



***FACULTY OF ENGINEERING***

***IASE University***

***Gandhi Vidya Mandir, Sardarshahr (Rajasthan) – 331401  
India***

**Teaching and Examination Scheme and Syllabus**

for

**BACHELOR OF TECHNOLOGY  
(BIOINFORMATICS)  
(Four-Year Full Time Degree Programme)  
(Semester Scheme)**

Sessions 2009-10 to 2012 - 13

## Rules and Guidelines for the students

### 1. BACHELOR OF TECHNOLOGY (BIOINFORMATICS)

Course is a Four -Year (8 Semester) Full Time Integrated Degree Programme

### 2. ELIGIBILITY FOR ADMISSION:

A candidate seeking admission to the first year of the **B.Tech. (Bioinformatics)** course shall be required to have passed 10+2 examination with physics, Chemistry, and Mathematics or Biology from any recognized Board with at least 45% marks in aggregate for general category candidates, 40% for SC/ST/OBC candidates.

### 3. ADMISSION PROCEDURE:

Admission to the first year **B.Tech. (BI)** course shall be made on the basis of marks scored by the candidates in his/her 10+2 examination.

### 4. THE PROGRAMME

The **Bachelor of Technology (Bioinformatics)** is a four year full-time Intergraded degree programme. The course structure and programme administration are as follows:

#### A) COURSE STRUCTURE

The programme has been organized in Four years, each year comprising of two semesters. Teaching consists of Theory (Lectures and Tutorials) and Practical's/ Sessional (Laboratory work, Engineering Graphics, workshop practice and project etc.) Examination will be held at the end of the each semester. Details of these are given in the teaching & examination scheme.

#### *B) PROGRAMME ADMINISTRATION*

### 1. PROGRAMME ADMINISTRATION

#### 1.1. MEDIUM OF INSTRUCTION

English shall be the medium of instruction and examination.

#### 1.2. EVALUATION

- a. Each theory paper will be evaluated through a theory paper at the end of the semester carrying 100 marks along with continuous evaluation of sessional work, carrying 50 marks. The theory paper shall be of three hour duration. The sessional work will consist of continuous assessment of student's performance by teachers in tutorial classes and class tests.
- b. Three class tests will be organised in each semester as per scheme. The higher two out of the marks scored in the three tests will be considered for the sessional marks.

- c. Evaluation of laboratory/practical work will be through continuous assessment throughout the semester as well as examination at the end of the semester.
- d. At the end of the sixth semester students will undergo practical training for a period of at Least 45 working days in an industry / research organization related to his / her field of Study. At the end of the training, the student will submit its report to the Head of the Department within two weeks of the start of the seventh semester. The report should not be less than 75 typed pages. The work of the practical training will be evaluated by a board of the two teachers appointed by the Head of the Department. The later will counter sign the marks.
- e. The scheme of evaluation of project studies shall be as follows: The project work will be spread in the seventh and eight semesters. The topic of the project will be approved by the Head of the Department and the entire project work will be carried out under the guidance of a department project supervisor approved by the Head of the Department. The nature of the project work will consist of varying proportions of designing, fabrication, testing and Analysis of results. The project topic can also be taken from a live industrial problem. The Report of the completed project shall be signed by the guide and submitted to the Head of The Department on or before the last working day of the eighth semester. The evaluation of the project will be done by a board consisting of an internal and an external examiner.

## **2. PROMOTION AND SPAN PERIOD**

- 2.1.** The maximum span period of the programme is eight years from the date of registration in the programme.
- 2.2.** The minimum marks for passing the examination for each semester shall be 50% in each sessional, 40% in End Semester Examination of each theory paper, 50% in each project and 45% in aggregate of all the courses (Subject, sessional and project) of the semester.
- 2.3.** The Course of Special Mathematics (BI/BT 100) is compulsory for student's having been admitted after passing (10+2) exam with Biology subject & the course of Language Lab (BI/BT 400) is also compulsory, Students have to pass these courses before they are admitted to the 7<sup>th</sup> semester .However; the marks obtained in these will not be counted for deciding the division of the student.
- 2.4.** A student will be permitted to attend the classes of the second/fourth/sixth/eight semesters immediately after the examination of the first/third/fifth/seventh semester's examination, as the case may be, provided he/she has appeared in the first/third/fifth/seventh semester examination respectively.
- 2.5.** To be eligible for promotion to the 3<sup>rd</sup> semester of the program a student must have successfully cleared at least 11 papers out of the 22 papers including practicals / sessionals of the first and second semesters taken together, excluding the compulsory paper.

