmission of infection, Factors predisposing to microbial pathogenicity, Types of infectious diseases. Normal Microbial flora of human body. Gram-positive pathogens *Staphylococcus, Streptococcus, Corynebacterium, Clostridium.*

**UNIT 2  GRAM NEGATIVE PATHOGENS**                                                  **12 Hrs.**
Gram negative pathogens- *Neisseria, E.coli, Klebsiella, Proteus, Salmonella, Shigella, Vibrio, Yersinia.*

**UNIT 3  ACID FAST BACTERIS**                                                       **12 Hrs.**
Acid fast bacteria-*Mycobacterium tuberculosis* and *M.lepreae*.

**UNIT 4  SPIROCHETES**                                                              **12 Hrs.**
Spirochetes-*Leptospira, Treponema.*

**UNIT 5  OTHER MEDICALLY IMPORTANT ORGANISMS**                                      **12 Hrs.**
*Mycoplasma. Chalmydia. Helicobacter* and *Campylobacter.*Other important anaerobic pathogens.

**Max Hours.60**

**TEXT / REFERENCE BOOKS**
1. Medical Microbiology-David Green wood
2. Text book of Microbiology,Ananthanarayan& Jayaram Panicker
3. Jawetz-Medical Microbiology-Geo F.Brooks,Janet S Butel.

**END SEMESTER EXAMINATION QUESTION PAPER PATTERN**
**Max. Marks : 100**                                                    **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 16 marks    **80 Marks**

| SMB3102 | MEDICAL VIROLOGY | L | T | P | Credits | Total Marks |
|---------|------------------|---|---|---|---------|-------------|
|         |                  | 3 | 0 | 0 | 3       | 100         |

## COURSE OBJECTIVES

➢ This course aims at understanding important medically important virus its mode of infection, pathogenesis prophylaxis and treatment.

**UNIT 1  GENERAL CONCEPTS**                                                              **12 Hrs.**

General Concepts: Virus history, Diversity, shapes, sizes and components of genomes. Isolation and purification of viruses and components.

**UNIT 2  INFECTION**                                                                      **12 Hrs.**

Consequences of virus infection to animals and human. Viral infection: affect on host macromolecules. Viral infection: establishment of the antiviral state. Viruses counter attack mechanisms.

**UNIT 3  CLASSIFICATION**                                                                 **12 Hrs.**

Classification of viruses and nomenclatures.
Positive strand RNA viruses- Picornaviruses. Flaviviruses- West Nile virus and Dengue virus. Coronaviruses- SARS pathogenesis
Negative strand RNA viruses Paramyxoviruses. Orthomyxoviruses: Influenza pathogenesis and Bird flu. Rhabdoviruses: Rabies pathogenesis.

**UNIT 4  RNA VIRUS**                                                                      **12 Hrs.**

dsRNA viruses- Reoviruses. Retroviruses: structure, classification, life cycle; reverse transcription. Retroviruses: HIV, viral pathogenesis and AIDS.

**UNIT 5  DNA VIRUS**                                                                      **12 Hrs.**

Small DNA viruses: parvo- and polyomaviruses. Large DNA viruses: Herpes-adeno-, and poxviruses. Miscellaneous viruses.

**Max Hours.60**

## TEXT / REFERENCE BOOKS

1. Principles of Virology 2nd edition by S.J.Flint, L.W.Enquist,R.M.Krug,V.R. Racaniello, and A.M.Skalka.
2. Fields Virology 5th Edition by Bernard Fields, David Knipeand Peter Howley.
3. Medical Virology 4th edition by David O.White and FrankJ. Fenner.

## END SEMESTER EXAMINATION QUESTION PAPER PATTERN

**Max. Marks : 100**                                                                      **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 16 marks         **80 Marks**

| SMB3103 | MEDICAL MYCOLOGY | L | T | P | Credits | Total Marks |
|---------|------------------|---|---|---|---------|-------------|
|         |                  | 3 | 0 | 0 | 3       | 100         |

## COURSE OBJECTIVES

➢ This course aims at understanding important medically important fungi its mode of infection, pathogenesis prophylaxis and treatment.

## UNIT 1  CLASSIFICATION                                                    12 Hrs.
General characteristics & classification of fungi - Morphology & reproduction of fungi - Pathogenesis of fungal infections - Isolation & identification of fungi

## UNIT 2  YEAST                                                            12 Hrs.
Yeasts and yeast like fungi of medical importance including Candida. - Cryptococcus, Malassezia, Trichosporon, Geotrichum, Saccharomyces etc.Mycelial fungi of medical importance including Aspergillus, Zygomycetes,Pseudoallescheria, Fusarium, Piedra, other dematiaceous hyphomycetes andother hyalohyphomycetes etc.

## UNIT 3  DIMORPHIC FUNGI                                                  12 Hrs.
Dimorphic fungi including Histoplasma, Blastomyces, Coccidioides,Paracoccidioides, Sporothrix, Penicillium marneffei etc. - Dermatophytes

## UNIT 4  FUNGI DISEASES                                                   12 Hrs.
Fungi causing mycetoma, keratomycosis & otomycosis.- Pneumocystis jerovesi infection - Rhinosporidium seeberi & Loboa loboi - Actinomycetes &.Nocardia.

## UNIT 5  COMMON LAB CONTAMINANTS                                          12 Hrs.
Common laboratory fungal contaminants- Mycetism & mycotoxicosis - Antifungal agents & in vitro antifungal susceptibility tests. - Hypersensitivity to fungi

**Max Hours.60**

## TEXT / REFERENCE BOOKS

1. Patel A.H. (1996). Industrial Microbiology. 1st edition, Macmillan India Limited
2. Okafor N. (2007). Modern Industrial Microbiology and Biotechnology. 1st edition. Bios Scientific Publishers Limited. USA
3. Waites M.J., Morgan N.L., Rockey J.S. and Higton G. (2001). Industrial Microbiology: An Introduction. 1st edition. Wiley – Blackwell
4. Glaze A.N. and Nikaido H. (1995). Microbial Biotechnology: Fundamentals of Applied Microbiology. 1st edition. W.H. Freeman and Company
5. Casida LE. (1991). Industrial Microbiology. 1st edition. Wiley Eastern Limited.
6. Crueger W and Crueger A. (2000). Biotechnology: A textbook of Industrial Microbiology. 2nd edition. Panima Publishing Co. New Delhi.
7. 7. Stanbury PF, Whitaker A and Hall SJ. (2006). Principles of Fermentation Technology. 2nd edition, Elsevier Science Ltd..

## END SEMESTER EXAMINATION QUESTION PAPER PATTERN

**Max. Marks : 100**                                                      **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 16 marks    **80 Marks**

| SMB3104 | PHYCOLOGY AND MEDICAL PARASITOLOGY | L | T | P | Credits | Total Marks |
|---------|-----------------------------------|---|---|---|---------|-------------|
|         |                                   | 3 | 1 | 0 | 4       | 100         |

## COURSE OBJECTIVES
➢ This course aims at understanding important medically important parasite its mode of infection, pathogenesis prophylaxis and treatment. To understand the Algal diversity.

**UNIT 1   CLASSIFICATION**                                                                 **12 Hrs.**
Algae in diversified habitats (terrestrial, fresh water, marine) thallus organization, cell ultrastructure, reproduction (vegetative, asexual, sexual) criteria for classification of algae: pigments, reserve food, flagella, modern classification.

**UNIT 2   CLASSFICATIONS & APPLICATIONS**                                                  **12 Hrs.**
Salient features of protochlorophyta, chlorophyta, charophyta, xanthophyta, Bacillariophyta, phaeophyta and Rhodophyta with special reference to Microcystis, Hydrodictyon, Chara, Drapernaldiopsis, Sargassum, Dictyota, Batrachospermum. Algal blooms, algal biofertilizers; algae as food, feed and use in industry.

**UNIT 3   PARASITOLOGY**                                                                   **12 Hrs.**
Parasitology – General Concepts – Introduction to Parasitology, Classification – Host parasite relationship. Laboratory techniques in parasitology-Blood –Thick and thin smear, Faeces –Examination for ova and cyst.

**UNIT 4   PROTOZOOLOGY**                                                                   **12 Hrs.**
Protozoology: Pathogenic mechanisms, Disease transmissions, their life cycles and Lab Diagnosis of the following- *Entamoebahistolytica, Plasmodium vivax, Plasmodium falciparum, Leishmaniadonovani, Giardia lamblia, Trichomonasvaginalis, Balantidium coli, Toxoplasmagondii*and *Cryptosporidium parvum.*

**UNIT 5   HELMINTHOLOGY**                                                                  **12 Hrs.**
**Helminthology**: Classification, Cestodes – *Taeniasolium,T. saginata, T.echinococcus*, trematodes – *Schistosomahaematobium,Fasciola hepatica*, Nematodes – *Ascaris, Anchylostoma, Trichuris, Enterobius* and *Wuchereria*- their life cycle , Transmission, pathogenicity and Lab Diagnosis.

**Max Hours.60**

## TEXT / REFERENCE BOOKS
1. Text Book of Medical Parasitology by P. Chakraborty
2. Text Book of Parasitology By JayaramPanicker
3. Text Book of Medical Parasitology by Parija S.C.
4. Parasitology by K.D. Chatterjee

### END SEMESTER EXAMINATION QUESTION PAPER PATTERN
**Max. Marks : 100**                                                          **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 16 marks         **80 Marks**

| SMB4501 | BACTERIOLOGY AND VIROLOGY LAB | L | T | P | Credits | Total Marks |
|---------|-------------------------------|---|---|---|---------|-------------|
|         |                               | 0 | 0 | 3 | 2       | 100         |

**SUGGESTED LIST OF EXPERIMENTS**

1. Collection and processing of clinical specimen for microbiological examination.
2. Staining techniques- Simple, Negative, Gram"s, capsule, Spores(Organism – Bacillus, Enterobacter, Escherichia coli) Acid fast staining.
3. Study of composition and use of important differential media for identification of pathogenic bacteria: EMB Agar, McConkey agar, Mannitol salt agar, Deoxycholate citrate agar, TCBS
4. Isolation and identification of microorganisms from urine sample(E.coli, Proteus, Pseudomonas
5. Biochemical tests for bacterial identification(IMViC, TSI, nitrate reduction, urease production,coagulase and catalase tests.)
6. Preparation of dried filter paper discs for susceptibility assay and Antimicrobial activity by Kirby – Bauer disc diffusion technique.
7. Determination of MIC & MBC.
8. Preservation of bacterial cultures by various techniques
9. Studying isolation and propagation of animal viruses by chick embryo technique
10. Isolation and enumeration of bacteriophages (PFU) from water/sewage sample using double agar layer technique
11. To perform HBsAg by ELISA
12. To perform HIV Tridot method.

| SMB4502 | MYCOLOGY AND PARASITOLOGY LAB | L | T | P | Credits | Total Marks |
|---------|-------------------------------|---|---|---|---------|-------------|
|         |                               | 0 | 0 | 3 | 2       | 100         |

**SUGGESTED LIST OF EXPERIMENTS**

1. Identification of common fungus like Mucor, Rhizopus, Penicillium, Aspergillus by Lactophenol cotton blue mount examination.
2. Preparation of fungal media and Cultivation of fungi study of colony characters of yeast and mold.
3. Leishman staining for malarial parasites
4. Demonstration of permanent slide of Trichuris, Ascaris and Hookworm
5. Saline wet mount for observing ova and eggs of parasites.
6. Iodine wet mount for observing ova and eggs of parasites.
7. Concentration of stool samples by floatation method
8. Zinc sulphate conc. Method for stool sample
9. Demonstration of various parasites by permanent slides.
10. Concentration of stool sample by sedimentation method

| SBB1002 | RESEARCH METHODOLOGY | L | T | P | Credits | Total Marks |
|---------|----------------------|---|---|---|---------|-------------|
|         |                      | 3 | 0 | 0 | 3       | 100         |

## COURSE OBJECTIVES

➢ This course aims at understanding the research terminology.Be aware of the ethical principles of research, ethical challenges and approval processes.Describe quantitative, qualitative and mixed methods approaches to research.Identify the components of a literature review process.Critically analyze published research.

**UNIT 1**                                                                                                        **12 Hrs.**
Research methodology-basic concepts-types- definition of research problems- statistical methods- Correlation and Regression, Binomial, Poisson and Normal Distributions (mean and variance applications only) -  Sampling Distributions: Tests based on t, F, Z and Chi square distributions- Analysis of Variance.

**UNIT 2**                                                                                                        **12 Hrs.**
Research design-Nature and Classification of research deigns,data classification,primary and secondary data,primary and secondary data- sources-advantages-    Sampling- sampling concepts and methods

**UNIT 3**                                                                                                        **12 Hrs.**
Principles of biophysical methods used for analysis.  X-ray diffraction, Fluoresncence, UV, ORD/CD, visible, NMR and ESR spectroscopy, Hydrodynamic methods, Atomic absorption, Plasma emission spectroscopy.

**UNIT 4**                                                                                                        **12 Hrs.**
Principles and techniques of nucleic acid hybridization and cot curves, sequencing of proteins and nucleic acids, southern, northern and south-western blotting techniques, PCR, methods for measuring nucleic acids and protein interactions.

**UNIT 5**                                                                                                        **12 Hrs.**
Principles and applications of tracer techniques in biology, radiation dosimetry, radio-active isotopes and half-life of isotopes, effect of radiation on biological systems, autoradiography, cerenkov radiation and liquid scintillation specterometry

**Max Hours.60**

## TEXT BOOK/ REFERENCES:

1. Principles of biochemistry and molecular biology – Keith Wilson & John Walker
2. Biostatistics – Khan & Khanum

## END SEMESTER EXAMINATION QUESTION PAPER PATTERN
**Max. Marks : 100**                                                                        **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 16 marks          **80 Marks**

| | L | T | P | Credits | Total Marks |
|---|---|---|---|---|---|
| **SMB3201** | **CLINICAL MICROBIOLOGY** | | | | |
| | 3 | 0 | 0 | 3 | 100 |

**COURSE OBJECTIVES**
➢ This course consists of instruction in practical application, and pathogenesis of clinical microbiology, including collection, setup, identification, susceptibility testing, and reporting procedures..

**UNIT 1   COLLECTION AND TRANSPORT OF SAMPLE**                                                    **12 Hrs.**
Selection, collection and transport of specimens – Blood, Urine, Sputum, CSF, Pus & Faeces – transport media and storage. Microscopic examination of specimen for Bacterial pathogens – simple, differential staining and motility. Cultivation and isolation of viable pathogens – Media used – differential, selective, enrichment and enriched media. Identification of organisms - Biochemical reaction – Sugar fermentation test - Susceptibility testing – MIC,- reporting of results & interpretation.

**UNIT 2   FUNGAL AND PARASATIC SAMPLE COLLECTION**                                           **12 Hrs.**
Fungal samples– Direct Microscopic examination, culture media and incubation, Serological tests for fungi – Antifungal susceptibility testing.
Laboratory methods for parasitic infections – Diagnostic techniques for faecal, gastrointestinal and urogenital specimen.

**UNIT 3   PROTOZOA**                                                                                              **12 Hrs.**
Identification of Intestinal Protozoa – Amoeba, Blood protozoa – Malaria, Intestinal Helminthes: *Ascaris, Taenia, Entrobius* and Blood Helminthes: *Wuchereria bancrofti.*

**UNIT 4   VIROLOGY**                                                                                             **12 Hrs.**
Laboratory methods in basic Virology- Detection of viral antigen (fluorescent antibody and solid phase immunoassays). Viral Serology- Special consideration- Hepatitis and AIDS.

**UNIT 5 VIRAL CULTURE**                                                                                        **12 Hrs.**
Viral culture- Media and cells used – Specimen processing – isolation and identification of viruses. Advanced techniques – automated methods – ELISA, RIA. Applications of Nucleic acid hybridization, PCR and blotting in diagnosis
                                                                                                            **Max Hours.60**

**TEXT / REFERENCE BOOKS**
1.   Diagnostic Microbiology, Bailey and Scott's., 1990. Eighth edition. The Mosby Company.
2.   Medical laboratory techniques, Abdul Khader, 2003, First edition. Frontline Publications, Hyderabad.
3.   Virology, Sawant, K.C., 2005, First edition, Dominant Publishers and distributors, Delhi.
4.   Medical Parasitology, Rajesh Karyrkarte, Ajit Damla, 2004. Books and allied publishers Ltd. Kolkata.
5.   Textbook of Medical Parasitology, Subash O. Barija , 1996. First edition. All India Publishers and Distributors Regd. 920 Poonamallee High Road, Chennai.
6.   Rajesh Karyakarte and Ajith Damle (2005)Medical Parasitology, Books and Allied(P)Ltd.

**END SEMESTER EXAMINATION QUESTION PAPER PATTERN**
**Max. Marks : 100**                                                                            **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 16 marks     **80 Marks**

| SMB1601 | ADVANCES IN MICROBIOLOGY | L | T | P | Credits | Total Marks |
|---------|--------------------------|---|---|---|---------|-------------|
|         |                          | 3 | 0 | 0 | 3       | 100         |

## COURSE OBJECTIVES

➤ This course aims at understanding the physiology of prokaryotes, advances in ecology, evolution, and biotechnology.

## UNIT 1  GENOMICS                                                                                         12 Hrs.

Salient features of sequenced microbial genomes, core genome pool, flexible genome pool and concept of pangenome, Horizontal gene transfer (HGT), Evolution of bacterial virulence - Genomic islands, Pathogenicity islands (PAI) and their characteristics

## UNIT 2  METAGENOMICS                                                                                    12 Hrs.

Brief history and development of metagenomics, Understanding bacterial diversity using metagenomics approach, Prospecting genes of biotechnological importance using metagenomics Basic knowledge of viral metagenome, metatranscriptomics, metaproteomics and metabolomics.

## UNIT 3  PLANT PATHOGENS                                                                                 12 Hrs.

Epiphytic fitness and its mechanism in plant pathogens, Hypersensitive response (HR) to plant pathogens and its mechanism, Type three secretion systems (TTSS) of plant and animal pathogens,

## UNIT 4  NETWORK BIOLOGY                                                                                 12 Hrs.

Networking in biological systems, Quorum sensing in bacteria, Co-ordinated regulation of bacterial virulence factors, Basics of synthesis of poliovirus in laboratory, Future implications of synthetic biology with respect to bacteria and viruses

## UNIT 5  BIOFILMS                                                                                        12 Hrs.

Biofilms: types of microorganisms, molecular aspects and significance in environment, health care, virulence and antimicrobial resistance

**Max Hours.60**

## TEXT / REFERENCE BOOKS

1. Fraser CM, Read TD and Nelson KE. Microbial Genomes, 2004, Humana Press
2. Miller RV and Day MJ. Microbial Evolution- Gene establishment, survival and exchange, 2004, ASMPress
3. Bull AT. Microbial Diversity and Bioprospecting, 2004, ASM Press
4. Sangdun C. Introduction to Systems Biology, 2007, Humana Press
5. Klipp E, Liebermeister W. Systems Biology – A Textbook, 2009, Wiley –VCH Verlag
6. Caetano-Anolles G. Evolutionary Genomics and Systems Biology, 2010, John Wiley and Sons
7. Wilson BA, Salyers AA Whitt DD and Winkler ME (2011)Bacterial Pathogenesis- A molecularApproach, 3rd edition, ASM Press,
8. Bouarab K, Brisson and Daayf F (2009) Molecular Plant-Microbe interaction CAB International
9. Voit EO (2012) A First Course in Systems Biology, Ist edition,Garland Science.

## END SEMESTER EXAMINATION QUESTION PAPER PATTERN

**Max. Marks : 100**                                                                        **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 16 marks                            **80 Marks**

| SMB1602 | BIOFERTILIZERS AND BIOPESTICIDES | L | T | P | Credits | Total Marks |
|---------|----------------------------------|---|---|---|---------|-------------|
|         |                                  | 3 | 0 | 0 | 3       | 100         |

## COURSE OBJECTIVES

➤ This course aims at understanding adverse effects of plant production and protection chemicals on the biotic and abiotic components of environment To familiarize students with the microbes used as bio fertilizers for various crop plants and their advantages over chemical fertilizers.

**UNIT 1**                                                                                          **12 Hrs.**
Introduction and historical developments in Biofertilizers and biopesticides,Types of synthetic pestiicdes- impacts-pest and disease management - Importance of soil microorganisms – factors affecting the activities of soil microorganisms. - ,Carbon and Nitrogen cycles- Biological nitrogen fixation - symbiotic and non-symbiotic microorganisms.

**UNIT 2**                                                                                          **12 Hrs.**
Bioinoculant Technology -Bioinoculants- various types- biofertilizer, biomanures and biopesticides-their importance in sustainable agriculture - organic farming and environmental health Historical development of Bioinoculants technology -bioinoculants technology development in India

**UNIT 3**                                                                                          **12 Hrs.**
Biofertilizers-broad grouping of biofertilizers -dinitrogen fixers, phosphorous solubilizers and P-mobilizers.Nitrogen fixing microorganisms.Diazotrophic bacteria and BGA-symbiotic- associative symbiotic and non- symbiotic groups. Biochemistry of dinitrogen fixation (BNF)- nitrogen fixation by Azotobacter, Rhizobium, Azorhizobium and Azospirillum- isolation of nitrogen fixing diazotrophs - screening for efficiency and selection as Bioinoculants.

