**Academic Regulations**

**Course Structure**

**And**

**Detailed syllabus (A-18)**

**For**

**B. Tech Four Year Degree Course – I and II Year**

**In**

BIOTECHNOLOGY

(BT)

(Applicable for the Batches admitted from 2019-20)



Sreenidhi Institute of Science AND Technology

**(An Autonomous Institution approved by Ugc and affiliated to JNTUH)**

Yamnampet, Ghatkesar, R.R.District-501 301. Telangana State

January 2019

**ABOUT THE DEPARTMENT OF BIOTECHNOLOGY**

The Biotechnology Industry harnesses advances in molecular biology, genomics, proteomics, metabolomics, bioinformatics and nanotechnology to move discoveries and ideas out of the laboratory and into the product development pipeline. Biotechnology continues to expand rapidly with new discoveries at a breathtaking pace. This industry, a merger of science and business, demands a multi-disciplinary workforce skilled in basic-research, product development, regulatory affairs and commercialization.

Students of B. Tech. (Biotechnology) learn to advance their careers by broadening their skill base and understanding of this dynamic field. Recognizing this wider impact of biotechnology education and research in the 21st century, and the limitations of the existing programmes elsewhere in India, the University School of Biotechnology at SNIST has placed due emphasis in the curriculum on interdisciplinary convergence in modern biology, engineering and technology, applied orientation, quantitative approach, practical training, awareness of the broader social, economic, environmental, ethical, legal and managerial issues in biotechnology. Some of the distinguishing features of the School include highly qualified faculty, quality laboratory infrastructure for teaching and research, individual projects, good library, etc.

Department of Biotechnology, SNIST offers students the ability to learn, advance and succeed in this exciting field with a variety of learning opportunities designed to meet the needs of working adults.

**Objectives:**

* To provide impetus to the activity of knowledge acquisition and education of students in basic sciences and technological know-how associated with the field of biotechnology, and other relevant areas.
* To focus our teaching and research activities strategically around national economic goals.
* To facilitate comprehensive learning combining the scientific, technological and social aspects.
* To seek new models of collaboration with other institutes, universities and industries.
* To combine academic study and the obtain the thrill of doing Research and development leading to innovation.
* Research on pathogenesis of tuberculosis and prevalence of asthma and transplantation biology is being carried out in Medical biotechnology domain
* Research on toxicity of heavy metals, nano-materials and endocrine disrupting chemicals, antimicrobial peptides using mammalian cell lines and zebra fish is being carried out in Animal and Environmental Biotechnology domain
* Research on Molecular modeling, Drug designing and molecular dynamic simulations of selected disease targets with hands on training using relevant software in bioinformatics domain
* Research on Qualitative and Quantitative analysis of phytochemicals of Indian medicinal plants is being executed in plant biotechnology domain
* Research on Enhancement of lipid content from Microalgal species for biodiesel production along with value added bioproducts and waste water treatment is being carried out in the Bioprocess engineering domain.

**Mission and Vision of the Department**

**VISION**

To emerge as a premier Centre in Biotechnology with scientific pursuits and focusing on human values & professional ethics

**MISSION**

1. Imparting knowledge of the fundamentals of Engineering, Science and Technology in students by providing good academic environment to pursue undergraduate, Post graduate and Doctoral programmes in Biotechnology for a successful professional career

2. Developing liaison with Academia, R & D institutions and Biotechnology Industry for exposure in practical aspects in engineering and solution of the industry oriented and societal problems, entrepreneurial pursuit and project management

3. Inculcating interpersonal skills, team work, professional ethics, IPR and regulatory issues in students to improve their employability in changing global environment

4. Promoting strong research culture in students for life – long learning

**PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)**

1. Graduates will have a strong foundation in fundamentals of mathematics, physical and biological sciences, and engineering sciences, to solve problems in health care, environment, Bioprocess Engineering and food security and successfully pursue higher studies
2. Graduates will have successful professional career by demonstrating good scientific and engineering breadth to comprehend the problems, conduct experiments, analyze the results and design novel products and solutions to the real life problems, promote entrepreneurship and skills in project and finance management
3. Graduates will be trained in biosafety, regulatory and Intellectual Property related issues in broader social context and sustainable development, Professional ethics, communication skills, team work skills, leadership and multidisciplinary approach
4. Graduates will be motivated to achieve academic excellence and pursue research to develop life – long learning in a world of constantly evolving technology

**PROGRAM OUTCOMES (POs) OF B. TECH BIOTECHNOLOGY**

1. **Engineering knowledge:** Apply the knowledge of mathematics, natural sciences, and chemical engineering fundamentals in biotechnology to provide solutions for engineering problems.
2. **Problem analysis:** Identify, formulate, review research literature, and analyze engineering problems in key areas of Biotechnology – bioprocess engineering, plant biotechnology, medical biotechnology and environmental biotechnology.
3. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems**: Use research-based knowledge and research methods in the area of Biotechnology including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools available in Biotechnology and related areas including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication:** Communicate effectively about Biotechnology activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one’s own work, as a member and leader in a team, to finalize technical and financial aspects of a project and to manage in multidisciplinary environments.
12. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological changes through individual/group assignments such as technical seminars, lab projects, group projects, mini and main projects in the area of Biotechnology or in multi disciplinary areas.

**ACADEMIC REGULATIONS**

**FOR B.TECH. REGULAR STUDENTS**

**WITH EFFECT FROM**

**THE ACADEMIC YEAR 2019-20**

**(A-18)**

**1.0 Under-Graduate Degree Programme in Engineering & Technology (E&T)**

**1.1** SNIST offers a 4-year (8 semesters) **Bachelor of Technology** (B.Tech.) degree programme, under Choice Based Credit System (CBCS) with effect from the academic year 2018-19 in the following branches of Engineering.

|  |  |
| --- | --- |
| **Sl. No.** | **Branch** |
|  | Civil Engineering |
|  | Electrical and Electronics Engineering |
|  | Mechanical Engineering |
|  | Electronics and Communication Engineering |
|  | Computer Science and Engineering |
|  | Information Technology |
|  | Electronics and Computer Engineering |

**1.2. Credits (Semester system for I year)**

The existing credit system of giving one credit for a lecture hour/ tutorial hour per week and giving 0.5 credit for every hour of practical and drawing shall be continued in these regulations also.

**2.0 Eligibility for admission**

**2.1** Admission to the Under graduate courses merit rank obtained by graduate programs shall be made either on the basis of the rank of the candidate in entrance test conducted by the Telangana State Government (EAMCET) or the University or on the basis of any other order of merit approved by the University, subject to reservations as prescribed by the government from time to time. However admissions under Management / NRI Category shall be made on the relevant orders issued by Govt. of Telangana from time to time.

**2.2** The medium of instruction for the entire under graduate programme of study in E&T will be **English** only.

**3.0 B.Tech. Programme structure**

**3.1** A student after securing admission shall pursue the under graduate programme in B.Tech. in a minimum period of **four** academic years (8 semesters), and a maximum period of **eight** academic years (16 semesters) starting from the date of commencement of first year first semester, failing which student shall forfeit seat in B.Tech course. However, the student can take two more years for appearing the examinations to clear the backlog subjects.

In the First year it is structured to provide 39 credits and the credits in II , III and IV years should not exceed 127 credits as per AICTE model curriculum for the B.Tech. programme.

Each student shall secure 166 total credits (with CGPA ≥ 5) for the completion of the under graduate programme for the award of the B.Tech. degree. However, any revision made in this regard and approved by the Academic Council of the college by Parent University shall be implemented from the date of the revision.

**3.2 UGC/AICTE** specified definitions/ descriptions are adopted appropriately for various terms and abbreviations stated below.

**3.2.1 Semester scheme**

Each under graduate programme is of 4 academic years (8 semesters) with the academic year being divided into two semesters of 22 weeks ( 90 instructional days) each, each semester having - ‘Continuous Internal Evaluation (CIE)’ and ‘Semester End Examination (SEE)’.

Choice Based Credit System (CBCS) and Credit Based Semester System (CBSS) as indicated curriculum / course structure as suggested by AICTE are followed.

**3.2.2 Credit courses**

* A student in a semester has to earn credits which shall be assigned to each subject/ course in an L: T: P: C (lecture periods: tutorial periods: practical periods: credits) structure based on the following general pattern.
* One credit for one hour/ week offered in the entire semester for theory lecture (L) / Tutorial (T) courses.
* One credit for two hours/ week offered in the entire semester for laboratory/ practical (P) courses.
* The orientation program recommended by AICTE in the model curriculum consisting of courses like Mandatory Induction program for 3 weeks like Physical Activity such as Yoga , Pranayama other games and sports in which the students are interested, Creative Arts , Universal Human Values, Literary, Proficiency Modules ( English and Computer Literacy ) , Lectures by Eminent People, Visits to local Areas and Familiarization to Dept/ Branch & Innovations does not carry any credits.
* However there will be an end examination and will also reflect in the Memo of Marks. The grading will be as follows

|  |  |
| --- | --- |
| **% of Marks Secured in a Subject/Course** | **Letter Grade** |
| Greater than or equal to 90% | O  (Outstanding) |
| 80 and less than 90% | A+  (Excellent) |
| 70 and less than 80% | A  (Very Good) |
| 60 and less than 70% | B+  (Good) |
| 50 and less than 60% | B  (Average) |
| 40 and less than 50% | C  (Pass) |
| Below 40% | F (FAIL) |
| Absent | Ab |

* Other mandatory courses i.e ., Environmental Science, Indian Constitution , Essence of Indian Traditional Knowledge also will not have credits but evaluation will be done as per the above table.

**3.2.3 Subject Course Classification**

All subjects / courses offered for the under graduate programme in E&T (B.Tech. Degree programmes) are broadly classified as follows. The Institution has followed almost all the guidelines issued by AICTE/UGC.

The groups of the subjects shall be as given in the table given hereunder along with the credits suggested by AICTE

|  |  |  |
| --- | --- | --- |
| **Sl.**  **No.** | **Category** | **Suggested Breakup of Credits**  **(Total 160)** |
| 1 | Humanities and social sciences including Management courses | 12\* |
| 2 | Basic Science courses | 25\* |
| 3 | Engineering Science courses including workshop, drawing, basics of electrical / mechanical / computer etc | 24\* |
| 4 | Professional core courses | 48\* |
| 5 | Professional Elective courses relevant to chosen specialization / branch | 18\* |
| 6 | Open Electives from other technical and / or emerging subjects | 18\* |
| 7 | Project work, seminar and internship in industry or elsewhere | 15\* |
| 8 | Mandatory courses (Environmental Sciences, Induction training, Indian constitution, Essence of Indian Traditional Knowledge) | (Non-credit) |
|  | Total | 160\* |

The Academic council of the institution has approved the total number of credits to be 165. The various groups of subjects mentioned above shall have credits suggested above with minor variations.

**4.0 Course registration**

**4.1** A ‘faculty advisor or counselor’ shall be assigned to a group of 20 students, who will advise student about the under graduate programme, its course structure and curriculum, choice/option for Professional and open Electives based on their employment potential / further studies.

**4.2** The student will progress semester after semester as the Institute is following cohort system to satisfying the conditions of promotion to the next semester.

**4.3 In the present system there shall be five subjects in each professional elective stream and three subjects in open elective stream.** A student can opt for a stream of professional/ open electives which should be submitted to the faculty advisor/ Councilor and copy of it to the Examination section through the Head of the department. A copy of it will be retained with the Head of the department/ faculty advisor / councilor and the student.

4.4. **The student can take extra credits and can complete the program in 3 ½ years but original degree will be issued along with his / her batch mates after 4 years.**

**4.5. If a student acquires 20 credits extra than the required credits as per the regulations he will be awarded honors.**

4.6 The purpose of offering Elective Streams in both Professional and Open Electives is to facilitate the students to have a minor specialization based on their interest, so that they will have multi disciplinary exposure. Hence , a student is to take a stream of Electives in either in Professional / Open Elective. He shall not be permitted to opt for other elective subjects in other streams in subsequent semesters.

**4.7** Dropping of Electives may be permitted, only after obtaining prior approval from the faculty advisor / counselor (subject to retaining a minimum of 16 credits), ‘**within a period of 15 days** from the beginning of the current semester.

**5.0 Subjects / courses to be offered**

**5.1** A typical section (or class) nominal strength for each semester shall be 60.

**5.2** A subject / course may be offered to the students, **only if** a minimum of 30 students opt for it. The maximum strength of a section is limited to 80.

**6.0 Attendance requirements:**

**6.1** A student shall be eligible to appear for the semester end examinations, if student acquires a minimum of 75% of attendance in aggregate of all the subjects / courses (excluding attendance in mandatory courses, Internship during II year, NCC / NSO and NSS) for that semester.

**6.2** Shortage of attendance in aggregate upto 10% (65% and above and below 75%) in each semester may be condoned by the college academic committee on genuine and valid grounds, based on the student’s representation with supporting evidence.

**6.3** A stipulated fee shall be payable towards condoning of shortage of attendance.

**6.4** Shortage of attendance below 65% in aggregate shall **NO CASE** be condoned.

**6.5 Students whose shortage of attendance is not condoned in any semester are not eligible to take their end examinations of that semester.**

**They get detained and their registration for that semester shall stand cancelled.**

**They will not be promoted to the next semester.** They may seek re-registration for all those subjects registered in that semester in which student was detained, by seeking re-admission into that semester as and when offered; in case if there are any professional electives and / or open electives, the same may also be re-registered if offered. However, if those electives are not offered in later semesters, then alternate electives may be chosen from the **same** set of elective subjects offered under that category.

6.6 A student fulfilling the attendance requirement in the present semester shall not be eligible for readmission into the same semester.

**7.0 Academic requirements**

The following academic requirements have to be satisfied, in addition to the attendance requirements mentioned in item no.6.

7.1 **A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject / course, if student secures not less than 35% marks (26 out of 75 marks) in the semester end examination, and a minimum of 40% of marks in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together; in terms of letter grades, this implies securing ‘C’ grade or above in that subject / course.**

**7.2** A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to UG mini-project and seminar, if student secures not less than 40% marks (i.e. 40 out of 100 allotted marks) in each of them. The student would be treated as failed, if student

(i) does not submit a report on UG mini-project, or does not make a presentation of the same before the evaluation committee as per schedule, or

(ii) does not present the seminar as required in the IV year I Semester, or

(iii) secures less than 40% marks in UG mini-project/ seminar evaluations.

Student may reappear once for each of the above evaluations, when they are scheduled again; if student fails in such ‘one reappearance’ evaluation also, student has to reappear for the same in the next subsequent semester, as and when it is scheduled.

**7.3 Promotion Rules based upon credits**

|  |  |  |
| --- | --- | --- |
| **S. No.** | **Promotion** | **Conditions to be fulfilled** |
| 1 | First year First Semester to Second Semester | Regular course of study of first year first semester and should have satisfied the minimum requirement of attendance to appear I year I semester. |
| 2 | First year to second year first semester | i. Regular course of study of first year First and second semesters.  ii. Must have secured at least 50% of credits upto first year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not. |
| 3. | II Year I Semester to II Semester | Regular course of study of second year first semester. |
| 4 | Second year to third year first semester | i. Regular course of study of First and second semesters of second year.  ii. Must have secured at least 60% of credits upto second year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not. |
| 5 | Third year first semester to second semester | Regular course of study of third year first semester. |
| 6 | Third year second semester to fourth year first semester | i. Regular course of study of third year second semester.  ii. Must have secured 60% of credits up to third year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not. |
| 7 | Fourth year first semester to fourth year second semester | Regular course of study of fourth year first semester. |

**7.4** A student shall register for all subjects as specified and listed in the course structure, fulfills all the attendance and academic requirements for all credits, ‘earn all credits’ by securing SGPA 5.0 (in each semester) and CGPA (at the end of each successive semester) 5.0 to successfully complete the under graduate programme.

**7.5** After securing total credits as specified for the successful completion of the entire under graduate programme, the student can avail exemption of two subjects i.e upto 6 credits, that is, one open elective and one professional elective subject or two professional elective subjects for optional drop out from total credits earned; resulting total credits specified for under graduate programme performance evaluation, i.e., the performance of the student in these credits shall alone be taken into account for the calculation of ‘the final CGPA of 5.0 (at the end of under graduate programme, which takes the SGPA of the IV year II semester into account)’ , and shall be indicated in the grade card of IV year II semester.

However, the performance of student in the earlier individual semesters, with the corresponding SGPA and CGPA for which grade cards have already been given will not be altered.

**7.6** If a student registers for some more ‘**extra subjects’** (in the parent department or other departments / branches of Engg.) other than those listed subjects as specified in the course structure of his Department, the performances in those ‘ **extra subjects**’ will not be taken into account while calculating the SGPA and CGPA. For such ‘**extra subjects’** registered, Percentage % of marks and letter grade alone will be indicated in the grade card as a performance measure, subject to completion of the attendance and academic requirements as stated in regulations 6 and 7.1 to 7.5 above.

**7.7** A student eligible to appear in the semester end examination for any subject / course, but absent from it or failed (thereby failing to secure **‘C’** grade or above) may reappear for that subject/ course in the supplementary examination as and when conducted. In such cases, CIE assessed earlier for that subject / course will be carried over, and added to the marks obtained in the supplementary examination for evaluating performance in that subject.

**7.8** A student **detained in a semester due to shortage of attendance, may be re-admitted when the same semester is offered in the subsequent academic years for the fulfillment of academic requirements**.

The academic regulations under which student has been readmitted shall be applicable. However, no grade allotments or SGPA / CGPA calculations will be done for the entire semester in which student has been detained.

**7.9** A student detained **due to lack of credits, shall be promoted to the next academic year only after acquiring the required academic credits.**

The academic regulations under which student has been readmitted shall be applicable to him / her.

**8.0 Evaluation - Distribution and weightage of marks**

8.1 The performance of a student in each semester shall be evaluated subject-wise for a maximum of 100 marks for a theory and 100 marks for a practical subject.

In addition, industry-oriented mini-project, group project, Project – I will also be evaluated for 100 marks, Project – II for 200 marks, Technical Seminar and comprehensive viva for 100 marks each.

The continuous internal evaluation for Project – I in IV year I semester shall consist of :

|  |  |  |
| --- | --- | --- |
| **Sl.No** | **Description** | **Marks** |
| 1 | Literature survey and presenting seminar at the end of 6 weeks | 10 marks |
| 2 | Report | 5 marks |
| 3 | Demonstration/presentation at the end of 14 weeks | 10 marks |
| 4 | Total sessional marks | 25 marks |

Semester end examination - 75 marks

Pattern of external evaluation for Project – I

|  |  |  |
| --- | --- | --- |
| **Sl.No** | **Description** | **Marks** |
| 1 | Final report | 15 marks |
| 2 | Presentation | 10 marks |
| 3 | Demonstration/defence of project | 50 marks |
| 4 | Total sessional marks | 75 marks |

The continuous internal evaluation for Project – II in IV year II semester shall consist of :

|  |  |  |
| --- | --- | --- |
| **Sl.No** | **Description** | **Marks** |
| 1 | Progress of Project work and the corresponding interim report as evaluated by Project Review Committee at the end of 6 weeks | 5 marks |
| 2 | Seminar at the end of 6 weeks | 5 marks |
| 3 | Progress of Project work as evaluated by Project Review Committee at the end of 11 weeks | 5 marks |
| 4 | Seminar at the end of 11 weeks | 5 marks |
| 5 | Evaluation by Project Review Committee at the end of 15 weeks | 10 marks |
| 6 | Final Project Report | 5 marks |
| 7 | Final presentation and defence of project | 15 marks |
| 8 | Total | 50 marks |

Division of marks for External Evaluation for project II – 150 Marks

|  |  |  |
| --- | --- | --- |
| **Sl.No** | **Description** | **Marks** |
| 1 | Final Project Report | 30 marks |
| 2 | Presentation | 20 marks |
| 3 | Demonstration / Defense of Project | 100 marks |
| 4 | **TOTAL** | **150 marks** |

8.2 For all the other theory and lab subjects the distribution of marks shall be 25 for Continuous Internal Evaluation (CIE) and 75 for the Semester End-Examination (SEE).

* 1. **Theory Subjects**

**8.3.1 Pattern for Continuous Internal Evaluation ( CIE) 25 marks**

**Subjects except Foreign languages (15+2+3+2=25 Marks)**

The following procedure is to be adopted for awarding internal marks of 25 for all the B. Tech., M. Tech., and MBA students from the Academic Year 2018-19

The distribution of marks for continuous internal evaluation ( 25 marks) is shown below. Average of two Mid Tests will be taken for final award of marks.

1. Part – A of Mid Test will have 10 questions – 5 marks
2. Part – B of Mid Test will have 3 questions (1 from each unit) and student

has to answer 2 questions - 10 marks

1. Assignment – I three questions from each unit – total of 9 questions

to be submitted before first mid test - 2 marks

Similarly assignment – II will be given to be Submitted before II Mid Test

and average of two assignments will be considered.

1. Part – C Mid Test Question Paper Will have 3 questions – One from

each unit taken from assignment questions. Student has to answer

1 question out of 3 questions - 3 marks

1. Attendance - 3 marks
2. Class notes - 2 marks

Three marks are assigned for each theory course for those students who put in attendance in a graded manner as given below:

|  |  |  |
| --- | --- | --- |
| **S.No.** | **Attendance Range** | **Marks Awarded** |
| 1. | 65 % and above but less than 75% | 1 |
| 2. | 75% and above and upto 85% | 2 |
| 3. | More than 85% | 3 |

Marks for attendance shall be added to each subject based on average of attendance of all

subjects put together.