- 2.6. To be eligible for promotion to the 5<sup>th</sup> semester of the program a student must have successfully cleared at least 12 papers out of the 23 papers including practicals/ sessionals of the third and fourth semesters taken together.
- 2.7. To be eligible for promotion to the 7<sup>th</sup> semester of the program a student must have successfully cleared at least 11 papers out of the 22 papers including practicals / sessionals of the fifth and Sixth semesters taken together.
- 2.8. A student promoted to the third/fifth/Seventh semesters, without having cleared all the papers, will have to appear and pass the backlog papers of the first/third/fifth semesters along with the regular examinations of the first/third/fifth semesters and the backlog papers of the second/fourth semesters along with the regular examination of the second/fourth /sixth semesters. For this purpose syllabus prevailing at the time of examination will be applicable.
- 2.9. A candidate who has secured minimum marks to pass in each paper but has not secured the minimum marks required to pass in the aggregate for the semester concerned may take re-examination in not more than two theory papers to obtain the aggregate percentage required to pass the semester. The candidate will have to pay the requisite examination fee in order to be eligible for re-examination. In this case the marks secured by the candidate in the earlier examination in the paper concerned will be treated as **cancelled**. For this purpose syllabus prevailing at the time of examination will be applicable.
- 2.10. (a) Award of Division:
- Securing 60% marks and above – 1<sup>st</sup> division
  - Securing 50% and above but below 60% - 2<sup>nd</sup> division
  - Securing 45% and above but below 50% – Pass
- (b) For the declaration of Final B.Tech result, marks shall be totalled up as follows:
- First B.Tech: 50% of the Marks secured
  - Second B.Tech: 75% of the Marks secured
  - Third B.Tech: 100% of the Marks secured
  - Final B.Tech: 100% of the Marks secured
  - For first B.Tech to third B.Tech the division will be decided based on the marks obtained in the respective class/ year
  - A student who has secured 75% marks and above shall be declared to have passed in first division with honours. However, for this the student must have cleared successfully the entire Subject in **single attempt** with in the final year period of his/her study.
  - Similarly to be eligible for a gold medal on account of having secured first position, the student must have cleared all papers in **single attempt** and passed with first division

- 2.11.** For determining merit position of the candidates at the final year level the marks obtained by them in the second, third final years as described above shall only be considered.
- 2.12.** If a student (who has successfully completed the programme) wishes to reappear in one or more theory papers of the first, second, third, fourth, fifth, sixth, seventh or eighth semesters for the purpose of **improving** his/her **marks**, he/she will be permitted to do so on payment of requisite examination fee along with the regular examinations of that semester; however, the total number of such attempts shall not exceed **four** theory papers during the span period of the programme. For this his/her previous performance in the paper/papers concerned will be treated as **cancelled**. The application for such reappearing/re-examination must be submitted before the next examination of the corresponding semester. However, such candidates shall not be considered for award of gold medal.
- 2.13.** A student to be eligible for award of **degree** has to **clear all papers** offered during four-year programme within the **span period** of eight years.

## 5. LATERAL ENTRY

a) Candidates having passed B.Sc with 60 % marks can be admitted to 3<sup>rd</sup> semester of B.Tech programme. However they shall be required to study and pass the following courses between the regular examinations of third to eighth semesters.

For students with Mathematics in B.Sc:

BI/BT 105-Manufacturing Process  
 BI/BT 106-Electrical Engineering I  
 BI/BT 110-Engineering Graphics I  
 BI/BT 111-Workshop Technology  
 BI/BT 202-Electrical Engineering II  
 BI/BT 204-Fundamental of Biotechnology  
 BI/BT 206-Electronics  
 BI/BT 210-Engineering Graphics II

For students with Biology in B.Sc:

BI/BT 100-Special Mathematics\*  
 BI/BT 101- Mathematics I  
 BI/BT 105-Manufacturing Process  
 BI/BT 106-Electrical Engineering I  
 BI/BT 110-Engineering Graphics I  
 BI/BT 111-Workshop Technology  
 BI/BT 201- Mathematics II  
 BI/BT 202-Electrical Engineering II  
 BI/BT 206-Electronics  
 BI/BT 210-Engineering Graphics II

\*the rule of the passing this Paper will remain the same as give in Point 4(B) 2.3 above

b) No candidate of this category shall be permitted for regular course of study in Final B.Tech unless he/she has passed the papers as mention above.