**UNIT 4**                                                                                          **12 Hrs.**
Phosphorous solubilization by microorganism like bacteria and fungi -  their importance in agriculture, mechanism of P -solubilization in soil ecosystem. Bacterial and fungal genera involved in P-solubilization –isolation, screening and testing the efficiency.

**UNIT 5**                                                                                          **12 Hrs.**
Biopesticides –various groups of bacterial, fungal and viral biocides- Bacillus thurengiensis, Trichodermaviride, NPV and GV- mode of action and the target pest and diseases.. Development of carrier based inoculants and storage under low temperature- importance of shelf life-methods for increasing shelf life using various low cost carrier materials.

**Max Hours.60**

## TEXT/REFERENCES BOOKS
1.   Motsara, M.R. Bhattacharyya, P.andSrivastava, B. 1995 Biofertilizer- Technology, Marketing and Usage.  Fertilizer Development & Consultant Organization , New Delhi.
2.   SubbaRao, N.S., 1994. Biofertilizers in Agriculture and Agroforestry. Oxford & IBH, New Delhi.  3.Alexander, M. 1985. Introduction to soil Microbiology. John Wiley & Sons, New York.

## END SEMESTER EXAMINATION QUESTION PAPER PATTERN
**Max. Marks : 100**                                                                     **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 16 marks                    **80 Marks**

| SMB1603 | FOOD FERMENTATION TECHNIQUES | L | T | P | Credits | Total Marks |
|---------|------------------------------|---|---|---|---------|-------------|
|         |                              | 3 | 0 | 0 | 3       | 100         |

## COURSE OBJECTIVES
> To impart knowledge about the innovations in food processing technologies and their applications. To understand changes in the composition of food and comparison with conventional cooking methods. To know the need according to different foods and to food quality parameters and their maintenance during storage.

## UNIT 1  HISTORY                                                                                   12 Hrs.
History and scope of fermented foods; definition and importance of fermented foods;Organisms used for production of fermented food products; Environmental parametersfor fermentation process; Classification of fermentation processes for fermented foods.

## UNIT 2  FERMENTED FOODS                                                                          12 Hrs.
Fermented beverages- production of different types of wine and beer; Fermented foodsof vegetables and fruits- Processing, microbiology, starter cultures, biochemistry, foodsafety of sauerkraut, pickles, Kimchi; Cereal and legume based fermented productsbread,Soya Sauce, Koji, Tempeh, Miso, Natto, Tofu, Angkkak; Indian products like Idly, Dosa, Bada

## UNIT 3  FERMENTED DIARY FOODS                                                                    12 Hrs.
Microbiology of Fermented Dairy Products (Product Characteristics, Processing, Starter culture, Growth, Genetics) Buttermilk; Yogurt (probiotics, prebiotics, synbiotics); Acidophilus Milk; Bifidus Milk, Bulgarian milk; acidophilus milk; Kefir; Kumiss; Cheeses; Properties and beneficial effects of probiotic and prebiotic.

## UNIT 4  FERMENTED MEAT AND DRINKS                                                                12 Hrs.
Fermented meat and fish products; Microbial fermentation of tea, coffee and cacao. health aspects of fermented foods.

## UNIT  5  FOOD PROCESSING                                                                         12 Hrs.
Benefits and drawback of food processing, parameters for food processing. Processing of milk, vegetablesmeat, oil processing, grind milling. Food additives-safety and their effects. Processing method- size reduction,mixing, separation and concentration of food components, High hydrostatic pressure, phytochemical processes. Effects of food processing on food nutrition.

**Max Hours.60**

## TEXT / REFERENCE BOOKS
1. James. M. Jay, Martin J. Loessner and David A.Golden, Food Microbiology, Springer Publication, 7thEdition, 2005.
2. Frazier, Food Microbiology, McGraw Hill Publication, 4th Edition, 2001
3. Shetty K., G. Paliyath et al. – Food Biotechnlogy – 2nd Edition- Taylor and francis, 2006.
4. Kosikowski, F.V. 1997. Cheese and fermented milk foods. Frank Kosikowski and Vikram Mistry, Brooktondale, N. Y.
5. Fox, P.F. 1993. Cheese : chemistry, physics, and microbiology, London ; New York: Chapman & Hall,.
6. Wood, J. B. 1985. Microbiology of fermented foods. Volumes I and II. . Elsevier Applied Science Publishers. London, England
7. Joshi, V.K. and Pandey, A. Ed. 1999. Biotechnology. Food Fermentation, (2 Vol. set). Education Publ. New Delhi
8. Jay, J.M. (2008) Modern Food Microbiology (Sixth Edition).Aspen Publishers, Inc. Gaithersburg, Maryland

## END SEMESTER EXAMINATION QUESTION PAPER PATTERN
**Max. Marks : 100**                                                                    **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 16 marks        **80 Marks**

| SMB1604 | MANAGEMENT OF HUMAN MICROBIAL DISEASES | L | T | P | Credits | Total Marks |
|---------|----------------------------------------|---|---|---|---------|-------------|
|         |                                        | 3 | 0 | 0 | 3       | 100         |

## COURSE OBJECTIVES

➢ The course provides the conceptual basis for understanding pathogens and the mechanisms by which they cause disease in the human body. It also provides opportUNITies to develop informatics and diagnostic skills, including the use and interpretation of laboratory tests in the diagnosis of infectious diseases..

**UNIT 1  INFECTION**                                                                            **12 Hrs.**

Infectious and non-infectious diseases, microbial and non-microbial diseases, Deficiency diseases, occupational diseases, Incubation period, mortality rate, nosocomial infections

**UNIT 2  DISEASES**                                                                             **12 Hrs.**

Respiratory microbial diseases, gastrointestinal microbial diseases, Nervous system diseases, skin diseases, eye diseases, urinary tract diseases, Sexually transmitted diseases: Types, route of infection, clinical systems and general prevention methods, study of recent outbreaks of human diseases (SARS/ Swine flu/Ebola) – causes, spread and control, Mosquito borne disease – Types and prevention

**UNIT 3  TREATMENT**                                                                            **12 Hrs.**

Importance of personal hygiene (Typhoid Marry), judicious use of antibiotics, importance of completing antibiotic regimen, emergence of antibiotic resistance, current issues of MDR/XDR microbial strains. Treatment using antiviral agents: Mechanism of action of Amantadine, Acyclovir, Azidothymidine. Concept of HAART.

**UNIT 4  VACCINES**                                                                             **12 Hrs.**

Importance, types of vaccines, vaccines available against microbial diseases, vaccination schedule (compulsory and preventive) in Indian context

**UNIT 5  PREVENTIONS AND TREATMENT**                                                            **12 Hrs.**

Types, causes, prevention, detection and treatment

## TEXT / REFERENCE BOOKS

1. Ananthanarayan R. and Paniker C.K.J. (2009) Textbook of Microbiology. 8th edition, University Press Publication.
2. Brooks G.F., Carroll K.C., Butel J.S., Morse S.A. and Mietzner, T.A. (2013) Jawetz, Melnick and Adelberg's Medical Microbiology. 26th edition. McGraw Hill Publication.
3. Goering R., Dockrell H., Zuckerman M. and Wakelin D. (2007) Mims' Medical Microbiology. 4th edition. Elsevier.
4. Willey JM, Sherwood LM, and Woolverton CJ. (2013) Prescott, Harley and Klein's Microbiology. 9th edition. McGraw Hill Higher Education.
5. Madigan MT, Martinko JM, Dunlap PV and Clark DP. (2014). Brock Biology of Microorganisms. 14th edition. Pearson International Edition.

## END SEMESTER EXAMINATION QUESTION PAPER PATTERN

**Max. Marks : 100**                                                                       **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 16 marks             **80 Marks**

| SBB1601 | ADVANCED INSTRUMENTATION TECHNIQUES | L | T | P | Credits | Total Marks |
|---------|-------------------------------------|---|---|---|---------|-------------|
|         |                                     | 3 | 0 | 0 | 3       | 100         |

### COURSE OBJECTIVES

> The primary objectives of this course are to develop the skills to understand the theory and practice of bioanalytical techniques. To provide scientific understanding of analytical techniques and detail interpretation of results. .

**UNIT 1**                                                                                    **12 Hrs.**
NMR spectroscopy: Principle, Instrumentation, Solvents used in NMR, NMR signals in variouscompounds, Chemical shift, Spin-Spin coupling, Coupling constant, Nuclear magnetic doubleresonance, $^{13}$C NMR, 1D and 2D NMR, NOESY and COSY techniques, Applications of NMRspectroscopy.

**UNIT 2**                                                                                    **12 Hrs.**
Mass Spectroscopy: Principle, Instrumentation of Mass Spectroscopy, Types of ionization likeelectron impact, chemical, field, FAB and MALDI, Analyzers of Quadrupole and Time of Flight,Mass fragmentation and its rules, Fragmentation of important functional groups like alcohols,amines, carbonyl groups and alkanes, Meta stable ions, Mc Lafferty rearrangement, Ring rule,Isotopic peaks, Tandem Mass Instruments, Applications of Mass spectroscopy

**UNIT 3**                                                                                    **12 Hrs.**
Chromatography: Principle, Apparatus / Instrumentation, Chromatographic parameters, Factorsinvolved, Endpoint determination and Applications of the following:a) Paper chromatography b) Thin Layer chromatography c) Ion exchange chromatography d)Column chromatography e) Gas chromatography f) GC-MS g) High Performance Liquid chromatography h) LC-MS i) High Performance Thin Layer chromatography k) Super criticalfluid chromatography l) Affinity chromatography

**UNIT 4**                                                                                    **12 Hrs.**
Electrophoresis: Principle, Instrumentation and applications of the following: a) Paperelectrophoresis b) Gel electrophoresis c) Capillary electrophoresis d) Zone electrophoresis e)Moving boundary electrophoresis
**UNIT 5**                                                                                    **12 Hrs.**
X ray Crystallography: Production of X rays, Different X ray methods, Braggs law, Rotatingcrystal technique, X ray powder technique, Types of crystals, Interpretation of diffraction patternsand applications of X-ray diffraction.

### TEXT / REFERENCE BOOKS

1. Prakash M and Arora CK. Laboratory instrumentation. Anmol Publications Pvt. Ltd.
2. Keith Wilson and John Walker (2000). Practical Biochemistry. 5th Edition, Cambridge University Press.
3. Practical Biochemistry by Boyer
4. Nelson DL and Cox MM. (2008). Lehninger Principles of Biochemistry, 5thEd., W.H.Freeman and Company.
5. Willey MJ, Sherwood LM &Woolverton C J. (2013). Prescott, Harley and Klein'sMicrobiology. 9thEd., McGraw Hill.
6. Karp G. (2010) Cell and Molecula r Biology: Concepts and Experiments. 6 thedition. JohnWiley & Sons. Inc.
7. De Robertis EDP and De Robertis EMF. (2006). Cell and Molecular Biology. 8thedition.Lipincott Williams and Wilkins, Philadelphia.

### END SEMESTER EXAMINATION QUESTION PAPER PATTERN

**Max. Marks : 100**                                                                **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 16 marks            **80 Marks**

| SBB1605 | COMPUTER APPLICATION IN BIOLOGY | L | T | P | Credits | Total Marks |
|---------|--------------------------------|---|---|---|---------|-------------|
|         |                                | 3 | 0 | 0 | 3       | 100         |

## COURSE OBJECTIVES

> This course aims to Covers basic computer concepts and Internet skills and uses a software suite, which includes word processing, spreadsheet, database, and presentation software to demonstrate skills.

**UNIT 1**                                                                                                          **12 Hrs.**

Introduction to Computers: Introduction – Types of Computers – Characteristics of Computers. Generations of Computers - Classification of Computers – Programming Languages : Machine Language – Assembly Language – High level languages. Input Devices- Keyboard – Mouse - Types of mice – Connections – Mouse Pad - Trackball – Joystick -Out put Devices – Dot Matrix Printer – Inkjet – Laser Printer – LCD & LED Printers– Line Printer Auxiliary Storage Devices : Hard Disk – CD –DVD – primary memory

**UNIT 2**                                                                                                          **12 Hrs.**

Overview of C: History of C – Importance of C – Basic structure of C programs. Constants, variables and data types: Character set – Keywords and identifiers – Constants– Variables – Declaration of storage classes. Operators and expression – Evaluation ofexpressions – Type conversions in expressions – Operator precedence and associatively – Mathematical functions. Managing input and output operations: Reading and writing a character – Formatted input and output.

**UNIT 3**                                                                                                          **12 Hrs.**

Decision making and branching: Simple IF, IF-ELSE, Nesting of IF-ELSE, ELSE-IF ladder, Switch statements – GOTO statements. Decision making and looping: WHILE statement – DO statement – FOR statement – Jumps in loops. Arrays: Definition &Declaration – One dimensional – Two dimensional – Multi dimensional arrays – Dynamic arrays.

**UNIT 4**                                                                                                          **12 Hrs.**

Character arrays and strings: Introduction – Declaring and initializing string variables – User – Defined functions: – Definition of functions – Return values and their types –Function calls – Function declaration – All category of functions – Nesting of functionsStructures and Unions: Introduction – Accessing structure members – Structure initialization - Arrays of structures – Arrays within structures - Unions

**UNIT 5**                                                                                                          **12 Hrs.**

Scope of bio informatics-internet basic-biological data analysis and applications sequences of data bases – application of bio informatics

**Max Hours.60**

## TEXT / REFERENCE BOOKS

1. Fundamentals of computers science and Communication Engineering. AlexisLeon & Mathews Leon, Vikas Publishing House Pvt. Ltd., New Delhi (UNIT-I)
2. Programming in ANSI C, E. Balgurusamy Tata McGraw Hall, New Delhi, 4thedition.
3. Introduction to Bioinformatics by V.Kothekar, 2004 Dhruv publications, Delhi

## END SEMESTER EXAMINATION QUESTION PAPER PATTERN

**Max. Marks : 100**                                                                                      **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 16 marks                             **80 Marks**

| SMB1605 | ENTREPRENEURIAL MICROBIOLOGY | L | T | P | Credits | Total Marks |
|---------|------------------------------|---|---|---|---------|-------------|
|         |                              | 3 | 0 | 0 | 3       | 100         |

## COURSE OBJECTIVES

➢ This course aims at understanding the basic of entrepreneur development in microbiology and the other process to initiate self-development in these industries

**UNIT 1   ENTREPRENEUR DEVELOPMENT**                                                    **12 Hrs.**

Entrepreneur development, activity, Institutes involved, Government contributions to entrepreneur, risk assessment. Industrial Microbiology, Definition, scope and historical development.

**UNIT 2   MICROBIAL PRODUCTS**                                                          **12 Hrs.**

Microbial cells as fermentation products- Baker's yeast, food and feed yeasts, Bacterial Insecticides, Legume Inoculants, Mushrooms, Algae. Enzymes as fermentation products- Bacterial and Fungal Amylases, Proteolytic Enzymes, Pectinases, Invertases and other enzymes.

**UNIT 3  MUSHROOM CULTIVATION AND BIOFERTILIZERS**                                      **12 Hrs.**

Mushroom cultivation and Composting- Cultivation of *Agaricus campestris*, *Agaricus bisporus,* and *Volvariella volvaciae;* Preparation of compost, filling tray beds, spawning, maintain optimal temperature, casing, watering, harvesting, storage. Biofertilizers- Historical background, Chemical fertilizers versus biofertilizers, organic farming. *Rhizobium* sp, *Azospirillum* sp, *Azotobacter* sp, as Biofertilizers.

**UNIT 4  PATENTS**                                                                      **12 Hrs.**

Patents and secret processes, History of patenting, composition, subject matter and characteristics of a patent, Inventor, Infringement, cost of patent. Patents in India and other countries. Fermentation Economics.

**UNIT 5  INDUSTRIAL PROCESS**                                                           **12 Hrs.**

Brewing- Media components, preparation of medium, Microorganisms involved, maturation, carbonation, packaging, keeping quality, contamination, by products. Production of Industrial alcohol.

## TEXT / REFERENCE BOOKS

1. Industrial Microbiology- L.E.Casida, jr, New age International publication.
2. Entrepreneurial Development in India- By Arora
3. Experiments in Microbiology, Plant pathology, Tissue culture and Mushroom production technology- K.R.Aneja, New age International publication.

**Max Hours.60**
### END SEMESTER EXAMINATION QUESTION PAPER PATTERN
**Max. Marks : 100**                                                     **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 16 marks       **80 Marks**

| SMB1606 | MICROBIAL DIVERSITY | L | T | P | Credits | Total Marks |
|---------|--------------------|---|---|---|---------|-------------|
|         |                    | 3 | 0 | 0 | 3       | 100         |

## COURSE OBJECTIVES
➢ This course aims at understanding the diversity of microbes and their application.
➢ To develop an understanding of the importance of microorganisms beyond those of medical importance.
➢ To introduce students to the tools used to identify and characterize microorganisms

### UNIT 1  CLASSIFICATION                                                      12 Hrs.
Microbial Systematics: General account of systematics, classification and nomenclature; Classification systems-artificial or phonetic, natural and phylogenetic; Species concept in microbiology, monophyletic, paraphyletic, polyphyletic; Newer approaches for exploring unculturable bacteria-molecular taxonomy, molecular phylogeny, molecular chronometers; Chemotaxonomy; Polyphasic taxonomy, Describing a new Prokaryotic species, Valid publication of names of bacterial taxa, Culture collection.

### UNIT 2  BACTERIA                                                            12 Hrs.
Bacteria: Conventional and molecular systematics, and general discussion on the occurrence, diversity, characteristic features, significance and potential applications of various groups of bacteria according to Bergey's Manual of Systematic Bacteriology.
Archaea: Systematics, and occurrence, diversity, characteristic features, significance and potential applications of different groups of Archaea

### UNIT 3  FUNGI                                                               12 Hrs.
Fungi: Modern trends of fungal classification and phylogeny. General features of fungi- cell structure; growth, environmental conditions for growth; nutrition and life cycle patterns, parasexuality and heterothallism.

### UNIT 4  ALGAE                                                               12 Hrs.
Algae: Distribution; classification nutrition and culture; reproduction and life cycles. Protozoa: General account, structure, reproduction and classification of protozoa.

### UNIT 5  VIROLOGY                                                            12 Hrs.
General Virology: Discovery of viruses, morphology and ultrastructure, capsids & their arrangements, viral genome – types and structures; nomenclature and classification of virus (Animal, plant, bacterial viruses). Virus related agents – viriods, prions.

**Max Hours.60**

## TEXT / REFERENCE BOOKS
1. Dubey RC and Maheswari DK (2005). A Text book of Microbiology. S.Chand &Company Ltd., New Delhi.
2. Sundara Rajan S (2003). College Microbiology. Volume 1 & 2. Revised Edition, Vardhana Publications, Bangalore.
3. Powar CB and Daginawala HF (2005). General Microbiology, Volume I & II,8th Edition, Himalaya Publishing House, Mumbai.
4. Pelczar Tr. MJ, Chan ECS & Kreig NR (1993). Microbiology MC Graw-Hill Inc., New York.
5. Robert F Boyd (1984). General Microbiology. Times Mirror/Mosby College Publishers.
6. Prescott LM, JP Harley and DA Klein (1993). Microbiology, 2nd Edition, W M, C Brown Publishers.

## END SEMESTER EXAMINATION QUESTION PAPER PATTERN
**Max. Marks : 100**                                                **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 16 marks    **80 Marks**

| SBB1609 | INTRODUCTION TO BIOINFORMATICS | L | T | P | Credits | Total Marks |
|---------|-------------------------------|---|---|---|---------|-------------|
|         |                               | 3 | 0 | 0 | 3       | 100         |

## COURSE OBJECTIVES

- ➢ The basic objective is to introduction to the basic practical techniques of bioinformatics and emphasis on the application of bioinformatics and biological databases to problem solving in real research problems.

## UNIT 1  INTRODUCTION TO BIOINFOMATICS                                       12 Hrs.

Introduction and history of bioinformatics – Internet, World Wide Web, Web browser, EMBnet, NCBI. File transfer protocol.

## UNIT 2  MS ACCESS                                                           12 Hrs.

Database browsers and search engines. Introduction to MS access, making queries, Designing forms, Report design

## UNIT 3  NUCLEOTIDE DATABASE                                                12 Hrs.

Database-Definition, DBMS, Biological Databases – FASTA, Blast, Genbank, DNA sequence databases, Protein databases.

## UNIT 4  PROTEIN DATABASE                                                   12 Hrs.

Entry formats, carbohydrate databases, Enzyme databases, Pathway databases. Relational database model. Theory on RDBMS. SQL.

## UNIT 5  APPLICATIONS                                                       12 Hrs.

Application aspects – gene prediction, target searching – drug designing – E- cell, phylogenetic analysis, PERL, Chemoinformatics.

**Max Hours.60**

## TEXT / REFERENCE BOOKS

1. T.K.Altwood, D.J.Parry-smith Introduction to Bioinformatics Pearson Education (2004)
2. Bioinformatics for the beginners K.Mani & N.vijayaraj
3. Proteomics- Pennigton & Dunn (2002) Viva books publishers, New Delhi
4. Bioinformatics- A practical guide to the analysis of genes & protein 2nd ED Andreas,Baxevanis and Francis Ouellette.