**i) Award of final sessional marks :**  Mid-examination marks, average marks of two assignments, marks for class notes, Attendance, shall be added and the total marks are awarded as final sessional marks towards Continuous Internal Evaluation ( CIE) for 25 marks as detailed below.

|  |  |  |
| --- | --- | --- |
| **S. No** | **Item** | **Marks** |
| 1. | Average of two Mid Tests | 15 |
| 2. | Average of two assignments | 2 |
| 3 | Assignment test in Mid Test paper (Part – C) | 3 |
| 4 | Class Notes | 2 |
| 5 | Attendance | 3 |
|  | **Total** | **25** |

**(ii) Foreign languages**

|  |  |  |
| --- | --- | --- |
| **S. No** | **Item** | **Marks** |
| 1 | 2 written tests (Average of two to be taken) | 12 marks |
| 2 | Oral Comprehension | 04 marks |
| 3 | Assignment & Class notes | 06 marks |
| 4 | Attendance | 03 marks |
|  | **Total marks** | **25 marks** |

**b) Pattern for External Examinations - (75 marks)**

• There shall be external examination in every theory course and its shall consists of two parts (Part-A & Part-B). The total time duration for this semester end examination will be 3 hours.

• **Part-A** shall have 25 marks, which is compulsory. It will have 10 short questions out of which 5 questions are set with 3 marks each and another 5 questions are set with 2 marks each. There shall be atleast one question to each of the six units and the number of questions from any unit shall not exceed two.

• **Part-B** of the question paper shall have essay type questions for 50 marks and shall have 8 questions out of which any 5 are to be answered. At least one question must appear from each Unit. . Seventh question must have 2 to 3 bits taken from 1st, 2nd, and 3rd units and 8th question also with 2 to 3 bits taken from 4th, 5th and 6th units, such that not more than 2 questions shall be from any one unit. All the questions carry equal marks.

**8.4**  **Pattern of Evaluation for Lab subjects** - **(100 marks)**

8.4.1 For practical subjects there shall be a continuous evaluation during the semester for 25 sessional marks and 75 marks for semester end examination. Out of the 25 marks for Continuous Internal Evaluation, the distribution of marks is as follows

|  |  |  |
| --- | --- | --- |
| **S. No** | **Item** | **Marks** |
| 1. | Day to Day work | 05 marks |
| 2. | Final Record and viva | 06 marks |
| 3. | Average of two tests including viva | 05 marks |
| 4. | Lab Based Project Report viva and demo | 06 marks |
| 5. | Attendance | 03 marks |
| **Total** | | **25 marks** |

8.4.2 The semester end examination for 75 marks for the lab subjects shall be conducted by an external examiner and an internal examiner appointed by the Chief Superintendent of Examinations of the college. The marks are distributed as follows:

|  |  |  |
| --- | --- | --- |
| **S. No** | **Item** | **Marks** |
| 1. | Procedure to experiment and Tabulation | 15 marks |
| 2. | Conduct of experiment, observation, Calculation | 30 marks |
| 3. | Results including graphs, discussions and conclusion | 20 marks |
| 4. | Viva voce and Record | 10 marks |
| Total | | 75 marks |

**8.4.3 In case computer based examinations**

|  |  |  |
| --- | --- | --- |
| **S. No** | **Item** | **Marks** |
| 1. | Flow chart and algorithms | 15 marks |
| 2. | Program writing and execution | 30 marks |
| 3. | Result and conclusions | 20 marks |
| 4. | Viva voce and Record | 10 marks |
| Total | | 75 marks |

8.5 **For the subject having design and / or drawing, (such as Engineering Drawing and Machine Drawing), the distribution shall be 25 marks for internal evaluation (10 marks for day-to-day work including drawing, home assignment work, 10 marks for average of two internal tests and 2 marks for class notes 3 marks for attendance) and 75 marks for end semester examination.**

There shall be two internal tests in a Semester and the average of the two shall be considered for the award of marks for internal tests.

Third test facility can be availed as mentioned above (8.3.1 (i) (a) and (b)

**8.6. Technical Seminar (100 marks)**

There shall be a technical seminar evaluated for 100 marks from I year to IV year\*. The evaluation is purely internal and will be conducted as follows:

|  |  |  |
| --- | --- | --- |
| Sl.No | Description | Marks |
| 1 | Literature survey, topic and content | 10 |
| 2 | Presentation including PPT | 15 |
| 3 | Seminar Notes | 10 |
| 4 | Interaction | 05 |
| 5 | Report | 10 |
| 6 | Attendance in the seminar class | 10 |
| 7 | Punctuality in giving seminar as per Scheduled time and date | 10 |
| 8 | Mid Semester Viva (on the seminar topics completed up to the end of 9th week | 10 |
| 9 | End Semester Viva | 20 |
|  | Total | 100 Marks |

Student must secure 40% i.e. 40 marks to be successful

\* According to the syllabus approved by the Academic Council as per Board of studies recommendations

**8.7 Comprehensive Viva-voce (II-II, III-II and IV-II\*)**

There shall be comprehensive viva voce as stated above which will be evaluated for 100 marks. Out of 100 marks, 25 marks are internal and 75 marks are external.

|  |  |  |
| --- | --- | --- |
| S.No. | Description | marks |
| 1 | First mid-sessional viva at the end of 5 weeks (Internal) | 12.5 marks |
| 2 | Second mid-sessional viva at the end of 10 weeks (Internal) | 12.5 marks |
| 3 | Final viva during practical examinations (External) | 75 marks |
| 4 | Total | 100 Marks |

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\* According to the syllabus approved by the Academic Council as per Board of Studies recommendations

**8.7.2** The evaluation of comprehensive viva-voce has to be carried out by two teachers independently and average be taken.

The sessional marks awarded by the Department are not final.

They are subject to scrutiny by a committee constituted by the college and scaling is done wherever necessary.

The recommendations of the Committee are final and binding.

8.8 The laboratory records and internal test papers shall be preserved in the respective departments as per the college norms and shall be produced to the Committee of the college or any external agency like AICTE, NAAC, JNTUH, NBA etc., as and when the same are called for.

**9.0 Grading procedure**

9.1 Marks will be awarded to indicate the performance of student in each theory subject, laboratory / practicals, seminar, UG mini project and UG major project.

Based on the percentage of marks obtained (Continuous Internal Evaluation plus Semester End Examination, both taken together) as specified in item 8 above, a corresponding letter grade shall be given.

**9.2** As a measure of the performance of student, a 10-point absolute grading system using the following letter grades (as per UGC / AICTE guidelines) and corresponding percentage of marks shall be followed:

|  |  |  |
| --- | --- | --- |
| **% of Marks Secured in a Subject / Course**  **(Class Intervals)** | **Letter Grade**  **(UGC Guidelines)** | **Grade Points (GP)** |
| Greater than or equal to 90% | O  (Outstanding) | 10 |
| 80% and less than 90% | A+  (Excellent) | 9 |
| 70% and less than 80% | A  (Very Good) | 8 |
| 60% and less than 70% | B+  (Good) | 7 |
| 50% and less than 60% | B  (Average) | 6 |
| 40% and less than 50% | C  (Pass) | 5 |
| Below 40% | F (FAIL) | 0 |
| Absent | Ab | 0 |

**9.3** A student obtaining ‘**F’** grade in any subject shall be deemed to have ‘**failed’** and is required to reappear as a ‘supplementary student’ in the semester end examination, as and when offered. In such cases, internal marks in those subjects will remain the same as those obtained earlier.

**9.4** A student who has not appeared for examination in any subject, ‘**Ab’** grade will be allocated in that subject, and student shall be considered ‘**failed’**. Student will be required to reappear as a ‘supplementary student’ in the semester end examination, as and when offered.

**9.5** A letter grade does not indicate any specific percentage of marks secured by the student, but it indicates only the range of percentage of marks.

**9.6** A student earns grade point (GP) in each subject / course, on the basis of the letter grade secured in that subject / course. The corresponding ‘credit points’ (CP) are computed by multiplying the grade point with credits for that particular subject/ course.

**Credit points (CP) = grade point (GP) x credits …. For a course**

**9.7** The student passes the subject / course only when **GP is not less than 5 (i.e. ‘C’ grade or above)**

**9.8** The semester grade point average (SGPA) is calculated by dividing the sum of credit points (CP) secured from all subjects / courses registered in a semester, by the total number of credits registered during that semester. SGPA is rounded off to two decimal places. SGPA is thus computed as

SGPA = { Ci Gi } / {  Ci } …. For each semester

**(i.e., upto and inclusive of S semesters, S 2),**

where ‘**N’** is the **total** number of subjects (as specifically required and listed under the course structure of the parent department) the student has ‘**registered’** i.e., from the 1st semester onwards upto and inclusive of the 8th semester, ‘j’ is the subject indicator index (takes into account the subjects from 1 to 8 semesters), CJ is the number of credits allotted to the Jth subjects and Gj represents the grade points (GP) corresponding to the letter grade awarded for that Jth subject.

After registration and completion of the first year first semester, SGPA of that semester itself may be taken as the CGPA, as there are no cumulative effects.

**Illustration of calculation of SGPA**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Course / Subject** | **Credits** | **Letter**  **Grade** | **Grade**  **Points** | **Credit**  **Points** |
| Course 1 | 4 | A | 8 | 4 x 8 = 32 |
| Course 2 | 4 | O | 10 | 4 x 10 = 40 |
| Course 3 | 4 | C | 5 | 4 x 5 = 20 |
| Course 4 | 3 | B | 6 | 3 x 6 = 18 |
| Course 5 | 3 | A+ | 9 | 3 x 9 = 27 |
| Course 6 | 3 | C | 5 | 3 x 5 = 15 |
|  | 21 |  |  | 152 |

SGPA = 152/21 = 7.24

**Illustration of calculation of CGPA:**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Course / Subject** | | **Credits** | **Letter Grade** | **Grade Points** | | **Credit points Points** |
| **I Year I Semester** | | | | | | |
| Course 1 | | 4 | A | 8 | | 4 x 8 = 32 |
| Course 2 | | 4 | A+ | 9 | | 4 x 9 = 36 |
| Course 3 | | 4 | B | 6 | | 4 x 6 = 24 |
| Course 4 | | 3 | O | 10 | | 3 x 10 = 30 |
| Course 5 | | 3 | B+ | 7 | | 3 x 7 = 21 |
| Course 6 | | 3 | A | 8 | | 3 x 8 = 24 |
| **I Year II Semester** | | | | | | |
| Course 7 | 4 | B+ | | 7 | 4 x 7 = 28 |
| Course 8 | 4 | O | | 10 | 4 x 10 = 40 |
| Course 9 | 4 | A | | 8 | 4 x 8 = 32 |
| Course 10 | 3 | B | | 6 | 3 x 6 = 18 |
| Course 11 | 3 | C | | 5 | 3 x 5 = 15 |
| Course 12 | 3 | A+ | | 9 | 3 x 9 = 27 |
| Total Credits | | = 42 |  |  | | Total Credit Points =327 |

CGPA = 327/42 = 7.79

**9.9** For merit ranking or comparison purposes or any other listing, **only** the ‘**rounded off’** values of the CGPAs will be used.

**9.10** For calculations listed in regulations 9.6 to 9.9, performance in failed subjects/ courses (securing **F** grade) will also be taken into account, and the credits of such subjects/courses will also be included in the multiplications and summations.

After passing the failed subject(s) newly secured letter grades will be taken into account for calculation of SGPA and CGPA.

However, mandatory courses will not be taken into consideration.

**10.0 Passing standards**

**10.1** A student shall be declared successful or ‘passed’ in a semester, if student secures a GP ≥ 5 (‘C’ grade or above) in every subject/course in that semester (i.e. when student gets an SGPA 5.00 at the end of that particular semester); and a student shall be declared successful or ‘passed’ in the entire under graduate programme, only when gets a CGPA 5.00 for the award of the degree as required.

**10.2** After the completion of each semester, a grade card or grade sheet (or transcript) shall be issued to all the registered students of that semester, indicating the letter grades and credits earned. It will show the details of the courses registered (course code, title, no. of credits, and grade earned etc.), credits earned, SGPA, and CGPA.

**11.0 Declaration of results**

**11.1** Computation of SGPA and CGPA are done using the procedure listed in 9.6 to 9.9.

**11.2** For final percentage of formula may be used.

**12.0 Award of degree** marks equivalent to the computed final CGPA, the following

**% of Marks = (final CGPA – 0.5) x 10**

**12.1** A student who registers for all the specified subjects/ courses as listed in the course structure and secures the total number of credits (with CGPA >5.0), within 8 academic years from the date of commencement of the first academic year, shall be declared to have ‘**qualified’** for the award of the B.Tech. degree in the chosen branch of Engineering as selected at the time of admission.

**12.2** A student who qualifies for the award of the degree as listed in item 12.1 shall be placed in the following classes.

**12.3** Students with final CGPA (at the end of the under graduate programme) 8.00 and above, and fulfilling the following conditions -

(i) Should have passed all the subjects/courses in ‘**first appearance’** within the first 4 academic years (or 8 sequential semesters) from the date of commencement of first year first semester.

(ii) Should have secured a CGPA 8.00, at the end of each of semesters, starting from first year first semester onwards.

(iii) Should not have been detained or prevented from writing the end semester examinations in any semester due to shortage of attendance or any other reason, shall be placed in **‘FIRST CLASS WITH DISTINCTION’**, otherwise **FIRST CLASS** only.

**12.4** Students with final CGPA (at the end of the under graduate programme) ≥ 7 but ≤ 8.00, shall be placed in ‘**FIRST CLASS’**.

**12.5** Students with final CGPA (at the end of the under graduate programme) ≥ 6 but ≤ 7, shall be placed in ‘**SECOND CLASS’**.

**12.6** All other students who qualify for the award of the degree (as per item 12.1), with final CGPA (at the end of the under graduate programme) ≥ 5 but ≤ 6, shall be placed in ‘**pass class**’.

**12.7** A student with final CGPA (at the end of the under graduate programme) < 5.00 will not be eligible for the award of the degree.

**12.8** Students fulfilling the conditions listed under item 12.3 alone will be eligible for award of ‘**university rank**’ and ‘**gold medal**’.

**13.0 Withholding of results**

**13.1** If the student has not paid the fees to the university / college at any stage, or has dues pending due to any reason whatsoever, or if any case of indiscipline is pending, the result of the student may be withheld, and student will not be allowed to go into the next higher semester. The award or issue of the degree may also be withheld in such cases.

**14.0 Transitory regulations**

**14.1** A student who has discontinued for any reason, or has been detained for want of attendance or lack of required credits as specified, or who has failed after having undergone the degree programme, may be considered eligible for readmission to the same subjects / courses (or equivalent subjects/ courses, as the case may be), and same professional electives / open electives (or from set/category of electives or equivalents suggested, as the case may be) as and when they are offered (within the time-frame of 8 years from the date of commencement of student's first year first semester).

A student admitted in one academic regulation and he is getting readmission in some other academic regulations , the college has to offer substitute / additional subjects based on the comparison of two academic regulations. The details of substitute / additional subjects offered with the recommendations of board of studies of the concerned branch has to be given from time to time.

**15.0 Student transfers**

15.1There shall be no branch transfers after the completion of admission process.

15.2 The students seeking transfer to Sreenidhi Institute of Science and Technology ( SNIST) from various other Universities / institutions have to pass the failed subjects which are equivalent to the subjects of SNIST, and also pass the subjects of SNIST which the students have not studied at the earlier institution.

Further, though the students have passed some of the subjects at the earlier semesters of SNIST, the students have to study substitute subjects in SNIST and get sessional marks by attending 3rd mid test and paying requisite fee as per the rules.

15.3 The transferred students from other Universities/ institutions to SNIST who are on rolls to be provide one chance to write the CBI (internal marks) in the failed subjects and /or subjects not studied as per the clearance letter issued by the Institution.

15.4 The autonomous affiliated colleges have to provide one chance to write the internal examinations in the failed subjects and /or subjects not studied, to the students transferred from other universities / institutions to SNIST who are on rolls, as per the clearance (equivalence) letter issued by the University.

16.0 **Scope**

16.1 The academic regulations should be read as a whole, for the purpose of any interpretation.

16.2 In case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Academic Council is final and binding.

16.3 The Institution may change or amend the academic regulations, course structure or syllabi at any time, and the changes or amendments made shall be applicable to all students with effect from the date notified by the Institution.

**Academic Regulations for B.Tech.**

**(LATERAL ENTRY SCHEME)**

**w.e.f the AY 2019-20**

**1. Eligibility for award of B. Tech. Degree (LES)**

The Lateral Entry Scheme (LES) students after securing admission shall pursue a course of study for not less than three academic years and not more than six academic years failing which he will forfeit the seat.

**2.** The student shall register and secure for all the credits with CGPA ≥ 5 from II year to IV year B.Tech. programme (LES) as per the regulations for the award of B.Tech. degree. **Out of the total credits secured, the student can avail exemption up to 6 credits**, that is, one open elective subject and one professional elective subject or two professional elective subjects resulting in 160 credits for B.Tech programme performance evaluation**.**

**3.** The students, who fail to fulfil the requirement for the award of the degree in six academic years from the year of admission, shall forfeit their seat in B.Tech.

**4.** The attendance requirements of B. Tech. (Regular) shall be applicable to B.Tech. (LES).

**5. Promotion rules based on credits**

|  |  |  |
| --- | --- | --- |
| **S. No** | **Promotion** | **Conditions to be fulfilled** |
| 1 | Second year first semester to second year second semester | Regular course of study of second year first semester. |
| 2 | Second year second semester to third year first semester | (i) Regular course of study of second year second semester.  (ii) Must have secured at least 29 credits  out of 48 credits i.e., 60% of credits up to second year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not. |
| 3 | Third year first semester to third year second semester | Regular course of study of third year first semester. |
| 4 | Third year second semester to fourth year first semester | (i) Regular course of study of third year second semester.  (ii) Must have secured at least 58 credits out of 96 credits i.e., 60% of credits up to third year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not. |
| 5 | Fourth year first semester to fourth year second semester | Regular course of study of fourth year first semester. |

**6.** All the other regulations as applicable to B. Tech. 4-year degree course (Regular) will hold good for B. Tech. (Lateral Entry Scheme).

**MALPRACTICES RULES**

**DISCIPLINARY ACTION FOR / IMPROPER CONDUCT IN EXAMINATIONS**

|  |  |  |
| --- | --- | --- |
|  | **Nature of Malpractice/Improper conduct** | **Punishment** |
|  | If the student: |  |
| 1. (a) | Possesses or keeps accessible in  examination hall, any paper, note book, programmable calculators, cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which student is appearing but has not made use of (material shall include any marks on the body of the student which can be used as an aid in the subject of the examination) | Expulsion from the examination hall and cancellation of the performance in that subject only. |
| (b) | Gives assistance or guidance or receives  it from any other student orally or by any other body language methods or communicates through cell phones with any student or persons in or outside the exam hall in respect of any matter. | Expulsion from the examination hall and cancellation of the performance in that subject only of all the students involved. In case of an outsider, he will be handed over to the police and a case is registered against him. |
| 2. | Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the student is appearing. | Expulsion from the examination hall and  cancellation of the performance in that subject and all other subjects the student has already appeared including practical examinations and UG major project and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year.  The hall ticket of the student is to be cancelled and sent to the university. |
| 3. | Impersonates any other student in connection with the examination. | The student who has impersonated shall be  expelled from examination hall. The student is also debarred and forfeits the seat. The performance of the original student who has been impersonated, shall be cancelled in all the subjects of the examination (including practicals and UG major project) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that semester/year. The student is also debarred for two consecutive semesters from class work and all university examinations. The continuation |

|  |  |  |
| --- | --- | --- |
|  |  | of the course by the student is subject to the  academic regulations in connection with forfeiture of seat. If the imposter is an outsider, he will be handed over to the police and a case is registered against him. |
| 4. | Smuggles in the answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination. | Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the student has already appeared including practical examinations and UG major project and shall not be permitted for the remaining examinations of the subjects of that semester/year. The student is also debarred for two consecutive semesters from class work and all university examinations. The continuation of the course by the student is subject to the academic regulations in connection with forfeiture of seat. |
| 5. | Uses objectionable, abusive or offensive  language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks. | Cancellation of the performance in that subject. |
| 6. | Refuses to obey the orders of the chief  superintendent/assistant – superintendent / any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in-charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the college campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination. | In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that subject and all other subjects the student(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year. The students also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case is registered against them. |

|  |  |  |
| --- | --- | --- |
| 7. | Leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination hall. | Expulsion from the examination hall and  cancellation of performance in that subject and all the other subjects the student has already appeared including practical examinations and UG major project and shall not be permitted for the remaining examinations of the subjects of that semester/year. The student is also debarred for two consecutive semesters from class work and all university examinations. The continuation of the course by the student is subject to the academic regulations in connection with forfeiture of seat. |
| 8. | Possess any lethal weapon or firearm in the examination hall. | Expulsion from the examination hall and  cancellation of the performance in that subject and all other subjects the student has already appeared including practical examinations and UG major project and shall not be permitted for the remaining examinations of the subjects of that semester/year. The student is also debarred and forfeits the seat. |
| 9. | If student of the college, who is not a student for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8. | Student of the colleges expulsion from the  examination hall and cancellation of the performance in that subject and all other subjects the student has already appeared including practical examinations and UG major project and shall not be permitted for the remaining examinations of the subjects of that semester/year. The student is also debarred and forfeits the seat.  Person(s) who do not belong to the college will be handed over to police and, a police case will be registered against them. |
| 10. | Comes in a drunken condition to the examination hall. | Expulsion from the examination hall and  cancellation of the performance in that subject and all other subjects the student has already appeared including practical examinations and UG major project and shall not be permitted for the remaining examinations of the subjects of that semester/year. |
| 11. | Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny. | Cancellation of the performance in that subject  and all other subjects the student has appeared including practical examinations and UG major project of that semester/year examinations. |

12. If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the university for further action to punishment. award suitable

**Malpractices identified by squad or special invigilators**

1. Punishments to the students as per the above guidelines.

2. Punishment for institutions: (if the squad reports that the college is encouraging malpractices)

a. A show cause notice shall be issued to the college. b. Impose a suitable fine on the college.

c. Shifting the examination centre from the college to another college for a specific period of not less than one year.