**6. ATTENDANCE**

All students are required to have 75% attendance in each subject and there must be 75% attendance of the student before he/she could be permitted to appear in the examination.

**7. RULES FOR THE AWARD OF GRACE MARKS**

UNDER GRADUATE/ POST GRADUATE (MAIN/SUPPLYMENTARY EXAMINATIONS UNDER THE FACULTIES OF ENGINEERING & TECHNOLOGY.

Grace marks to the extent of 1% of the aggregate marks prescribed for an examination will be awarded to a candidate failing in not more than 25% of the total number of theory papers, practicals, sessionals, dissertation, viva-voce and the aggregate, as the case may be in which minimum pass marks have been prescribed; provided the candidate passes the examination by the award of such Grace marks. For the purpose of determining the number of 25% of the papers, only such theory papers practicals, dissertation, viva-voce etc. would be considered, of which, the examination is conducted by the University.

N.B.:- If 1% of the aggregate marks or 25% of the papers works out in fraction, the same will be raised to the next whole number. For example, if the aggregate marks prescribed for the examination are 450, grace marks to the extent of 5 will be awarded to the candidate, similarly, if 25% of the total papers is 3.2, the same will be raised to 4 papers which grace marks can be given.

**GENERAL:-**

- A candidate passes in a paper/ practical or the aggregate by the award of grace marks will be deemed to have obtained the necessary minimum for a pass in that paper/ practical or in the aggregate and shown in the marks sheet to have passed by grace. Grace marks will not be added to the marks obtained by a candidate from the examiners nor will the marks obtained by the candidate be subject to any deduction due to award of grace marks in any other paper/ practical or aggregate.
- If a candidate passes the examination but misses First or Second Division by one mark, his aggregate will be raised by one mark so as to entitle him for the first or second division, as the case may be. This one mark will be added to the paper in which he gets the least marks and also in the aggregate by showing +1 in the tabulation register below the marks actually obtained by the candidate. The marks entered in the marks-sheet will be inclusive of one grace mark and it will not be shown separately.
- Non appearance of a candidate in any paper will make him ineligible for grace marks. The place of a passed candidate in the examination list will, however be determined by the aggregate marks he secures from the examiners, and he will not, by the award of grace marks, become entitled to a higher division.
- Distinction won in any subject at the examination is not to be forfeited on the score that a candidate has secured grace to pass the examination.

Note: - The Grace marks will be awarded only, if candidate appears in all the papers prescribed for the examination.

### **8. Rules for change of branch for the students of III Sem. B.Tech/ B.E.:**

- I The faculty, on the basis of applications received from desirous students up to the date and time notified by the Director, will prepare a merit list of the students. The list will be prepared on the basis of overall merit of the 1<sup>st</sup> (Semester) result only and the applications for change of branch will be processed as per the merit list.
- II Request for change from B.E. to B. Tech. programme or vice versa by any student will be considered only if, the candidate fulfils basic admission criteria for the desired programme and using the guidelines below:

If the candidate is eligible for change from B. Tech. to B.E. & vice-versa is found deficit in the course coverage of first and second semester, he will have to pass the deficit courses before the candidate is admitted to the seventh semester. However, the marks obtained in the deficit courses will not be added for deciding the division of the student.

#### **ELIGIBILITY CRITERIA:**

- (a) The students must have passed the 1<sup>st</sup> Semester B.Tech./B.E Examination in all components in one attempt with at least 60% marks in aggregate. The student with back papers or whose result has not been declared will not be considered for change of branch.
- (b) In case any student has applied for re-valuation/re-totalling of his/her marks of 1<sup>st</sup> Semester B.Tech/B.E and the result has not been received till the time of change of branch, such a student will not be entitled for change of branch on the basis of his/her subsequently revised result.