## END SEMESTER EXAMINATION QUESTION PAPER PATTERN

**Max. Marks : 100**                                                    **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 16 marks   **80 Marks**

| SMB1607 | MEDICAL LABORATORY TECHNIQUES | L | T | P | Credits | Total Marks |
|---------|-------------------------------|---|---|---|---------|-------------|
|         |                               | 3 | 0 | 0 | 3       | 100         |

## COURSE OBJECTIVES
➢ The main purpose of the program is to provide the students with the good knowledge of the basic techniques used in the laboratory.

**UNIT 1  DISEASES**                                     **12 Hrs.**
Bacterial, Viral, Fungal and Protozoan Diseases of various human body systems, Disease associated clinical samples for diagnosis.

**UNIT 2  COLLECTION OF SAMPLES**                   **12 Hrs.**
Collection of clinical samples (oral cavity, throat, skin, Blood, CSF, urine and faeces) and precautions required. Method of transport of clinical samples to laboratory and storage.

**UNIT 3  EXAMINATION OF SAMPLES**                  **12 Hrs.**
Examination of sample by staining - Gram stain, Ziehl-Neelson staining for tuberculosis, Giemsa stained thin blood film for malaria Preparation and use of culture media - Blood agar, Chocolate agar, Lowenstein-Jensen medium, MacConkey agar, Distinct colony properties of various bacterial pathogens.

**UNIT 4  SEROLOGICAL ANALYSIS**                      **12 Hrs.**
Serological Methods - Agglutination, ELISA, immunofluorescence, Nucleic acid based methods - PCR, Nucleic acid probes

**UNIT 5  ANALYSIS METHODS**                          **12 Hrs.**
Typhoid, Dengue and HIV, Swine flu Testing for Antibiotic Sensitivity in Bacteria Importance, Determination of resistance/sensitivity of bacteria using disc diffusion method, Determination of minimal inhibitory concentration (MIC) of an antibiotic by serial double dilution method

**Max Hours.60**

## TEXT / REFERENCE BOOKS.
1. Ananthanarayan R and Paniker CKJ (2009)Textbook of Microbiology, 8th edition, Universities Press Private Ltd.
2. Brooks G.F., Carroll K.C., Butel J.S., Morse S.A. and Mietzner, T.A. (2013) Jawetz, Melnick and  Adelberg's Medical Microbiology. 26th edition. McGraw Hill Publication
3. Randhawa, VS, Mehta G and Sharma KB (2009) Practicals and Viva in Medical Microbiology 2nd edition, Elsevier India Pvt Ltd
4. Tille P (2013) Bailey's and Scott's Diagnostic Microbiology, 13th edition, Mosby Collee JG, Fraser, AG, Marmion, BP,

## END SEMESTER EXAMINATION QUESTION PAPER PATTERN
**Max. Marks : 100**                                                  **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 16 marks     **80 Marks**

| SMB1608 | HUMAN PHYSIOLOGY | L | T | P | CREDITS | TOTAL MARKS |
|---------|------------------|---|---|---|---------|-------------|
|         |                  | 3 | 0 | 0 | 3       | 100         |

## COURSE OBJECTIVES
➢ This course aims to introduce the students to the Physiological concepts of homeostasis and control mechanisms and to study the functions of body systems- with emphasis on clinical relevance

### UNIT 1   DIGESTIVE SYSTEM                                                                                     12 Hrs.
Structure of alimentary canal - salivary glands, pancreas, liver. Deglutition. Movements of alimentary canal and their regulations. Role of secretary fluids in digestion- salivary, gastric, pancreatic and intestinal juices and bile. Digestion and absorption of carbohydrates, lipids, proteins and nucleic acids.

### UNIT 2   RESPIRATORY SYSTEM                                                                                12 Hrs.
Respiratory System : Structure of the lung and airways. Mechanics of breathing -- role of respiratory muscles, glottis. Transport of gases in body - Partial pressure and composition of normal atmospheric gases. Hypoxia – types, effects.

### UNIT 3   NERVOUS SYSTEM                                                                                      12 Hrs.
Outline of organization and basic functions (sensory, motor and association) of the nervous system. Structural organization of different parts of brain and spinal cord. Reflex action – definition, reflex arc, classification and properties; Autonomic nervous system. Chemical involved in the neural transmission.

### UNIT 4   ENDOCRINE SYSTEM                                                                                   12 Hrs.
Classification of endocrine glands and hormones. Pituitary gland, Pineal, Thyroid, Adrenal, Pancreatic -- structure and function of the gland. Regulation of endocrine synthesis - Feedback mechanism.

### UNIT 5   REPRODUCTIVE SYSTEM                                                                            12 Hrs.
Primary and accessory sex organs and secondary sex characters. Structure of testis, endocrine functions, Spermatogenesis. Structure of ovary. Ovarian hormones and their functions. Oogenesis and ovulation. Formation and functions of corpus luteum. Physiology of puberty.

**Max Hours.60**

## TEXT / REFERENCE BOOKS
1. Molecular Biology of the cells : Alberts et. al., Garland Publications Inc. NY
2. Cell and Molecular Biology by E D P de Robertis and E M F de Robertis.
3. Text book of Medical Physiology by A. C. Guyton and J. E. Harcourt.
4. Text book of Medical Physiology by Garong.
5. Text book of Biochemistry and Human Biology by Talwar.
6. Principles of anatomy and physiology by Tortora Grabowski, 10th edition

### END SEMESTER EXAMINATION QUESTION PAPER PATTERN
**Max. Marks : 100**                                                                                 **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 16 marks      **80 Marks**

| SMB1609 | MARINE MICROBIOLOGY | L | T | P | Credits | Total Marks |
|---------|---------------------|---|---|---|---------|-------------|
|         |                     | 3 | 0 | 0 | 3       | 100         |

## COURSE OBJECTIVES
> This course aimed to understand microbiology of marine environment with special emphasis on microbiological ecology, taxonomy, nutrient cycle, food microbiology and microbial biodegradation.

**UNIT 1  INTRODUCTION**                                                                                          **12 Hrs.**
Ecology of coastal, shallow and deep sea microorganism – importance and their significance. Diversity of microorganism - Archaea, bacteria, cyanobacteria, algae, fungi, viruses and actinomycetes in the mangroves and coral environs.

**UNIT 2  ESTIMATION AND PRESERVATION**                                                                          **12 Hrs.**
Methods of studying the marine micro-organisms-Methods of collection, enumeration (total and viable counts), Isolation, culture & identification based on morphological, physiological and biochemical characteristics; Preservation of marine microbes; Culture collection Centers (ATCC, IMTECH, etc.).Microbial nutrition - influence of environment factors on microbial growth, activity and distribution

**UNIT 3  DECOMPOSITION**                                                                                         **12 Hrs.**
Microbial nitrogen fixation; Carbon, nitrogen and phosphorus cycle; Decomposition of organic matter; Bioleaching and bio-deterioration of natural and synthetic materials.

**UNIT 4 MICROBIAL METABOLITES**                                                                                 **12 Hrs.**
Microbes of Biotechnological importance; Primary and secondary metabolites (enzymes, antibiotics, organic acid, toxins etc.)

**UNIT 5 SOILAGE**                                                                                               **12 Hrs.**
Seafood microbiology - normal genera associated with fish, food spoilage, fish & human pathogens; Indicator of Pollution – faecal coliforms; Prevention & control.

**Max Hours.60**

## TEXT / REFERENCE BOOKS
1. Pelczar MJ Jr., Chan ECS and Kreig NR. Microbiology, 5th Edition, Tata McGraw Hill, 1993.
2. G Reed, Prescott and Dunn's, Industrial Microbiology, 4th Edition, CBS Publishers, 1987. 3
3. M.T. Madigan and J.M. Martinko, Biology of Microorganisms, 11th Edition, Pearson Prentice Hall, USA, 2006.
4. Rheinhemer, G., 1980. Aquatic Microbiology, Johnwiley & Sons, pp. 235.
5. Elay, A.R.1992. Microbial food poisoning. Chapman and Hall London, 191 pp.
6. Ford, T.E., 1993. Aquatic microbiology. An ecological approach.Blackwell scientific publication, London, 168
7. Krichman, D.L., 2000. Microbial ecology of the oceans. Wiley –liss, NewYork, 542

## END SEMESTER EXAMINATION QUESTION PAPER PATTERN
**Max. Marks : 100**                                                                                  **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 16 marks                             **80 Marks**

| SBB3203 | PLANT BIOTECHNOLOGY | L | T | P | Credits | Total Marks |
|---|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 | 100 |

## COURSE OBJECTIVES

➢ This course aims to impart the skills of Plant tissue culture and its applications

**UNIT 1  MEDIA**                                                                                   **12 Hrs.**

Plant Tissue culture – History, Plant tissue culture media, types, constituents and preparation of media, selection of suitable medium.

**UNIT 2  CULTURE TECHNIQUES**                                                          **12 Hrs.**

Protoplast culture and somatic hybridization, production of Haploid plants, Somaclonal variations, Clonal propagation (micro propagation) germplasm conservationand cryopreservation.

**UNIT 3  GENE TRANSFER**                                                                   **12 Hrs.**

Genetic Engineering of plants – Gene transfer methods – vector mediated gene transfer, virus – mediated gene transfer, Direct or Vectorless DNA transfer.

**UNIT 4  TRANSGENIC PLANTS**                                                           **12 Hrs.**

Application of Transgenic plants – Resistance to biotic stresses – Insect resistance plant virus, bacteria and fungi resistance, abotic stress – herbicide resistance plants.

**UNIT 5  GREEN HOME TECHNOLOGY**                                               **12 Hrs.**

Molecular Marker Aided plant Breeding – Molecular markers, Molecular marker assisted selection, Arid & semi-arid plant Biotech, Green house & Green home technology.

**Max Hours.60**

## TEXT / REFERENCE BOOKS

1. Dr. U. Sathyanarayana – Biotechnology. Books and Allied Publications
2. Winnacker, E.L. 1989: From genes to clones. Introduction to Gene Technology. VCH Weinhein.
3. Old, R,M. and S.B. Primrose. 1995. Principles of Gene Manipulation. Blackwell Scientific Publication. London.
4. Glick, B.K. and Pasternak, J.J. 2002. Molecular Biotechnology. Principles andapplications of recombinant DNA. ASM Press, Washington.

## END SEMESTER EXAMINATION QUESTION PAPER PATTERN

**Max. Marks : 100**                                                                         **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 16 marks                 **80 Marks**

| SBB1611 | **BIOSTATISTICS** | **L** | **T** | **P** | **Credits** | **Total Marks** |
|---------|-------------------|-------|-------|-------|-------------|-----------------|
|         |                   | **3** | **0** | **0** | **3**       | **100**         |

## COURSE OBJECTIVES
➢ This course aim to use and interpret results of, descriptive statistical methods effectively;
➢ Demonstrate an understanding of the central concepts of basic biomathematics and biostatistical theory.

### UNIT 1   VARIABLES                                                                                        12 Hrs
Definitions in Statistics, Sample and Population, Variables: Discrete and Continuous, Collection, Classification and Tabulation of data, Bar diagrams and Pie diagrams, Histogram, Frequency curve and frequency polygon, Ogives.

### UNIT 2   SAMPLING                                                                                         12 Hrs
Concept of Sampling and Sampling Distribution. Measures of Central tendency (Mean, Median, Mode), Measures of deviation (Standard deviation, variance and coefficient of variation).

### UNIT 3   HYPOTHESIS                                                                                       12 Hrs
Test of significance,  Hypothesis Testing, Null and Alternate Hypothesis, Level of significance, Confidence Limit Student, T and F Test, Chi-square test

### UNIT 4   PROBABILITY                                                                                      12 Hrs
Probability and Distribution, Concepts and problems on probability, Binomial, Poisson, Normal Distribution and their applications

### UNIT 5   REGRESSION                                                                                       12 Hrs
Simple Regression and Correlation, Concept of analysis of variance (one-way classification)

**Max Hours.60**

## TEXT / REFERENCE BOOKS
1. Fundamentals of Biostatistics. by Irfan A Khan.
2. An introduction to Biostatistics. by PSS Sunder Rao.
3. Introduction to the Practice of Statistics by Moore and McCabe
4. Biostatistics : Gurumani
5. Biostatistics: Palanisamy

### END SEMESTER EXAMINATION QUESTION PAPER PATTERN
**Max. Marks : 100**                                                                       **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 16 marks            **80 Marks**

| SBB1615 | BIOETHICS, BIOSAFETY AND IPR | L | T | P | CREDITS | TOTAL MARKS |
|---------|------------------------------|---|---|---|---------|-------------|
|         |                              | 3 | 0 | 0 | 3       | 100         |

## COURSE OBJECTIVES
➢ To understand importance of bioethics and biosafety. To understand legal social and economic impacts of biotechnology. To understand regulatory guidelines and their importance. To understand importance of patent.
➢ To understand procedure to apply for patent.
➢ To understand procedure of assessment of biosafety for biotech foods. To understand ethical implications of biotechnology.

## UNIT 1   INTRODUCTION TO BIOSAFETY                                                12 Hrs
Definition of ethics and Bioethics, Ethics in Biotechnology(positive and negative effects with classical examples – Rice with Vitamin A, No-till Agriculture, cotton without insecticide, reduced need for fertilizer, biological pest control , slow ripening fruits and controlled ripening, fast growing trees and fishes.

## UNIT 2   GMO                                                                      12 Hrs.
Guidelines for research with transgenic organisms. Environmental impact of genetically modified organisms (beneficial and hazardous impact), Field trials with GMO, Containment levels. Biosafety protocol, Cartagena Biosafety protocol, Mechanism of implementation of biosafety guidelines. Biosafety and politics. Biosafety database.

## UNIT 3   IMPLICATIONS OF BIOSAFETY                                                12 Hrs
Awareness education on genetically engineered organism.-Transgene instability, gene flow, resistance/ tolerance of target organism, increase weedlessness, risks and uncertainty associated with Biotechnology. Containment levels and their impact on Environment- Containment- definition, types of containment, summary of recommended Biosafety levels for infectious agents, detail checklist–premises and lab equipment, Animal facilities, environment.

## UNIT 4 GLP AND PATENTS                                                            12 Hrs
Gene technology laboratory. GLP and Bioethics- introduction, national Good Laboratory Practices (GLP), the GLP authority functions, Good Laboratory Practices- necessity, aspiration and responsibility. Procedure to apply patent, other intellectual properties viz copy rights, Rights, Plant breeder's rights, trade secrets/ trade symbol etc. WTO, TRIPS, PCT and GATT. IPR problems and its hindrance.

## UNIT 5   ETHICS                                                                   12 Hrs.
Ethics in clinical trials and Good Clinical Practices (GCP) – Definition of clinical trials and GCP, general information about clinical trials, need to conduct clinical trials, faces ofclinical trials, institutional set ups for conducting clinical trials, ethics in clinical Biotechnology

**Max Hours.60**

## TEXT / REFERENCE BOOKS
1. Safety Assessment by Thomas, J.A., Fuch, R.L. (2002), Academic Press.
2. Biological safety Principles and practices) by Fleming, D.A., Hunt, D.L., (2000). ASMPress.
3. Biotechnology - A comprehensive treatise. Legal economic and ethical dimensions VCH.Bioethics by Ben Mepham, Oxford University Press, 2005.
4. Bioethics & Biosafety by R Rallapalli & Geetha Bali, APH Publication, 2007
5. Bioethics & Biosaftey By Sateesh Mk (2008), Ik Publishers
6. Biosafety And Bioethics Rajmohan Joshi Publishers

## END SEMESTER EXAM QUESTION PAPER PATTERN
**Max. Marks : 100**                                                                **Exam Duration : 3 Hrs.**
**PART A :** 10 Questions of 2 marks each-No choice                                  **20 Marks**

**PART B :** 2 Questions from each UNIT with internal choice, each carrying 16 marks                           **80 Marks**

| SBB1616 | NANOBIOTECHNOLOGY | L | T | P | CREDITS | TOTAL MARKS |
|---------|-------------------|---|---|---|---------|-------------|
|         |                   | 3 | 0 | 0 | 3       | 100         |

## COURSE OBJECTIVES

➢ This course aims the wide range of applications of nanotechnology and its interdisciplinary aspect. Learn the principles governing the effect of size on material properties at the nanoscale,and perform quantitative analysis.
➢ Familiarize the students with native bionanomachinery in living cells for generating energy, motion, synthesizing biomolecules, and principles can be applied to design new biomolecules and bionanodevices.
➢ Gain a working knowledge in synthesis, fabrication, characterization.

## UNIT 1   BASICS OF NANOTEHNOLOGY                                                                                 12 Hrs.

Introduction and Classification: What is nanotechnology – Classification of Nanostructures - 1D, 2D and 3 D nanomaterials – Nanoscale Architecture.

## UNIT 2   SYNTHESIS OF NANOMATERIALS                                                                          12 Hrs.

Synthesis of Nanomaterials: Top down – ball milling; Bottom up – co-precipitation –sol-gel – electrodeposition – using natural nanoparticles – chemical vapor deposition - biosynthesis of nanomaterials.

## UNIT 3   NANOBIOMETRICS                                                                                          12 Hrs.

Nanobiometrics: Introduction – lipids as nano-bricks and morter- Self assembled nanolayers - the bits that do things - proteins – DNA Computer

## UNIT 4   NANOTECHHNOLOGY IN NATURE                                                                        12 Hrs.

Natural nanocomposites : Introduction - natural nanocomposite materials – biologically synthesized nanostructures – protein based nanostructure formation – Nanotechnology inAgriculture. Nanoanalytics: Quantum dot Biolabelling – Nanoparticle Molecular labels – Analysis of Biomolecular Structure by AFM.

## UNIT 5   NANOBIOTECHNOLOGY                                                                                    12 Hrs.

Poly hydroxyalkonate particles produced by microbes-synthesis and potential application, cyanophyacin inclusions-biosynthesis and application, Magnetotactic bacteria for natural synthesis of magnetic nanoparticles; Mechanism of formation- Magnetosomes in bacteria biochemistry and application Viruses as components for the formation of nanostructured materials- bacteriophages; Synthesis process, self-assembly and application

**Max Hours.60**

## TEXT / REFERENCE BOOKS

1. Hari Singh Nalwa - Encyclopedia of Nanotechnology, Journal of Nanoscience and Nanotechnology, 2011.
2. Bharat Bhusan,Springer Handbook of Nanotechnology, Springer, 2006.
3. Rao CNR  et.al,Chemistry of nanomaterials : Synthesis, properties and applications, Wiley, 2006
4. Hari Singh Nalwa, Handbook of Nanostructured Biomaterials and Their Applications in Nanobiotechnology, Amer ScientificPub, 2005.
5. Niemeyer, C.M.., Mirkin, C.A.,  Nanobiotechnology, Wiley, 2003.
6. Ed. Challa S., S. R. Kumar, J. H. Carola,Nanofabrication towards biomedical application: Techniques, tools, Application and
   impact -Wiley, 2006..