\* \* \* \* \*

**4 Year Curriculum structure**

**Undergraduate Degree in B. Tech Biotechnology**

**Model Curriculum A18**

**B. Tech. I Year I Semester**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Sl.No.** | **Subject**  **Code** | **Name of the Course** | **L** | **T** | **P** | **C** | **Max. Marks** | |
| **CIE** | **SEE.** |
| 1. | 7HC02 | English (Oral communication skills) | 1 | 0 | 0 | 1 | 25 | 75 |
| 2 | 7HC10 | Fundamentals of Mathematics \* or  Fundamentals of Biology # | 3 | 1 | 0 | 4 | 25 | 75 |
| 7G101 |
| 3 | 7HC03 | Chemistry | 3 | 1 | 0 | 4 | 25 | 75 |
| 4 | 7FC01 | Problem Solving using C | 3 | 0 | 0 | 3 | 25 | 75 |
| 5 | 7BC02 | Engineering Graphics & Design | 1 | 0 | 4 | 3 | 25 | 75 |
| 6. | 7HC62 | English (Oral communication skills) Lab | 0 | 0 | 2 | 1 | 25 | 75 |
| 7 | 7HC63 | Chemistry Lab | 0 | 0 | 3 | 1.5 | 25 | 75 |
| 8 | 7FC71 | Problem Solving using C Lab | 0 | 0 | 3 | 1.5 | 25 | 75 |
| 9 | 7G191 | Technical Seminar – I | 0 | 0 | 2 | 1 | 100 | -- |
|  |  | **Total** | **11** | **2** | **14** | **20** | **300** | **600** |

**Note : All End Examinations (Theory and Practical) are of Three Hours Duration.**

**\* Mandatory for BiPC students; # Mandatory for MPC students**

**L – Lecture T- Tutorial P/D – Practical /Drawing**

**C-Credit CIE – Continuous Internal Evaluation SEE – Semester End Examination**

**Course Code Definitions**

|  |  |  |
| --- | --- | --- |
|  | BS | Basic Science Courses |
|  | ES | Engineering Sciences |
|  | HS | Humanities and Social Sciences including management Courses |
|  | PC | Professional Core |
|  | PE | Professional Elective Courses |
|  | OE | Open Elective Courses |
|  | PS | Project Seminar (Summer Industry Internship, Projects, Comprehensive viva voce, Technical Seminars) |

**4 Year Curriculum structure**

**Undergraduate Degree in B. Tech Biotechnology**

**Model Curriculum A18**

**B. Tech. I Year II Semester**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Sl.No.** | **Subject**  **Code** | **Name of the Course** | **L** | **T** | **P** | **C** | **Max. Marks** | |
| **CIE** | **SEE** |
| **1** | 7HC01 | English ( Reading, Listening and Writing skills) | 1 | 0 | 0 | 1 | 25 | 75 |
| **2** | 7HC11 | Mathematics for Biotechnology – I | 3 | 1 | 0 | 4 | 25 | 75 |
| **3** | 7HC05 | Engineering Physics | 3 | 1 | 0 | 4 | 25 | 75 |
| 4 | 7G202 | Process Engineering Calculations | 3 | 1 | 0 | 4 | 25 | 75 |
| 5 | 7BC01 | Workshop/Manufacturing Practices | 1 | 0 | 0 | 1 | 25 | 75 |
| 6 | 7HC61 | English (Reading, Listening and Writing skills) lab | 0 | 0 | 2 | 1 | 25 | 75 |
| 7 | 7BC61 | Workshop/Manufacturing Practices lab | 0 | 0 | 3 | 1.5 | 25 | 75 |
| 8 | 7HC65 | Engineering Physics lab | 0 | 0 | 2 | 1.5 | 25 | 75 |
| 9 | 7G292 | Technical Seminar – II | 0 | 0 | 2 | 1 | 100 | -- |
|  |  | **Total** | **11** | **3** | **9** | **19** | **300** | **600** |

**4 Year Curriculum structure**

**Undergraduate Degree in B. Tech Biotechnology**

**Model Curriculum A18**

**B. Tech. II Year I Semester**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Sl.No.** | **Subject**  **Code** | **Name of the Course** | **L** | **T** | **P** | **C** | **Max. Marks** | |
| **CIE** | **SEE** |
| **1** | 7G303 | Biochemistry | 3 | - | - | 3 | 25 | 75 |
| **2** | 7G304 | Microbiology | 2 | 1 | - | 3 | 25 | 75 |
| **3** | 7G305 | Cell Biology | 3 | - | - | 3 | 25 | 75 |
| 4 | 7HC14 | Mathematics for Biotechnology-II | 3 | - | - | 3 | 25 | 75 |
| 5 | 7AC48 | Electrical & Electronics Engineering | 2 | 0 | - | 2 | 25 | 75 |
| 6 | 7ZC01 | Management science and Financial Accounting | 2 | 0 | 0 | 2 | 25 | 75 |
| 7 | 7G371 | Biochemistry Lab | - | - | 3 | 1.5 | 25 | 75 |
| 8 | 7G372 | Microbiology and Cell Biology Lab | - | - | 3 | 1.5 | 25 | 75 |
| 9 | **7AC95** | Electrical & Electronics Engineering Lab | - | - | 2 | 1 | 25 | 75 |
| 10 | 7G393 | Technical Seminar -III | - | - | 2 | 1 | 100 | -- |
|  |  | **Total** | **16** | **2** | **10** | **21** | **325** | **675** |

**4 Year Curriculum structure**

**Undergraduate Degree in B. Tech Biotechnology**

**Model Curriculum A18**

**B. Tech. II Year II Semester**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Sl.No.** | **Subject**  **Code** | **Name of the Course** | **L** | **T** | **P** | **C** | **Max. Marks** | |
| **CIE** | **SEE** |
| **1** | 7G406 | Genetics and Molecular Biology | 3 | - | - | 3 | 25 | 75 |
| **2** | 7BC04 | Elements of Mechanical Engineering | 3 | - | - | 3 | 25 | 75 |
| **3** | 7G407 | Thermodynamics for Biotechnologists | 2 | 1 | - | 3 | 25 | 75 |
| 4 | 7G408 | Analytical Techniques in Biotechnology | 3 | - | - | 3 | 25 | 75 |
| 5 | 7G409 | Bioprocess Engineering | 2 | 1 | - | 3 | 25 | 75 |
| 6 | 7HC15 | Probability Theory & Statistics | 2 | 0 | - | 2 | 25 | 75 |
| 7 | 7G473 | Analytical Techniques in Biotechnology Lab | - | - | 3 | 1.5 | 25 | 75 |
| 8 | 7G474 | Bioprocess Engineering Lab | - | - | 3 | 1.5 | 25 | 75 |
| 9 | 7G494 | Technical Seminar -IV | - | - | 2 | 1 | 100 | -- |
| 10 | 7G475 | Comprehensive Viva-voce - I | - | - | 2 | 1 | 25 | 75 |
| 11 |  | Summer Industry Internship – I (evaluation will be done along with III/I subjects) | | | | | | |
|  |  | **Total** | **17** | **1** | **9** | **22** | **325** | **675** |

**4 Year Curriculum structure**

**Undergraduate Degree in B. Tech Biotechnology**

**Proposed Model Curriculum R18**

**B. Tech. III Year I Semester (A18)**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Sl.No.** | **Course Category** | **Dept Course** | **Name of the Course** | **L** | **T** | **P** | **C** | **Max. Marks** | |
| **CIE** | **SEE** |
| **1** | PC | BT | Genetic Engineering | 3 | 1 | - | 4 | 25 | 75 |
| **2** | ES | BT | Momentum and Heat Transfer | 3 | - | - | 3 | 25 | 75 |
| **3** | PC | BT | Bioinformatics | 3 | - | - | 3 | 25 | 75 |
| 4 | PC | BT | Biochemical Reaction Engineering | 3 | 1 | - | 4 | 25 | 75 |
| 5 | PE | BT | **Professional Elective-I** | 3 | - | - | 3 | 25 | 75 |
| 6 | OE | CSE | **Open Elective – I** | 2 | - | - | 2 | 25 | 75 |
| 7 | BS | BT | Quantitative Aptitude | - | - | 2 | 1 | 25 | 75 |
| 8 | HS | BT | Soft Skills | - | - | 2 | 1 | 25 | 75 |
| 9 | PC | BT | Bioinformatics Lab | - | - | 3 | 1.5 | 25 | 75 |
| 10 | PC | BT | Molecular Biology and Genetic Engineering Lab | - | - | 3 | 1.5 | 25 | 75 |
| **11** | PS | BT | Group Project | - | - | 2 | 1 | 25 | 75 |
| **12** | PS | BT | Summer Industry Internship-I | - | - | - | 1 | 25 | 75 |
|  |  |  | Total | **17** | **2** | **12** | **26** | **300** | **900** |

**4 Year Curriculum structure**

**Undergraduate Degree in B. Tech Biotechnology**

**Proposed Model Curriculum R18**

**B. Tech. III Year II Semester (A18)**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Sl.No.** | **Course Category** | **Dept Course** | **Name of the Course** | **L** | **T** | **P** | **C** | **Max. Marks** | |
| **CIE** | **SEE** |
| **1** | PC | BT | Plant Biotechnology | 3 | 1 | - | 4 | 25 | 75 |
| **2** | PC | BT | Immunology | 3 | - | - | 3 | 25 | 75 |
| **3** | PC | BT | Mass Transfer and Separations | 3 | 1 | - | 4 | 25 | 75 |
| 4 | PC | BT | **Professional Elective-II** | 3 | - | - | 3 | 25 | 75 |
| 5 | PE | BT | **Professional Elective-III** | 3 | - | - | 3 | 25 | 75 |
| 6 | PE | BT | **Open Elective-II** | 2 | - | - | 2 | 25 | 75 |
| 7 | BS | BT | Logical Reasoning | - | - | 2 | 1 | 25 | 75 |
| 8 | HS | BT | Plant Biotechnology Lab | - | - | 3 | 1.5 | 25 | 75 |
| 9 | PC | BT | Immunology lab | - | - | 3 | 1.5 | 25 | 75 |
| 10 | PS | BT | Comprehensive Viva Voce-II | - | - | 2 | 1 | 25 | 75 |
| **11** | PS | BT | Summer Industry Internship –II  (Evaluation will be done along with IV /I subjects ) | | | | | | |
|  |  |  | Total | **17** | **2** | **10** | **24** | **250** | **750** |

**4 Year Curriculum structure**

**Undergraduate Degree in B. Tech Biotechnology**

**Proposed Model Curriculum R18**

**B. Tech. IV Year I Semester (A18)**

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| **Sl.No.** | **Course Category** | **Dept Course** | **Name of the Course** | **L** | **T** | **P** | **C** | **Max. Marks** | |
| **CIE** | **SEE** |
| 1 | PC | BT | Industrial Biotechnology | 3 | 1 | - | 4 | 25 | 75 |
| 2 | PC | BT | Downstream Processing | 3 | 1 | - | 4 | 25 | 75 |
| 3 | PC | BT | Animal Biotechnology | 3 | 1 | - | 4 | 25 | 75 |
| 4 | PE | BT | **Professional Elective-IV** | 3 | - | - | 3 | 25 | 75 |
| 5 | PE | BT | **Open Elective -III** | 2 | - | - | 2 | 25 | 75 |
| 6 | BS | BT | Downstream Processing Lab | - | - | 3 | 1.5 | 25 | 75 |
| 7 | HS | BT | Animal Biotechnology Lab | - | - | 3 | 1.5 | 25 | 75 |
| 8 | PC | BT | Project - I | - | - | 2 | 1 | 25 | 75 |
| 9 | PS | BT | Evaluation of Summer Industry Internship – II | - | - | - | 1 | 25 | 75 |
|  |  |  | Total | **14** | **3** | **8** | **22** | **225** | **675** |

**4 Year Curriculum structure**

**Undergraduate Degree in B. Tech Biotechnology**

**Proposed Model Curriculum R18**

**B. Tech. IV Year II Semester (A18)**

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| **Sl.No.** | **Course Category** | **Dept Course** | **Name of the Course** | **L** | **T** | **P** | **C** | **Max. Marks** | |
| **CIE** | **SEE** |
| **1** | PC | BT | Bioethics, Biosafety & IPR | 3 | - | - | 3 | 25 | 75 |
| **2** | PC | BT | **Professional Elective – V** | 3 | - | - | 3 | 25 | 75 |
| **3** | PC | BT | Project - II | - | - | 12 | 6 | 50 | 150 |
|  |  |  | Total | **6** | **0** | **12** | **12** | **100** | **300** |

**4 Year Curriculum structure**

**Undergraduate Degree in B. Tech Biotechnology**

**Proposed Model Curriculum A18**

**List of Open Electives (A18)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Minor Stream** | **Open Elective –I**  **(3/1sem)** | **Open Elective – II (3/2 sem)** | **Open Elective –III**  **(4/1 sem)** |
| **Computer stream -1** | Data Base Systems (DBS) | Python Programming | Data Analytics |
| **Entrepreneurship Stream** | Basics of Entrepreneurship | Innovations and Design Thinking | Advanced Entrepreneurship |
| **Finance Stream** | Banking Operations, Insurance and Risk Management | Entrepreneurship Project Management and Structured Finance | Financial Institutions, Markets and Services |
| **Technology Entrepreneurship** | Product and Services | Innovations and Design Thinking | General Management and Entrepreneurship |

**List of Professional Electives (A18)**

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| --- | --- | --- | --- | --- | --- |
| **Professional Elective Streams** | **Professional Elective – I**  **(3-1)** | **Professional Elective – II**  **(3-1)** | **Professional Elective – III**  **(3-2)** | **Professional Elective – IV**  **(3-2)** | **Professional Elective – V**  **(4-1)** |
| Medical Biotechnology | Molecular Pathogenesis | Molecular Toxicology | Applied Virology | Cancer Biology | Clinical Trials & Regulatory Affairs |
| Plant Biotechnology | Plant Metabolic Engineering | Phytochemicals & Herbal medicine | Food Biotechnology | Molecular Markers and crop Improvement | Biopharmaceutical technology |
| Environmental Biotechnology | Environmental Biotechnology | Green Manufacturing Technology | Enzyme Engineering | Environmental Impact Assessment | Bioremediation and Metagenomics |
| Bioprocess Engineering | Instrumentation and Bioprocess control | Optimization and numerical methods in biotechnology | Advanced Bioprocess Control | Bioprocess economics and plant design | Advanced Mass transfer separations |
| Nanobiotechnology | Nanomaterials synthesis and characterization | Biosensors and Bioelectronics | Nanomaterials in medical applications | Nanotoxicology | Nanoelectronics MEMS and NEMS |

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**Syllabus for B. Tech I Year I semester**

**ENGLISH (Oral Communication Skills)**

**Course code: 7HC02 L T P C**

**1 0 0 1**

Course Objectives : The course will develop the students’ ability to

* integrate listening and speaking skills
* communicate effectively
* speak effectively on a given topic
* master the art of presentation
* interact with peers in a group discussion
* get exposed to face interviews

**Course Outcomes :** After completing the course students will be able to

* understand, analyze and respond to the audience by listening effectively
* acquire the articulation of different types of sentences by practicing pause patterns and question tags.
* translate and demonstrate self, participate effectively in activities like JAM, extempore
* express and deliver a presentation on the given topic through role plays and situational dialogues
* implement English language to meet the standards of corporate and real world in a group.
* present and communicate effectively by facing mock interviews by experts from industry and academy.

**Unit-I : Listening Skills**

* 1. Integrating Listening, Reading and Speaking

1.2Introduction Integrated Speaking Skills

**Unit-II: Oral Communication Skills -I**

2.1 Types of Sentences – Assertive, Interrogative, Imperative and Exclamatory

2.2 Difference between Pauses, Gaps

2.3 Question Tags

2.4 Introduction and Greetings

2.5 Asking and Giving Directions

**Unit-III: Oral Communication Skills -II**

3.1 Speaking on a particular topic

3.2 Content development using cohesive devices

3.3 Common Errors in Spoken English

**Unit-IV: Presentation skills**

4.1Introduction to Presentation Skills

4.2 Role Plays & Situational Dialogues

**Unit-V : Group Discussion**

5.1 Importance of Group Discussion

5.2 Do’s and Don’ts of Group Discussion

**Unit-VI: Interview Skills**

6.1 Introduction to Interview Skills

* 1. Types of Interviews
  2. Pre-Interview Preparation
  3. Interview Etiquette (Non-Verbal)

**Suggested Readings:**

1. *Step by step learning language and life skills* by Niruparani, Jayasree Mohanraj, Indira, Sailakshmi Pearson Publishers
2. *Communication skills for technical students* by TM Farhathullah, Orient Black swan Publications
3. *English for technical Communication* by K.R. Lakshmi Narayan , Scitech Publications
4. *Practical English Usage.* Michael Swan. OUP. 1995.
5. *Communication Skills*. Sanjay Kumar and Pushp Lata. Oxford University Press. 2011.
6. *Exercises in Spoken English.* Parts. I-III. CIEFL, Hyderabad. Oxford University Press

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(An Autonomous Institution approved by UGC and ‘A’ Grade Awarded by NAAC)

**Sreenidhi Institute of Science & Technology**

(An Autonomous Institution approved by UGC and ‘A’ Grade Awarded by NAAC)

**I Year B.Tech, Semester-I FUNDAMENTALS OF MATHEMATICS L T P/D C**

**Code:** 7Hc10  **(For Bio-Technology) 3**  1 **0 4**

**Pre Requisites**: Nil

***Course Objectives:*** *To learn 11th and 12th standard mathematics syllabus by the students who were not studied Mathematics subject at 10+2 level. The contents expected to learn in this course are*

1. *Trigonometry, partial fractions and about series concepts in algebra also measures of dispersion.*
2. *Matrix theory and its applications to find the solutions of linear systems also the concepts of vector algebra.*
3. *Coordinate geometry concepts such as straight lines, circles and conic sections.*
4. *Basic concepts of differential calculus such as limit continuity and differentiability of a function.*
5. *The concepts of integral calculus such as evaluation of integration of a function and definite integrals.*
6. *First order and first degree Ordinary Differential equations.*

***Syllabus***

***UNIT-I***

**Trigonometry:** Trigonometric Ratios of Compound angles, multiple and Sub-multiple Angles, Transformations.

**Algebra:** Partial fractions, exponential and logarithmic series.

**Statistics:** Measures of dispersion.

***UNIT-II***

**Matrices:** Types of matrices, Elementary transformations, Adjoint and inverse of a matrix, Solutions of simultaneous linear equations in two and three variables, Cramer’s method & Matrix inversion method.

**Vector Algebra:** Addition of vectors and multiplication of vectors.

***UNIT-III***

**Coordinate Geometry: Straight lines-** Equation of straight line in different forms. Angle between two lines, Concurrent lines. Circles, **Conics-** parabola, ellipse and hyperbola.

**(PTO)**

***UNIT-IV***

**Limit Continuity and Differentiability:** Limit of a function, standard limits, continuity and discontinuity of a function, derivative of a function, methods of differentiation. Geometrical interpretation of a derivative, Length of tangent, sub-tangent, Normal and Sub-normal, Maxima and minima.

***UNIT –V***

**Integral Calculus:** Integration as the reverse process of differentiation –standard forms**,** Methods of integration**,** Integration by parts, Basic properties of definite integrals (with out proofs) and evaluation of

definite integrals, reduction formulae.

***UNIT-VI***

**Differential Equations:** Definition, order and degree, formation of ordinary differential equation, solution of first order first degree differential equations- variable separable method-homogeneous differential equation.

**TEXT BOOKS:**

1. Differential Calculus, Shanti Narayan & P.K.Mittal, S.Chand Publications.

2. Integral Calculus, Shanti Narayan & P.K.Mittal, S.Chand Publications.

3. CBSE Mathematics for Class XI & XII, Dinesh Khattar and Anita Khattar, P H I Publications.

***Course Outcomes:*** *Students will able to*

1. *Solve the problems of Trigonometry, partial fractions and exponential and logarithmic series.*
2. *Identify the importance of matrices and they can apply it to solve the linear systems.*
3. *Solve the problems of 2D geometry.*
4. *Evaluate the limits and test the continuity of a function and also able to find the derivatives of a functions.*
5. *Solve the problems on integration.*

*Solve the differential equations using the analytical methods mentioned the syllabus*

**I Year I Semester SYLLABUS FOR B. TECH - BIOTECHNOLOGY**

**FUNDAMENTALS OF BIOLOGY**

**(FOR MPC STUDENTS)**

**Code: 7G101**

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**L T P/D C**

**3 2 -- 3**

**Course Objective:**

To understand why it is important to have a good working knowledge of biology and to develop a substantive knowledge of other fields of biology, how they relate to biotechnology and understand the impact of biotechnology on society.