#### **PROCEDURE:**

- 1) Applications in a specified format (developed by the faculty) for change of branch will be invited by the Director/Principal of the faculty on the basis of the result of I (Semester) B. Tech./ B.E in duplicate, up to the date notified by IASE University. One copy of each such application be sent to IASE University by that date.
- 2) The students would submit a photo copy of 1<sup>st</sup> (Semester) Examination mark sheet of that year along with the application. The student may give as many preferences as possible against the vacant seats in respective college.
- 3) A seat matrix shall be prepared by the faculty, as per the details of the vacant seats (admitted through direct admission) in the previous year.
- 4) Due to change of branch, the strength of student in any branch should not fall short of 75% of the enrolled students in that branch in that year. And under no circumstances, due to change of branch, the number of seats in a particular branch in a college shall exceed the sanctioned strength approved by the AICTE, for that batch.
- 5) All students who have applied for the change of branch in-time will be called for counselling by the admission council of the faculty and considered for change of branch as per merit, preference and availability of seat. However, at the time of the counselling, if any student wishes to withdraw his/her application he/she can do so by a written request. In case any student does not present himself/herself for counselling, his/her branch will be changed as per the preference mentioned in the application form, merit and availability of seat.

**PROPOSED DRAFT OF TEACHING & EXAMINATION SCHEME  
for B.Tech. (BI) – Four Year (8 Semester) Full Time Degree Programme**

**B.Tech. (BI) – First Year****Semester - I**

S. No.	Course No.	Subject	Periods			Evaluation Scheme				
			L	T	P	SESSIONAL EXAM			ESE	TOTAL
						TA	CT	TOT		
THEORY										
1	BI/BT 101	Mathematics I	3	1	-	30	20	50	100	150
2	BI/BT 102	Engineering Chemistry I	3	1	-	30	20	50	100	150
3	BI/BT 103	Engineering Physics I	3	1	-	30	20	50	100	150
4	BI/BT 104	English	2	1	-	30	20	50	100	150
5	BI/BT 105	Manufacturing Processes	2	1	-	30	20	50	100	150
6	BI/BT 106	Electrical Engineering I	3	1	-	30	20	50	100	150
PRACTICALS / SESSIONALS										
7	BI/BT 107	Engineering Chemistry Lab I	-	-	3	50	-	50	50	100
8	BI/BT 108	Engineering Physics Lab I	-	-	2	50	-	50	50	100
9	BI/BT 109	Electrical Engineering Lab I	-	-	2	50	-	50	50	100
10	BT /BI 110	Practical Geometry	-	-	3	50	-	50	50	100
11	BI/BT 111	Workshop Technology	-	-	3	50	-	50	50	100

TA – Teacher's Assessment  
CT – Class Test  
ESE – End Semester Examination

Total Marks – 1400  
Total Periods – 35

	BI/BT 100*	Special Mathematics	3	1	-	30	20	50	100	150
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\*This Course of Special Mathematics (BI/BT 100) is compulsory for student's having been admitted after passing (10+2) exam with Biology Subject. Students have to pass this course, however the marks obtained in this will not be counted for deciding the division of the student.

**B.Tech. (BI) – First Year****Semester- II**

S. No.	Course No.	Subject	Periods			Evaluation Scheme				
			L	T	P	SESSIONAL EXAM			ESE	TOTAL
						TA	CT	TOT		
THEORY										
1	BI/BT 201	Mathematics II	3	1	-	30	20	50	100	150
2	BI/BT 202	Electrical Engineering II	3	1	-	30	20	50	100	150
3	BI/BT 203	Engineering Physics II	3	1	-	30	20	50	100	150
4	BI/BT 204	Fundamental of Biotechnology	3	1	-	30	20	50	100	150
5	BI/BT 205	Engineering Chemistry II	2	1	-	30	20	50	100	150
6	BI/BT 206	Electronics	3	1	-	30	20	50	100	150
PRACTICALS / SESSIONALS										
7	BI/BT 207	Electrical Engineering Lab II	-	-	2/2	50	-	50	50	100
8	BI/BT 208	Engineering Physics II	-	-	2	50	-	50	50	100
9	BI/BT 209	Electronics Lab	-	-	2/2	50	-	50	50	100
10	BI/BT 210	Machine Drawing	-	-	3	50	-	50	50	100
11	BI/BT 211	Computer System and Programming	2	-	2	50	-	50	100	150
		Discipline and Co- curricular activities	-	-	-	-	-	-	-	100