<p align="center"><b>END SEMESTER EXAM QUESTION PAPER PATTERN</b></p>

**Max. Marks : 100**                                                                                          **Exam Duration : 3 Hrs.**
**PART A :** 10 Questions of 2 marks each-No choice                                                            **20 Marks**
**PART B :** 2 Questions from each UNIT with internal choice, each carrying 16 marks                           **80 Marks**

## PROGRAMME: B.Sc. BIOTECHNOLOGY

## CURRICULUM

| SEMESTER 1 | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Sl. No. | Course Type | Course Code | Course Title | L | T | P | C | Marks | | Page No. |
| | | | | | | | | CAE | ESE | |
| 1. | Theory | STA 1101<br>SFR 1101<br>SHN 1101 | Tamil - I<br>French – I<br>Hindi –I | 3 | 0 | 0 | 3 | 50<br>50<br>50 | 50<br>50<br>50 | 1<br>3<br>4 |
| 2. | Theory | SHS 1109 | General English-I | 3 | 0 | 0 | 3 | 50 | 50 | 5 |
| 3. | Theory | SBB 1101 | Cell Biology | 4 | 0 | 0 | 4 | 50 | 50 | 7 |
| 4. | Theory | SBB 1102 | Fundamentals of microbiology | 4 | 0 | 0 | 4 | 50 | 50 | 8 |
| 5. | Theory | SBT 1001 | Environmental Science | 3 | 0 | 0 | 3 | 50 | 50 | 9 |
| 6. | Practical | SBB4101 | Cell biology Lab | 0 | 0 | | 2 | 50 | 50 | 11 |
| 7. | Practical | SBB4102 | Fundamentals of Microbiology Lab | 0 | 0 | 4 | 2 | 50 | 50 | 11 |
| Total Credits for Semester 1 – 21 | | | | | | | | | | |
| Total Marks for Semester 1 – 700 | | | | | | | | | | |

| SEMESTER 2 | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Sl. No. | Course Type | Course Code | Course Title | L | T | P | C | Marks | | Page No. |
| | | | | | | | | CAE | ESE | |
| 1. | Theory | STA 1102<br>SFR 1102<br>SHN 1102 | Tamil - II<br>French – II<br>Hindi –II | 3 | 0 | 0 | 3 | 50<br>50<br>50 | 50<br>50<br>50 | 12<br>14<br>15 |
| 2. | Theory | SHS 1110 | General English-II | 3 | 0 | 0 | 3 | 50 | 50 | 16 |
| 3. | Theory | SMB 1102 | Basic Biochemistry | 4 | 0 | 0 | 4 | 50 | 50 | 18 |
| 4. | Theory | SBB 1201 | Immunology | 4 | 0 | 0 | 4 | 50 | 50 | 19 |
| 5. | Theory | SBB 1202 | Intermediary Metabolism | 3 | 0 | 0 | 3 | 50 | 50 | 20 |
| 6. | Practical | SMB4102 | Basic Biochemistry Lab | 0 | 0 | 4 | 2 | 50 | 50 | 21 |
| 7. | Practical | SBB4201 | Immunology Lab | 0 | 0 | 4 | 2 | 50 | 50 | 21 |
| Total Credits for Semester 2– 21 | | | | | | | | | | |
| Total Marks for Semester 2 – 700 | | | | | | | | | | |

L - LECTURE HOURS, T – TUTORIAL HOURS, P – PRACTICAL HOURS, C – CREDITS
CAE – CONTINUOUS ASSESSMENT EXAMINATION,
ESE – END SEMESTER EXAMINATION

| SEMESTER 3 | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Sl. No. | Course Type | Course Code | Course Title | L | T | P | C | Marks | | Page No. |
| | | | | | | | | CAE | ESE | |
| 1. | Theory | SBB2101 | Introduction to Molecular Biology & Genetics | 4 | 0 | 0 | 4 | 50 | 50 | 22 |
| 2. | Theory | SBB2102 | Genetic Engineering | 4 | 0 | 0 | 4 | 50 | 50 | 23 |
| 3. | Theory | SBB2103 | Concepts in Biotechnology | 3 | 0 | 0 | 3 | 50 | 50 | 24 |
| 4. | Theory | SBB2104 | Analytical techniques | 3 | 0 | 0 | 3 | 50 | 50 | 25 |
| 5. | Theory | | Elective | 3 | 0 | 0 | 3 | 50 | 50 | |
| 6. | Practical | SBB4301 | Molecular biology Lab | 0 | 0 | 4 | 2 | 50 | 50 | 26 |
| 7. | Practical | SBB4302 | Bioinstrumentation Lab | 0 | 0 | 4 | 2 | 50 | 50 | 26 |
| Total Credits for Semester 3– 21 | | | | | | | | | | |
| Total Marks for Semester 3 – 700 | | | | | | | | | | |

| SEMESTER 4 | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Sl. No. | Course Type | Course Code | Course Title | L | T | P | C | Marks | | Page No. |
| | | | | | | | | CAE | ESE | |
| 1. | Theory | SBB2201 | Environmental and Agricultural biotechnology | 3 | 0 | 0 | 3 | 50 | 50 | 27 |
| 2. | Theory | SBB2202 | Basic Industrial Biotechnology | 3 | 0 | 0 | 3 | 50 | 50 | 28 |
| 3. | Theory | SBB2203 | Food biotechnology | 4 | 0 | 0 | 4 | 50 | 50 | 29 |
| 4. | Theory | SBB2204 | Enzyme technology | 4 | 0 | 0 | 4 | 50 | 50 | 30 |
| 5. | Theory | | Elective | 3 | 0 | 0 | 3 | 50 | 50 | |
| 6. | Practical | SBB4401 | Soil & Agricultural biotechnology Lab | 0 | 0 | 4 | 2 | 50 | 50 | 31 |
| 7. | Practical | SBB4402 | Food Biotechnology Lab | 0 | 0 | 4 | 2 | 50 | 50 | 31 |
| Total Credits for Semester 4– 21 | | | | | | | | | | |
| Total Marks for Semester 4 – 700 | | | | | | | | | | |

L - LECTURE HOURS, T – TUTORIAL HOURS, P – PRACTICAL HOURS, C – CREDITS
CAE – CONTINUOUS ASSESSMENT EXAMINATION,
ESE – END SEMESTER EXAMINATION

| SEMESTER 5 | | | | | | | | | | | |
|------|------|------|------|------|------|------|------|------|------|------|------|
| Sl. No. | Course Type | Course Code | Course Title | L | T | P | C | Marks | | Page No. |
| | | | | | | | | CAE | ESE | |
| 1. | Theory | SBB3101 | Medical Biotechnology | 4 | 0 | 0 | 4 | 50 | 50 | 32 |
| 2. | Theory | SBB3102 | Advanced Genetic Engineering | 4 | 0 | 0 | 4 | 50 | 50 | 33 |
| 3. | Theory | SBB3103 | Plant Biotechnology | 3 | 0 | 0 | 3 | 50 | 50 | 34 |
| 4. | Theory | SBB3104 | Animal Biotechnology | 3 | 0 | 0 | 3 | 50 | 50 | 35 |
| 5. | Theory | | Elective | 3 | 0 | 0 | 3 | 50 | 50 | |
| 6. | Practical | SBB4501 | Genetic Engineering Lab | 0 | 0 | 4 | 2 | 50 | 50 | 36 |
| 7. | Practical | SBB4502 | Plant and Animal Biotechnology Lab | 0 | 0 | 4 | 2 | 50 | 50 | 36 |
| Total Credits for Semester 5– 21 | | | | | | | | | | |
| Total Marks for Semester 5 – 700 | | | | | | | | | | |

| SEMESTER VI | | | | | | | | | | | |
|------|------|------|------|------|------|------|------|------|------|------|------|
| Sl. No. | Course Type | Course Code | Course Title | L | T | P | C | Marks | | Page No. |
| | | | | | | | | CAE | ESE | |
| 1. | Theory | SBT1002 | Research Methodology | 3 | 0 | 0 | 3 | 50 | 50 | 37 |
| 2. | Theory | SMB3201 | Clinical Microbiology | 3 | 0 | 0 | 3 | 50 | 50 | 38 |
| 3. | Project | S30PROJ | Project | 0 | 0 | 30 | 15 | 50 | 50 | |
| Total Credits for Semester 6 – 21 | | | | | | | | | | |
| Total Marks for Semester 6 – 300 | | | | | | | | | | |

L - LECTURE HOURS, T – TUTORIAL HOURS, P – PRACTICAL HOURS, C – CREDITS
CAE – CONTINUOUS ASSESSMENT EXAMINATION,
ESE – END SEMESTER EXAMINATION

## LIST OF ELECTIVES

| Sl. No. | Course Code | Course Title | L | T | P | C | Marks | | Page No. |
|---|---|---|---|---|---|---|---|---|---|
| **ELECTIVE COURSES** | | | | | | | | | |
| | | | | | | | CAE | ESE | |
| 1 | SBB1601 | Advanced instrumentation Techniques | 3 | 0 | 0 | 3 | 50 | 50 | 39 |
| 2 | SBB1602 | Biopharmaceutical Technology | 3 | 0 | 0 | 3 | 50 | 50 | 40 |
| 3 | SMB1603 | Food Fermentation Techniques | 3 | 0 | 0 | 3 | 50 | 50 | 41 |
| 4 | SBB1604 | Protein engineering | 3 | 0 | 0 | 3 | 50 | 50 | 42 |
| 5 | SBB1605 | Cancer biology | 3 | 0 | 0 | 3 | 50 | 50 | 43 |
| 6 | SBB1606 | Computer Application in Biology | 3 | 0 | 0 | 3 | 50 | 50 | 44 |
| 7 | SBB1607 | Genomics and Proteomics | 3 | 0 | 0 | 3 | 50 | 50 | 45 |
| 8 | SBB1608 | Metabolic Engineering | 3 | 0 | 0 | 3 | 50 | 50 | 46 |
| 9 | SBB1609 | Introduction to Bioinformatics | 3 | 0 | 0 | 3 | 50 | 50 | 47 |
| 10 | SBB1610 | Entrepreneurial biotechnology | 3 | 0 | 0 | 3 | 50 | 50 | 48 |
| 11 | SBB1611 | Biostatistics | 3 | 0 | 0 | 3 | 50 | 50 | 49 |
| 12 | SBB1612 | Molecular Modeling & Drug Design | 3 | 0 | 0 | 3 | 50 | 50 | 50 |
| 13 | SBB1613 | Marine biotechnology | 3 | 0 | 0 | 3 | 50 | 50 | 51 |
| 14 | SMB1602 | Biofertilizers and Biopesticides | 3 | 0 | 0 | 3 | 50 | 50 | 52 |
| 15 | SBB1615 | Bioethics, Biosafety and IPR | 3 | 0 | 0 | 3 | 50 | 50 | 53 |
| 16 | SBB1616 | Nanobiotechnology | 3 | 0 | 0 | 3 | 50 | 50 | 54 |

L - LECTURE HOURS, T – TUTORIAL HOURS, P – PRACTICAL HOURS, C – CREDITS

CAE – CONTINUOUS ASSESSMENT EXAMINATION,

ESE – END SEMESTER EXAMINATION

| Semester | Theory courses (including elective courses) | | | Practical Courses (including Project) | | |
|---|---|---|---|---|---|---|
| | Total No. | Total Credits | Total Marks | Total No. | Total Credits | Total Marks |
| **1** | 5 | 17 | 500 | 2 | 4 | 200 |
| **2** | 5 | 17 | 500 | 2 | 4 | 200 |
| **3** | 5 | 17 | 500 | 2 | 4 | 200 |
| **4** | 5 | 17 | 500 | 2 | 4 | 200 |
| **5** | 5 | 17 | 500 | 2 | 4 | 200 |
| **6** | 2 | 6 | 500 | 1 | 15 | 100 |
| **Overall Total** | 27 | 91 | 3000 | 11 | 35 | 1100 |

| | |
|---|---|
| Overall total credits for B.Sc.(Biotechnology) Programme | 126 |
| Overall total marks for B.Sc.( Biotechnology) Programme | 4100 |

# PROGRAMME: B.Sc. BIOCHEMISTRY
## CURRICULUM

| SEMESTER I | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **SI. No** | **Course Code** | **Course Title** | **L** | **T** | **P** | **C** | **Marks** | | **Page No.** |
| | | | | | | | **CAE** | **ESE** | |
| 1. | STA1101 SFR1101 SHN1101 | Tamil - I French - I Hindi – I | 3 | 0 | 0 | 3 | 50 | 50 | 1 3 4 |
| 2. | SHS1109 | General English – I | 3 | 0 | 0 | 3 | 50 | 50 | 5 |
| 3. | SBC1001 | Biomolecules | 4 | 0 | 0 | 4 | 50 | 50 | 7 |
| 4. | SBB1102 | Fundamentals of Microbiology | 4 | 0 | 0 | 4 | 50 | 50 | 8 |
| 5. | SBT1001 | Environmental Science | 3 | 0 | 0 | 3 | 50 | 50 | 9 |
| 6. | SBC4101 | Fundaments of Biochemistry Lab | 0 | 0 | 2 | 2 | 50 | 50 | 11 |
| 7. | SBB4102 | Fundaments of Microbiology Lab | 0 | 0 | 2 | 2 | 50 | 50 | 11 |
| Total Credits for Semester 1 – 21 | | | | | | | | | |
| Total Marks for Semester 1  – 700 | | | | | | | | | |

| SEMESTER II | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **SI. No** | **Course Code** | **Course Title** | **L** | **T** | **P** | **C** | **Marks** | | **Page No.** |
| | | | | | | | **CAE** | **ESE** | |
| 1. | STA 1102 SFR 1102 SHN1102 | Tamil – II French – II Hindi – II | 3 | 0 | 0 | 3 | 50 | 50 | 12 14 15 |
| 2 | SHS 110 | General English – II | 3 | 0 | 0 | 3 | 50 | 50 | 16 |
| 3. | SBB1101 | Cell Biology | 4 | 0 | 0 | 4 | 50 | 50 | 18 |
| 4. | SBB1201 | Zoology | 4 | 0 | 0 | 4 | 50 | 50 | 19 |
| 5. | SBC1202 | Basics of Computers | 3 | 0 | 0 | 3 | 50 | 50 | 20 |
| 6. | SBB4202 | Cell Biology Lab | 0 | 0 | 4 | 2 | 50 | 50 | 21 |
| 7. | SBC4201 | Zoology Lab | 0 | 0 | 4 | 2 | 50 | 50 | 21 |
| Total Credits for Semester 2 – 21 | | | | | | | | | |
| Total Marks for Semester 2 – 700 | | | | | | | | | |

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CAE – CONTINUOUS ASSESSMENT EXAMINATION,
ESE – END SEMESTER EXAMINATION

| SEMESTER III | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| S. No. | Course Code | Course Title | L | T | P | C | Marks | | Page No. |
| | | | | | | | CAE | ESE | |
| 1. | SBC2101 | Molecular Biology I | 4 | 0 | 0 | 4 | 50 | 50 | 22 |
| 2. | SCY1213 | Chemistry I | 3 | 0 | 0 | 3 | 50 | 50 | 23 |
| 3. | SBC2102 | Enzymes | 4 | 0 | 0 | 4 | 50 | 50 | 24 |
| 4. | SBC2103 | Biophysical chemistry | 3 | 0 | 0 | 3 | 50 | 50 | 25 |
| 5. | | Elective I | 3 | 0 | 0 | 3 | 50 | 50 | |
| 6. | SBB4301 | Molecular Biology Lab | 0 | 0 | 3 | 2 | 50 | 50 | 26 |
| 7. | | Chemistry Lab | 0 | 0 | 3 | 2 | 50 | 50 | 26 |
| Total Credits for Semester 3 – 21 | | | | | | | | | |
| Total Marks for Semester 3 – 700 | | | | | | | | | |

| SEMESTER IV | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Sl. No. | Course Code | Course Title | L | T | P | C | Marks | | Page No. |
| | | | | | | | CAE | ESE | |
| 1. | SBC2201 | Intermediary Metabolism I | 4 | 0 | 0 | 4 | 50 | 50 | 27 |
| 2. | SCY1214 | Chemistry II | 3 | 0 | 0 | 3 | 50 | 50 | 28 |
| 3. | SBC2202 | Molecular Biology II | 3 | 0 | 0 | 3 | 50 | 50 | 29 |
| 4. | SBB1201 | Immunology | 4 | 0 | 0 | 4 | 50 | 50 | 30 |
| 5. | | Elective II | 3 | 0 | 0 | 3 | 50 | 50 | |
| 6. | SBB4201 | Immunology Lab | 0 | 0 | 3 | 2 | 50 | 50 | 31 |
| 7. | SBC4401 | Enzymology Lab | 0 | 0 | 3 | 2 | 50 | 50 | 31 |
| Total Credits for Semester 4 – 21 | | | | | | | | | |
| Total Marks for Semester 4 – 700 | | | | | | | | | |

L - LECTURE HOURS, T – TUTORIAL HOURS, P – PRACTICAL HOURS, C – CREDITS
CAE – CONTINUOUS ASSESSMENT EXAMINATION,
ESE – END SEMESTER EXAMINATION

| SEMESTER V | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Sl. No. | Course Code | Course Title | L | T | P | C | Marks | | Page No. |
| | | | | | | | CAE | ESE | |
| 1. | SBC3101 | Intermediary Metabolism II | 4 | 0 | 0 | 4 | 50 | 50 | 32 |
| 2. | SBC3102 | Genetics | 3 | 0 | 0 | 3 | 50 | 50 | 33 |
| 3. | SBC3103 | Endocrinology | 3 | 0 | 0 | 3 | 50 | 50 | 34 |
| 4. | SBC3104 | Clinical Biochemistry | 4 | 0 | 0 | 4 | 50 | 50 | 35 |
| 5. | | Elective III | 3 | 0 | 0 | 3 | 50 | 50 | |
| 6. | SBC4501 | Clinical Biochemistry Lab | 0 | 0 | 3 | 2 | 50 | 50 | 36 |
| 7. | SBC4502 | Genetics Lab | 0 | 0 | 3 | 2 | 50 | 50 | 36 |
| Total Credits for Semester 5 – 21 | | | | | | | | | |
| Total Marks for Semester 5 – 700 | | | | | | | | | |

| SEMESTER VI | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Sl. No. | Course Code | Course Title | L | T | P | C | Marks | | Page No. |
| | | | | | | | CAE | ESE | |
| 1. | SBT1002 | Research Methodology | 3 | 0 | 0 | 3 | 50 | 50 | 37 |
| 2. | SBC3201 | Plant Biochemistry | 3 | 0 | 0 | 3 | 50 | 50 | 38 |
| 3. | S30PROJ | Project | 0 | 0 | 30 | 15 | 50 | 50 | |
| Total Credits for Semester 6 – 21 | | | | | | | | | |
| Total Marks for Semester 6 – 300 | | | | | | | | | |

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CAE – CONTINUOUS ASSESSMENT EXAMINATION,
ESE – END SEMESTER EXAMINATION,

| Semester | Theory courses (including elective courses) | | | Practical Courses (including Project) | | |
|---|---|---|---|---|---|---|
| | Total No. | Total Credits | Total Marks | Total No. | Total Credits | Total Marks |
| 1 | 5 | 17 | 500 | 2 | 4 | 200 |
| 2 | 5 | 17 | 500 | 2 | 4 | 200 |
| 3 | 5 | 17 | 500 | 2 | 4 | 200 |
| 4 | 5 | 17 | 500 | 2 | 4 | 200 |
| 5 | 5 | 17 | 500 | 2 | 4 | 200 |
| 6 | 2 | 6 | 500 | 1 | 15 | 100 |
| Overall Total | 27 | 91 | 3000 | 11 | 35 | 1100 |

| | |
|---|---|
| Overall total credits for B.Sc.(Biochemistry) Programme | 126 |
| Overall total marks for B.Sc.(Biochemistry) Programme | 4100 |

**LIST OF ELECTIVES**

| | | ELECTIVE COURSES | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Sl. No. | Course Code | Course Title | L | T | P | C | Marks | | Page No. |
| | | | | | | | CAE | ESE | |
| 1 | SBB2103 | Concepts in Biotechnology | 3 | 0 | 0 | 3 | 50 | 50 | 39 |
| 2 | SMB1602 | Biofertilizers and Biopesticides | 3 | 0 | 0 | 3 | 50 | 50 | 40 |
| 3 | SMB1603 | Food Fermentation Techniques | 3 | 0 | 0 | 3 | 50 | 50 | 41 |
| 4 | SBB1601 | Nutritional Biochemistry | 3 | 0 | 0 | 3 | 50 | 50 | 42 |
| 5 | SMB1605 | Advanced instrumentation Techniques | 3 | 0 | 0 | 3 | 50 | 50 | 43 |
| 6 | SBB1609 | Introduction to Bioinformatics | 3 | 0 | 0 | 3 | 50 | 50 | 44 |
| 7 | SMB1607 | Medical Laboratory techniques | 3 | 0 | 0 | 3 | 50 | 50 | 45 |
| 8 | SMB1611 | Biostatistics and probability | 3 | 0 | 0 | 3 | 50 | 50 | 46 |
| 9 | SMB1612 | Human Physiology | 3 | 0 | 0 | 3 | 50 | 50 | 47 |
| 10 | SBB1615 | Bioethics, Biosafety and IPR | 3 | 0 | 0 | 3 | 50 | 50 | 48 |
| 11 | SBB1607 | Genomics and Proteomics | 3 | 0 | 0 | 3 | 50 | 50 | 49 |
| 12 | SBB1605 | Cancer biology | 3 | 0 | 0 | 3 | 50 | 50 | 50 |
| 13 | SBB1602 | Biopharmaceutical Technology | 3 | 0 | 0 | 3 | 50 | 50 | 51 |
| 14 | SBB1604 | Protein engineering | 3 | 0 | 0 | 3 | 50 | 50 | 52 |
| 15 | SBB1608 | Metabolic Engineering | 3 | 0 | 0 | 3 | 50 | 50 | 53 |
| 16 | SBB1616 | Nanobiotechnology | 3 | 0 | 0 | 3 | 50 | 50 | 54 |

L - LECTURE HOURS, T – TUTORIAL HOURS, P – PRACTICAL HOURS, C – CREDITS
CAE – CONTINUOUS ASSESSMENT EXAMINATION,
ESE – END SEMESTER EXAMINATION

**APPROVED SYLLABUS FOR NEW ELECTIVES INTRODUCED IN 2018-2019**

| SBT 1609 | INDUSTRIAL SAFETY | L | T | P | Credits | Total Marks |
|----------|-------------------|---|---|---|---------|-------------|
|          |                   | 3 | 0 | 0 | 3       | 100         |

**COURSE OBJECTIVE**

　To promote safety in industries, reduce hazards and maintain high standards in industries. Also to help maintain healthy work practices and promote quality work keeping in mind environmental preservation.

**UNIT 1　INDUSTRIAL SAFETY PRINCIPLES　　　　　　　　　　9 Hrs.**
　　　　　History of Safety movement –Evolution of modern safety concept- general concepts of management – planning safety for optimization of productivity -productivity, quality and safety-line and staff functions for safety- budgeting for safety-safety policy. Incident Recall Technique (IRT), disaster control, job safety analysis, safety survey, safety inspection, safety sampling, evaluation of performance of supervisors on safety.