**COURSE OUTCOMES**

1. Ability to apply the knowledge of biology to evaluate the effects of bacteria, viruses and protozoan on human health.

2. Ability to distinguish major plant phyla and analyze algae, mosses, ferns, gymnosperms and angiosperms

3. Ability to distinguish the major animal phyla and evaluate the effects of protozoans and helminthes on human health.

4. Ability to understand the functional inter relationships of the structures of all the organ systems and analyze their functional inter-relationships.

5. Ability to understand the functional inter relationships of the structures of all the organ systems and analyze their functional inter-relationships

6. Gain an understanding of various stages of development and the importance of teratology

**UNIT I**: Introduction to Biology

Origin of life, Diversity in biological systems, Kingdom systems of classification, General characters, brief account on ecology, morphology, nutrition, locomotion and reproduction, useful and harmful effects of Bacteria, Viruses, Algae, Fungi and Protozoans

**UNIT II:** Biology of Plants

Classification of Plant Kingdom, Concepts of Growth, Meristems, Development of different plant organs; Plant Growth Regulators; Economic Importance of Plants, Biology of Pests in relation to Rice, Cotton, Sugarcane and Groundnut, Photosynthesis – overview

**UNIT III:** Biology of Animals

Classification of Animal Kingdom, General Characters of Chordates and Non-chordates, Protozoan Parasites (Plasmodium, Entamoeba histolytica), Helminth parasites (Taenia solium, Ascaris)

**UNIT IV**: Human Biology I

Introduction to human body, Structure and function of Digestive, Respiratory, And Circulatory systems.

**UNIT V**: Human Biology II

Structure and function of Nervous, Endocrine, Excretory and Reproductive systems

**UNIT VI**: Developmental Biology

Gametogenesis, fertilization, gastrulation, Cleavage, organogenesis, and teratology.

**TEXT BOOKS:**

Introduction To Biology And Biotechnology by Vaidyanath K. , K. Patrap Reddy, BS publications, Second Edition

Basic Biotechnology, Second Edition, by Colin Ratledge and Bjorn Kristiansen, Cambridge University Press.

**REFERENCES**

Dr. C.C. Chatterjee, Human Physiology (11th Edition) Vol I and II, Medical Allied Agency, Kolkata, 1987.

H.G. Rehm and G. Reed, Biotechnology Volume I & 2

**COURSE OUTCOMES**

1. Ability to apply the knowledge of biology to evaluate the effects of bacteria, viruses and protozoan on human health.

2. Ability to distinguish major plant phyla and analyze algae, mosses, ferns, gymnosperms and angiosperms

3. Ability to distinguish the major animal phyla and evaluate the effects of protozoans and helminthes on human health.

4. Ability to understand the functional inter relationships of the structures of all the organ systems and analyze their functional inter-relationships.

5. Ability to understand the functional inter relationships of the structures of all the organ systems and analyze their functional inter-relationships

6. Gain an understanding of various stages of development and the importance of teratology

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**Syllabus for B. Tech I Year I semester**

**CHEMISTRY**

**(Common to all branches)**

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**Code: 7HC03**

**Course Objectives**:

* To understand microscopic chemistry in terms of atomic and molecular orbitals
* To learn the preparation and applications of commercial and conducting polymers and lubricant materials
* To learn the industrial problems caused by water and municipal water treatment
* To acquire knowledge about different types of batteries and their working mechanism
* To develop the concepts and types of corrosion and the factors influence corrosion and to understand the control methods and protective coatings for metals
* To learn the chemical reactions of drugs that are used in the synthesis of drug molecules

**Course Outcomes**

After completion of the course, the student will be able to:

1. Understand and analyse microscopic chemistry in terms of atomic orbitals, molecular orbitals and intermolecular forces.
2. Identify and differentiate conductivity of polymers, thermoplastic, thermosetting plastics and various lubricants.
3. Recognize and select the domestic and industrial problems caused by hard water and also learn about the municipal water treatment using various methods.
4. Understand and interpret the important fundamental concepts of electrochemistry and solve the problems related to batteries.
5. Differentiate the types of corrosion and methods used to prevent the corrosion.
6. Learn and implement synthesis of drug molecules and learn fundamentals of analytical techniques like electronic, vibrational and rotational spectroscopy.

**UNIT - I**

**Atomic and molecular structure (6L)**

Molecular orbitals of diatomic molecules and plots of the multicentre orbitals. Equations for atomic and molecular orbitals. Energy level diagrams of diatomics. Pi-molecular orbitals of butadiene and benzene and aromaticity. Crystal field theory and the energy level diagrams for transition metal ions and their magnetic properties. Band structure of solids and the role of doping on band structures.

**UNIT - II**

**Engineering materials (8L)**

**Plastics** – Thermosetting and Thermoplastics, preparation, properties and engineering applications of plastics: PVC, Teflon, Bakelite. **Fibers:** Nylon 6,6 and Dacron.

**Rubbers** – natural and artificial rubber, vulcanization of natural rubber, Buna-S, Buna-N and their **engineering applications.**

**Lubricants**

Definition, classification and function of lubricants, Types of lubrication and mechanisms – Thick Film or Hydrodynamic Lubrication, Thin Film or Boundary Lubrication, Extreme Pressure Lubrication. Classification and properties of lubricants – Viscosity, flash and fire point, cloud and pour point and acid value. **Engineering applications.**

**UNIT - III**

**Water Technology (8L)**

1. **Introduction**:- Hardness of water – types of hardness (temporary and permanent), calculation of hardness- Numerical problems. Estimation of hardness of water by EDTA Method.
2. **Water for Industrial purpose**: Food, sugar, textile, paper and pharma industries, water for steam making characteristics of boiler feed water, boiler troubles- scale and sludge & Carry over (priming &foaming),boiler corrosion, caustic embrittlement.
3. **Water Treatment**: Internal conditioning- phosphate, carbonate & calgon conditioning. External Treatment: Ion-exchange process. Desalination-reverse osmosis. Municipal water treatment-sedimentation, coagulation, filtration, disinfection-chlorination, ozonization. **Engineering applications: Methodology and working of mineral water plant for drinking purpose.**

**UNIT - IV**

**Electrochemistry (8L)**

Conductance – conductors (metallic and electrolytic), types of conductance – specific, equivalent and molar conductance – effect of dilution on conductance.

Free energy and emf, cell potentials, electrode potential (oxidation and reduction). Types of electrodes - redox electrode (quinhydrode electrode), metal – metal insoluble salt electrode and Ion selective electrode. Cell notation and cell reaction –Nernst equation and applications. **Engineering Applications.**

**Batteries** : Types of batteries

1. Primary batteries – Lechalanche cell (dry cell), Lithium cell
2. Secondary batteries(Accumulators) – Lead acid battery, Lithium-ion battery
3. Fuel cells- H2 – O2 fuel cell and MeOH-O2 fuel cell-advantages and applications.

**Engineering applications – future water powered car, Hydrogen production and storage**.

**UNIT - V**

**Corrosion and its prevention (7L)**

Corrosion – basic concepts –types of corrosion, chemical, electrochemical corrosion (absorption of O2 and evolution of H2). Types of electrochemical corrosion – galvanic corrosion, pitting corrosion- factors affecting the rate of corrosion.

**Cathodic protection** – sacrificial anodic protection and impressed current cathodic protection method. Methods of metallic coatings-hot dipping (**tinning and galvanizing**), metal cladding (**Al cladding**), electroplating (**copper plating**) and electroless plating (**nickel plating**).

**UNIT-VI**

**Organic reactions and drug molecules (5L)**

Introduction : reactions involving substitution(SN1, SN2) addition to double bond(C=C), elimination(E1 and E2), oxidation (using KMnO4, CrO3), reduction (Hydrogenation by Ni/H2, Pd/C)

**Drugs :** Definition, classification structure and applications of commonly used drug molecules- paracetamol, aspirin, ibuprofen and diphenhydramine (Benadryl)

Principles of spectroscopy and selection rules: Electronic spectroscopy. Fluorescence and its applications in medicine. Vibrational and rotational spectroscopy of diatomic molecules-**Applications**.

**TEXT BOOKS:**

1. Engineering Chemistry: by Jain & Jain ,Dhanapathrai Publications (2015)
2. Engineering Chemistry: by Thirumala Chary & Laxminarayana, Scitech Publications (2016)
3. Engineering Chemistry: by & B.Rama Devi, Prsanta Rath & Ch. Venkata Ramana Reddy, Cengage Publications (2016)

**REFERENCE BOOKS:**

1. Fundamentals of Molecular Spectroscopy by C. N. Banwell
2. Drugs by David Krupadanam- Universities Press
3. University chemistry by B. H. Mahan
4. Chemistry: Principles and Applications, by M. J. Sienko and R. A. Plane
5. Organic Chemistry: Structure and Function by K. P. C. Volhardt and N. E. Schore, 5th Edition http://bcs.whfreeman.com/vollhardtschore5e/default.asp

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**Syllabus for B. Tech I Year I semester**

**PROBLEM SOLVING USING C**

**(Common to all branches)**

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**Code: 7FC01**

**Course Outcomes:**

**After completion of this course student will learn**

1. To formulate simple algorithms for arithmetic, logical problems and to translate the algorithms to programs(in C language)
2. To test and execute the programs and correct syntax and logical errors, to implement conditional branching, iteration and recursion
3. To decompose a problem into functions and synthesize a complete program using divide and conquer approach.
4. To use arrays, pointers and structures to formulate algorithms and programs.
5. To apply programming to solve matrix addition and multiplication problems and searching and sorting problems.
6. To apply programming to solve simple numerical method problems, namely rot finding of function, differentiation of function and simple integration.

**UNIT I**

**Introduction to Programming:** Introduction to components of a computer system (disks, memory, processor, where a program is stored and executed, operating system, compilers etc.)

**Idea of Algorithm:** steps to solve logical and numerical problems. Representation of Algorithm: Flowchart/Pseudocode with examples.

From algorithms to programs; source code, variables (with data types) variables and memory locations, Syntax and Logical Errors in compilation, object and executable code

**UNIT II**

**History of C language, Characteristics of C language, Structure of C Language, C Tokens**

Arithmetic expressions, Operator Precedence & **Associativity**

Conditional Branching and Loops

Writing and evaluation of conditionals and consequent branching and **Jumping Constructs**

**Pretest and Post test**, Iteration and loops (3 lectures)

**UNIT III**

**Function:** Functions (including using built in libraries), Parameter passing in functions, call by value, passing arrays to functions: idea of call by reference, **Storage Classes**

**Recursion:** Recursion, as a different way of solving problems. Example programs, such as Finding Factorial, Fibonacci series, Ackerman function etc.

**UNIT IV**

**Arrays:** Arrays (1-D, 2-D), Character arrays **Ragged Arrays and Dynamic Arrays**

Basic Algorithms Searching, Basic Sorting Algorithms (Bubble, Insertion and Selection), Finding roots of equations, notion of order of complexity through example programs (no formal definition required) Quick sort or Merge sort.

**UNIT V**

Pointers Idea of pointers, Defining pointers, Use of Pointers in self-referential structures, notation of linked list (no implementation) **Dynamic Memory allocation Functions**.

**Strings:** **String Handling Functions.**

**UNIT IV**

Structure: Structures, Defining structures and Array of Structures,

**Nested Structures enum, typedef**

File handling (only if time is available, otherwise should be done as part of the lab)

**File Handling Functions, File Modes, File Operations**

**Suggested Text Books**

1. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill
2. E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill Suggested

**Reference Books**

Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India

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**Syllabus for B. Tech I Year I semester**

**ENGINEERING GRAPHICS & DESIGN**

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**Code: 7BC02**

**Course objectives:**

1: To teach students the basic principles of Engineering graphics and instruments used

2: To introduce the concept of projections in drawing and its applications for simple drawing entities

3: To impart the knowledge of various types of solids and their projections in different position wrt principle planes

4: To teach the concept of sections of solids and their applications

5: To develop a clear understanding of the basic principles involved in three dimensional Engineering drawings.

6: To train the students for the extraction of multiple views from a solid model using AutoCAD

**Course outcomes**

After completing this course, the student will able to:

1. Get familiar to use the instruments to solve the engineering problem and draw various type of curves used in engineering
2. Understand and Implement Orthographic projections and draw projections of simple drawing entities such as points Lines, and Planes
3. Draw projections of different types of regular solids in various positions wrt principal planes of projection
4. Draw Sections of various Solids including Cylinders, cones, prisms and pyramids and draw the developments of these solids and their sections.
5. Construct Isometric Scale, Isometric Projections and Views and convert 3D views to 2D orthographic views
6. Understand from basic sketching through 2D and 3-D solid modeling using computer aided design (CAD) software

**UNIT – I**

**Introduction to Engineering Drawing:** Drawing Instruments and their uses, types of lines, Types and uses of pencils, Lettering, Rules of dimensioning.

**Curves used in Engineering Practice and their Constructions**:

Conic Sections including Rectangular Hyperbola - General method, Cycloid, Epicyloid, and Involutes of circles.

**UNIT – II**

**Orthographic Projection:** Principles of Orthographic Projections – Conventions – First angle and third angle projections (however all drawing exercises must be in first angle only) - Projection of Points, Lines - Inclined to both planes, Projections of regular Plane, inclined planes - Auxiliary views.

**UNIT –III**

**Projections of Regular Solids:** Projections of Regular Solids: Prisms, Cylinders, Pyramids, Cones – Axis inclined to both planes, Auxiliary views.

**UNIT –IV**

**Sections and sectional views of Solids:** Sections and Sectional views of Right Regular Solids – Prism, Cylinder, Pyramid, Cone – Auxiliary views.

**Development of Surfaces:** Development of Surfaces of Right Regular Solids – Prisms, Cylinders, Pyramids, Cones and their sections.

**UNIT – V**

**Isometric Projections/views:** Principles of Isometric Projection – Isometric Scale – Isometric Views – Conventions – Isometric Views of Lines, Plane, Simple Solids. Conversion of isometric views to orthographic views.

**UNIT –VI**

**Overview of Computer Graphics :** Demonstrating features of the CAD software - The Menu System, Toolbars, , Dialog boxes and windows, Drawing entities - lines, circles, arcs etc and editing commands, Dimensioning of objects,2D drawings-simple exercises , 3D wire-frame and shaded solids- Commands, Boolean operations.

**Text/Reference Books:**

(i) Bhatt N.D., Panchal V.M. & Ingle P.R., (2014), Engineering Drawing, Charotar Publishing House

(ii) Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education

(iii) Agrawal B. & Agrawal C. M. (2012), Engineering Graphics, TMH Publication

(iv) Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers

1. AUTOCAD Software Theory and User Manuals

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**Syllabus for B. Tech I Year I semester**

**ENGLISH (Oral Communication Skills) Lab**

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**Code: 7HC62**

Course Objectives : The course will develop the students’ ability to

* integrate listening and speaking skills
* communicate effectively
* speak effectively on a given topic
* master the art of presentation
* interact with peers in a group discussion
* get exposed to face interviews

**Course Outcomes :** After completing the course students will be able to

* understand, analyze and respond to the audience by listening effectively
* acquire the articulation of different types of sentences by practicing pause patterns and question tags.
* translate and demonstrate self, participate effectively in activities like JAM, extempore
* express and deliver a presentation on the given topic through role plays and situational dialogues
* implement English language to meet the standards of corporate and real world in a group.
* present and communicate effectively by facing mock interviews by experts from industry and academy.

**Unit-I :** Practice sessions on

Listen & Speak

Listen, Read, and Speak

**Unit-II:** Practice sessions on

Articulation of types of Sentences

Question Tags

Introduction and greeting

Asking for and Giving

Directions

**Unit-III:** Practice sessions on

JAM/Extempore/

Impromptu

Prepared talk on given topics

**Unit-IV:** Practice sessions on

Formal Presentation

Role Plays & Situational Dialogues

**Unit-V :** Practice sessions on

Group Discussion

**Unit-VI:** Practice sessions on

Mock Interviews

**Suggested Readings:**

1. *Step by step learning language and life skills* by Niruparani, Jayasree Mohanraj, Indira, Sailakshmi Pearson Publishers
2. *Communication skills for technical students* by TM Farhathullah, Orient Black swan Publications
3. *English for technical Communication* by K.R. Lakshmi Narayan , Scitech Publications
4. *Practical English Usage.* Michael Swan. OUP. 1995.
5. *Communication Skills*. Sanjay Kumar and Pushp Lata. Oxford University Press. 2011.
6. *Exercises in Spoken English.* Parts. I-III. CIEFL, Hyderabad. Oxford University Press

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**Syllabus for B. Tech I Year I semester**

**CHEMISTRY LAB**

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| **0** | **0** | **3** | **1.5** |

**Code: 7HC63**

**Course Objectives**:

The student will be able to learn:

1. Preparation of coordination complex NiDMG Complex
2. Determination of surface tension
3. Determination of viscosity
4. Saponification /acid value of an oil
5. Ion exchange column for removal of hardness of water / Estimation of Hardness of water by EDTA Method
6. Determination of chloride content of water
7. Determination of cell constant and conductance of solutions (HCl Vs NaOH / Mixture of acid Vs Strong base)
8. Potentiometry - determination of redox potential and emf (FeSO­4 Vs KMNO4 / HCl Vs NaOH)
9. Determination of the rate constant of acid catalyzed hydrolysis of methylacetete
10. Synthesis of a polymer- Thiakol rubber / Urea-Farmaldehyde resin
11. Synthesis of a drug- Aspirin
12. Thin layer chromatography

**Course Outcomes**

After completion of the course, the student will be able to learn:

1. Methods to prepare inorganic complexes.
2. The process to determine surface tension of different liquids using stagnometer
3. The process to determine viscosity of lubricants by using redwood viscometer.
4. How to find acid value of an oil.
5. The principle and determination of Hardness of a water sample.
6. The methods to estimate amount of chlorine in water.
7. To determine unknown concentration of acid by using conductometric method.
8. To determine unknown concentration of acid by using potentiometric method.
9. Estimate rate constants of reactions from concentration of reactants/products as a function of time.
10. Methods to prepare industrially important polymers.
11. The method of preparation for organic compounds.
12. To separate the organic compounds from their mixture by using Thin layer chromatography.

**List of Experiments**

1. Preparation of coordination complex NiDMG Complex
2. Determination of surface tension
3. Determination of viscosity
4. Saponification/acid value of an oil
5. Ion exchange column for removal of hardness of water / Estimation of Hardness of water by EDTA Method
6. Determination of chloride content of water
7. Determination of cell constant and conductance of solutions (HCl Vs NaOH / Mixture of acid Vs Strong base)
8. Potentiometry - determination of redox potential and emf (FeSO­4 Vs KMNO4 / HCl Vs NaOH)
9. Determination of the rate constant of acid catalyzed hydrolysis of methylacetete
10. Synthesis of a polymer- Thiakol rubber / Urea-Farmaldehyde resin
11. Synthesis of a drug- Aspirin
12. Thin layer chromatography

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**H: High M: Medium L: Low**

**Syllabus for B. Tech I Year I semester**

**PROBLEM SOLVING USING C LAB**

**(Common to all branches)**

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**Code: 7FC61**

**Course Outcomes:**

**After completion of this course student will learn**

1. To formulate the algorithms for simple problems
2. To translate given algorithms to a working and correct program
3. To be able to correct syntax errors as reported by the compilers
4. To be able to identify and correct logical errors encountered at run time
5. To be able to write iterative as well as recursive programs
6. To be able to represent data in arrays, strings and structures and manipulate them through a program
7. To be able to declare pointers of different types and use them in defining self referential structures.
8. To be able to create, read and write to and from simple text files.