TA – Teacher’s Assessment  
 CT – Class Test  
 ESE – End Semester Examination

Total Marks – 1550  
 Total Periods – 35

**B.Tech. (BI) – Second Year****Semester- III**

S. No.	Course No.	Subject	Periods			Evaluation Scheme				
			L	T	P	SESSIONAL EXAM			ESE	TOTAL
						TA	CT	TOT		
THEORY										
1	BI/BT 301	Mathematics III	3	1	-	30	20	50	100	150
2	BI 302	Introduction to Bioinformatics	3	-	-	30	20	50	100	150
3	BI 303	Data Structure & C	3	1	-	30	20	50	100	150
4	BI/BT 304	Cell Biology	3	-	-	30	20	50	100	150
5	BI/BT 305	Bio molecules & Metabolism	3	1	-	30	20	50	100	150
6	BI/BT 306	Microbiology	3	-	-	30	20	50	100	150
7	BI 307	Internet & Networking fundamentals	3	1	-	30	20	50	100	150
PRACTICALS / SESSIONALS										
8	BI 308	Introduction to Bioinformatics	-	-	2	30	-	30	45	75
9	BI/BT 309	Cell Biology	-	-	2/2	30	-	30	45	75
10	BI/BT 310	Bio molecules & Metabolism	-	-	2/2	50	-	50	50	100
11	BI/BT 311	Microbiology			2	50	-	50	50	100
12	BI 312	Data Structure & C	-	-	3	50	-	50	50	100

TA – Teacher's Assessment  
 CT – Class Test  
 ESE – End Semester Examination

Total Marks – 1500  
 Total Periods – 34

**B.Tech. (BI) – Second Year****Semester- IV**

S. No.	Course No.	Subject	Periods			Evaluation Scheme				
			L	T	P	SESSIONAL EXAM			ESE	TOTAL
						TA	CT	TOT		
THEORY										
1	BI/BT 401	Genetics	3	1	-	30	20	50	100	150
2	BI/BT 402	Molecular Biology	3	1	-	30	20	50	100	150
3	BI/BT 403	Bio Physics	3	1	-	30	20	50	100	150
4	BI/BT 404	Instrumental Methods of Analysis	3	1	-	30	20	50	100	150
5	BI 405	Computational Biology	3	1	-	30	20	50	100	150
6	BI/BT 406	Technical Communication	3	1	-	30	20	50	100	150
PRACTICALS / SESSIONALS										
7	BI/BT 407	Genetics	-	-	2	50	-	50	50	100
8	BI/BT 408	Molecular Biology	-	-	2	50	-	50	50	100
9	BI/BT 409	Bio Physics	-	-	2	50	-	50	50	100
10	BI/BT 410	Instrumental Methods of Analysis	-	-	2	50	-	50	50	100
11	BI 411	Computational Biology	-	-	3	50	-	50	50	100
		Discipline and Co- curricular activities	-	-	-	-	-	-	-	100

TA – Teacher’s Assessment  
 CT – Class Test  
 ESE – End Semester Examination

Total Marks – 1500  
 Total Periods – 33

	BI/BT 400*	Language Lab	3	1	-	30	20	50	100	150
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\*This Course of Language Lab (BI/BT 400) is compulsory, Students have to pass this course, however the marks obtained in this will not be counted for deciding the division of the student.

**B.Tech. (BI) – Third Year****Semester- V**

S. No.	Course No.	Subject	Periods			Evaluation Scheme				
			L	T	P	SESSIONAL EXAM			ESE	TOTAL
						TA	CT	TOT		
THEORY										
1	BI/BT501	Management Concepts and Practices	3	1	-	30	20	50	100	150
2	BI/BT502	Genetic Engineering	3	1	-	30	20	50	100	150
3	BI/BT503	Biochemical Engineering	3	1	-	30	20	50	100	150
4	BI 504	Comparative Genomics & Proteomics	3	1	-	30	20	50	100	150
5	BI/BT505	Immuno Technology	3	1	-	30	20	50	100	150
6	BI 506	Structural Bioinformatics	3	1	-	30	20	50	100	150
7	BI 507	Operating System	3	1	-	30	20	50	100	150
PRACTICALS / SESSIONALS										
8	BI/BT508	Genetic Engineering	-	-	2	50	-	50	50	100
9	BI 509	Comparative Genomics & Proteomics	-	-	2/2	30	-	30	45	75
10	BI/BT510	Immuno Technology	-	-	2/2	50	-	50	50	100
11	BI 511	Structural Bioinformatics	-	-	2/2	30	-	30	45	75
12	BI 512	Operating System	-	-	2/2	25	-	25	25	50