**UNIT 2　ENVIRONMENTAL SAFETY　　　　　　　　　　　　9 Hrs.**
　　　　　Hazardous waste management in India-waste identification, characterization and classification technological options for collection, treatment and disposal of hazardous waste-selection charts for the treatment of different hazardous wastes-methods of collection and disposal of solid wastes-health hazards-toxic and radioactive wastes- incineration and vitrification - hazards due to bio-process dilution- standards and restrictions – recycling and reuse.

**UNIT 3　BIOLOGICAL AND ERGONOMICAL HAZARDS　　　　　9 Hrs.**
　　　　　Classification of Biohazardous agents – examples, bacterial agents, rickettsial and chlamydial agents, viralagents, fungal, parasitic agents, infectious diseases - Biohazard control program, employee health program- laboratory safety program-animal care and handling-biological safety cabinets - building design. Work Related Musculoskeletal Disorders –carpal tunnel syndrome CTS- Tendon pain-disorders of the neck- back injuries.

**UNIT 4　OCCUPATIONAL PHYSIOLOGY　　　　　　　　　　9 Hrs.**
　　　　　Man as a system component – allocation of functions – efficiency – occupational work capacity – aerobic andanaerobic work – evaluation of physiological requirements of jobs – parameters of measurements – categorizationof job heaviness – work organization – stress – strain – fatigue – rest pauses – shift work – personal hygiene.

**UNIT 5　BIOSAFETY　　　　　　　　　　　　　　　　　　9 Hrs.**
　　　　　Biosafety issues in Biotechnology – primary containment for Biohazards – National and international biosafety guidelines and regulations – operation of biosafety guidelines and regulations of Government of India – Risk analysis – risk assessment – risk management.

　　　　　　　　　　　　　　　　　　　　　　　　　　**Max. 45 Hours**

**TEXT / REFERENCE BOOKS**

1. Heinrich H.W. Industrial Accident Prevention McGraw-Hill Company, New York, 1980.
2. Blake R.P., Industrial Safety, Prentice Hall Inc., New Jersey, 2nd Edition, 1963.
3. Hand book of "Occupational Safety and Health, National Safety Council, Chicago, 1982

**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**

| SBT 1610 | GMP AND QUALITY CONCEPTS | L | T | P | Credits | Total Marks |
|---|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 | 100 |

**COURSE OBJECTIVE**

* To introduce students about Good manufacturing practices quality concepts which would expose them toindustrial scenario.

**UNIT 1        INTRODUCTION**                                                                                         **9 Hrs.**
    Basic Concepts: Quality concepts, Quality Control, Quality Assurance, Good Manufacturing Practices, Good Laboratory Practices, Responsibilities. Quality Control: Quality control laboratory: Responsibilities, good laboratory practices, routine controls, instruments, protocols.

**UNIT 2        GMP**                                                                                                           **9 Hrs.**
    Good Manufacturing Practice. Legal requirements pertaining to GMP: GMP Guidelines, Standards, Regulatory agencies. Basic Components of GMP: Organization & Personnel, Premises, Equipments, Raw Materials, Complaints and recalls, Specifications, Self inspection.

**UNIT 3        GLP**                                                                                                             **9 Hrs.**
    Good Laboratory Practice (GLP) – an overview and basic information, Scope. Principles of GLP: Test Facility Organization and Personnel, Quality Assurance Programme, Facilities, Test Systems, Test and Reference Items,Standard Operating Procedures, Performance of the Study, Reporting of Study Result, Storage and Retention ofRecords and Materials.

**UNIT 4        INSPECTION**                                                                                             **9 Hrs.**
    Inspections, Quality Audit and Quality System Reviews: Inspections, role of quality audit, role of inspectors, methods of inspection-routine, concise, follow-up and special inspections, frequency and duration of inspections,preparations for inspections, conduct, report and regulatory actions.

**UNIT 5        REGULATION**                                                                                         **9 Hrs.**
    Regulatory bodies – Need and role of regulatory bodies. Different regulatory bodies – FDA, HACCP and their scope. Importance of regulatory approval. ISO 9000 – regulations.

**Max. 45 Hours**

**TEXT / REFERENCE BOOKS**

1. Sidney H. Willig, Good manufacturing Practices for Pharmaceuticals, 5th Edition, Revised and Expanded, Marcel Dekker, Inc. New York, 2005.
2. Jose Rodriguez-Perez, The FDA and Worldwide Current Good Manufacturing Practices and Quality System requirements guidebook for finished pharmaceuticals, American Society for Quality, ASQ Quality Press, Milwaukee, Wisconsin, 2014.

### 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**

| SPR1307 | RESOURCE MANAGEMENT TECHNIQUES | L | T | P | Credits | Total Marks |
|---|---|---|---|---|---|---|
| | | 2 | 1 | 0 | 3 | 100 |

**COURSE OBJECTIVE**

To develop in a student efficient and effective deployment of an organization's resources when they are needed. Such resources may include financial resources, inventory, human skills, production resources, or information technology.

**UNIT 1       INTRODUCTION AND LINEAR PROGRAMMING                                   9 Hrs.**

Operations Research (OR)- Nature – Characteristics – Phases - Role of OR in Decision making - Outline ofOR Models Linear Programming – Formulation of L.P.problems –Solution by graphical method, simplex method, Two Phase Method, Big M methods, Dual Simplex method

**UNIT 2       TRANSPORTATION AND ASSIGNMENT MODEL                                   9 Hrs.**

Transportation problem – Initial Basic feasible solution- Northwest corner method, Least Cost method, Vogel's approximation method – Test for optimality-MODI method. Assignment problems- Hungarian assignmentmodels- Travelling salesman problems

**UNIT 3       RESOURCE SCHEDULING AND NETWORK ANALYSIS                             9 Hrs.**

Problem of Sequencing – Problem with N jobs and 2 machines N Jobs 3 machines N Jobs and m machinesand 2 Jobs m machines (Graphical method). Project Management -Basic concepts–Network construction and scheduling Critical Path Method (CPM) & Program evaluation review technique (PERT) and resource leveling bynetwork techniques, time – Cost trade off.

**UNIT 4       INVENTORY CONTROL                                                     9 Hrs.**

Inventory Control – Various Types of inventory models – deterministic inventory models – Production model,Purchase model– with and without shortage- Economic Order Quantity (EOQ) – Buffer stock – Shortage quantity, Probabilistic inventory models – Quantity Discount and Price Breaks

**UNIT 5       QUEUEING THEORY AND REPLACEMENT MODELS                               9 Hrs.**

Queuing theory – Poisson arrivals and exponential service times, Single channel models only, Replacement policy for items whose maintenance cost increases with time- Consideration of time value of money - Replacement policy- Individual, Group replacement of items that fail completely and suddenly.

Max. 45 Hours

**TEXT / REFERENCE BOOKS**

1.. R.Panneerselvam,Operation research, 2nd Edn., Prentice Hall, 2001.

2.  S.D Sharma, Operation research Theory,Methods and Application, 17th Edn., Kedar Nath Ram Nath Publication, 2010.

3.  Nita H Shah, Ravi M Gor & Hardik Soni, Operation research, 4th Edn., PHI, 2010.

4.  Hamdy A.Taha, Opeartion Research, 8th Edn, PHI, 2008

5.  Hiller & Liberman., Introduction to Operations Research, 5th Edition, Mc Graw Hill, 2001

6.  Ravindran,Phillips &Solberg, Operations Research: principles and practice, 2nd Edn., Wiley India Lts, 2007

7.  Ronald L. Rardin, Optimization in Operations Research, Prentice Hall, 1998

**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**

| SHS1601 | LIFE AND EMPLOYABILITY SKILLS | L | T | P | Credits | Total Marks |
|---------|------------------------------|---|---|---|---------|-------------|
|         |                              | 3 | 0 | 0 | 3       | 100         |

**COURSE OBJECTIVES**

      The course aims at equipping students to be competent in facing the challenges in today's globalizedcontext, by providing an insight to soft skills for success and life skills for survival at the workplace.

**UNIT 1      ACHIEVEMENT MOTIVATION**           **9 Hrs.**

      Time Management - Positive and negative aspects of time log - Formula for successful time management.

**UNIT 2      SELF-AWARENESS AND EMPATHY**           **9 Hrs.**

      Work-Life Balance – Project completion Techniques – Effective Planning and Organisation - Strategies toimprove team communication.

**UNIT 3      DECISION MAKING**           **9 Hrs.**

      Decision making techniques- types of decisions- Setting Goals and Plans - Problem Solving Techniques.

**UNIT 4      EFFECTIVE COMMNICATION**           **9 Hrs.**

      Non-verbal communication - means of communication – Personality development – Language and bodylanguage for interviews- Self Empowerment.

**UNIT 5      NEGOTIATION SKILLS**           **9 Hrs.**

      Negotiation skills – skill acquisition strategies – effective persuading skills.

                                **Max. 45 Hours**

**TEXT / REFERENCE BOOKS**

1. Gravells, Ann. "Delivering Employability Skills in the Lifelong Learning Sector Further Education and Skills", UnitedKingdom: SAGE Publications Ltd, 2010.

2. Hind, David W.G., Stuart Moss, "Employability Skills," Business Education Publishers Ltd., United Kingdom :Tyne & Wear, 2005.

3. Rao M.S., "Enhancing Employability: Connecting Campus with Corporate", New Delhi: I K International Publishing House Pvt. Ltd, 2010

**END SEMESTER EXAM 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**

| SHS1602 | TECHNICAL WRITING FOR SCIENTISTS | L | T | P | Credits | Total Marks |
|---------|--------------------------------|---|---|---|---------|-------------|
|         |                                | 3 | 0 | 0 | 3       | 100         |

**COURSE OBJECTIVE**

To provide with an introduction to professional writing as a disciplinary field.

**UNIT 1 INTRODUCTION TO TECHNICAL WRITING**                                    9 Hrs.

Technical Writing – Principles and procedure of technical writing; Role of a Technical writer, Various forms of Technical Writing

**UNIT 2        ONLINE TOOLS**                                                  9 Hrs.

Printed documentation and Online Help Systems, Working with images and illustrations, designing graphic aids.

**UNIT 3        PROCESS OF WRITING**                                            9 Hrs.

Collecting and Organizing information, Drafting information verbally and visually, Producing Information,Documentation Process.

**UNIT 4        REACHING THE AUDIENCE**                                         9 Hrs.

Technical Writing Process Templates and Page design, Audience Profiling.

**UNIT 5        PRESENTATION**                                                  9 Hrs.

Writing specialized forms as abstracts, instructions, proposals and project and lab reports

**Max. 45 Hours**

**TEXT / REFERENCE BOOKS**

1.    Mike Markel's "Technical Communication", New York: Bedford/St. Martin's, 2009
2.    Joseph M. Williams book Style: "Toward Clarity and Grace", Chicago, University of Chicago Press, 1995

**END SEMESTER EXAM 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**

| SHS1603 | PROFESSIONAL WRITING ANDADVANCED RHETORIC | L | T | P | Credits | Total Marks |
|---------|--------------------------------------------|---|---|---|---------|-------------|
|         |                                            | 3 | 0 | 0 | 3       | 100         |

## COURSE OBJECTIVE

To educate the learners on written communication and provide exposure to practical aspects of writing forwider audience and for scientific community.

**UNIT 1      BASICS OF PROFESSIONAL COMMUNICATION**                                                 9 Hrs.

Technical Writing and Business communication (process, networks, importance, cultural variations, today's globalized workplaces), Practical aspects of communication, Principles and procedure of technical writing, Role of a Technical writer , attention to analyzing audience and purpose, Understanding and Inventing Pedagogies for Professional Writing.

**UNIT 2       PROCESS OF PROFESSIONAL COMMUNICATION**                                               9 Hrs.

Technical Writing Process Today, Genres of Technical Communication, Writing Proposals, Formats for Letters, Memos, abstracts, instructions, and proposals, and Email Messages.

**UNIT 3      PRACTICAL ASPECTS OFPROFESSIONAL COMMUNICATION**                                        9 Hrs.

Drafting and Documentation, Collecting and Organizing information, drafting information verbally and visually, Producing Information, Documentation Process, Argument, Persuasion, Propaganda, Audience and Style, Readers and Context of Use, The participatory model of writing.

**UNIT 4      PROFESSIONAL ETHICS & STRATEGIES IN CHANGING SCENARIO**                                 9 Hrs.

Ethics in Professional Communication, Applying theory to practice- analysis of papers and speeches, Writing on line-Principles while designing web sites, Creating effective presentation slides, Speech writing- basics, scrutiny and observation, Speech writing techniques and application.

**UNIT 5      PROFESSIONAL COMMUNICATION & FUTURE**                                                   9 Hrs.

Future of Technical Communication, multimedia genre, Identity, Authority, and Learning to Write in New Workplaces, Writing work, technology, and pedagogy in the present era

**Max. 45 Hours**

## TEXT / REFERENCE BOOKS

3. Dubinsky, James, ed., "Teaching Technical Communication: Critical Issues for the Classroom". Bedford, 2004
4. Hawk, Byron. "Toward a Post-Techne: or, Inventing Pedagogies for Professional Writing." (TCQ)
5. Mara, Andrew and Byron Hawk. "Posthuman Rhetorics and Technical Communication."
6. Henry, Jim. "Writing Workplace Cultures: An Archaeology of Professional Writing". SIUP, 2000.
7. Johnson-Sheehan, Richard. "Technical Communication Today" 3rd ed. NY: Longman, 2010.
8. Locker, Kitty O. and Donna S. Kienzler., "Business and Administrative Communication". 9th ed. McGraw Hill, 2010.
9. Mike Markel's Technical Communication, New York: Bedford/St. Martin's, 2009
10. Spilka, Rachel, ed. "Digital Literacy in/for Technical Communications". Routledge, 2009.
11. Spinuzzi, Clay. "Tracing Genres through Organizations: A Sociocultural Approach to Information Design (Acting with Technology)". MIT, 2003

### END SEMESTER EXAM 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**

| SCI1619 | DISASTER MANAGEMENT | L | T | P | Credits | Total Marks |
|---------|---------------------|---|---|---|---------|-------------|
|         |                     | 3 | 0 | 0 | 3       | 100         |

**COURSE OBJECTIVE**

 To create an awareness towards natural and man-made disasters, disaster preparedness and disaster management

**UNIT 1      INTRODUCTION TO DISASTERS**                                                           **12 Hrs.**

Natural resources and its importance - understanding on fragile eco-system - characteristics and types of Disasters, Geological and Mountain Area Disasters: Earthquakes, Volcanic eruption, landslides - Wind and WaterRelated Natural Disaster: Floods, Droughts, Cyclones, Tsunamis - Man Made Disasters: Forest fires, Nuclear, Biological and Chemical disaster - Causes and effects - Disaster Profile of India - Disaster Management cycle.

**UNIT 2      DISASTER PREPAREDNESS**                                                               **8 Hrs.**

Disaster management, mitigation and preparedness: Disaster Preparedness for People and Infrastructure,CommUNITy based Disaster Preparedness Plan - Roles & Responsibilities of Different Agencies and Government: Education, Communication & Training, Central, State, District and local administration, Armed Forces, Police, Para Military Forces, International Agencies, and NGO's - Disaster Mitigation: Strategies, Emerging Trends, Mitigationmanagement and Role of Team and Coordination.

**UNIT 3      REHABILITATION, RECONSTRUCTION & RECOVERY**                                           **10 Hrs.**

Damage assessment – Development of Physical and Economic Infrastructure -  Nature of Damage to Houses and Infrastructure due to Disasters - Funding Arrangements for Reconstruction - Monitoring and Evaluation of Rehabilitation Work: Training, Rescue and planning the rescue activities and rehabilitations - Role of Governmentand NGO's - Participative Rehabilitation Process: Case Studies

**UNIT 4      DISASTER RESPONSE AND DISASTER MANAGEMENT**                                            **8 Hrs.**

Disaster Response Plan: Communication, Participation and Activation of Emergency Preparedness Plans,Search, Rescue, Evacuation and other logistic management - Human Behaviour and Response Management: Psychological Response and Psychological Rehabilitation, Trauma and Stress Management, rumour and Panic Management, Medical and Health Response to Different Disasters - Relief Measures: Minimum Standard of Relief, essential components of Relief Management, and funding.

**UNIT 5      RISK ASSESSMENT AND VULNERABILITY ANALYSIS**                                           **7 Hrs.**

Hazard, Risk and Vulnerability: Concept and Relationship: Disaster Risk Reduction, People Participation inRisk Assessment - Vulnerability Analysis, Vulnerability Identification - Vulnerability profile of India - Strategies forSurvival - Social Infrastructure for Vulnerability Reduction.

**Max. 45 Hours**

**TEXT / REFERENCE BOOKS**

1. Bryant Edwards, "Natural Hazards", Cambridge University Press, U.K, 2005
2. Carter, W. Nick, "Disaster Management, Asian Development Bank", Manila, 1991.
3. Government of India, "Vulnerability Atlas of India", New Delhi, 1997.
4. Sahni, Pardeep et.al. (eds.), "Disaster Mitigation Experiences and Reflections", Prentice Hall of India, New Delhi, 2002
5. Sahni, Pardeep and Ariyabandu, Madhavi Malalgoda, 2012: "Disaster risk reduction in South Asia", Phi learning pvt. Ltd.- publisher, New Delhi, 2012.
6. Sharma, R.K. & Sharma, G.,(ed), "Natural Disaster", APH Publishing Corporation, New Delhi, 2005.
7. Taori, K, "Disaster Management through Panchayati Raj", Concept Publishing Company, New Delhi, 2005.
**Websites:**

8. NOAA Coastal Services Center, "Linking People Information and Technology",
9. "Risk and Vulnerability Assessment Tool", at, http://www.csc.noaa.gov/rvat/criticalEdd.html

**END SEMESTER EXAM 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**

| SBI1101 | INTRODUCTION TO BIOINFORMATICS | L | T | P | Credits | Total Marks |
|---------|-------------------------------|---|---|---|---------|-------------|
|         |                               | 3 | 0 | 0 | 3       | 100         |

## COURSE OBJECTIVE

 To enable the students to understand the tools used in Bioinformatics & how to use them. This will facilitate thestudents to undertake projects in modern biology.

**UNIT 1          INTRODUCTION                                                                                    9 Hrs.**

Introduction to bioinformatics, biological information, the Central Dogma, Bioinformatics: Definition and overview Bioinformatics, Branches of Bioinformatics, Aim, Scope and Research areas of Bioinformatics. Genomeprojects, human genome project- Databases and human chromosomes, role of Bioinformatics in biological sequences. Biological data- DNA sequence protein sequence, macromolecular structure.Challenges in bioinformatics.

**UNIT 2          COMPUTING IN BIOINFORMATICS                                                    9 Hrs.**

Introduction to internet-facilities used on the internet-www- web browsers, introduction to network basics- LAN, wan, network topology, protocol. Basic principles of computing in bioinformatics - database system, programming languages for bioinformatics- Perl, python. Introduction to computational biology.

**UNIT 3          BIOLOGICAL DATABASES                                                              9 Hrs.**

Databases and programs, Information retrieval from databases of nucleic acid and proteins. Pair wise alignment and database searching, Multiple Sequence Alignment database searching, DNA analysis, protein analysis, Data information and Knowledge Management, Concepts in Bioinformatics, Databases and Data Warehouses in Bioinformatics. Challenges, combining multiple types of data, Information Retrieval system in bioinformatics.

**UNIT 4          TOOLS APPLICATIONS IN BIOINFORMATICS                                    9 Hrs.**

Bio-algorithms and Tools- Identifying genes, Overview of sequence annotation. Gene prediction methods- Human variation and disease identification, Visualizing and comparing nucleic acids and Protein Introduction to Phylogenetic analysis definition, concepts of tree, steps in constructing Phylogenetic analysis. Introduction to microarray.

**UNIT 5          SOFTWARES IN BIOINFORMATICS                                                  9 Hrs.**

Basic software tools used in bioinformatics - Sequence analysis- GCG, Emboss - Cn3D viewer- Rasmol, Swiss pdb viewer, Pymol, Jmol. Modeling- Discovery studio 2.0, Docking -Auto dock,HEX.

**Max. 45 Hours**

## TEXT / REFERENCE BOOKS

1. Des Higgins and Willie Taylor, Bioinformatics sequence structures and databases, by Oxford University press, 1st ed., 2000.
2. Atwood, Paey Smith, Introduction to bioinformatics, Woodhead Publisher Ltd., 2001.
3. Arthur M.Lesk, Introduction to bioinformatics, Oxford University Press, 2002.
4. David W. Mount, Bioinformatics: Sequences and genome analyses, Cold Spring Harbor Laboratory press, 2000.
5. Westhead, Parish and Twyman, Instant notes: Bioinformatics, 2003.

## 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**

| SBI1207 | PERL PROGRAMMING | L | T | P | Credits | Total Marks |
|---------|------------------|---|---|---|---------|-------------|
|         |                  | 3 | 0 | 0 | 3       | 100         |

## COURSE OBJECTIVE

　To understand the basics of PERL programming and its role and applications in Bioinformatics discipline.

**UNIT 1      INTRODUCTION TO PERL PROGRAMMING      9 Hrs.**

Introduction to Perl for Bioinformatics- Comprehensive PERL Archive Network-Variables in Perl: Scalars, Arrays and Hashes. Basic structure of Perl language- a functional approach ▪ constructing atgc.pl. tr/// function ▪text formatting ▪ formatting numerical output with printf ▪ trapping errors at run time ▪ the s/// operator ▪ the chop and chomp operators.