**[The laboratory should be preceded or followed by a tutorial to explain the approach or algorithm to be implemented for the problem given.]**

1. **Unit I (Cycle 1)**
2. Write an algorithm for converting a given Celsius temperature to its equivalent Fahrenheit temperature and draw a flowchart.
3. Write an algorithm to find the largest of three given numbers and draw a flowchart.
4. Write an algorithm and draw a flowchart for finding the roots and nature of roots of a quadratic equation, given its coefficients.
5. Write an algorithm and flowchart for finding the first n Fibonacci numbers, give n.
6. **Unit II (Cycle 2)**
7. Write an algorithm, flowchart, and C program for:
8. Finding the area and circumference of a circle of given radius.
9. Finding the volume of a sphere of given radius.
10. Finding the lateral surface area of a right circular cone of given base radius and height.
11. Finding selling price of an item, given its cost price and profit percent.
12. Finding the interest on a given principal for a given period of time at a given rate of per year.
13. Write a C program to display all the sizes of data types in C.
14. Write a C program to display a given decimal integer into an equivalent octal number and hexadecimal number using %o and %x in printf function.
15. **Unit II (Cycle 3)**
    1. Write a C program to find the roots and nature of the roots of a quadratic equation, given its coefficients.
    2. Write a C program for finding the largest of three given numbers.
    3. A salesman gets a commission of 5% on the sales he makes if his sales is below Rs.5000/- and a commission of 8% on the sales that exceeds Rs.5000/- together with Rs.250/-. Write an algorithm or a flowchart and develop C program for computing the commission of the salesman, given his sales.
16. **Unit III (Cycle 4)**
17. Write three C programs to print a multiplication table for a given number using while, do-while, and for loops.
18. Write a C program to compute the sum of:
19. 1+x+x2+x3+………….+xn, given x and n.
20. 1! + 2! + 3! + . . . + n!, given n.
21. 1 – x2/2! + x4/4! – x6/6! + x8/8! – x10/10! + … to n terms where the nth term becomes less than 0.0001.
22. **Unit III (Cycle 5)**
    1. Write a C program in the menu driven style to perform the operations +, -, \*, /, % between two given integers.
    2. Write a C program to find the largest and the least of some numbers given by the user.
    3. Write a C program to find the sum of the digits of a positive integer.
23. **Unit III (Cycle 6)**
    1. Write C functions for the following:
       1. A function that takes an integer n as argument and returns 1 if it is a prime number and 0 otherwise.
       2. A function that takes a real number x and a positive integer n as arguments and returns xn.
       3. A function that takes a positive integer n as an argument and returns the nth Fibonacci number.
    2. Using recursion write C functions for the following:
       1. Factorial of a non-negative integer n.
       2. Number of combinations of n things taken r at a time.
       3. Greatest Common Divisor of two integers.
       4. Least Common Multiple of two integers.
24. **Unit III (Cycle 7)**
    * 1. Write a menu driven style program to compute the above functions (cycle 6) on the choice of the function given by the user.
      2. Define macros for the following and use them to find sum of the squares of the minimum and maximum of two given numbers.
         1. Larger of two numbers.
         2. Smaller of two numbers.
         3. Sum of the squares of two numbers.
      3. Write a program to generate Pascal’s triangle.
      4. Write a program to count the number of letters, words, and lines in a given text.
25. **Unit IV (Cycle 8)**
    1. Write a program to store the numbers given by the user in an array, and then to find the mean, deviations of the given values from the mean, and variance.
    2. Write a C program to initially store user given numbers in an array, display them and then to insert a given number at a given location and to delete a number at a given location.
    3. Write a program to store user given numbers in an array and find the locations of minimum and maximum values in the array and swap them and display the resulting array.
26. **Unit IV (Cycle 9)**
    1. Write a C program to implement the operations of matrices – addition, subtraction, multiplication.
    2. Write a program to find whether a given matrix is symmetric, lower triangular, upper triangular, diagonal, scalar, or unit matrix.
27. **Unit V (Cycle 10)**
    1. Write a function to swap two numbers.
    2. Write a function to compute area and circumference of a circle, having area and circumference as pointer arguments and radius as an ordinary argument.
28. **Unit VI (Cycle 11)**
29. Define a structure for complex number. Write functions on complex numbers (addition, subtraction, absolute value, multiplication, division, complex conjugate) and implement them in a menu driven style.
30. Define a structure point. Write a program to find the distance between two points.
31. Define a structure student having members roll no., name, class, section, marks. Create an array of 10 students give the data and find the average marks, section-wise.
32. **Unit VI (Cycle 12)**
    1. Write a program to:
       1. Create a file by the name given by the user or by command line argument and add the text given by the user to that file.
       2. Open the file created above and display the contents of the file.
       3. Copy a file into some other file, file names given by the user or by command line arguments.
       4. Append a user mentioned file to another file.
       5. Reverse the first n characters of a file.

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**Syllabus for B. Tech I Year I semester**

**TECHNICAL SEMINAR - I**

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**Code: 7G291**

**Course objectives:**

Develop an ability to understand and present seminar on the latest scientific and technological developments in the field of engineering and technology which enhances writing as well as oral communication skills.

**Course outcomes:**

1. Understand the concepts of technological developments in the chosen area.  
2. Enhance presentation, communication and analytical skills.  
3. Improve self confidence to face the audience.

**Syllabus**

Various research areas of Biotechnology

**Procédure**

1. Seminar in-charges shall highlight the significance of technical seminar in the first two sessions and enlighten the students on the utility of these seminars.
2. The student has to identify the related topic.
3. The slots, titles shall be decided upfront and seminar in charge shall take signatures.
4. The same sheet shall be affixed in the respective classrooms and seminar register.
5. If any student fails to present his/her seminar on the given slot, to genuine reasons, they may be asked to present in the subsequent slot/week.
6. Progress of the seminars need to be reviewed by the concerned HOD once in 15 days.
7. The evaluation for technical seminars has to be informed to students and displayed in the classrooms.
8. Report and presentation must contain topic, introduction, explanation, diagrams, tables, applications and conclusions.

The evaluation procedure for this subject is already stated in the Academic Regulations.

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**Syllabus for B. Tech I Year II semester**

**ENGLISH (Reading, Listening and Writing Skills)**

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**Code: 7HC01**

**Course Objectives :** The students will

* acquire knowledge on various types of listening techniques, barriers and benefits of listening
* recognize the speech sounds and learn the intonation patterns
* learn various vocabulary patterns
* develop the ability to structure and punctuate the sentences
* learn different reading techniques
* learn different writing skills

**Course Outcomes :** At the end of the course the students will be able to

* understand and differentiate different types of listening techniques used to interact with real world problems
* differentiate the speech sounds and improve their accent and modulation while speaking
* understand and illustrate different word roots, word derivatives – synonyms, antonyms and word inflections
* discriminate a variety of sentence types, their structure and use punctuations
* get acclimatized to reading strategies and note making.
* develop proficiency in writing and preparing resume

**Unit-I : Listening**

* 1. Importance of Listening;

1.2 Types of listening

1.3 Barriers to Listening

1.4 Benefits of Listening

**Unit-II: Basic Communication Skills**

2.1 Introduction to Speech Sounds

2.2 Vowels, Diphthongs, Consonant Sounds

2.3 Significance of word accent

2.4.Intonation Patterns

**Unit-III: Vocabulary**

3.1 Word Roots - Affixes: Prefixes and Suffixes

3.2 Homophones, Homonyms, Homographs

3.3 Synonyms – Antonyms

3.4 One word substitutes

3.5 Idioms and Phrases

**Unit-IV: Basic Writing Skills**

4.1 Sentence Structure

4.2 Kinds of Sentences

4.3 Punctuation in Writing

**Unit-V : Reading Comprehension**

5.1 Skimming and Scanning

5.2 Prediction Techniques and Inferring

5.3 Note Making

5.4 Reading Comprehension

**Unit-VI: Writing Skills**

6.1 Paragraph Writing

* 1. Paraphrasing
  2. Letter Writing
  3. Resume Writing

**Suggested Readings:**

(i)*English grammar just for you*Rajeevan Karal, Oxford publications

(ii) *Practical English Usage.* Michael Swan. OUP. 1995.

(iii) *Remedial English Grammar.* F.T. Wood. Macmillan.2007

(iv) *On Writing Well.* William Zinsser. Harper Resource Book. 2001

(v) *Study Writing.* Liz Hamp-Lyons and Ben Heasly. Cambridge University Press. 2006.

(vi) *Communication Skills*. Sanjay Kumar and Pushp Lata. Oxford University Press. 2011.

(vii) *Learn to Write* by Dr. G. Varalakshmi, Kindle Edition 2016

(viii) *A practical course for developing writing skills in English* by J.K. Gangal, PHI Learning Pvt Ltd.

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**B. Tech I Year II Semester**

**MATHEMATICS FOR BIO-TECHNOLOGY – I**

**(For Bio-Technology)**

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**Code: 7Hc11**

**Pre Requisites**: Nil

***Course Objectives:*** *To learn various methods to solve differential equations and their applications, Fourier series and Laplace transform method and its applications.*

**UNIT– I:**  **First order Ordinary Different Equations**: Differential equations of first order and first degree –Exact, Linear and Bernoulli’s Equation.

*Applications: Newton’s Law of Cooling, Law of Natural Growth and Decay*.

**UNIT– II: Higher Order Differential Equations:** Non-homogeneous linear differential equations of second and higher order with constant coefficients. Methods of variation of parameters.

*Application: Simple harmonic motion.*

**UNIT– III: Introduction to Partial Differential Equations:** Formation of Partial Differential Equations, Solutions to First order Linear and Non-linear Equations, Four Standard types.

**UNIT-IV: Fourier series:** Fourier coefficients**,** Fourier series to the functions of any period (p=2L, 2π) Fourier series of even and odd functions, Half-range Expansions.

**UNIT–V: Laplace Transforms:** Laplace transform of standard functions, shifting theorems, change of scale property, multiplication by powers of t, Divison by t, Laplace transform of unit step function, Impulse function and periodic functions.

**UNIT–VI:**  **Inverse Laplace Transforms:** Inverse Laplace transforms**:** properties, partial fraction method and convolution theorem (without proof).

*Applications: Laplace transforms to solve ordinary differential equations with constant coefficients.*

**TEXT BOOKS**:

1. Higher Engineering Mathematics, B.S. Grewal, Khanna Publications, New Delhi.

2. Advanced Engineering Mathematics, S.R.K. Iyengar and R.K.Jain, Narosa Publication.

3. Erwin Kreyszig: Advanced Engineering Mathematics, John Wiley and Sons, 8th Edition

**REFERENCE BOOKS:**

1. Engineering Mathematics, Ravish R.Singh, McGraw Hill Education

2. Engineering Mathematics, B. V. Ramana, Tata McGraw Hill Publishing Company Ltd

3. Engineering Mathematics, P.Sivaramakrishna Das, Pearson Publications.

4. Mathematical Methods of Science and Engineering, Kanti B.Datta, CENGAGE Learning.

***Course Outcomes:*** *Students will able to*

1. *Solve the problems of first order and first degree differential equations.*
2. *Solve higher order differential equations with constant coefficients.*
3. *Form partial differential equations and find the solution to first order linear and nonlinear partial differential equations.*
4. *Find the Fourier series of a function, Fourier transformations and their applications.*
5. *Solve the problems in evaluating Laplace transformation.*
6. *Solve problems in inverse Laplace transforms and learn its applications to solve ordinary differential equation with constant coefficients.*

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**Syllabus for B. Tech I Year II semester**

**ENGINEERING PHYSICS**

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**Code: 7HC05**

**Course Objectives**

* To know about the semiconductors, types, carrier concentration, Thermistor, Hall effect and also to understand the concept of PN-junction, I-V Characteristics, LED, Solar Cell and Photo diode.
* Explain about the Quantum Mechanics to understand wave particle duality, necessity of quantum mechanics to explore the behavior of sub atomic particles. Schroedinger’s Time Independent Wave Equation, Physical Significance of the Wave Function – Application of Schroedinger wave equation.
* To understand the basic concepts of normal light, Laser and its applications and to know about the fiber optics, principle (TIR), Numerical Aperture, Types of optical Fibers, Step index and graded index Fibers, attenuation in optical fibers. Applications: optical fiber communication system, fiber optic sensors, medical endoscopy.
* To study the concepts of magnetism and superconductivity, Bohr magneton, Hysteresis nature, domain structure, Meissner effect, types of superconductors, BCS theory and applications of superconductors.
* To understand the concepts of dielectrics, polarizations and its types, internal fields, Clausius-Mossitti equation, Frequency and temperature effect on dielectrics and its applications – Piezo-electricity, pyro-electricity and ferro-electricity.
* To discuss about the nano-technology, preparation techniques and characterization (XRD, SEM & TEM), CNTs and to know about the fundamentals of radioactivity and its applications.

**Unit:1**

**Semiconductors**

Fermi Level in Intrinsic and Extrinsic Semiconductors, calculation of carrier concentration of Intrinsic and Extrinsic Semiconductors, Direct & Indirect Band Gap Semiconductors, Thermistor, Hall Effect in semiconductors and applications.

**Semiconductor devices**

Formation of PN Junction and working of PN Junction. Energy Diagram of PN Diode, Diode equation (Quantitative treatment), I-V Characteristics of PN Junction, Application - LED, Solar Cell and Photo diode.

**Unit:2**

**Wave nature of particles, Schroedinger equation and its application**

Waves and Particles, de Broglie Hypothesis, Matter waves, Davisson and Germer’s Experiment, G.P. Thomson Experiment, Heisenberg’s Uncertainty Principle, Schroedinger’s Time Independent Wave Equation – Physical Significance of the Wave Function – Application of Schroedinger wave equation - Particle in One Dimensional Potential Box.

**Unit:3**

**Lasers**

Characteristics of LASER, Spontaneous and Stimulated Emission of Radiation, Meta-stable State, Population Inversion, Lasing Action, Einstein’s Coefficients and Relation between them and significance, Ruby Laser, Helium-Neon Laser, Semiconductor Diode Laser, Applications of Lasers.

**Fiber optics**

Introduction, Principle of Optical Fiber, Acceptance Angle and Acceptance Cone, Numerical Aperture, Types of Optical Fibers, Step index and graded index Fibers Attenuation in Optical Fibers. Applications: Optical Fiber communication system, Fiber Optic Sensors, Medical Endoscopy.

**Unit:4**

**Magnetic and Superconducting materials**

Permeability, Field Intensity, Magnetic Induction, Magnetization, Magnetic Susceptibility, Origin of Magnetic Moment, Bohr Magneton. Hysteresis behavior of Ferro Magnetic materials based on Domain theory. Hard and Soft Magnetic Materials, Properties of Anti-Ferro and Ferri Magnetic Materials and their applications,

**Super conductivity**, effect of Magnetic Field, Critical current density, Meissner effect, Type-I and Type-II superconductors, BCS theory, applications of superconductors.

**Unit:5**

**Dielectric materials and their properties**

Electric Dipole, Dipole Moment, Dielectric Constant, Electric Susceptibility, Electronic and Ionic polarizability (Quantitative) Orientation Polarization (Qualitative), Internal fields in Solids, Clausius - Mossotti equation, Frequency and temperature effect on Dielectrics (Qualitative), Applications - Piezo-electricity, Pyro-electricity and Ferro-electricity.

**Unit:6**

**Nanotechnology**

Origin of Nanotechnology, Nano Scale, Surface to Volume Ratio, Quantum Confinement, Bottom-up Fabrication, Sol-gel, Precipitation, Chemical vapor Deposition(CVD); Top-down Fabrication; Thermal evaporation, Ball Milling, Characterization of Nano materials (XRD&TEM), carbon nano tubes(CNTs), Applications of Nano Materials.

**Nuclear Energy:** Radioactivity, Nuclear binding energy, Nuclear fission, Nuclear fusion, , β, γ rays decay, Geiger-Muller counter and practical applications of nuclear physics.

**Text Books:**

1.B.K. Pandey & S. Chaturvedi Engineering Physics, Cengage Learning

2.D.K. Bhattacharya and Poonam Tandon, OXFORD university press.

**Reference Books:**

1. Charles Kittel, Introduction to Solid State Physics, John Wiley Publisher

2. A.S. Vasudeva , Modern engineering Physics, S Chand

3. Dekker, Solid State Physics

4. Dr.M.N. Avadhanulu, Engineering Physics, S Chand

5. Dekker, Solid State Physics

6. Halliday and Resnick, Physics

7. S.O. Pillai, Solid State Physics

8. P K Palanisamy, Engineering Physics, Sitech Publications

9. A. Ghatak - Optics

**Course Outcomes**

After completing the course, students will be able to

* Explain semiconductor behaviour, types, carrier concentration, Hall effect, Thermistor, demonstrate and analyze semiconductor devices like a PN-junction, I-V characteristics, LED, solar cell, photo diode and their applications.
* Differentiate the wave and particle, de-Broglie matter waves-its experimental evidence, Schroedinger’s wave concept and its application for a particle in one dimension box.
* Explain about emission, its types, laser principle, types, working and its applications and to reveals about TIR principle, optical fiber-types and signal propagation, attenuation, communication system and applications of optical fibers (sensors and medical endoscopy)
* Reveals about the magnetism-its origin and types, Hysteresis, domain theory, Anti-ferro and ferri magnetism superconductivity, experimental facts, theoretical analysis, types of superconductors and its applications.
* Explain the basic concepts of dielectric materials, polarization and its types, local fields, frequency and temperature effect on dielectrics and their applications (piezo, ferro and Pyro electricity).
* Summarize nano & bulk concepts, surface to volume ratio, quantum confinement, CNTs and preparation methods (physical & chemical), analysis the techniques like XRD, SEM, TEM and also to understand the radioactivity, fusion & fission, alpha, beta and gamma rays decay and its applications.

**Syllabus for B. Tech – BIOTECHNOLOGY I Year II Semester**

**(7G202) PROCESS ENGINEERING CALCULATIONS**

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**H: High M: Medium L: Low**

**L T P/D C**

**3 1 - - 4**

**Course Objective:** Main objective is to understand chemical process flow sheets, develop process alternatives, to perform recycle material and energy balances for process flow sheets and simulate steady state behavior at each level of process development

**UNIT-I: Introduction to Engineering calculations**

Measurement conventions, density, mole, chemical composition, mass fraction, mole fraction, volume fraction, standard conditions and ideal gas, Properties of gases, liquids and solids, ideal gaseous mixtures, real gas relationships, equations of state

*Applications: Flow of mass through sonic nozzle, Synthesis of ammonia which is used as fertilizer*

**UNIT-II:** **Presentation and analysis of Data:**

Errors in data calculations, presentation of experimental data, Data analysis: testing mathematical models, least squares analysis, linear and non linear models. Graph paper with logarithmic coordinates, general procedures for plotting data

*Applications:Graphical representation could be used in research methodology*

**UNIT-III: Material Balances**

Law of Conservation of mass, types of material balance, procedure for material balance calculations, application of material balance to filtration, mixing, fermentation, distillation, evaporation, crystallization, drying. Material balance with recycle, by-pass and purge systems

*Applications: Bioremediation (Cleaning contaminated ground water), Separation of acetic acid, benzene, water by process of distillation*

**UNIT-IV: STOICHIOMETRY**

Stoichiometry of Cell growth and product formation, elemental balances, degrees of reduction of substrate and biomass, available electron balances, yield coefficients of biomass and product formation, maintenance coefficients

*Applications: Combustion of charge material in furnace, Preheating of air entering the furnace*

**UNIT-V: Energy balances**

Intensive and extensive properties, enthalpy, calculation of enthalpy changes, general energy balance equations, energy balance calculations without reaction, heat of combustion, heat of reaction at nonstandard conditions, heat of reaction for processes with biomass production.

*Applications: Reduction of NOX from flue gases*

**UNIT-VI: Unsteady state material balance and energetic analysis of microbial growth**

Unsteady state material balances, material balance in batch distillation, Energy analysis of microbial growth and product formation, oxygen consumption and heat evolution in aerobic cultures, thermodynamic efficiency of growth

*Applications: Calculation of time for emptying the tank, Calculation of time in distillation process*

**TEXT BOOKS:**

* + - 1. Himmelblau,”Basic Principles and calculations in chemical engineering”, VI ed. Prentice Hall.1999.
      2. Pauline M Doran,” Bioprocess Engineering Principles”, Academic Press 2nd edition, 2013.

**References:**

1. .Bhatt and Vora “Stoichiometry” , IV ed. Tata McGraw Hill 2006.

2. Himmelblau,”Basic Principles and calculations in chemical engineering”, I ed. Prentice Hall.1999.

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| **Unit** | **Course Outcomes** | **Programme Outcomes** |
| I | Ability to convert from one set of units to another, compare dimensionless groups, interconvert mass, volume and moles and their flows, interconvert between different temperature scales and to do mathematical calculations. | a |
| II | Student understands the importance of analysis and presentation of data, calculations of errors in data. | c |
| III | Student understands the basics of material balances and ables to perform material balances for systems with recycle, bypass purge calculations. | a,d |
| IV | Ability to determine combustion process, perform elemental balances, heat of reaction, calculation of enthalpy changes, energy balance on cell cultures. | a,g |
| V | Ability to estimate the physical properties of process streams, performs energy balances, simultaneous material and energy balances. | c |
| VI | Ability to perform a combined material and energy balance analysis for system at unsteady state, Graphical integration, concepts of CSTR, PFR | d |

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**Syllabus for B. Tech I Year II semester**

**WORKSHOP/MANUFACTURING PRACTICES**

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**Code: 7BC01**

**Course Objectives:**

Upon completion of this course, the students will gain knowledge of the different manufacturing processes which are commonly employed in the industry, to fabricate components using different materials.

**COURSE OUTCOMES:**

1. To understand various basic tools to perform simple joints using metal and wood.
2. To understand the principle of various electrical and electronic appliances and their applications.
3. To understand the manufacturing process of welding, casting and tin smithy and their applications.
4. To understand the operation of basic as well as advanced machines used for fabrication of Metals, Plastics and Glass.

**I: Theory:** In theory classes the following syllabus is to be covered in 10hrsusing PPTS and Videos (Elementary treatment only)

* 1. Fitting & Power Tools
  2. Electrical & Electronics Appliances
  3. Carpentry
  4. Plastic molding & Glass Cutting
  5. Metal Casting
  6. Metal Joining: Arc & gas welding and brazing
  7. Metal forming
  8. Machining
  9. Advanced manufacturing methods: (Micro machining, USM,ECM,EDM )
  10. CNC machining & Additive Manufacturing

**Suggested Text/Reference Books:**

(1) Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K., “Elements of Workshop Technology”, Vol. I 2008 and Vol. II 2010, Media promoters and publishers private limited, Mumbai.

(2) Rao P.N., “Manufacturing Technology”, Vol. I and Vol. II, Tata McGrawHill House, 2017.