**UNIT 2      INTRODUCTION TO ARRAYS AND HASHES      9 Hrs.**

Introduction to arrays and Hashes Variables ▪ Printing hash data, accessing and removing elements. Special variable $[ Accessing elements in an array. Function list ▪ reverse- sort- join- split- pop- push- shift- unshift-split function▪advanced array operation ▪ copying and creating arrays ▪ populating arrays with sequential data ▪ qw function ▪ determination of the size of an array ▪counting arrays ▪ accessing first element in an array, accessing last element in an array, accessing other elements in an array ▪ adding elements to the end of an array ▪ adding elements▪ removing elements ▪ appending elements ,altering elements ▪ array slices ▪ splicing array ▪ sorting arrays ▪ reversing arrays ▪ arrays from strings. Merging arrays, Transforming strings to arrays, transforming arrays to strings (Split and join functions).

**UNIT 3      PERL REGULAR EXPRESSIONS AND CONTROL STRUCTURES.      9 Hrs.**

Perl regular expressions ▪ special characters (+, *,?, [ ]) ▪ regex operator ▪ pattern modifier operator ▪ conditional matching operator ▪ range operator ▪ match quantifiers ▪ matching boundaries, grouping matching. Perlcontrol statements ▪ control structures ▪ if statements ▪ if-else ▪ if-elsif ▪ if-elsif-else ▪ while loop ▪ until loop ▪unless for loop ▪ foreach loop ▪scoping of variables.

**UNIT 4      FILES AND DIRECTORY MANIPULATIONS      9 Hrs.**

Files- Operating modes: read, write, append function- File variable, Die function▪ terminating a program, Reading complete file, Reading a file line by line, Closing a file. File test operators (d, e, l, r, s, w, x, B, T)- Manipulation Functions ▪link, unlink, rename, truncate, removing files. Directory Manipulation functions ▪ mkdir, chdir, opendir, readdir, closedir, rmdir, chmod.

**UNIT 5      INTRODUCTION TO PERL MODULES      9 Hrs.**

Introduction to modules and Subroutines- BioPerl module, Getopt: Long module and LWP: Simple Module-Cwd module ▪ creating perl module tree, system function ▪Perl subroutines and functions. Introduction and applications of Common Gateway Interfaces (CGI).

**Max. 45 Hours.**

## TEXT / REFERENCE BOOKS

1. Harshawardhan P Bal, Perl Programming for Bioinformatics, Tata McGraw Hill Publishing Company Limited, 2003.
2. Tim Bunce and Alligator Descartes, Programming the Perl DBI, O'Reilly Media, USA, 2000.
3. Michael Moorhouse and Paul Berry, Bioinformatics, Biocomputing and PERL, John Wiley and Sons Ltd., UK, 2004.
4. James Tisdall, Beginning Perl for Bioinformatics, O'Reilly & Associates, USA, 2001.
5. Steven Holzner, PERL, Black Book, Dreamtech Publications, 2nd Edition, 2001.

## 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**

| SBI1605 | PYTHON | L | T | P | Credits | Total Marks |
|---------|--------|---|---|---|---------|-------------|
|         |        | 3 | 0 | 0 | 3       | 100         |

## COURSE OBJECTIVE

- To learn to appreciate the programming language that can be used for a wide variety of programming tasks andto expose the student to the standard scripting language. At the end of the course, the student will be developing adequate skills in programming and will be known to understand the implementation of various applications using powerful assortment of built-in types in python.

**UNIT 1      INTRODUCTION TO PYTHON                                9 Hrs.**

Introduction to PYTHON- History -Features –installation - Setting up path -Working with Python -Basic Syntax -–Operator

**UNIT 2      VARIABLE AND DATA TYPES                               9 Hrs.**

Native datatypes – Booleans –Numbers – Strings - Bytes and byte arrays-Lists- Tuples – Sets - Dictionaries

**UNIT 3      REGULAR EXPRESSIONS                                  9 Hrs.**

Python regular expressions – Match function -Search function -Matching *Vs* Searching -Modifiers -Patterns.

**UNIT 4      CONTROL STATEMENTS                                   9 Hrs.**

Conditional Statements -If , If- else , Nested if-else , - Looping- For , While , Nested loops,- Control Statements- Break , Continue , Pass

**UNIT 5 FUNCTIONS AND MODULES                                    9 Hrs.**

Functions - Defining a function -Calling a function -Types of functions -Function Arguments -Anonymous functions -Global and local variables, Modules- Importing module -Math module -Random module -Packages – Composition

**Max. 45 Hours**

## TEXT / REFERENCE BOOKS

1. Hetland., Beginning Python , Apress, 2008
2. Mark Pilgrim, Dive Into Python, Apress, 2004
3. Martin C. Brown, Python: The Complete Reference (English) ,McGraw-Hill/Osborne Media, 2001.
4. Mark Summerfield, Programming in Python 3 2nd ed (PIP3) - Addison Wesley ISBN: 0-321-68056-1,2009

## 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**

| SBM1304 | BIOMATERIALS | L | T | P | Credits | Total Marks |
|---------|--------------|---|---|---|---------|-------------|
|         |              | 3 | 0 | 0 | 3       | 100         |

## COURSE OBJECTIVE

⬭ The course provides an intriguing insight in chemistry, engineering, biology and medicine that has a significant impact on biomaterials.

⬭ It highlights the way in which modern biology and medicine is inextricably linked to scientific discipline and helping us to understand the complex world of biomaterials.

**UNIT 1        INTRODUCTION AND METALS        9 Hrs**

Biomaterials - Overview, Classification of biomaterials, Interfacial Phenomena and tissue response to biomaterials, Metals and alloys for orthopedic implants-Stainless steel, Cobalt chromium alloy, Titanium and its alloys, Precious metal alloys, Other metal alloys. Dental implants - materials, types and designs

**UNIT 2        REPLACEMENT AND FIXATION DEVICES        9 Hrs**

Bioelectric effect, Wolff's Law, Types of orthopedic fixation devices-pins, screws and plates, Intra Medullary and spinal nails. Interface Problems with artificial joints and various fixation methods, Hard tissue replacements - total hip and knee joint replacements. Soft Tissue replacements- Sutures -Tapes, Staples, Adhesives. Maxillofacial Implants

**UNIT 3        POLYMERS AND APPLICATIONS        9 Hrs.**

Polymers in biomedical use, Hydrogels, silicone rubber, biodegradable polymers, Polymer Sterilization, Deterioration of polymers

**UNIT 4        BIOCERAMICS AND COMPOSITES        9 Hrs**

Bioceramics, types and - bioactive resorbable, non - resorbable, bioceramic coatings on metallic and implants and bone bonding reactions on implantation. Hydroxyapatite - properties and applications. Composites - Types and Applications, Bioglass

**UNIT 5        OPTHALMOLOGY, CORROSION AND TESTS        9 Hrs**

Ophthalmology- Introduction, Contact lenses, Eye shields, Viscoelastic solutions, Vitreous implants, Acrylate adhesives, Scleral buclikng materials for retinal detachment, artificial tears. Corrosion, Biocompatibility and Hemocompatibility, Biological Tests. Material surface characterization

**Max. 45 Hours**

## TEXT / REFERENCE BOOKS

1. Sujata V Bhat, Biomaterials, Narosa Publishing House, New Delhi, 2002.
2. Rolando Barbucci, Integrated Biomaterials Science, Plenum Publishers, New York, 2002.
3. A.F. Von Recum, Handbook of Biomaterials Evaluation - Scientific, Technical and Clinical Testing of Implant Materials, 1998.
4. 2nd Edition, Taylor & Francis, Philadelphia,1999.
5. 4. J.B Park and R.S Lakes, Biomaterials: An Introduction, Second Edition, Plenum press, New York, 1992.
6. 5. Joseph D Bronzino, The Biomedical Engineering Hand Book, Vol - 11, CRC press, 2000.

## 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**

| SBM1404 | HOSPITAL MANAGEMENT | L | T | P | Credits | Total Marks |
|---------|---------------------|---|---|---|---------|-------------|
|         |                     | 3 | 0 | 0 | 3       | 100         |

## COURSE OBJECTIVES

- The paper provides opportunities for training and research in all aspects of hospital / health administration. It helps to promotesscientific management of hospital and advancement of health care systems so as to make itrational, responsive and cost efficient.
- The student is thus educated in the development of high quality of hospital care in the community and the countryso as to provide a satisfactory environment to the patient and clinical research

**UNIT 1          STANDARD OF HOSPITAL**                                                    **9 Hrs**

Concept of Hospital Management ▪ Role of Administrator ▪ Responsibilities of Administrator ▪ Hospital Design ▪ Outlines for establishing Departmental Zones ▪ Hospital Engineering

**UNIT 2          HOSPITAL ORGANIZATION**                                                   **9-Hrs.**

Organization of Out-Patient Services ▪ Problems encountered in functioning of O.P Department ▪ Organization of In- Patient Services ▪ Casualty & Emergency Services - Organization and management of Operation theatres

**UNIT 3          SERVICES IN HOSPITAL**                                                     **9 Hrs**

Organization of Ancillary Services: Lab Services ▪ Department of Physiotherapy & Occupational Therapy ▪ Organization of Blood Transfusion Services ▪ Department of Radio ▪ diagnosis ▪ Hospital Pharmacy

**UNIT 4          STERILIZATION AND HOSPITAL SAFETY**                                        **9 Hrs**

Disease transmission, Sterilization and disinfection methods, Hospital safety ▪ Radiation Safety, hazardoussafety, safety disposal of biological waste - Maintenance of Equipments & Instruments.

**UNIT 5          SUPPORTIVE SERVICES IN HOSPITAL**                                          **9 Hrs**

Organization and management of Nursing services and Dietary Services in hospital ▪ House-keeping and maintenance ▪Medical Records -Staffing the hospital - Human resources management in hospital - Management Assisted by Computers: Reservation, Admission, Registration & Discharge Module

                                                                                           **Max.45 Hours.**

## TEXT / REFERENCE BOOKS

1. Dr. L.L. Rao, Hospital Management.Annamalai University Press
2. R. D. Lele, Computers in Medicine, Tata McGraw Hill, 2008
3. Mohan Bansal, Medical informatics, Tata McGraw Hill, 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**

| SBM1606 | BIOMEMS AND NANOTECHNOLOGY | L | T | P | Credits | Total Marks |
|---------|----------------------------|---|---|---|---------|-------------|
|         |                            | 3 | 0 | 0 | 3       | 100         |

## COURSE OBJECTIVE

 To enable the student to acquire adequate knowledge on micro mechanical devices and their applications indrug delivery and nanotechnology.

**UNIT 1      INTRODUCTION**                                                                 9 Hrs.

MEMS – definition. Origin of MEMS – Types – Materials used and their properties. MEMS Technology. Applications in health care. Integrated MEMS and microsystem.

**UNIT 2      PROCESSING: MICRO MACHINING TECHNOLOGY**                                        9 Hrs.

Lithography- etching- Ion implantation- wafer bonding- Integrated processing- Bulk micro machining- surface micro machining- coating technology and CVD-LIGA process.

**UNIT 3      MICROSYSTEMS AND MICROFLUIDS**                                                  9 Hrs.

General principles- Microsensors – Actuators- Electrostatic forces- Piezoelectric crystals – Intelligentmaterials and structures. Fundamentals of micro fluids, lab – on – a chip devices - Silicon and glass micromachining for micro total analysis systems.Surface chemistry in polymer microfluidic systems.

**UNIT 4      APPLICATION IN MEDICINE**                                                       9 Hrs.

Trends in MEMS for health care. Drug delivery systems - Biochip – Micro needles- Microelectrodes- Neuralprosthesis – shape memory implants.

**UNIT 5      BIOMEDICAL NANOTECHNOLOGY**                                                     9 Hrs.

Nanotechnology- Medical applications of Nanotechnology- Drug synthesis and delivery- Nanofabrication methods – Nanomaterials in human body- Toxicity in nanomaterials.

Max. 45 Hours

## TEXT / REFERENCE BOOKS

1. Tai-Ran Hsu, MEMS & Microsystem, Design and manufacture, Mc. Graw Hill 2002.

2. Malsch, NeelinaH., ed., Biomedical Nanotechnology, Washington, DC: CRC Press, 2005

3. Marc J. Madou, Fundamentals of Microfabrication and Nanotechnology, 3rd Edition, Three-Volume Set,CRC Press 2011.

4. Mohamed Gad-el-Hak, The MEMS Handbook, CRC Press, 2005

5. HocineYahia, Shape Memory Implants Springer Verlag 2000.

## 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**

| SBT 1610 | GMP AND QUALITY CONCEPTS | L | T | P | Credits | Total Marks |
|---|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 | 100 |

**COURSE OBJECTIVE**

To introduce students about Good manufacturing practices quality concepts which would expose them toindustrial scenario.

**UNIT 1          INTRODUCTION                                                              9 Hrs.**

Basic Concepts: Quality concepts, Quality Control, Quality Assurance, Good Manufacturing Practices, Good Laboratory Practices, Responsibilities. Quality Control: Quality control laboratory: Responsibilities, good laboratory practices, routine controls, instruments, protocols.

**UNIT 2          GMP                                                                        9 Hrs.**

Good Manufacturing Practice. Legal requirements pertaining to GMP: GMP Guidelines, Standards, Regulatory agencies. Basic Components of GMP: Organization & Personnel, Premises, Equipments, Raw Materials, Complaints and recalls, Specifications, Self inspection.

**UNIT 3          GLP                                                                        9 Hrs.**

Good Laboratory Practice (GLP) – an overview and basic information, Scope. Principles of GLP: Test Facility Organization and Personnel, Quality Assurance Programme, Facilities, Test Systems, Test and Reference Items,Standard Operating Procedures, Performance of the Study, Reporting of Study Result, Storage and Retention ofRecords and Materials.

**UNIT 4          INSPECTION                                                                9 Hrs.**

Inspections, Quality Audit and Quality System Reviews: Inspections, role of quality audit, role of inspectors, methods of inspection-routine, concise, follow-up and special inspections, frequency and duration of inspections,preparations for inspections, conduct, report and regulatory actions.

**UNIT 5          REGULATION                                                                9 Hrs.**

Regulatory bodies – Need and role of regulatory bodies. Different regulatory bodies – FDA, HACCP and their scope. Importance of regulatory approval. ISO 9000 – regulations.

**Max. 45 Hours**

**TEXT / REFERENCE BOOKS**

1. Sidney H. Willig, Good manufacturing Practices for Pharmaceuticals, 5th Edition, Revised and Expanded, Marcel Dekker, Inc. New York, 2005.
2. Jose Rodriguez-Perez, The FDA and Worldwide Current Good Manufacturing Practices and Quality System requirements guidebook for finished pharmaceuticals, American Society for Quality, ASQ Quality Press, Milwaukee, Wisconsin, 2014.

**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**

| SBT 1611 | BIOLOGY FOR ENGINEERS | L | T | P | Credits | Total Marks |
|---|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 | 100 |

**COURSE OBJECTIVE**

⬜ To understand the essentials of basic biological principles

**UNIT 1          INTRODUCTION TO CELLS                                                    9 Hrs.**

Cell: Functional unit of living organisms - Cell theory - Prokaryotic and eukaryotic cell – bacterial, plant, animal cells - cell components - functions- cell organization – tissues - basic types -cell division: Mitosis, meiosis,cell cycle regulation

**UNIT 2          SOCIAL IMPORTANCE                                                       9 Hrs.**

Application of biological sciences and biotechnology to the society - human health care and medicines - pharmaceuticals and nutraceuticals -food and agriculture- pollution management and environment - Biofuels

**UNIT 3          INTRODUCTION TO BIOMOLECULES                                  9 Hrs.**

Biomolecules - classification, salient features - biological significance - carbohydrates, proteins and aminoacids - lipids and fats - nucleic acids - vitamins-Enzymes

**UNIT 4          HUMAN PHYSIOLOGY                                                       9 Hrs.**

Human Physiology - Different systems associated with humans- Tissues, organ and physiology of the various systems: Digestive, respiratory, circulatory, skeletal, nervous, excretory and reproductive system - Artificial  memory and neural network

**UNIT 5          MEDICAL IMPORTANCE                                                    9 Hrs.**

Infectious and non infectious diseases- causative agents, epidemiology, pathogenicity, control and prevention, treatment of AIDS, tuberculosis, Pathology of non infectious and genetic diseases and disorders - cancer, diabetes mellitus, cardiac diseases- neurological disorders-Parkinson's disease

**Max. 45 Hours**

**TEXT / REFERENCE BOOKS**

1.  Satyanarayana, U. Biotechnology, 4th Edition, Books and Allied Pvt. Ltd. Kolkata, 2007.
2.  Lehninger A.L, Nelson D.L, Cox .M.M, Principles of Biochemistry. CBS Publications 1993

**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**

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| SCY1601 | SPECTROSCOPY | L | T | P | Credits | Total Marks |
|---------|--------------|---|---|---|---------|-------------|
|         |              | 3 | 0 | 0 | 3       | 100         |

## COURSE OBJECTIVE

 To make the students to understand the basic concepts about the analytical techniques

**UNIT 1          UV-VIS SPECTROSCOPY                                                                9 Hrs.**

Principles of radiation – Frank condon principle – Various electronic transitions (185-800 nm) – Beer-Lambert law – Instrumentation of single beam and double beam spectrophotometer – Woodward and Fieser rule – Applications of UV-Visible spectroscopy.

**UNIT 2          IR AND RAMAN SPECTROSCOPY                                                    9 Hrs.**

Principles of IR spectra – Instrumentation of IR spectroscopy – Force constant – Effect of hydrogen bonding – Applications of IR spectroscopy – Raman spectroscopy: Principle – Strokes line and antistrokes line –Instrumentation – Applications of Raman spectroscopy.

**UNIT 3          $^1$H NMR AND $^{13}$C SPECTROSCOPY                                        9 Hrs.**

General introduction and definition: Chemical shift – Spin-spin interaction – Shielding mechanism – Couplingconstants. Nuclear overhauser effect (NOE). Instrumentation of $^1$H NMR and $^{13}$C spectroscopy.

**UNIT 4          MASS SPECTROMETRY                                                              9 Hrs.**

Principle of Mass spectra – Instrumentation – Principle of fragmentation – Nitrogen rule – McLafferty rearrangement – Representation of Mass spectrum – Applications of mass spectra.

**UNIT 5          IMAGING TECHNIQUES                                                             9 Hrs.**

Scanning electron microscopy – Energy dispesrve X-ray spectroscopy – Transmission electron microscopy – Atomic force microscopy – Scanning tunneling microscopy – X-ray photoelectron spectroscopy.

**Max. 45 Hours**

## TEXT / REFERENCE BOOKS

1.  Banwell C.N., and McCash E. M., "Fundamentals of Molecular Spectroscopy", 4$^{th}$ Edition, Tata McGraw Hill, 2000.

2.  Silverstein R. M., and Webster F. X., "Spectroscopic Identification of Organic Compounds", 6$^{th}$ Edition, John Wiley & Sons, 2003.

3.  Levine I. N., "Molecular Spectroscopy", John Wiley & Sons, 1974.

4.  Williams D. H., and Fleming I., "Spectroscopic Methods in Organic Chemistry", 4$^{th}$ Edition, Tata McGraw-Hill PublishingCompany, 1988.

5.  Kemp W., "Applications of Spectroscopy", English Language Book Society, 1987.

### END SEMESTER EXAM 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** |
| | | (10% problems may be asked) |

| SCY1602 | ENERGY SOURCES | L | T | P | Credits | Total Marks |
|---------|----------------|---|---|---|---------|-------------|
|         |                | 3 | 0 | 0 | 3       | 100         |

**COURSE OBJECTIVE**

 To know the various sources of energy available and to face the future challenges arising due to energy crisis.

**UNIT 1        GLOBAL AND INDIAN ENERGY SCENARIO                                        9 Hrs.**

Bio-fuels − Nuclear energy − Their utilization pattern in the past, present and future projections of consumption pattern. Power sector reforms − Restructuring of energy supply sector − Energy strategy for future.

**UNIT 2        HYDROGEN ENERGY                                        9 Hrs.**

Hydrogen as a renewable energy source: Sources of Hydrogen – Fuel for Vehicles. Hydrogen Production: Direct electrolysis of water – Thermal decomposition of water – Biochemical methods of hydrogen production. Storage of Hydrogen: Gaseous, Cryogenic and Metal hydride.

**UNIT 3        ELECROCHEMICAL ENERGY                                        9 Hrs.**

Fuel cells: Principle of working, construction and applications of phosphoric acid fuel cell – Solid oxide fuelcell – Molten carbonate fuel cell – Polymer electrolyte membrane fuel cell. Batteries: Lead-acid battery – Nickel- cadmium battery – Lithium batteries – Nickel hydride batteries.

**UNIT 4        BIOENERGY                                        9 Hrs.**

Thermo-chemical Conversion: Pyrolysis – Combustion – Gasification – Liquification. Bio-Chemical Conversion: Aerobic and Anaerobic conversion – Fermentation. Ethanol as a fuel for I.C. engines. Isolation of methane from Biogas and packing and its utilization.

**UNIT 5        NUCLEAR ENERGY                                        9 Hrs.**

Nuclear Energy – Nuclear Chain reaction – Fuel enrichment – Different Types of Nuclear Reactors: Pressurised water reactor – Boiling water reactor – Fast Breeder reactor. Nuclear waste disposal – Nuclear Fusion.

**Max. 45 Hours**

**TEXT / REFERENCE BOOKS**

1.   Culp A. W., "Principles of Energy Conversion", 2nd Edition, McGraw-Hill, 1991.
2.   Maths D. A., "Hydrogen Technology for Energy", Noyes Data Corp., 1976.
3.   Linden D., Handbook: "Batteries and Fuel cell", Mc.Graw Hill, 1984.
4.   Bansal N. K., and Kleeman M. K., "Renewable Sources of Energy and Conversion Systems", Tata McGraw Hill, 1990.
5.   White L. P., "Biomass as Fuel", Academic Press, 1981.
6.   Raymond Murray, Keith Holbert, "Nuclear Energy: An Introduction to the Concepts, Systems, and Applications of NuclearProcesses", 7th Edition, Elsevier Science & Technology, 2014.
7.   Arniker H. J., "*Essentials of Nuclear Chemistry",* New Age Publications, 1996.

**END SEMESTER EXAM 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**
                                                                                       (10% problems may be asked)

| SPH1601 | ENERGY PHYSICS | L | T | P | Credits | Total Marks |
|---|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 | 100 |

## COURSE OBJECTIVE

To expose the students to the basic principles of energy conversions, materials for energy conversion andenergy storage devices.

**UNIT 1        ENERGY AND THERMODYNAMICS**                                                        **9 Hrs.**

Forms of Energy, Conservation of Energy, Entropy, Heat capacity, Thermodynamic cycles: Brayton, Carnot Diesel, Otto and Rankin cycle; Fossil fuels, time scale of fossil fuels and solar energy as an option,.

**UNIT 2        ENERGY CONVERSION MATERIALS**                                                      **9 Hrs.**

Single, poly – and amorphous silicon, GaAs, CdS, Cu2S, CuInSe2, CdTe etc. technologies for fabrication of single and polycrystalline silicon solar cells, amorphous silicon solar cells and tandem cells, solar cell modules, photovoltaic systems, space quality solar cells

**UNIT 3        PHOTOVOLTAIC CONVERTORS**                                                          **9 Hrs.**

Introduction- Photovoltaic effect-conversion of solar energy into electrical energy- behaviour of solar cells-basic structure and characteristics of solar cells-single, multi and thin film silicon solar cells-solar cell arrays- PV modules, generators-interfacing PV modules to loads, direct connection of load to PV modules and connection of PV modules to a battery and load together-energy storage alternatives to PV systems..

**UNIT 4        THERMOELECTRIC CONVERTERS**                                                        **9 Hrs.**

Thermoelectric effects, solid state description of thermoelectric effect, Kelvin's thermodynamic relations, analysis of thermoelectric generators, basic assumptions, temperature distribution and thermal energy transfer forgenerator, co-efficient of performance for thermoelectric cooling,.

**UNIT 5        ENERGY STORAGE DEVICES**                                                           **9 Hrs.**

Cuprates and MgB2 superconductors and their properties, superconducting wires, Role of superconductor in Electric generator, Magnetic energy storage devices and power transmission. Energy storage systems, Faradaicand non-Faradaic processes, Types of capacitors and batteries, Comparison of capacitor and battery, Charge- discharge cycles, experimental evaluation using Cyclic voltammetry, and other techniques.

**Max. 45 Hours**

## TEXT / REFERENCE BOOKS

1. Richard C. Neville, "Solar energy conversion: The solar cell", Elsevier Science; 2 edition, 1995
2. Peter Aue, "Advances in Energy systems and technology", Academic Press, 1978.
3. Frank Kreith and Jang Kreider, "Principles of solar engineering", CRC Press; 2 edition, 2000.
4. A. E. Dixon & J. D. Leslie, "Solar energy conversion", Science Direct, 1999.
5. A.Goetzberger, V.U.Hoffmann, "Photovoltaic solar energy generation", Springer-Verlag, 2005.
6. Castaner, S.Silvestre, "Modelling Photovoltaic systems", Pspice John Wiley & Sons, 2002.
7. R.J.Komp, Practical Photovoltaics, "Electricity from solar cells", 3$^{rd}$ edition, Aatec Publ., 2001.
8. R.Messeiger, J.Ventre, "Photovoltaic systems Engg", 2$^{nd}$ edition, CRC Press, 2004.
9. Stanley W Angrist, "Direct energy conversion" (4th edition) –Allyn and Bacon, Inc., 1982
10. B. E. Conway, "Electrochemical supercapacitors", Kluwer Academic Press. *Springer* US, Apr 30, 1999
11. David Linden, "Handbook of Batteries and Fuel Cells", McGraw-Hill, 1984
12. A.G. Milnes and D. L. Feucht, "Heterojunction and metal – semiconductor junctions", Academic Press, 1972.
13. B.G. Streetman, "Solid state electronic devices", 5th Edition, Prentice Hall, 2000.

## END SEMESTER EXAM 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**

(10% problems may be asked)

| SPH1602 | GEOPHYSICS | L | T | P | Credits | Total Marks |
|---------|------------|---|---|---|---------|-------------|
|         |            | 3 | 0 | 0 | 3       | 100         |

## COURSE OBJECTIVE

To provide a qualitative idea on the fundamentals of seismology and theoretical understanding of various physical properties of earth.

**UNIT 1        SEISMOLOGY                                                                     9 Hrs.**

Introduction-Seismology-P-waves-S waves, their velocities-the location of epicenters-Effect of Boundaries-Major discontinuities-.Seismic energy sources-Detectors-Interpretation of time and distance curves.-Derivation of properties from the velocities.

**UNIT 2        INTERNAL STRUCTURE OF EARTH                                     9 Hrs.**

Introduction-Seismic waves-Rayleigh waves and love waves-Study of earth by seismic waves-Earthquake seismology-Horizontal and vertical seismograph-Seismograph equation-Internal structure of earth..

**UNIT 3        EARTHQUAKES AND GRAVITY                                         9 Hrs.**

Earthquakes: Focus, Magnitude, Frequency–Detection and prediction–Gravity–Absolute and relative measurements of gravity-Worden gravimeter-Application of gravity methods.

**UNIT 4        GEOMAGNETISM                                                           9 Hrs.**

Geomagnetism-Definitions, magnetic field,-Measurements Proton precession magnetometer, Alkali vapour magnetometer–Theory of Earth magnetism-Dynamo theory of earth magnetism-Magnetic surveying-application.

**UNIT 5        GEOCHRONOLOGY AND GEOTHERMAL PHYSICS                    9 Hrs.**

Geochronology-Radioactivity of the earth-Radioactive dating of rocks and minerals-Geological time scale Geothermal Physics: Flow of heat to the surface of earth–Sources of heat within earth--Process of heat transport-Internal temperature of earth..

**Max. 45 Hours**

## TEXT / REFERENCE BOOKS

1. Cook,A.H., "Physics of the Earth and Planets", I Ed, McMillan Press, London ,1973
2. William Lourie, "Fundamentals of Geophysics", II Ed, Cambrige University Press, 1982
3. Garland .G.D., "Introduction to Geophysics", 11 Ed, WB Saunder Company, London.1979
4. Ramachandra Rao M.B., "Out lines of Geophysical prospecting-A manual for Geologists", Prasaranga University ofMysore, Mysore, 1975
5. Telford, W.M. Geldart, L. P. Sheriff R.E. and Keys .D.A., "Applied Geophysics:, Oxford–IBH Publishing Co.Pvt.Ltd. NewDelhi. 1976
6. Rama Rao.B.S., Murthy I.V.R., "Gravity and magnetic methods of prospecting", Arnold Heinemann Publishers, New Delhi, 1978

## END SEMESTER EXAM 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**

| SPH1603 | SPACE PHYSICS | L | T | P | Credits | Total Marks |
|---------|---------------|---|---|---|---------|-------------|
|         |               | 3 | 0 | 0 | 3       | 100         |

**COURSE OBJECTIVE**

To provide the Windows to the Universe, Solar System, and Planetary Atmospheres and also to expose the students to the instruments related with space physics.

**UNIT 1        ASTRONOMY FUNDAMENTALS, TELESCOPES FOR ASTRONOMY                      9 Hrs.**

Radiation from space, radiation laws, Basic terminology used in astronomy, Introduction to the various types of astronomy: optical, radio, IR, UV, X-ray, γ ray, Gravitational etc. Introduction to Optical, IR, X ray, γ ray telescopes, brief description of the various instruments.

**UNIT 2        RADIO TELESCOPES AND RECEIVERS                      9 Hrs.**

Antennas, Types of interferometers, array, Radio telescopes of the world including GMRT, OOTY, PRL, Radio telescope receivers, total power receiver, Dicke receiver, correlation receiver, noise temperature. Noise sources.

**UNIT 3        SOLAR SYSTEM, TERRESTRIAL AND JOVIAN PLANETS                      9 Hrs.**

Origin of solar system, occurrence of planetary systems, celestial mechanics, properties of the sun. Orbital and physical characteristics, atmosphere, Studies of Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune and their moons. Recent explorations of various planets..

**UNIT 4        SCINTILLATION, PLASMA, IONIZATION                      9 Hrs.**

Interplanetary scintillation, interstellar scintillation, methods for probing solar wind, use of IPS in measurement of solar wind, study of irregularities in the interplanetary medium, properties of plasma at different distances from earth, photoionisation, cosmic ray ionization, meteoric ionization, various resonances in plasma, various waves in plasma, measurement procedures.

**UNIT 5        DIAGNOSTIC TECHNIQUES FOR PROBING IONOSPHERE                      9 Hrs.**

Radio wave propagation in absence and presence of magnetic field, Formation of Chapman layer, Appleton Hartree equation and its explanation, propogation of radio waves at different frequencies. Ground based, balloonbased, space based techniques, Ionosonde, air glow, P.R.Radar, radio scintillation, magnetometer, Langmuir probe, electrostatic analyzer, mass spectrometer, radiosonde.

**Max. 45 Hours**

**TEXT / REFERENCE BOOKS**

1. Glasstone. Van Nostrand, **"Sourcebook on the Space Sciences"**, Princeton, N.J., 1965

2. John Daniel Kraus Cygnus, "Radio Astronomy: Quasar Books"; 2nd edition, 1986

3. W.N.Christiansen & J.A.Hogbom, " Radiotelescopes, Radio Telescopes", 1st edition, Cambridge University Press 1969

4. H.Karttunem, P.Kroger, H.Oja, M.Poutanen, K.J.Donner, "Fundamental Astronomy", Springer-Verlag; 2nd edition, 1994

5. N.Henbest, M.Marten, "The new Astronomy", Cambridge University Press, 1996

6. S.K.Alurkar, "Solar and Interplanetary Disturbances", World Scientific Publishing Company, 1997.

7. J.A.Ratcliffe, "An introduction to ionosphere and magnetosphere", Cambridge : Cambridge University Press, 1972

8. A.Giraud, M.Petit, "Ionosphere techniques and phenomena", First Edition, D. Reidel Pub Co, 1978.

## END SEMESTER EXAM 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**

| SPH1604 | ASTROPHYSICS | L | T | P | Credits | Total Marks |
|---------|--------------|---|---|---|---------|-------------|
|         |              | 3 | 0 | 0 | 3 | 100 |

**COURSE OBJECTIVE**
    To provide qualitative description of interesting astronomical aspect and evolution of structures in the Universe.

**UNIT 1        GRAVITY                                                                        9 Hrs.**
    Newtonian gravity and basic potential theory, Simple orbits – Kepler's laws and precession, flat rotation curve of galaxies and implications for dark matter, virial theorem and simple applications, role of gravity in different astrophysical systems,.

**UNIT 2        RADIATIVE PROCESSES                                                       9 Hrs.**
    Overview of radiation theory and Larmor formula, Different radiative processes : Thomson and Compton scattering, Bremsstrahlung, Synchrotron [detailed derivations are not expected] Radiative equilibrium, Planck spectrum and properties; line widths and transition rates in QT of radiation, qualitative description of which radiative processes contribute in which waveband/ astrophysical system, distribution function for photons and its moments, elementary notion of radiation transport through a slab, concept of opacities.

**UNIT 3        GAS DYNAMICS                                                              9 Hrs.**
    Equations of fluid dynamics; equation of state in different regimes [including degenerate systems]; Models for different systems in equilibrium, Application to White dwarfs/Neutron stars, Simple fluid flows including supersonicflow, example of SN explosions and its different phases.

**UNIT 4        STELLAR SYSTEM                                                            9 Hrs.**
    Basic equations of stellar structure, Stellar energy sources; qualitative description of numerical solutions  for stars of different mass, homologous stellar models, Stellar evolution, Evolution in the HR-Diagram.

**UNIT 5        GALACTIC DYNAMICS                                                         9 Hrs.**
    Milky Way Galaxy, Spiral and Elliptical galaxies, Galaxies as self gravitating systems; spiral structure, Supermassive black holes, Active galactic nuclei.

                                                                                    **Max. 45 Hours**

**TEXT / REFERENCE BOOKS**

 1. Bradley W. Carroll, D.A.Ostlie, "Modern Astrophysics", Addison-Weseley, 1996.
 2. Frank H. Shu,"The physical universe: An Introduction to Astronomy", University Science books, 1982.
 3. Frank H. Shu, "The Physics of Astrophysics", Volume I and II, University Science books, 2010.
 4. T. Padmanabhan, "Theoretical Astophysics", Volumes I, II and III, Cambridge University Press; First edition,2001.
 5. Arnab Rai Choudhuri, "The Physics of fluids and plasmas", Cambridge University Press, 1998.
 6. Martin. Harwitt, "Astrophysical concepts", 3rd edition, Springer Science & Business Media, 1998.
 7. James Binney & Michael Merrifield, "Galactic Astronomy", Princeton University Press, 1998.
 8. James Binney & Scott Tremaine, "Galactic dynamics", 2nd edition, Princeton University Press, 2008.
 9. A. K. Kembhavi and J. V. Narlikar, "Quasars and Active Galactic Nuclei", Cambridge University Press, 1999.
10. Bradley M. Peterson, "An Introduction to Active Galactic Nuclei", Cambridge University Press, 1997.

## END SEMESTER EXAM 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**

| SPH1605 | ATOMIC AND NUCLEAR PHYSICS | L | T | P | Credits | Total Marks |
|---|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 | 100 |

## COURSE OBJECTIVE

To enable the students understand the laws that govern the structure and properties of the atom, molecules and the nucleus. Also to provide an introduction to the elementary particles.

**UNIT 1          IONS, ELECTRONS AND ATOMIC STRUCTURE                                    9 Hrs.**

Detection of charged particles in electric and magnetic fields-Dunnigton's method for e/m-positive ray analysis: Thomson's parabola method-Bohr's atom model-Sommerfeld's relativistic atom model-the Vector atom model and the quantum numbers-comparison with quantum model. Coupling schemes: L-S coupling and j-j coupling–Pauli's exclusion principle-Magnetic moment due to (i) orbital motion of the electron (ii) due to spin-Sternand Gerlach experiment

**UNIT 2          ATOMIC AND MOLECULAR SPECTRA                                    9 Hrs.**

Spin-orbit interaction in atomic spectra-fine structure and sodium doublet-Zeeman effect: experiment- classical result-Quantum mechanical explanation-anomalous Zeeman effect-Paschen Back effect-Stark effect (qualitative) Origin of a pure rotational spectra of a rigid linear molecule-vibrating diatomic molecule as a quantum harmonic oscillator-pure vibrational spectra-Spectroscopy (Schematic): Ultraviolet-Infrared-absorption-Raman.

**UNIT 3          PROPERTIES OF NUCLEI AND RADIOACTIVITY                                    9 Hrs.**

Isobars, isotopes, mirror nuclei-Nuclear mass and binding energy-Parity-Nuclear spin–Mass defect and packing fraction-Stable nuclei–Nuclear size, nuclear magnetic moment-Electric quadrapole moment-Nuclear energy levels. Radioactivity: Range and stopping power of alpha particles.-Geiger-Nuttal law-Feature of alpha decay Tunnelling–Beta ray spectrum-Energetic of beta decay-Detection of neutrino-Gamma ray absorption in matter.

**UNIT 4          NUCLEAR MODELS, FISSION AND FUSION                                    9 Hrs.**

Neutron: Discovery, Mass, Half life, Magnetic Moment, sources and detection–Shell model, Liquid drop theory-Nuclear fission–Spontaneous fission and potential barrier-Self sustaining Chain Reaction–Neutron balance in Nuclear Reactor-Uncontrolled chain reaction-Nuclear Fusion–radiation hazards and safety measures-Controlled fusion-Fusion in stars..

**UNIT 5          ELEMENTARY PARTICLE PHYSICS                                    9 Hrs.**

Discovery of cosmic rays-primary and secondary rays-cosmic ray showers-discovery of positron–the mesons–origin of cosmic rays-the Big-Bang theory-thermal history of the Universe-Hubble's law–the future of the universe-dark matter. Particles and anti-particles-antimatter-the fundamental interactions–elementary–particle quantum numbers–conservation laws and symmetry–the Quark model–quantum chromodynamics-the standard model–unification of interactions–Grand unified theories. (Qualitative).

**Max. 45 Hours**

## TEXT / REFERENCE BOOKS

1.    R.Murugeshan and Kiruthiga Sivaprasath, "Modern Physics" 14thEd, S.Chand and Company Ltd, 2009

2.    A.B. Gupta and Dipak Ghosh, "Atomic and Nuclear Physics", Books and Allied(P)Ltd, Calcutta, 1997

3.    Ronald Gautreau and William Savin, "Modern Physics, Schaum's outline series, 2nd Ed., Tata McGraw Hill P.Ltd, 2004

4.    K.Gopla Krishnan, Atomic and Nuclear Physics", 3$^{rd}$ Ed. ,MacMillan India Ltd. 1994

5.    H.S.Mani and Mehta ( G.K) , "Introduction to Modern Physics", Affiliated EWast-West Press, 1989

6.    R.P.Feynmann, R.B. Leighton and M.Sands , "The Feynmann Lectures on Physics", Vol III, 7$^{th}$ Indian reprint, Narosa Pub. Ltd, 1992

## END SEMESTER EXAM 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**

| SIT1402 | MOBILE APPLICATION DEVELOPMENT | L | T | P | Credits | Total Marks |
|---------|-------------------------------|---|---|---|---------|-------------|
|         |                               | 3 | 0 | 0 | 3       | 100         |

## COURSE OBJECTIVES

- To develop applications for current and emerging mobile computing devices, performing tasks at all stages of thesoftware development life-cycle.
- To learn how to utilize rapid prototyping techniques to design and develop sophisticated mobile interfaces.
- To design, implement and deploy mobile applications using an appropriate software development environment.

**UNIT 1        INTRODUCTION AND UI INTERFACE**                                                          **9 Hrs.**

Introduction to mobile technologies, mobile operation systems, Mobile devices-pros and cons, Introduction to Android, Versions, Features, Architecture, UI Widgets and Events handling, Layouts, Required tools-Eclipse, ADT, AVD, Application structure, AndroidManifest file, Android design philosophy, Creating Android applications.

**UNIT 2        BUILDING BLOCKS AND DATABASES**                                                          **9 Hrs.**

Introduction to Activities and Intents-Understanding Activity life cycle, Linking Activities, Passing Data, Toast, Displaying a Dialog Window and Notifications. Content Provider, Services, Broadcast receivers, accessing databases, sample applications, debugging and deploying app, publish in Playstore.

**UNIT 3        C PROGRAMMING**                                                                          **9 Hrs.**

C- Data Types and Expressions, Decision Making and Looping, Objects and Classes, Property, Messaging, Categories and Extensions, Fast Enumeration – NSArray, NSDictionary, Methods and Selectors, Static & Dynamic objects, Exception handling, Memory management, Required Tools- Xcode, iOS Simulator, Instruments, ARC, frameworks.

**UNIT 4        INTRODUCTION TO IOS**                                                                    **9 Hrs.**

Introduction to iPhone, History, Versions, Features, MVC Architecture, View Controller - Building the UI and Event handling, Application life cycle, Tab Bars, Story Boards and Navigation Controllers, Table View, Push Notification, Database handling, Debugging and Deployment, Publishing app in Appstore, sample applications.

**UNIT 5        WINDOWS MOBILE APP DEVELOPMENT**                                                         **9 Hrs.**

Introduction to Windows Phone 8, Application Life cycle, UI Designing and events, Building, Files and Storage, Network Communication, Push Notification, Background Agents, Maps and Locations, Data Access andstorage,Introduction to silvelight and XAML, Running and Debugging the App, Deploying and Publishing.

**Max. 45 Hours**

## TEXT / REFERENCE BOOKS

1. Reto Meier, "Professional Android Application Development", Wrox Edition.
2. http://www.tutorialspoint.com/android/index.htm
3. http://developer.android.com/training/index.html
4. Stephen G. Kochan, "Programming ui COURSE OBJECTIVE C", Addition Wesley, 4th Edition.
5. David Mark, Jack Nutting and Jeff LaMarche, "Beginning iOS 5 Development", Apress Edition.
6. Baijian Yang, Pei Zheng, Lionel M. Ni, "Professional Microsoft Smartphone Programming", Wrox Edition.