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|  |  |  |  |  |  |  | **X** | **X** | **X** |  | **X** |

**Syllabus for B. Tech I Year II semester**

**ENGLISH LAB (Reading, Listening and Writing Skills)**

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| **L** | **T** | **P/D** | **C** |
| **0** | **0** | **2** | **1** |

**Code: 7HC61**

**Course Objectives :** The students will

* acquire knowledge on various types of listening techniques, barriers and benefits of listening
* recognize the speech sounds and learn the intonation patterns
* learn various vocabulary patterns
* develop the ability to structure and punctuate the sentences
* learn different reading techniques
* learn different writing skills

**Course Outcomes :** At the end of the course the students will be able to

* understand and differentiate different types of listening techniques used to interact with real world problems
* differentiate the speech sounds and improve their accent and modulation while speaking
* understand and illustrate different word roots, word derivatives – synonyms, antonyms and word inflections
* discriminate a variety of sentence types, their structure and use punctuations
* get acclimatized to reading strategies and note making.
* develop proficiency in writing and preparing resume

**Unit-I :** Practice sessions on

Listening for Basic Vocabulary

Listening for General Information

Listen for specific information

Listening Comprehension

**Unit-II:** Practice sessions on Pronunciation

Articulation of Vowel and Consonant sounds

Listening for Word accent

Intonation Patterns

**Unit-III:** Exercises on Word Roots

Affixes : Prefixes and Suffixes

Identifying Homophones,

Homonyms, Homographs

Synonyms - Antonyms

One word substitutes

Idioms and Phrases

**Unit-IV:** Exercises on

Punctuation and Spelling

Error Identification in Sentences

Conversion of Sentences

**Unit-V :** Practice sessions on

Using passages for skimming and scanning

Note Making using Texts

Reading Comprehension using different techniques

**Unit-VI:** Exercises on

Paragraph Writing using hints/Guided Paragraphs

Writing Letters

Writing Resume

**Suggested Readings:**

(i)*English grammar just for you*Rajeevan Karal, Oxford publications

(ii) *Practical English Usage.* Michael Swan. OUP. 1995.

(iii) *Remedial English Grammar.* F.T. Wood. Macmillan.2007

(iv) *On Writing Well.* William Zinsser. Harper Resource Book. 2001

(v) *Study Writing.* Liz Hamp-Lyons and Ben Heasly. Cambridge University Press. 2006.

(vi) *Communication Skills*. Sanjay Kumar and Pushp Lata. Oxford University Press. 2011.

(vii) *Learn to Write* by Dr. G. Varalakshmi, Kindle Edition 2016

(viii) *A practical course for developing writing skills in English* by J.K. Gangal, PHI Learning Pvt Ltd.

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**Syllabus for B. Tech I Year II semester**

**WORKSHOP/MANUFACTURING PRACTICES LAB**

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| **L** | **T** | **P/D** | **C** |
| **0** | **0** | **3** | **1.5** |

**Code: 7BC61**

**Course Objectives:**

1. To identify various basic tools to perform simple joints using metal and wood.
2. To recognize various electrical and electronic and their applications.
3. To understand the manufacturing process of welding , casting and tinsmithy and apply the processes in making simple products.
4. To understand and operate basic machines for fabrication of Metals, Plastics and Glass.
5. To understand the functions and parts of commonly used domestic appliances.

**COURSE Outcomes:**

1. After completion of the course , the student will be able tofabricate components with their own hands.
2. Assemble different components and produce small devices of their interest.

**Work shop and Manufacturing Practices**: Minimum of 10 experiments out of twelve given here under are to be completed

**LIST OF EXPERIMENTS**

|  |  |  |
| --- | --- | --- |
| **S. No.** | **Trades** | **List of Experiments** |
| 1 | Fitting Shop | **1**. Preparation of T-Shape Work piece  **2.** Preparation of U-Shape Work piece which contains: Filing, Sawing, Drilling, Grinding. |
| 2 | Carpentry | 3.Practice of Cross Half lap joint  4. Practice of Half lap Dovetail joint |
| 3 | Electrical & Electronics | 5. One lamp one switch Practice  6. Stair case wiring: Practice |
| 4 | Welding shop  ( Arc & Gas) | Demonstration of Gas and Resistance welding  7. Practice of Lap and Butt joint using Arc welding |
| 5 | Casting | 8.Preparation of mould by using split pattern  9. Mould preparation and pouring of molten metal. |
| 6 | Tin Smithy | 10. Preparation of Rectangular Tray & Square box |
| 7 | Machine Shop | 11. Demonstration of turning , Drilling and Reaming operations |
| 8 | Plastic molding & Glass Cutting | 12 a) Demonstration of Injection Moulding  b) Demonstration of Glass Cutting with hand tools |
| 9 | Domestic Appliances | 13.Demonstration of Electric Iron, fan, Mixer, Hair Drier, Washing Machine etc. |
| 10 | Lab project | 14. Making various components and / or assembling the components which can be useful in domestic / engineering applications |

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**Syllabus for B. Tech I Year II semester**

**ENGINEERING PHYSICS LAB**

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| **L** | **T** | **P/D** | **C** |
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**Code: 7HC65**

**Course Objectives**

* To study the concepts (numerical aperture) of a optical fiber,
* To explain about magnetic induction, Biot-Savart principle.
* To discuss the energy gap (Eg) of a semiconductor diode.
* To understand the rigidity modulus, periodicity.
* Understand the concept of photo electric effect using photo voltaic cell.
* To understand about the [ionizing radiation](https://en.wikipedia.org/wiki/Ionizing_radiation) by using the Geiger–Muller counter.
* Discuss the dispersive power of prism-minimum deviation method.
* Explain the formation of Newton’s rings-interference
* Study the frequency of AC mains using Sonometer.
* To study the LED characteristics and forward resistance
* Explaining about the electrical resonance by using the LCR circuit
* To know the time constant of RC circuit

**List of Experiments**

1. Determination of a Numerical Aperture (NA) of an optical fiber – Fiber optics .
2. Determination of magnetic induction flux density along the axis of a current carrying circular coil using Stewart and Gee’s experiment - Magnetism.
3. Determination of the energy gap (Eg) of a given semiconductor-Temperature/semiconductor
4. Determination of rigidity modulus of a given wire material using the Torsional pendulum - Vibrations
5. Determination the Planck’s constant using the photo voltaic cell - Photo voltaic cell
6. Studying the characteristics of Geiger–Muller counter and verifying the inverse square law - Nuclear physics
7. Calculation of dispersive power of a given material of prism by using

Spectrometer in minimum deviation method - Light.

1. Determination of wavelength of a monochromatic light source by using Newton’s rings experiment - Light
2. Calculating the frequency of AC supply by using the Sonometer – Electromagnetic/ Electrical
3. Studying the characteristics and calculating the forward resistance of a LED – Semiconductor/devices.
4. Study of series and parallel resonance of an LCR circuit – Electrical devices
5. Determination of time constant of an RC-circuit – Electrical/ Electronics

**NOTE**: Any **TEN** of the above experiments are to be conducted.

**Course Outcomes**

After completing the experiment, students will be able to

* Analyze the concepts of fiber optics, fundamentals, numerical aperture its importance, attenuation in fiber and applications.
* Understand and search to apply the fundamentals of magnetic induction, Ampere’s law, Oersted’s law and the Biot-Savart law.
* Analyze the concept a semiconductors, types, calculation of energy gap of a semiconductor diode and importance.
* Summarize the fundamentals of modulus-types, stress, strain, elasticity, plasticity and Hook’s law.
* Understand the concepts of photo electric effect, importance, photo current, colour filters, optical sensors (photo voltaic cell).
* Understand the concept of radiation, ionizing radiation, [radiological protection](https://en.wikipedia.org/wiki/Radiological_protection) and inverse square law.
* Know about the light properties-dispersion, prism, spectrometer and minimum deviation arrangement.
* Understand the concepts of interference, conditions, formation of Newton’s rings-reason.
* Know the difference between AC and DC fundamentals, magnetostriction, resonance, air column vibrations.
* Analyze the difference between normal diode, LED, forward bias, reverse bias, I-V characteristics, direct and indirect band gap semiconductors.
* Analyze the LCR circuit combination, parallel, series electrical resonance, inductance, reactance, capacitance and electrical and electronic fundamentals.
* Characterize the RC network, time constant, capacitor functioning and its application.

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**Syllabus for B. Tech I Year II semester**

**TECHNICAL SEMINAR - II**

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| **L** | **T** | **P/D** | **C** |
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**Code: 7G292**

**Course objectives:**

Develop an ability to understand and present seminar on the latest scientific and technological developments in the field of engineering and technology which enhances writing as well as oral communication skills.

**Course outcomes:**

1. Understand the concepts of technological developments in the chosen area.  
2. Enhance presentation, communication and analytical skills.  
3. Improve self confidence to face the audience.

**Syllabus**

Various research areas of Biotechnology

**Procédure**

1. Seminar in-charges shall highlight the significance of technical seminar in the first two sessions and enlighten the students on the utility of these seminars.
2. The student has to identify the related topic.
3. The slots, titles shall be decided upfront and seminar in charge shall take signatures.
4. The same sheet shall be affixed in the respective classrooms and seminar register.
5. If any student fails to present his/her seminar on the given slot, to genuine reasons, they may be asked to present in the subsequent slot/week.
6. Progress of the seminars need to be reviewed by the concerned HOD once in 15 days.
7. The evaluation for technical seminars has to be informed to students and displayed in the classrooms.
8. Report and presentation must contain topic, introduction, explanation, diagrams, tables, applications and conclusions.

The evaluation procedure for this subject is already stated in the Academic Regulations.

**Syllabus for B. Tech - BIOTECHNOLOGY**

**II Year I Semester (7G303) BIOCHEMISTRY**

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**H: High M: Medium L: Low**

**L T P/D C**

**3 - - 3**

**OBJECTIVE**

To understand the structural and functional aspects of biomolecules and develop ability to conduct investigations to identify, formulate and solve problems using research based knowledge and methods.

**Course Outcomes**

1. Ability to understand the structure and function of monosaccharide’s, disaccharides, oligo and polysaccharides.

2. Ability to apply knowledge of Structure, properties, classification and biological functions, metabolism of amino acids

3. Ability to demonstrate the knowledge of Structure, types, properties, classification, assembly and biological functions of proteins

4. Ability to demonstrate the knowledge of properties, classification and biological functions of Enzymes. To study mechanism of action, inhibition and regulatory of enzymes

5. Ability to demonstrate the structure, properties, classification, biological functions and metabolism of fatty acids, Lipoproteins and application of lipids as surfactants in industry

6. Ability to demonstrate the Structure, properties biological functions and metabolism of RNA and DNA

**UNIT I: Carbohydrates**- Structure, Properties, Classification and Biological functions- monosaccharides, disaccharides, oligo and polysaccharides, Glycolysis, TCA cycle, Aerobic and anaerobic respiration, overview of Respiratory chain

*Applications: Carbohydrates have six major applications in Body:*

*(1) Providing energy and regulation of blood glucose (2) Sparing the use of proteins for energy (3) Breakdown of fatty acids and preventing ketosis (4) Biological recognition processes (5) Flavor and Sweeteners (6) Dietary fiber*

**UNIT II**: **Amino acids** - Structure, properties, classification and biological functions of amino acids - Nitrogen Cycle, Nitrogen Balance, Reductive Amination & Transamination & Urea cycle, Biosynthesis of amino acids - Glutamate and Shikimate pathway

*Applications of Amino acids*

*1) muscle protein maintenance, 2) potentiation of immune function, 3) affecting neuronal activities in the brain, 4) tissue repair acceleration after burn or trauma, 5) protecting liver from toxic agents, 6)pain relief effects, 7) lowering blood pressure, 8) modulating cholesterol metabolism, 9) stimulating insulin or growth hormone secretion, 10) reducing blood ammonia*

**UNIT III: Proteins:** Structure, properties, classification and biological functions, structural organization of Proteins, Protein folding

*Applications of proteins*

***(1) Antibodies*** *- are specialized proteins involved in defending the body from antigens (foreign invaders). (2)* ***Enzymes*** *- are proteins that facilitate biochemical reactions. (3)* ***Hormonal Proteins*** *- are messenger proteins which help to coordinate certain bodily activities. Eg. insulin, oxytocin, and somatotropin. (4)****Structural Proteins*** *- are fibrous and stringy and provide support. Examples include keratin, collagen, and elastin (5)* ***Storage Proteins*** *- store amino acids. Examples include ovalbumin, casein, ferritin. (6)****Transport Proteins*** *- are carrier proteins which move molecules from one place to another around the body. Examples include hemoglobin and cytochromes.*

**Unit IV: Enzymes:** Introduction, Properties, classification, Factors affecting enzyme action, enzyme inhibition, enzyme catalysis-acid-base catalysis, covalent catalysis, metal ion catalysis

*Applications of Enzymes: (1)To breakdown (Digestion, (2)To build up or put together (Synthesis) (3) To release energy (Cellular Respiration)(4) To capture energy (Photosynthesis)*

**UNIT V: Lipids:** Structure, properties, classification and biological functions-phospholipids, Sphingolipids, fatty acid metabolism, cholesterol structure and function. Lipoproteins – classification & function, Lipid Profile assays

*Application of Lipids:*

*(1)Lipids acts as Chemical messengers, (2) storage and provision of energy (3) Helps in Maintenance of body temperature (4) Helps in Membrane lipid layer formation (5) helps in biosynthesis of "fat-soluble" vitamins*

**UNIT VI: Nucleic Acids:** Structure, properties of DNA and RNA. Metabolism of Purines & Pyrimidines: overview of de Novo & salvage pathway, Conversion of nucleoside monophosphates to nucleoside triphosphate

*Application of* *Nucleic Acids:*

*(1)Nucleic acids encode all the Genetic informationation of the cell. (2)****Macroergic compounds*** *which deliver energy necessary to different biological processes (eg. ATP, GTP). (3)* ***Allosteric regulators*** *of different enzymes (4)* ***Methyl group donor*** *(eg. S-adenosylmethionine) (5)* ***Signal transduction****: intracellular messengers of hormones (eg. AMPc, GMCc)*

**TEXT BOOKS:**

1. Biochemistry, U. Staynarayana and. U. Chakrapani, Third Edition, Published by Books & Allied, 2008
2. Fundamentals of Biochemistry J.L. Jain S. Chand Publishers

**REFERENCES:**

1. Voet D, Voet J. G, Biochemistry, Second Edition, John C Wiley and Sons, 1994.
2. L. Stryer, J.M. Berg, JL Tymockzo Biochemistry 5th edition, WH Freemen & Co 2002.
3. Biochemistry by K. Mathews, K.E. Van Holde, Kevin G Ahern, Pearson Education.
4. Protein’s Structure and function. Daviel Whitford John Wiley Publications.
5. Biochemistry by Cristopher K.Mathews, K.E.Van Holde, Pearsons education.
6. Principles of Biochemistry, Horton,Moran,Scrimgeour, Printice Hall,4th edition, 2006.
7. Lehninger A.L, Nelson O.’L, M.M. Cox, Principles of Biochemistry, 3rd Edition, 2000 CBS Publications, 1993

**Syllabus for B. Tech - BIOTECHNOLOGY**

**II Year I Semester (7G304) MICROBIOLOGY**

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| **M** | **M** | **M** | **H** | **M** | **H** |  |  |  |  |  | **L** |

**H: High M: Medium L: Low**

**T P/D C L**

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**OBJECTIVE**

To gain knowledge in fundamentals of microbiology through the study of the characteristics of microorganisms, and solve problems and conduct experiment, analyze and interpret data in microbiology.

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| **S.No** | **Course Outcomes** | **PO** | **Contribution** |
| **CO 1** | Ability to understand the *Major breakthrough in microbiology apart from the historical development from a non technological to technological era.* | 1 | M |
| **CO 2** | Ability to *Understand different methods of identification techniques and classify microbes by very specific activities / function /factors which is applied in disease diagnostics labs.* | 2 | M |
| **CO 3** | Ability to understand methods *in culturing the single colony microbe pure cultures from complex mixtures by using culture techniques, apart from using selective media / components / factors for optimal growth of microbe, essential in diagnostic and therapeutic approach.* | 3  4 | M  H |
| **CO 4** | Ability to *Understand the type of sterilization technique to be applied to kill a specific microbe based on the location. It is very important in industries, health sector and daily needs at house.* | 6 | H |
| **CO 5** | Ability to *Emphasis on culturing & advantages and disadvantages of virus and how they could be used for mankind with and without modifications in Biotech Industries* | 5 | M |
| **CO 6** | Ability to demonstrate the different types of replications in various types of living forms | 6 | H |

**UNIT I: Introduction To Microbiology:** Pioneers and their discoveries in Microbiology: Antony von Leuwenhoeck, Louis Pasteur, Edward Jenner etc, Theory of spontaneous generation, Germ theory of diseases, Major contributions and events in the field of Microbiology, Scope and relevance of microbiology

**Applications:** The exploitation of microbes for use in industrial processes of fermentation and waste-water treatment.

**UNIT II: Major Groups Of Microorganisms:** General characteristics of Bacteria, Archaea and Eubacteria, Fungi Classification systems-Phylogenetic, Phenetic, Taxonomic ranks, Major characteristics used in Taxonomy- Morphological, Physiological, Ecological, Biochemical, Immunological, Genetical and Molecular

**Applications:** Providesknowledge of the various types of microorganisms and describe their defining characteristics to identify and classify microorganisms.

**UNIT III: Nutrition and Cultivation:**

Nutritional Types in microbes, Growth curve, Growth factors, Aerobic and anaerobic metabolism. Medium and its types, Pure culture techniques, special techniques for cultivation of anaerobes, Influence of environmental factors on growth- solutes, water activity, pH, temperature, oxygen, osmotic pressure, radiation etc, bacterial growth curve, methods for determining bacterial numbers, mass and cell constituents.

**Applications:** Culturing bacteria is the initial step in studying its morphology and its identification. Microbial cultures are used to determine the type of organism, its abundance in the sample being tested, or both in clinical laboratories.

Enumeration and Estimations of bacteria in milk foods, soil, water, laboratory cultures or cellular vaccines, Biological assays – cell yield in various industries.

**UNIT IV: Control and Preservation of Microbes:**

Control of microorganisms- sterilization and disinfection: physical (moist and dry heat, radiation and filtration), chemical (disinfectants, antiseptics, antibiotics and other chemotherapeutic agent), Preservation of Microorganisms: cryopreservation, Lyophilization, Application and limitation of various methods

**Applications:** Control of microorganisms are used in hospitals, clinics, and laboratories to prevent the spread of diseases by adopting any one of these methods.

preserved microorganisms are used in Agriculture, Industry, Medicine, and in bioremediation

**UNIT V: Introduction to Viruses:**

Virus properties, Structure of viruses, Classification of viruses-Bacteria, plants and animals, Applications of Viruses in Biotech Industry

**Applications:** Todeliver the genetic material into host using suitable vectors in genetic engineering for developing vaccines for various viral diseases

**UNIT VI: Viral replication**

Viral replication, Bacterial, plant and animal replication in cytoplasm and nucleus with 1 example each (DNA and RNA viral replication), Cultivation of viruses-overview

**Applications:**

Virus as a tool in cancer therapy and to control the damaging pests in agriculture.

**TEXT BOOKS:**

1. Microbiology, Pelczar M.J. Chan ECE and Krieg NR. Tata McGraw Hill.
2. Microbiology by Prescott

**REFERENCES:**

1. Biology of Microorganisms. BROCK, Prentice Hall, International Inc.

2. General Microbiology. Hons. G.Schlege. Combridge university press.

3. General Microbiology. Roger Y stanier, Macmillan.

**II Year I Semester B.Tech - Biotechnology**

**(7G305) CELL BIOLOGY**

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| H |  | M | H | M | M |  | H |  | H |  | M |

**L T P/D C**

**3 - - 3**

**OBJECTIVE**

To gain knowledge in basic concept of cell structure, membrane, cellular functions of different types of cell, modes of cellular signaling and signal amplification and to design and conduct experiment, analyze and interpret data in cell biology.

|  |  |  |  |
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| **S.No** | **Course Outcomes** | **PO** | **Contribution** |
| **CO 1** | Ability to understand the discovery of cell and its basic functions in both prokaryotic and eukaryotic cells , cytoskeleton and cell motility | a | H |
| **CO 2** | Ability to observe, identify, compare and describe Plasma membrane, Nucleus, Endoplasmic Reticulum, Golgi complex, Lysosomes, Peroxisomes, Chloroplast & Mitochondria in terms of their structure, function and regulation | a | H |
| **CO 3** | Ability to understand the process of Passive and Active transport across the cell membrane including membrane receptors and membrane potential | a  c | H  M |
| **CO 4** | Ability to analyze the mechanism of Protein Glycosylation, Intracellular protein traffic & targeting | d | H |
| **CO 5** | Ability to understand various stages of cell cycle, cytokinesis and checkpoints that regulate the progression of cells | c  f  h | H  M  H |
| **CO 6** | Ability to demonstrate examples of different types of extracellular signals and receptors, and explain their functional significance | d  e | H  M |

**UNIT I: Introduction to Cell:** Theories of the origin and history of life, Cell theory; Cell complexity – Cell size & shape; Prokaryotic and Eukaryotic cells, Basic properties of cells, Protoplasm and cytoplasm, Chemistry of the cell, Cytoskeleton - Microtubules, Microfilaments & Intermediate filaments, cell motility – cilia & flagella

**Applications:** Graduates will be able to distinguish between prokaryotes and eukaryotes

**UNIT II: Cell Organelles:** Plasma membrane- structure and function Structure and functions of Nucleus, Endoplasmic Reticulum, Golgi complex, Lysosomes, Peroxisomes, Chloroplast & Mitochondria

**Applications:** Graduates will be able to distinguish between different organelles and isolate them

**UNIT III: Membrane Transport:** Passive and Active Transport, Uniport, Symport, Antiport, Permeases, Ion-gradient Pumps- Na+/K+ Pumps (Na+/K+ ATPase), Calcium pump, Proton pump, membrane receptors, membrane potential

**UNIT IV: Trafficking:** Protein Glycosylation, Intracellular Protein traffic & targeting, Endocytosis and Exocytosis, Transport into Prokaryotic Cells

**Applications:** Graduates will be able to analyze the protein glycosylation

**UNIT V: Cell Division and Cell Cycle Regulation:** Overview of the Cell Cycle, Interphase, Mitosis, Meiosis, Animal Cell & Yeast Cell Division, Cell Cycle Control & Checkpoints, General Characteristics of Cell Differentiation, Embryonic and adult stem cells and its Biological Importance, Cell Death- apoptosis, necrosis

**Applications:** Graduates will be able to use stem cells and study cellular responses in biomaterials

**UNIT VI: Receptors and Signal Transduction:** Cell to Cell communication, Signaling molecules, Types of cell surface receptors-GPCR, Ion Channel-linked receptors, Enzyme linked receptors- Protein tyrosine kinases, Receptor tyrosine kinases, Molecular mechanism of signaling transduction, Signal transduction by steroid hormones, Concept of secondary messengers, cAMP, cGMP

**Applications:** Graduates will be able to study the receptor mediated signal transduction and apply them in diagnostics

**TEXT BOOKS:**

1. Cell and Molecular biology – De Robertis and De Robertis (1998) Waverly Pvt. Ltd.
2. The Cell by C.B.Powar.

**References:**

1) Cell & Molecular Biology by Gerald Karp (2nd Ed.) Wiley publishers.

2) The World of the cell by Becker, Reece, Poenie (3rd edition) Benjamin Publishers.

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**II Year B.Tech, Semester-I MATHEMATICS FOR BIO-TECHNOLOGY - II**

**L T P/D C**

**Code: 7Hc14 (For Bio-Technology) 2**  **1 0 3**

**Pre Requisites**: Nil

**Course Objectives:** *To learn basic concepts of linear algebra and its applications to find solve linear system, numerical methods to solve algebraic and transcendental equations, numerical integration methods and numerical solutions of ordinary differential equations of first order and first degree.*

**Unit-I:**

**Matrices and Linear systems of equations:** Introduction, Rank of a Matrix, Elementary Transformation-Echelon Form, Normal Form, Inverse of a Matrix by Gauss-Jordan method, Linear Dependence and Independence of Vectors, Linear Systems Gauss Elimination method, Rank method – Applications.

**Unit–II:**

**Eigenvalues, Eigenvectors:** Eigenvalues and Eigenvectors of a Matrix- Properties of Eigenvalues and Eigenvectors, Cayley-Hamilton theorem(without proof) and its Applications, Diagonalization of a Matrix.

**Unit-III:**

**Interpolation:** Introduction, Finite differences, Forward Differences, Backward differences,Central differences, Newton’s interpolation formulae, Gauss interpolation formulae (without proofs) -Lagrange’s Interpolation formula.

**Unit–IV:**

**Solution of Algebraic and Transcendental Equations:** Introduction – The Bisection Method – The Method of False Position – The Iteration Method – Newton-Raphson Method.

**Unit–V:**

**Numerical Integration:** Trapezoidal Rule and Simpsons 1/3, 3/8 rule. Curve fitting: Fitting a straight line –Second degree curve-exponential curve-power curve by method of least squares.

**Unit– VI:**

**Numerical solution of Ordinary Differential equations:** Solution by Taylor’s Series-Picard’s Method of successive Approximations-Euler’s Method, Runge-Kutta Method.

**(PTO)**

**TEXT BOOKS**:

1. Higher Engineering Mathematics, B.S. Grewal, Khanna Publications, New Delhi.
2. Erwin Kreyszig: Advanced Engineering Mathematics, John Wiley and Sons, 8th Edition

**REFERENCE BOOKS:**

1. Engineering Mathematics, B. V. Ramana, Tata McGraw Hill Publishing Company Ltd.
2. Engineering Mathematics, Ravish R.Singh, McGraw Hill Education
3. Advanced Engineering Mathematics, Jeffrey, Elsevier Publications.
4. Mathematical Methods of Science and Engineering, Kanti B.Datta, CENGAGE Learning.
5. Engineering Mathematics, Srimanta Pal, OXFORD university press.

**Course Outcomes:** *Students*

1. *Will able to find the solution of linear systems by various methods.*
2. *Able to evaluate eigen values and eigen vectors, learn properties and applications to find higher powers of a matrix using diagonalization.*
3. *Able solve problems using finite differences.*
4. *Able to find the numerical solution of algebraic and transcendental equations.*
5. *Will learn basic concepts of Numerical integration and able to solve problems.*
6. *Able to find numerical solution of ordinary differential equation problems.*

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**Code: 7AC48 ELEMENTS OF ELECTRICAL & ELECTRONICS ENGINEERING**

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CO’s: after studying this course, the student will be able to

1. Understand the fundamentals of electrical engineering and DC machines.
2. Understand the principles of AC circuits.
3. Understand the principle and operation of three phase induction motor and measuring instruments.
4. Understand the principle and operation of diode.
5. Understand the principle and operation of transistor.
6. Understand the principles of digital electronics.

**Unit – I: Fundamentals of Electrical Engineering and DC Machines:**

Ohm’s Law, Kirchhoff’s Laws, types of sources, passive elements. Series parallel circuits, mesh and nodal analysis. Superposition, Reciprocity theorem.

**DC Machines**: Principle of operation of D.C generators, types, E.M.F equation. Principle of operation of D.C motors, Types motors, Torque equation, Losses and efficiency, simple problems on D.C Generators and motors.

**Unit – II: Fundamentals of AC circuits:**

AC voltage wave form and basic definitions: Peak Value, R.M.S. value, Average values, Form factor and Peak factor, ’j’ operator, Analysis of single phase AC circuits series and parallel (Simple circuits). Three phase circuits – Star - delta connection, Relation between line and phase voltages / currents in a 3-phase Star-Delta balanced system.

**Unit – III: Induction Motors and Instruments:**

Concept of Faraday’s laws, 3- phase induction motor working principle, operation and construction details.

**Instruments**: Introduction, classification of instruments, operating principles, essential features of measuring instruments, permanent magnet moving coil (PMMC) instruments, moving iron (MI) instruments.

**UNIT IV-DIODE:** Overview of Semiconductors, PN junction diode and Zener diode –Diode circuits: rectifiers (bridge type only), filters, clippers and clampers.

**UNIT V- TRANSISTOR**: BJT construction, operation, characteristics (CB, CE and CC configurations) and uses – JFET and MOSFET construction, operation, characteristics (CS configuration) and uses.

**UNIT VI-DIGITAL ELECTRONICS**: Number systems – binary codes –binary arithmetic - Boolean algebra, laws & theorems - simplification of Boolean expression using K maps - logic gates - implementation of Boolean expressions is using logic gates - standard forms of Boolean expression.

**Text Books:**

1. Basic Electrical Engineering –T.K. Nagesarkar and M.S. Sukhja, Oxford University Press.2nd edition.
2. Basic electrical Engineering – M.S. Naidu and S. Kamakshiah – TataMcGraw-Hill, 2005 edition.
3. Principles of Electronics - V.K.Mehta, S.Chand Publications, 2nd edition.

**References:**

1. Theory and problems of Basic electrical Engineering- D.P.Kotahari & I.J.Nagrath PHI.

Electronic Devices and Circuits, Millman & Halkias, TMH publications.

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**II Year I SEM**

**L T P C**

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**7ZC01**

**MANAGEMENT SCIENCE AND FINANCIAL ACCOUNTING (MSFA)**

**Course Objective:** To make students understand the basics of management and Financial Accounting, its principles, practices and latest concepts for increasing the performance of engineering graduates in their respective fields, which facilitate them in making better planning and decisions

**Course Outcomes:**

1. Outlines the significance of management, defines the basic concepts and applicability of management principles in changing paradigms.
2. Helps in understanding organization behavior, personality determinants and other key aspects
3. Infers the need to understand the importance of Strategic management and Business environment in particular
4. Enrich students with basic concepts of Financial Accounting.
5. Understand basic concepts of Depreciation and need for preparing trial balance.
6. Helps in preparation of Financial Statements (final accounts).

**UNIT I**

**INTRODUCTION TO MANAGEMENT:** Management- Definitions, Levels of Management, Functions of management- Planning: types of planning, planning process; Organizing: Organizational Design and Structure, Staffing; Directing; Controlling: Basic control process- Fayol’s principles of Management - Taylor’s principles of scientific management- Maslow’s Motivational theory.

**UNIT II**

**INTRODUCTION TO ORGANIZATIONAL BEHAVIOR:** Definition, Nature and Scope of OB, Personality-determinants of Personality – Perception- Attitudes- Attribution theory- Johari Window and Transactional Analysis, Stress Management- factors and remedies

**UNIT III**

**STRATEGIC MANAGEMENT: I**ntroduction to Strategic Management, Vision, Mission, Goals, Objectives, Environmental Scanning- PESTEL, SWOT Analysis, Competitive Advantage, Concept of Core Competence, PORTER’s five force model, types of strategies, Strategic formulation and Implementation.

**UNIT IV**

**FUNDAMENTALS OF FINANCIAL ACCOUNTING:** Definition of Accounting, Accounting Concepts and conventions, principles of Double-Entry system, Book Keeping, Overview of books of original records Journal, Ledger and Subsidiary books

**UNIT V**

**TRIAL BALANCE AND DEPRECIATION OF FIXED ASSETS:** Significance of Trial balance, Preparation of trial balance Definition of Depreciation, Depreciation of fixed assets, Methods of Depreciation – Straight line method and Diminishing Balance method

**UNIT VI**

**CLASSIFICATION OF REVENUE AND CAPITAL EXPENSES, AND PREPARATION OF FINAL ACCOUNTS:** Revenue expenditure, Capital expenditure, Preparation of Final Accounts - Trading Account, Profit and Loss Account and Balance Sheet with simple adjustments

**References:**

* A R Aryasri: Management Science, Tata Mc Graw Hill
* Ambrish Gupta, Financial Accounting for Management, Pearson Education, New Delhi
* A R Aryasri: Managerial Economics and Financial Analysis, Tata Mc Graw Hill

**Syllabus for B. Tech - BIOTECHNOLOGY**

**II Year I SEM (7G371) BIOCHEMISTRY LABORATORY**

**L T P/D C**

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**H: High M: Medium L: Low**

**OBJECTIVE**

To provide an opportunity to experimentally verify the theoretical concepts of Biochemistry and to identify problems associated with functioning of biomolecules and design projects accordingly.

1. Units, Volume & Weight measurements. Concentration units, pH Measurement. Preparation of buffers
2. Qualitative analysis of carbohydrates
3. Quantitative estimation of Reducing sugars by the DNS / Benedict’s method.
4. Qualitative analysis of Amino Acids
5. Qualitative analysis of proteins
6. Quantitative estimation of Amino Acids by Ninhydrin method
7. Quantitative estimation of Proteins by Biuret /Lowry method
8. Quantitative estimation of cholesterol
9. Saponification value of oils
10. Estimation of Starch using amylase
11. Quantitative Estimation of DNA/RNA
12. Quantitative estimation of succinate dehydrogenase activity

An Introduction to Practical Biochemistry ,

David T. Plummer, third edition, 2004 Tata McGraw-Hill Education Ltd.

Syllabus for B. Tech - BIOTECHNOLOGY

**II Year I Semester**

**(7G372) MICROBIOLOGY AND CELL BIOLOGY LABORATORY**

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**H: High M: Medium L: Low**

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| **S.L No** | **Name of the Experiment** |
| **1** | Introduction to Microscope and Sterilization Techniques |
| **2** | Simple and Gram staining |
| **3** | Hanging drop technique for demonstrating motility of bacteria |
| **4** | Preparation of Media |
| **5** | Isolation, enumeration and purification of microbes from a given sample |
| **6** | Determination of bacterial growth curve |
| **7** | Effect of temperature and pH on microbial growth |
| **8** | Antibiotic Sensitivity Test By Disc Diffusion Method |
| **9** | Micrometry |
| **10** | Mitosis in onion root tip cells |
| **11** | Meiosis In Flower Buds Cells |
| **12** | Microbiological examination of water |

**TEXT BOOKS:**

1. Microbiological and applications, Laboratory, Manual in General Microbiology by Benson, Mc Graw Publications.
2. Laboratory exercises in Microbiology by Prescott – Harley, 5th edition, 2002

**REFERENCES**:

1. J.G. Cappucin and N. Sherman, A Laboratory manual, 4th edition, Addison & weslay, 1999.
2. Practical Manual in microbiology, Plant tissue culture and pathology – K.R. Aneja , New age Publication, 2001

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**Code: 7AC95 ELECTRICAL & ELECTRONICS ENGINEERING LAB**

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**Electrical Experiments**

1. Brake test on 3-phase induction motor (performance characteristics).
2. Speed control of DC shunt motor by
   1. Armature Voltage Control .
   2. Field flux control method.
3. Brake test on DC shunt motor.
4. Swinburne’s test on DC shunt machine.
5. OCC characteristics of DC shunt generator.
6. Verification of superposition and Reciprocity Theorems.

**Electronics Experiments**

1. PN Junction diode characteristics A. Forward bias B. Reverse bias.
2. Zener diode characteristics
3. Half wave Rectifier with and without filters.
4. Full wave Rectifier (Centre tapped and Bridge)with and without filters
5. Transistor CE characteristics (Input and Output)
6. Verification of Logic gates

Technical Seminar –III

**Course objectives:**

Develop an ability to understand and present seminar on the latest scientific and technological developments in the field of engineering and technology which enhances writing as well as oral communication skills.

**Course outcomes:**

1. Understand the concepts of technological developments in the chosen area.  
2. Enhance presentation, communication and analytical skills.  
3. Improve self confidence to face the audience.

**Syllabus**

Various research areas of Biotechnology

**Procédure**

1. Seminar in-charges shall highlight the significance of technical seminar in the first two sessions and enlighten the students on the utility of these seminars.
2. The student has to identify the related topic.
3. The slots, titles shall be decided upfront and seminar in charge shall take signatures.
4. The same sheet shall be affixed in the respective classrooms and seminar register.
5. If any student fails to present his/her seminar on the given slot, to genuine reasons, they may be asked to present in the subsequent slot/week.
6. Progress of the seminars need to be reviewed by the concerned HOD once in 15 days.
7. The evaluation for technical seminars has to be informed to students and displayed in the classrooms.
8. Report and presentation must contain topic, introduction, explanation, diagrams, tables, applications and conclusions.

The evaluation procedure for this subject is already stated in the Academic Regulations.

**Syllabus for B. Tech - BIOTECHNOLOGY**

**II Year II Semester**

**(7G406) GENETICS AND MOLECULAR BIOLOGY**

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**H: High M: Medium L: Low**

**L T P/D C**

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**Course Objective:**

On completion of the course, a student should be able to Identify patterns of inheritance, Understand the molecular mechanisms of replication ,transcription and translation.

**COURSE OUTCOMES**

1. Ability to apply the knowledge of Mendel’s laws in pedigree analysis
2. Apply the knowledge of chromosome structure in karyotyping
3. Ability to construct genetic maps
4. Ability to understand the structural and functional aspects of DNA
5. Ability to understand the structural and functional aspects of RNA
6. Gain an understanding of various stages of protein synthesis

**UNIT – I: Mendelian Genetics**

Mendel’s Laws of inheritance, Incomplete dominance and co-dominance, multiple alleles, epistasis, lethal genes, Genes and environment, sex determination, Sex-linked inheritance, extra chromosomal inheritance

**UNIT – II: Molecular Genetics – I**

Evidences for Nucleic acids as genetic material - Hershey Chase, Avery and McLeod Experiments; Ultrastructure of eukaryotic chromosome, Types of Chromosomes, Variation in chromosome number, Definition & Classification of mutations

**UNIT – III: Molecular Genetics – II**

Linkage & crossing over, Recombination, chromosomal mapping, Karyotyping, Allele frequencies and genotype frequencies, Random mating and Hardy-Weinberg principle, Quantitative inheritance

**UNIT – IV: DNA Replication**

Models of DNA replication: semi conservative Mechanism of DNA replication in bacteria, Enzymes involved in replication. , DNA damage and repair mechanisms, Telomeres and telomerase

**UNIT – V: Transcription**

m-RNA, r-RNA, t-RNA structures, Transcription, RNA polymerases and proteins involved in transcription, Post transcriptional processing of RNA‘s

**UNIT – VI: Translation**

Genetic code and Wobble Hypothesis, Protein synthesis in prokaryotes and eukaryotes, Post translational modifications

**TEXT BOOKS**

* 1. Molecular Biology of the Gene, James D Watson, Pearson-Benjamin Cummings
  2. Molecular Biology, 1987, David Freifelder, Jones and Bartlett Publishing Home
  3. Principles of Genetics, 1991, E.J. Gardner, M.J.Simmons & D P Shustad.

**REFERENCES:**

1. Molecular Cell Biology, 2003, Lodish, H., Berk A., Zipursky, S.L. Matsudaria, P. Baltimore, D. and Darnell, J. W.H. Freeman and Company.

2. Cell and Molecular Biology 1996. De Robertis and De Robertis, Waverly Pvt. Ltd. New Delhi.

3. Genetics, 1985, Goodenough U, Hold International

4. Genetics by Strickberger

5. Genetics from Genes to Genomes-Leland H. Hartwell, Leroy Hood, Mc Graw Hill.

**Syllabus for B. Tech - BIOTECHNOLOGY**

**II Year II Semester**

**(7BC04) ELEMENTS OF MECHANICAL ENGINEERING**

(Common to All Branches except Mechanical Engineering)

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**UNIT - I**

Energy Resources and Conversion,Basic concepts of Thermodynamics – general classification of heat engines, Property and state, System, Boundary and surroundings , Zeroth Law, First Law of Thermodynamics and its applications- Joule’s experiment, reversible non-flow processes-Constant volume, constant pressure, constant temperature process, polytropic process, Second Law of Thermodynamics – Statements, Heat engines, Carnot cycle, Air standard cycles – Otto, Diesel Cycles.

**UNIT-II Internal combustion engines:**

Internal combustion engines, definition, classification, components, working of four stroke cycle engines, SI and CI Engines, Performance parameters, Need for cooling, and lubrication of IC engines.

**Steam Power plant, Boiler, Steam Turbines:** Layout of steam power plant, Water tube and Fire tube Boilers :- Simple cross-tube boiler, Cochran, Babcock and Wilcox Boiler and High Pressure Boilers. (Benson & La-mount only).

**UNIT- III**

1. **Hydraulic pumps & turbines:-** Centrifugal Pumps, Pelton wheel, Francis turbine and Kaplan Turbine -- Layout of Hydro electric power plant

b) **Refrigeration & Air conditioning systems:-** Description of Vapour Compression and Vapour Absorption systems

**UNIT-IV**

**Engineering Materials**

Classification, mechanical properties, Ferrous Materials – Constituents of Cast Iron & types of Cast Iron, Steels – manufacture by Bessemer converter, Arc furnace, types of steel, effect of alloying elements on steel, Stainless steel, Non- Ferrous Materials: Properties and applications of Aluminum & alloys, Copper and alloys, composite materials – types, fabrication methods, Ceramics – Properties and applications

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**UNIT-V Transmission of Motion and Power**

Shafting, Belt drive, types of belt drive, types of belts, chain drives, types of chain drive, Pulleys, parts, types of pulleys, gear drive- classification, Terminology of spur gear, Gear trains – simple and compound, Clutches – purpose and basic principle of contact clutch, brakes - purpose and basic principle of block brake

**UNIT-VI**

**Robot and sensors**

Introduction, definition, Robot component, **CNC Machine tools** – Introduction, Machine control, Vertical and Horizontal spindles, CNC drill, mill, boring and tapping, Adaptive control, NC and CNC turning centers

**TEXT BOOKS:**

1. Mathur, M.L., Mehta, F.S. and Tiwari, R.P., Elements of Mechanical Engineering, Jain Brothers, New Delhi, 2005.
2. R.K. Rajput, “Elements of Mechanical Engineering”, Laxmi Publications, 1994.

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**II Year II Semester B.TECH - BIOTECHNOLOGY**

**(7G407) THERMODYNAMICS FOR BIOTECHNOLOGISTS**

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**L T P/D C**

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**Course Objective:** The objective of this course is to familiarize the students with basics of thermodynamics and enables them to calculate material and energy balances involved in design of biological processes

**COURSE OUTCOMES**

1. Student ables to understand the terminology associated with engineering and thermodynamics.
2. Student understands the concepts of heat, work and energy conversion and can calculate heat and work for industrial processes.
3. Student understand the applications of First law of thermodynamics, basics of enery calculations involved with thermodynamics.
4. Reiterate the first and second law of thermodynamics and understands the practical

implications of these laws in engineering design.

1. Student can calculate the properties of ideal and real gases mixtures based on thermodynamic principles.
2. Can able to understand the Maxwell relations and principles underlying the phase equilibrium, Partial molar properties.