## END SEMESTER 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**

| SIT1606 | BIG DATA | L | T | P | Credits | Total Marks |
|---------|----------|---|---|---|---------|-------------|
|         |          | 3 | 0 | 0 | 3 | 100 |

**COURSE OBJECTIVES**

 To understand the dominant software systems and algorithms for coping with Big Data.

 Apply appropriate analytic techniques and tools to analyze big data, create statistical models, and identifyinsights that can lead to actionable results

 To explore the ethical implications of big data research, and particularly as they relate to the web

**UNIT 1      INTRODUCTION                                                                        9 Hrs.**

Introduction to Big Data – Challenges of Conventional Systems - Nature of Data - Small data-Medium data – Big Data – Small data vs Big data - Sources of Big Data- Big Data Characteristics – Big Data Analytics – Importance of Big Data, Big Data in the Enterprise – Big Data Enterprise Model – Building a Big Data Platform -Big data in Social and Behavioral sciences.

**UNIT 2      HDFS, HADOOP AND HADOOP INFRASTRUCTURE                              9 Hrs.**

Hadoop and Databases - Typical Datacenter Architecture - Adding Hadoop to the Mix - Key Benefit -· Flexibility: Complex Data Processing - HDFS - Hadoop Infrastructure -Architecture – Different in Data Model and Computing Model – HDFS Files and Blocks , Components of HDFS - Hadoop framework - HDFS-Map Reduce Framework-Data Loading techniques-Hadoop Cluster Architecture-Hadoop Configuration files-Hadoop Cluster modes-Single Node-Multi Node-Fully distributed node.

**UNIT 3      HADOOP MAP REDUCE FRAMEWORK                                           9 Hrs.**

Relationship between MapReduce and HDFS- Relationship between MapReduce and HDFS- Clients, Data Nodes, and HDFS Storage - MapReduce workloads.

Hadoop framework- Hadoop data types-Hadoop map reduce Paradigm-Map and Reduce Tasks-Map reduce Execution framework-Partitioners and Combiners-Input formats (Input Splits and Records, Text Input, Binary Input, Multiple Inputs)- Output Formats (TextOutput, BinaryOutPut, Multiple Output)- Hadoop Mapreduce programming-Advanced Map reduce concepts- Counters, Custom Writables-Unit testing framework-Error Handling-Tuning- Advanced Map reduce.

**UNIT 4      HADOOP IMPLEMENTATION AND HADOOP ECO SYSTEM TOOLS            9 Hrs.**

Hadoop Implementation - · Job Execution - · Hadoop Data Types - · Job Configurations - · Input and Output Formats ECO system tools- Pig's Data Model, Pig Latin, Developing & Testing Pig Latin Scripts- Writing Evaluation,

Filter, Load & Store Functions-Hive- Hive Architecture- Comparison with Traditional Database- HiveQL: Data Types, Operators and Functions- Hive Tables- Querying Data-Advance Hive, NoSQL Databases -HBase-Loading Data in Hbase-Querying Data in Hbase

**UNIT 5      HADOOP PROJECT ENVIRONMENT                                            9 Hrs.**

HBase: Introduction to HBase, Client API's and their features, Available Client, HBase Architecture, MapReduce Integration. HBase: Advanced Usage, Schema Design, Advance Indexing, Coprocessors, Hadoop 2.0- MRv2 –YARN- NameNode High Availability, HDFS Federation, MRv2, YARN, Running MRv1 in YARN, Upgrade your existing MRv1 code to MRv2, Programming in YARN framework-cover Apache Oozie Workflow Scheduler for Hadoop

**Max. 45 Hours**

**TEXT / REFERENCES BOOKS**

1.   WA Gmob , "Big Data and Hadoop", Kindle Edition, 2013

2.   Eric Miller, "A Overview of Map Reduce and its impact on Distributed Data", Kindle Edition, 2012.

3.   Strata, " Big Data Now", O'Reily Media Inc., Kindle Edition, 2012.

**END SEMESTER 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**

| SIT1609 | GAME PROGRAMMING | L | T | P | Credits | Total Marks |
|---------|------------------|---|---|---|---------|-------------|
|         |                  | 3 | 0 | 0 | 3       | 100         |

## COURSE OBJECTIVES

◻ To provide introductions to event driven programming, game engine scripting, game engine class structures.

◻ Learning to plan and to report on a significant programming project.

◻ Learn to work in programming in teams, and learn to use standard game development environments, inparticular the Unity3d development platform.

**UNIT 1        3D GRAPHICS FOR GAME PROGRAMMING                                      9 Hrs.**

Coordinate Systems, Ray Tracing, Modelling in Game Production, Vertex Processing, Rasterization, Fragment Processing and Output Merging, Illumination and Shaders, Parametric Curves and Surfaces, Shader Models, Image Texturing, Bump Mapping, Advanced Texturing, Character Animation, Physics-based Simulation

**UNIT 2        GAME DESIGN PRINCIPLES                                                9 Hrs.**

Character development, Story Telling, Narration, Game Balancing, Core mechanics, Principles of level design, Genres of Games, Collision Detection, Game Logic, Game AI, Path Finding.

**UNIT 3        GAMING ENGINE DESIGN                                                  9 Hrs.**

Renderers, Software Rendering, Hardware Rendering, and Controller based animation, Spatial Sorting, Levelof detail, collision detection, standard objects, and physics

**UNIT 4        GAMING PLATFORMS AND FRAMEWORKS                                       9 Hrs.**

Flash, DirectX, OpenGL, Java, Python, XNA with Visual Studio, Mobile Gaming for the Android, iOS, Game engines - Adventure Game Studio, DXStudio, Unity.

**UNIT 5        GAME DEVELOPMENT                                                      9 Hrs.**

Developing 2D and 3D interactive games using OpenGL, DirectX – Isometric and Tile Based Games, Puzzle games, Single Player games, Multi-Player games.

**Max. 45 Hours**

## TEXT REFERENCE BOOKS

1. David H. Eberly, "3D Game Engine Design, Second Edition: A Practical Approach to Real-Time Computer Graphics"Morgan Kaufman , 2 Edition, 2006.

2. Jung Hyun Han, "3D Graphics for Game Programming", Chapman and Hal/CRC,1st edition, 2011 .

3. Mike McShaf rfy, "Game Coding Complete", Third Edition, Charles River Media, 2009.

4. Jonathan S. Harbour, "Beginning Game Programming", Course Technology PTR, 3 edition, 2009.

5. Ernest Adams and Andrew Rolings, "Fundamentals of Game Design", Prentice Hall 1st edition, 2006.

## END SEMESTER 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**

| SIT1608 | GREEN COMPUTING | L | T | P | Credits | Total Marks |
|---------|-----------------|---|---|---|---------|-------------|
|         |                 | 3 | 0 | 0 | 3       | 100         |

## COURSE OBJECTIVES

- To study about existing green computing strategies
- fundamental challenges in achieving green operations of computing units
- Assess enterprise-wide and personal computing and computing related energy consumption.

**UNIT 1      GREEN COMPUTING FUNDAMENTALS**                                        **9 Hrs.**

Green IT fundamentals: Business, IT, and the environment – Green computing: Carbon foot print - scoop on power – Green IT strategies: Drivers, Dimensions, and Goals – Environmentally responsible business: Policies, Practices and Metrics.

**UNIT 2      GREEN ASSETS AND MODELING**                                           **9 Hrs.**

Green Assets: Buildings, data centers, networks and devices – Green business process management: Modeling, optimization and collaboration – Green enterprise architecture – Environmental intelligence – Green supply chains – Green information systems: Design and development models.

**UNIT 3      GRID FRAMEWORK**                                                      **9 Hrs.**

Virtualizing of IT systems – Role of electric utilities, telecommuting, teleconferencing and teleporting – Materials recycling – Best ways for green PC – Green data center – Green grid framework

**UNIT 4      GREEN COMPLIANCE**                                                    **9 Hrs.**

Socio-cultural aspects of green IT – Green enterprise transformation roadmap – Green Compliance: protocols, standards and audits –Emergent carbon issues: technologies and future.TheWayClimate SaversComputing Initiative Do - The Climate Savers Computing Initiative - What Green Computing Impact OrganizationSupplies - Green Computers Initiatives - Green Computing Impact Organization Overview - Green Electronics Council -  Going Green Can Be Truly Challenging - The Green Grid Framework -  The CSCI Top Secrets Revealed - The EPEAT Standards - To Have a Green Computer - Green Computing Means to Save Your Money and Your Business - Finances - Green Computing Initiative Platforms.

**UNIT 5      CASE STUDIES**                                                        **9 Hrs.**

The Environmentally Responsible Business Strategies (ERBS) – Case study scenarios for trial runs – Casestudies – Applying green IT strategies and applications to a home, hospital, packaging industry and telecom sector.

**Max. 45 Hours**

## TEXT / REFERENCE BOOKS

1. Bhuvan Unhelkar, "Green IT Strategies and Applications- Using Environmental Intelligence", CRC Press, June 2011.
2. Woody Leonhard, Katherrine Murray, "Green Home computing for dummies", August 2009.
3. Warland & Pravin Varaiya, "High Performance Communication Networks", Jean Harcourt Asia Pvt. Ltd., II Edition, 2001.
4. Jason Harris, "Green Computing and Green IT- Best Practices onregulations & industry", Lulu.com, 2008.
5. Alin Gales, Michael Schaefer, Mike Ebbers, "Green Data Center:steps for the Journey", Shoff/IBM rebook, 2011.
6. John Lamb, "The Greening of IT", Pearson Education, 2009.

## END SEMESTER 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**

| SCS1302 | COMPUTER GRAPHICS AND MULTIMEDIA SYSTEMS | L | T | P | Credits | Total Marks |
|---------|------------------------------------------|---|---|---|---------|-------------|
|         |                                          | 3 | 0 | 0 | 3       | 100         |

## COURSE OBJECTIVES

- To gain knowledge to develop, design and implement two and three dimensional graphical structures
- To enable students to acquire knowledge of Multimedia compression and animations.
- To learn creation, Management and Transmission of Multimedia objects.

**UNIT 1        BASICS OF COMPUTER GRAPHICS                                    9 Hrs.**

Output Primitives: Survey of computer graphics – Overview of graphics systems – Line drawing algorithm – Circle drawing algorithm – Curve drawing algorithm - Attributes of output primitives – Anti-aliasing.

**UNIT 2        2D TRANSFORMATIONS AND VIEWING                                    8 Hrs.**

Basic two dimensional transformations – Other transformations – 2D and 3D viewing – Line clipping – Polygon clipping – Logical classification – Input functions – Interactive picture construction techniques.

**UNIT 3 3D CONCEPTS AND CURVES                                    10 Hrs.**

3D object representation methods - B-REP , sweep representations, Three dimensional transformations. Curve generation - cubic splines, Beziers, blending of curves- other interpolation techniques, Displaying Curves and Surfaces, Shape description requirement, parametric function. Three dimensional concepts.Introduction- Fractals and self similarity- Successive refinement of curves, Koch curve and peano curves.

**UNIT 4        METHODS AND MODELS                                    8 Hrs.**

Visible surface detection methods – Illumination models – Halftone patterns – Dithering techniques – Polygon rendering methods – Ray tracing methods – Color models and color applications.

**UNIT 5 MULTIMEDIA BASICS AND TOOLS                                    10 Hrs.**

Introduction to multimedia - Compression & Decompression – Data & File Format standards – Digital voiceand audio – Video image and animation. Introduction to Photoshop – Workplace – Tools – Navigating window – Importing and exporting images – Operations on Images – resize, crop, and rotate. Introduction to Flash – Elements of flash document – Drawing tools – Flash animations – Importing and exporting - Adding sounds – Publishing flashmovies – Basic action scripts – GoTo, Play, Stop, Tell Target

**Max. 45 Hours**

## TEXT / REFERENCE BOOKS

1. Donald Hearn, Pauline Baker M., "Computer Graphics", 2nd Edition, Prentice Hall, 1994.
2. Tay Vaughan ,"Multimedia", 5th Edition, Tata McGraw Hill, 2001.
3. Ze-Nian Li, Mark S. Drew ,"Fundamentals of Multimedia", Prentice Hall of India, 2004.
4. D. McClelland, L.U.Fuller ,"Photoshop CS2 Bible", Wiley Publishing, 2005.
5. James D. Foley, Andries van Dam, Steven K Feiner, John F. Hughes, "Computer Graphics Principles and Practice, 2nd Edition in C, Audison Wesley, ISBN – 981-235-974-5
6. William M. Newman, Roberet F. Sproull, "Principles of Interactive Computer Graphics", Second Edition, Tata McGraw-Hill Edition.

## END SEMESTER QUESTION PAPER PATTERN

**Max. Marks : 80Exam 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**

# SATHYABAMA
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## SCHOOL OF BIO AND CHEMICAL ENGINEERING

## DEPARTMENT OF BIOTECHNOLOGY

### Board of Studies 2018-2019 (EVEN SEM)

### Minutes of Meeting

Date: 01-12-2018 (Saturday)                                     10.00am-12.00pm

Chair-person  :                    Dr.Ramesh Kumar, Prof and Head

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

                                   **Dr.P.Venkatachalam, External Member**
                                   Professor and Head, Department of Genetics, SRMC

                                   **Dr. Valli Nachiyar C**, Internal member
                                   **Dr. Jayshree Nellore**, Internal member

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

**Item 1**: To discuss on the modifications to the existing regulations (2015) of B.Tech Biotechnology and M.Tech (Biotechnology) to be implemented from 2019-2020.

- External member suggested in reducing the number of credits required for theory and introducing credits for internships and short-term professional courses.

- Dr.Jayshree suggested that the students need to be engaged more on practical's with laboratory assignments.

- Dr.Valli  suggested in Improving the School-Industry Collaboration in Curriculum Development

- External member suggested to introduce Case method teaching to improve student learning,

- The need for updating the Practical syllabus was suggested by Dr.Ramesh

The suggestions were welcomed by the chair person

**Item 2:** To consider and approve the value added courses offered by the Department of Biotechnology

The Department of Biotechnology is offering the following value added courses:

- Introduction To Matlab
- Art Of Scientific Wrting
- Bio Enterprenurship
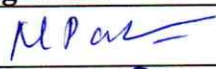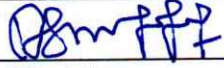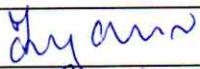- R Programming
- Mushroom Training

The syllabi of the courses were discussed in the Board of Studies of the  Department of Biotechnology and the board has recommended the same for approval.

The detailed syllabi of the value added courses are given in Annexure 1.

The Academic Council  may consider and approve the same.

Resolution:

After discussion the above item was approved.

| External Member | Signature |
|---|---|
| Dr. Parthiban.M | |
| Dr.P.Venkatachalam | |
| **Internal Member** | **Signature** |
| Dr. Jayshree Nellore | |
| Dr.Valli Nachiyar | |
| Dr. Karthick Raja Namasivayam | |

Dr.Ramesh Kumar
(Head of the Department)

# SATHYABAMA

## SCHOOL OF BIO AND CHEMICAL ENGINEERING

### DEPARTMENT OF BIOTECHNOLOGY

## Organizes value added course

## on

# ART OF SUCCESSFUL FOR SCIENTIFIC WRITING

**OBJECTIVES:**                                           **Total: 30 Hrs**

This course teaches students to become more effective writers, using practi
examples and exercises.

## COURSE CONTENT

| Module | Hrs |
|---|---|
| Module 1: Ethics in Research Publication | 6 Hrs |
| Module 2: Writing a Scientific Review Article | 6 Hrs |
| Module 3: How to Write a Scientific research Article | 6 Hrs |
| Module 4: How to Avoid plagiarism | 6 Hrs |
| Module 5: Use of Drawing and Graphical Tools | 6 Hrs |

**Outcomes:**

- Students can get knowledge in scientific review article writing
- Students can get opportunities in E-Publishing Companies

# SATHYABAMA

## SCHOOL OF BIO AND CHEMICAL ENGINEERING

### DEPARTMENT OF BIOTECHNOLOGY

*Organizes value added course*

*on*

# INTRODUCTION TO MATLAB FOR BIOSCIENCE

**OBJECTIVES**                                                                                           **TOTAL: 30 HRS**
- Courses cover the basics of MATLAB, tips, and tricks, and advanced techniques for specialized areas.
- To apply MatLab techniques in bioprocess engineering and computational biology.

**MODULE 1: DESKTOP, VARIABLES, AND DATA TYPES**                                                         **6 HRS**
Introduction to MATLAB, Creating Variables, Some Useful MATLAB Functions, Data Types.

**MODULE 2: BASIC PLOTTING**                                                                             **6 HRS**
Creating simple plots, Adding titles, axis labels, and annotations, Multiple data sets in one plot,
Specifying line styles and colors.

**MODULE 3: GRAPHICS WITH MATLAB**                                                                       **6 HRS**
Basic 2D, 3D plots, Graphic handling

**MODULE 4: PROGRAMMING WITH MATLAB**                                                                    **6 HRS**
Applications of MATLAB Programming

**MODULE 5: MATHEMATICAL COMPUTING WITH MATLAB**                                                         **6HRS**
Algebraic equations, Basic Symbolic Calculus, and Differential equations.

**OUTCOMES:**
- Able to use Matlab for interactive computations.
- Familiar with memory and file management in Matlab.
- Able to generate plots and export this for use in reports and presentations

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**SCHOOL OF BIO AND CHEMICAL ENGINEERING**
**DEPARTMENT OF BIOTECHNOLOGY**

*Organizes value added course on*

## "BIO ENTREPRENEURSHIP"

### OBJECTIVES

- Spirulina cultivation and it's upscaling through economically feasible protocols.
- Identify the factors in the selection of a suitable site for Eucheuma farming and conduct test planting.
- the objective is to compost organic wastes, not for the disposal of solid organic wastes.

### COURSE CONTENT                                    TOTAL : 30 HRS

**Module 1: Spirulina Cultivation:**                                10 Hrs

Growing Conditions of Spirulina, Spirulina Cultivation, and Production, Harvesting of Spirulina, Cost, and Profits in Spirulina Farming.

**Module 2: Seaweed cultivation:**                                10 Hrs

Site selection, installation of test plants, preparation of the farm site, construction of Echeuma farm, management of Eucheuma farm, harvesting, drying, maintenance of the farm.

**Module 3: Vermicomposting:**                                10 Hrs

Introduction, Materials for the preparation of Vermicompost, Vermicompost Production Methodology, Advantages of vermicompost, Pests, and Diseases of vermicompost

### OUTCOMES

- The course will be an attempt to train the interested Students for all aspects of Spirulina, Seaweed, Vermicomposting at small and large scale upscaling, harvesting, drying, and processing.
- Source of income generation either independently or through integrating with progressive farmers and established entrepreneurs.

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## SCHOOL OF BIO AND CHEMICAL ENGINEERING

### DEPARTMENT OF BIOTECHNOLOGY

*Organizes value added course on*

## Mushroom Farming

**OBJECTIVES:**

- To explain and apply the basic skills involved in the cultivation of edible mushrooms.

- To explain the post-harvest process of edible mushroom farming harvesting, packaging, preserving and having basic knowledge of marketing their mushrooms.

**MODULE 1:  Production of Oyster Mushrooms (*Pleurotus Florida*) — 15 Hours**

1. Introduction to edible mushrooms.
2. Substrate Preparation, Sterilization: Boiling, Steam sterilization, chemical sterilization.
3. Oyster mushroom's Spawn Production.
4. Production Process and Maintenance of humidity, temperature, pest management
5. Harvesting and value-added products: Soup preparation, Mushroom powder.

**MODULE 2: Production of Milky Mushrooms (*Calocybe spp*) — 15 Hours**

1. Introduction to Milky mushroom
2. Substrate Preparation, Sterilization: boiling, Steam sterilization, chemical sterilization
3. Milky mushroom's Spawn Production using various substrates
4. Production Process: Spawning and casing
5. Harvesting and value-added products: Soup preparation, Mushroom powder
6. Cost-benefit analysis

**OUTCOMES:**

- Students can start a small-scale industry of Mushroom cultivation.
- Students study the morphology and types of Mushrooms.
- They are aware of the identification of edible and poisonous Mushrooms. Students will be able to produce spawn on their own.

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## SCHOOL OF BIO AND CHEMICAL ENGINEERING

**DEPARTMENT OF BIOTECHNOLOGY**

*Organizes value added course*
*on*

## "R Programming"

### OBJECTIVES

- This course objective is to provide a practical introduction to the R programming language.
- Explore and understand how to use the R documentation.

### COURSE CONTENT                                          TOTAL: 30 HRS

| | |
|---|---|
| Module 1: The R Statistical Programming Language, The RStudio Integrated development environment (IDE) | 6 Hrs |
| Module 2: Data importation methods, Basic R Data Types | 6 Hrs |
| Module 3: Data processing and manipulation techniques. | 6 Hrs |
| Module 4: External add-in packages for R, Summary statistic functions | 6 Hrs |
| Module 5: Data visualizations using ggplot, Error types. | 6 Hrs |

### OUTCOMES

By the end of this course, Students be able to:

- Download and install R and RStudio
- Navigate and optimize the R integrated development environment (IDE) RStudio
- Install and load add-in packages
- Import external data into R for data processing and statistical analysis