**Unit I: CONCEPTS AND DEFINITIONS**

System, Surroundings, Intensive and extensive properties, Thermodynamic equilibrium: Thermal, mechanical and chemical equilibrium, Process, work, pure substance, concept of phase, Equations of state: Ideal gas, Vander waals equation of state, critical constants

**Unit II: FIRST LAW OF THERMODYNAMICS**

First law of thermodynamics, consequences of first law of thermodynamics, constant volume, constant pressure, constant temperature process. Adiabatic processes, Calculation of heat , work, internal energy and enthalpy

**Unit III : FIRST LAW ANALYSIS**

First law of thermodynamics for a continuous system and a control volume, Steady state flow processes, Fuels and Combustion: Standard Heat of Reaction, Standard enthalpy of formation, standard enthalpy of Combustion, Effect of Temperature on standard heat of reaction,

**Unit IV: SECOND LAW OF THERMODYNAMICS**

First law of thermodynamics limitation, Statements of Second Law, Equivalence of Kelvin-Planck and Clausius statements, Entropy concept, Carnot cycle, Carnot power cycle, Rankine cycle, practical Rankine cycle, Refrigeration cycles, calculation of COP, Calculations of Entropy change, Second law analysis of control volume.

**Unit V: THERMODYNAMIC RELATIONS**

Maxwells relations, Thermodynamic potentials: Internal Energy, Helmholtz Potential, Enthalpy, Gibb free Energy . entropy as function of temperature and pressure , entropy as function of temperature and specific volume, Specific heat relations, Clasius-Clapeyron equation

**Unit VI: SOLUTION THERMODYNAMICS**

Concepts of chemical potential and fugacity, Ideal and non ideal solutions, Activity Coefficient, Criteria for phase equilibrium; Vapor-liquid equilibrium calculations for binary mixtures from Raoult’s law and Henry’s law

**TEXT BOOKS:**

1. Y.V.C.Rao An introduction to Thermodynamics, University Press.
2. J.M.smith, H.C.Van Ness and M.M.Abbott. Introduction to chemical Engineering Thermodynamics McGraw Hill.

**References:**

1. P.K.Nag “ Engineering thermodynamcs” ,The McGraw Hill Companies, IV ed.

**II Year II Semester B.TECH - BIOTECHNOLOGY**

**(7G408) ANALYTICAL TECHNIQUES IN BIOTECHNOLOGY**

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**H: High M: Medium L: Low**

**L T P/D C**

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**OBJECTIVE**

To understand principles and operations of instruments in Biotechnology and to develop skills in using them to conduct investigations to solve problems in key areas of Biotechnology.

**COURSE OUTCOMES**

1. Ability to have a fair knowledge of various Analytical methods and instrumental methods of analysis of biological substances.

2. Ability to understand the principle and working of Bright field, Dark field, Fluorescent, Phase contrast, Electron Microscopy

3. Ability to demonstrate knowledge of Electromagnetic Spectrum. principle, working and application of UV - VIS Spectrophotometer, Spectrofluorimetry, Atomic absorption & Atomic emission spectroscopy

4. Ability to demonstrate knowledge of principle, working and application of various Separation Techniques like -Sedimentation, Centrifugation, Filtration, Dialysis, Salting in & Salting out, Electrophoresis of proteins and nucleic acids, pulse field, capillary and 2 D Gel, Flow cytometry

5. Ability to demonstrate the principle, working and application of various chromatographic techniques like- Paper and Thin Layer & Gas Chromatography, Gel filtration, Ion exchange and Affinity Chromatography, Principles and Operation of HPLC

6. Ability to demonstrate of uses of Radioactive and stable isotopes and their detection in biological systems half-life decay counters and autoradiography

UNIT I: **Introduction**

Types of Analytical Methods – Instruments for Analysis, classification of instrumental methods, Errors, Precision and Accuracy, Sensitivity and detection limit for instruments

Applications of using Instruments

1. Small Sample can be used 2. High Sensitivity is obtained 3. Measurement obtained are reliable 4. The determination is very fast 5. Even complex samples can be handled easily.

UNIT II: **Microscopy**

Bright field, Dark field, Fluorescent, Phase contrast, Electron Microscopy

Applications

1. Simplicity of setup with only basic equipment required.
2. No sample preparation required, allowing viewing of live cells.
3. Dark field microscopy is a very simple yet effective technique and well suited for visualizing Live and unstained biological samples, such as a smear from a tissue culture or individual water borne single-celled organisms.

**Applications of Fluorescent Microscope**

1. Diagnosis for immunological disease
2. Research and study for pathological change
3. Finding intracellular parasite
4. Differentiation between live-dead parasite

**Applications of Phase contrast microscopy**

1. Objects with poor intensity can be resolved well.
2. Image of the unstained object can be obtained
3. It is widely used in microbiology and tissue culture research to detect bacteria, cellular organelles and other small entities in living specimens
4. It allows the visualization of living unstained cells and their organelles. For the detection of bacterial components such as endospores and inclusion bodies containing poly β hydroxy butyrate, polymetaphosphate, sulpher and other substances

UNIT III: **Spectroscopy**

Radiation, energy and atomic structure- types of spectra and their biochemical usefulness, Electromagnetic radiation & Spectrum, Beer – Lambert’s Law and apparent deviations; UV – VIS Spectrophotometer, Spectro fluorimetry, Atomic absorption & Atomic emission spectroscopy

*Visible Spectrophotometer Applications*

*Quantification of Niacin*

*Quantification of Pyridoxine*

*Quantification of Vitamin B12*

*Metal Determination (Fe)*

*Fat-quality Determination (TBA)*

*Enzyme Activity (glucose oxidase)*

*Applications of Spectro fluorimetry*

*Immunoassay*

*Environmental monitoring*

*Clinical chemistry*

*DNA sequencing*

*Cell identification and sorting (by flow cytometry)*

*Genetic analysis (by fluorescence in site hybridization (FISH))*

*Application of UV/Vis atomic Absorption*

1. *Atomic absorption using either flame or electrothermal atomization is widely used for the analysis of trace metals in a variety of sample matrices.*
2. *Using the atomic absorption analysis for zinc as an example, procedures have been developed for its determination in samples as diverse as water and wastewater, air, blood, urine, muscle, tissue, hair, milk, breakfast cereals, shampoos, alloys, industrial plating baths, gasoline, oil, sediments, and rocks*
3. *Sodium and potassium may be assayed at concentration of a few parts per million using AES.*
4. *Emission flame spectrophotometer may be used to assay some 20 elements in biological samples,*
5. *The most common being*

*Calcium*

*Magnesium*

*Manganese*

1. *The techniques are widely used in clinical laboratories, for the determination of metals in body fluids.*

UNIT IV: **Separation Techniques – I**

Sedimentation, Centrifugation, Filtration, Dialysis, Salting in & salting out, Electrophoresis of proteins and nucleic acids, pulse field, capillary and 2 D Gel, Flow cytometry

Applications of Centrifugation

1. Dirt and water are removed from oils. Example, in the purification of olive oil or fish liver oil,

2. Lanolin is recovered from the wool

3. The liquid /liquid phases are separated in the extraction of drugs

4. Bacterial enzymes are prepared by removing bacteria.

5. Suspensions containing low concentration of solids can be separated quickly

6. Blood plasma is separated from whole blood.

7. Starch is collected after washing and purification states.

8. In the manufacture of insulin, liquor is clarified so as to remove the precipitated proteins

Applications of Filtrations

1. Recovery of crystalline solids

2. Separation of catalysts

3. Recovery of cells from fermentation medium

4. Clarification of liquids

5. Removal of particles from gases

6. Sterilization of liquids

Applications of Electrophoresis

The vast applications of electrophoresis are most evident in the health or medical industry, including antibiotic and vaccine analysis. Protein and DNA analysis are also important electrophoresis applications. Aside from allowing researchers to map and see the differences in the genetic code of species on earth, electrophoretic DNA analysis also provides a reliable tool in forensic investigations.

UNIT V: **Separation Techniques – II**

Paper, Thin Layer & Gas Chromatography, Gel filtration, Ion exchange and Affinity Chromatography, Principle and Operation of HPLC

*Paper Chromatography Applications*

1. *Can be used to determine the number of components in a mixture.*
2. *Can be used to identify the presence of specific compounds.*
3. *Can be used to monitor the progress of a reaction.*
4. *Will show if any reactant has disappeared, if any product has appeared, and how many products are present.*

*Applications of TLC*

*TLC has largely replaced paper chromatography.*

*Several advantages:*

*1.Runs faster*

*2.Better separations*

*3.Can choose between different stationary phases*

*Application of HPLC*

*1 Pharmaceuticals industry*

*i. To control the drug stability*

*ii Quantity of drug determination from pharmaceutical dosage forms, ex. Paracetamol determination in panadol tablet*

*iii. Quantity of drug determination from biological fluids, ex: blood glucose level*

*2. Analysis of natural contamination*

*i. Phenol & Mercury from sea water*

*3.Forensic test*

*i. Determination of steroid in blood, urine & sweat.*

*ii.Detection of psychotropic drug in plasma*

Unit VI: **Methods in Biochemical Analysis:**

Carbohydrates, Lipids, Protein and Nucleotide analysis; Use of Radioactive and stable isotopes and their detection in biological systems

Application:

*Radioactive isotopes are used for many different things:*

1. *To detect very small amounts of DNA using radioactive probes.*
2. *To measure very small amounts of specific molecules using radioimmunoassays.*
3. *To determine DNA sequences by the older methods.*
4. *To measure replication of DNA in cells and in test tubes.*

**II Year II Semester B.TECH - BIOTECHNOLOGY**

**(7G409) BIOPROCESS ENGINEERING**

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**L T P/D C**

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**COURSE OBJECTIVE**

To gain knowledge in the area of Bioprocess Engineering and to design and conduct experiment, analyze and interpret data in Bioprocess technology using research based knowledge and methods.

**UNIT I: INTRODUCTION TO BIOPROCESS**

An overview of traditional and modern applications of biotechnology industry, outline of an integrated bioprocess and the various (upstream and downstream) unit operations involved in bioprocesses, generalized process flow sheets.

**UNIT II: FERMENTATION -I**

General requirements of fermentation processes, Basic design and construction of fermentor and ancillaries, Main parameters to be monitored and controlled in fermentation processes; An overview of aerobic and anaerobic fermentation processes and their application in the biotechnology industry, solid-substrate, slurry fermentation and its applications, whole cell immobilization

**UNIT III: MEDIA FORMULATION**

Medium requirements for fermentation processes, carbon, nitrogen, minerals, vitamins and other complex nutrients, oxygen requirements, medium formulation for optimal growth and product formation, examples of simple and complex media, design and usage of various commercial media for industrial fermentations.

**UNIT IV: STOICHIOMETRY**

Stoichiometry of Cell growth and product formation, elemental balances, degrees of reduction of substrate and biomass, available electron balances, yield coefficients of biomass and product formation, maintenance coefficients, Energy analysis of microbial growth and product formation, oxygen consumption and heat evolution in aerobic cultures, thermodynamic efficiency of growth.

**UNIT V: GROWTH KINETICS**

Phases of cell growth in batch cultures, Simple unstructured kinetic models for microbial growth, Monod model, Growth of filamentous organisms. Growth associated (primary) and non - growth associated (secondary) product formation Kinetics. Leudeking-Piret models, substrate and product inhibition on cell growth and product formation.

**UNIT VI: BIOREACTORS**

Differences and similarities between chemical and bioreactors, classifications of bioreactors, fluidized bed reactor, packed bed reactor, bubble column reactors air lift reactors. Bioreactor for plant and animals cells.

**All relevant units will have basic numerical problems.**

**TEXT BOOKS**

1. P.M. Doran, “Bioprocess Engineering Principles”, Academic Press, 1995.
2. Stanbury, Whitaker, Hall “Principles of fermentation Technology,.Second Edition

**References:**

1 M. L. Shuler and F. kargi “Bioprocess engineering”, Prentice Hall of India 1992.

**COURSE OUTCOMES**

1. Ability to use microorganisms to transform biological materials for production of fermented foods has its origins in antiquity, such as antibiotics, therapeutic proteins and vaccines which involves upstream and downstream processes.

2. Ability to focus on basic design, ancillaries of fermenter and various important parameters to be monitored and controlled in fermentation process. This enables the student to get a basic idea of fermenter ,operation and maintainance and about different types of reactors which improves their practical knowledge

3. Ability to demonstrate importance and different types of media and use statistical techniques like Plackett-Burman design to solve problems

4. Ability to apply stoichiometry to reactions in the fermentor, yield coefients and apply stoichiometric principles for macroscopic analysis of cell growth and product formation

5. Ability to demonstrate the growth curve of microbe in batch culture, difference between batch,continuos and fed batch culture and inhibition kinetics.

6. Ability to apply the knowledge of bioreactors for mass cultivation of cells

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Sreenidhi Institute of Science & Technology

(An Autonomous Institution approved by UGC and ‘A’ Grade Awarded by NAAC)

**II Year B.Tech. Semester-II Probability Theory & Statistics L T P/D C**

**Code: 7HC15 (EEE and BT) 2**  0 **0 2**

**Pre Requisites**: Nil

**Course Outcomes:** *Students*

1. *Learn basic concepts of probability and able to evaluate probability.*
2. *Will able to solve problems on discrete and continuous probability distributions.*
3. *Learn basic concepts of sampling distribution and able solve problems on estimation.*
4. *Learn basic concepts of test of hypothesis and are able solve problems.*
5. *Will able to solve problems on correlation and regression.*

# ***UNIT-I: Basic Probability: (10L)***

Probability spaces, conditional probability, independent events, and Bayes’ theorem.

# Random variables: Discrete and continuous random variables, Expectation of Random Variables, Moments, Variance of random variables, Chebyshev's Inequality

## UNIT-II: Discrete Probability distributions: (10L)

## Binomial, Poisson, evaluation of statistical parameters for these distributions, Poisson approximation to the binomial distribution

***UNIT-III: Continuous Random variable & Distributions: (10L)***

Continuous random variables and their properties, distribution functions and densities,

Normal, exponential and gamma distributions, evaluation of statistical parameters for these distributions

***UNIT-IV: Applied Statistics: (10L)***

Curve fitting by the method of least squares- fitting of straight lines, second degree parabolas and more general curves; Correlation and regression – Rank correlation.

***UNIT-V:******Tests of Hypothesis for Large Samples: (10L)***

Tests of Hypothesis, Type–I and Type-II Errors, Hypothesis testing concerning one mean and two means and test of hypothesis concerning to one Proportion and difference of proportions.

***UNIT-VI: Tests of Hypothesis for Small Samples****:* ***(10L****)*

Student t-test, Hypothesis testing concerning one mean and two Means, F-test and χ2 test-Goodness of fit, Independence of Attributes.

**Text Books:**

1. Ronald E. Walpole,Raymond H. Myers,Sharon L. Myers,Keying Ye, Probability & Statistics For Engineers & Scientists, 9th Ed. Pearson Publishers.
2. S C Gupta and V K Kapoor, Fundamentals of Mathematical statistics, Khanna publications.
3. Probability and Statistics, T.K.V. Iyengar, B. Krishna Gandhi, S. Ranganatham, M.V.S.S.N. Prasad, S. Chand Publications.

**Reference Books:**

1. Miller and Freund’s, Probability and Statistics for Engineers, 8th Edition, pearson Educations.
2. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.
3. A.Ross, A First Course in Probability, 6th Ed., Peasrson Education India, 2002.

***Course Outcomes:*** *After the course completion the students will able to*

1. *Solve the random variable problems and probability distributions.*
2. *Estimate the parameters and solve the problems using central limit theorem.*
3. *Test the hypothesis related to samples concerning to the means and proportions of large size samples.*
4. *Apply and solve the problems using t-test, Chi-square test also testing the hypothesis problems on small size samples, goodness of fit and independence of attributes.*
5. *Solve the problems on Correlation. .*
6. *Solve problems on regression models.*

**II Year II Semester - B.TECH - BIOTECHNOLOGY**

**B.TECH - BIOTECHNOLOGY**

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**(7G473) ANALYTICAL TECHNIQUES IN BIOTECHNOLOGY LABORATORY**

**L T P/D C**

**- - 3 1.5**

**H: High M: Medium L: Low**

**OBJECTIVE**

To provide hands on training in using various equipments used in biotechnology for doing specialized project work to solve problems in key areas of Biotechnology.

**Experiments**

1. Calibration of pH meter, Colorimeter and conductive meter
2. Demonstration of viable cells using Phase Contrast Microscopy
3. Verification of Beer Lambert’s Law & Determination of Molar Extinction Coefficient by UV – VIS spectrophotometer
4. Absorption Spectra of Nucleic acids & Amino Acids
5. Estimation of turbidity using Nephelometer
6. Emission spectra of Anthracene using Spectrofluorimeter
7. Estimation of proteins by U.V. Spectrophotometric method
8. Estimation of nucleic acids by U.V. Spectrophotometric method.
9. Separation of compounds by Paper Chromatography
10. Separation of compounds by Thin layer Chromatography
11. Separation of biomolecules by Gel Chromatography
12. Separation of biomolecules using Dialysis

Textbook

1. An Introduction to Practical Biochemistry , David T. Plummer, third edition, 2004,Tata McGraw-Hill Education Ltd.

**Course outcomes**

* Ability to Calibrate pH meter, Colorimeter and conductive meter
* Ability to demonstrate viable cells using Phase Contrast Microscopy
* Ability to Verify the Beer Lambert’s Law & Determination of Molar Extinction Coefficient by UV – VIS spectrophotometer
* Ability to Measure Absorption Spectra of Nucleic acids & Amino Acids
* Ability to demonstrate Emission spectra of Anthracene using Spectrofluorimeter
* Ability to demonstrate the Estimation of proteins by U.V. Spectrophotometric method
* Ability to demonstrate separation of compounds by Paper Chromatography
* Ability to demonstrate separation of compounds by thin layer Chromatography
* Ability to demonstrate separation of compounds by Gel Chromatography
* Ability to demonstrate separation using Dialysis

**II Year II Semester B.TECH - BIOTECHNOLOGY**

**(7G474) BIOPROCESS ENGINEERING LABORATORY**

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**L T P/D C**

**- - 3 1.5**

**Course Objective**

For gaining hands on experience in conducting various fermentation experiments and to understand kinetics of the biochemical reactions and organisms

**Experiments**

* + 1. Extraction of commercially important enzymes from natural source
    2. Quantification of enzyme activity and specific activity
    3. Effect of pH, temperature, enzyme and concentration of substrate on enzyme activity
    4. Estimation of Michaelis - Menten parameters
    5. Immobilization of cells using gel entrapment and calculation of average diameter of bead.
    6. Estimation of Monod’s parameters µmax and ks
    7. Demonstration ofBatch, Fed-batch reactors.
    8. Production and estimation of ethanol from Glucose using S*acharomyces* *cerevisiae* in batch reactor using Taguchi method
    9. Production of wine
    10. Production and estimation of citric acid by *Aspergillus niger using* Taguchi method
    11. Determination of BOD
    12. Production and assay of antibiotic

**Course outcomes**

* Ability to demonstrate Extraction of commercially important enzymes from natural source
* Ability to demonstrate the quantification of enzyme activity and specific activity
* Ability to study the ffect of various parameters on enzyme activity, pH, temperature, enzyme and concentration of substrate
* Ability to demonstrate the Estimation of Michaelis - Menten parameters
* Ability to demonstrate the immobilization of cells using gel entrapment and calculation of average diameter of bead.
* Ability to demonstrate the Estimation of Monod’s parameters µmax and ks
* Ability to demonstrate Batch, Fed-batch reactors.
* Ability to Produce and estimation of ethanol from Glucose using S*acharomyces* *cerevisiae* in batch reactor using Taguchi
* Ability to demonstrate the Production of wine
* Ability to demonstrate the Production and estimation of citric acid by *Aspergillus niger*
* Ability to demonstrate the Determination of BOD
* Ability to demonstrate the Production and assay of antibiotic

II year II semester

**7G494 Technical Seminar –IV**

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**Course objectives:**

Develop an ability to understand and present seminar on the latest scientific and technological developments in the field of engineering and technology which enhances writing as well as oral communication skills.

**Course outcomes:**

1. Understand the concepts of technological developments in the chosen area.  
2. Enhance presentation, communication and analytical skills.  
3. Improve self confidence to face the audience.

**Syllabus**

Various research areas of Biotechnology

**Procédure**

1. Seminar in-charges shall highlight the significance of technical seminar in the first two sessions and enlighten the students on the utility of these seminars.
2. The student has to identify the related topic.
3. The slots, titles shall be decided upfront and seminar in charge shall take signatures.
4. The same sheet shall be affixed in the respective classrooms and seminar register.
5. If any student fails to present his/her seminar on the given slot, to genuine reasons, they may be asked to present in the subsequent slot/week.
6. Progress of the seminars need to be reviewed by the concerned HOD once in 15 days.
7. The evaluation for technical seminars has to be informed to students and displayed in the classrooms.
8. Report and presentation must contain topic, introduction, explanation, diagrams, tables, applications and conclusions.

The evaluation procedure for this subject is already stated in the Academic Regulations.

**B. Tech. II Year II semester**

**7G475 Comprehensive Viva-voce – I**

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**L T P/D C**

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**Pre-Requisites:** None

**Course Objectives:**

Prepare students in basics and advanced relevant courses to revise and face technical interviews for enhancing employability**.**

**Course Outcomes: After completing this course, student shall be able to**

|  |
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| 1. Assess the relevant courses they have undergone till the completion of that academic year. |
| 1. Comprehend the concepts in the core subjects and the elective subjects, to make them ready to face technical interviews which improve their employability skills. |

There will be 100 marks in total with 25 marks of internal evaluation and 75 marks of external evaluation.

**Internal:**

Comprehensive Viva Voce is Conducted twice in a semester.

End examination : 75 Marks.

The end examination will be carried out by a committee consisting of an external examiner, head of the department, a senior faculty member and the supervisor.