TA – Teacher’s Assessment  
CT – Class Test  
ESE – End Semester Examination

Total Marks – 1450  
Total Periods – 34

**B.Tech. (BI) – Third Year****Semester- VI**

S. No.	Course No.	Subject	Periods			Evaluation Scheme				
			L	T	P	SESSIONAL EXAM			ESE	TOTAL
						TA	CT	TOT		
THEORY										
1	BI/BT601	Economics	3	1	-	30	20	50	100	150
2	BI 602	Data mining & Data Ware Housing	3	1	-	30	20	50	100	150
3	BI 603	Computer Networking	3	1	-	30	20	50	100	150
4	BI 604	Numerical Analysis & Optimization Techniques	3	1	-	30	20	50	100	150
5	BI/BT605	Environment & Disaster Management	3	1	-	30	20	50	100	150
6	BI 606	Biological Databases and their Management	3	1	-	30	20	50	100	150
7	BI 607	Cheminformatics	3	1	-	30	20	50	100	150
PRACTICALS / SESSIONALS										
8	BI 608	Biological Databases and their Management	-	-	2	30	-	30	45	75
9	BI/BT609	Group Discussion & Viva - Voce	-	-	-	50	-	50	50	100
10	BI 610	Cheminformatics	-	-	2	30	-	30	45	75
		Discipline and Co- curricular activities	-	-	-	-	-	-	-	100

TA – Teacher's Assessment  
 CT – Class Test  
 ESE – End Semester Examination

Total Marks – 1400  
 Total Periods – 32

**B.Tech. (BI) – Fourth Year****Semester- VII**

S. No.	Course No.	Subject	Periods			Evaluation Scheme				
			L	T	P	SESSIONAL EXAM			ESE	TOTAL
						TA	CT	TOT		
THEORY										
1	BI 701	Drug Designing & Discovery	3	1	-	30	20	50	100	150
2	BI 702	Bioinformatics Algorithm	3	1	-	30	20	50	100	150
3	BI/BT703	Bio safety , Ethics , Patenting and IPR	2	1	-	30	20	50	100	150
4	BI 704	Bio Mark-up Languages	3	1	-	30	20	50	100	150
5	BI 705	Java and Web Technology	3	1	-	30	20	50	100	150
6	BI 706	System Biology	3	1	-	30	20	50	100	150
PRACTICALS / SESSIONALS										
7	BI 707	Drug Designing & Discovery	-	-	2/2	25	-	25	25	50
8	BI 708	Bio Mark-up Language	-	-	2/2	25	-	25	25	50
9	*BI 709	Project	-	-	4	-	-	-	-	-
10	BI 710	Practical Training	-	-	-	-	-	-	-	100
11	BI 711	Java and Web Technology	-	-	2/2	25	-	25	25	50

\*Project will continue in the 7<sup>th</sup> & 8<sup>th</sup> Semesters but will be tabulated in the final result, 8th Semester.

TA – Teacher's Assessment  
 CT – Class Test  
 ESE – End Semester Examination

Total Marks – 1150  
 Total Periods – 30

**B.Tech. (BI) – Fourth Year****Semester- VIII**

S. No.	Course No.	Subject	Periods			Evaluation Scheme				
			L	T	P	SESSIONAL EXAM			ESE	TOTAL
THEORY						TA	CT	TOT		
1	BI 801	Information Protection and Security	3	1	-	30	20	50	100	150
2	BI 802	Machine Learning Approach	3	1	-	30	20	50	100	150
PRACTICALS / SESSIONALS										
3	BI/BT 803	Project	-	-	16	-	-	100	300	400
4	BI 804	Machine Learning Approach	-	-	2	25	-	25	25	50
		Discipline and Extra curricular activities	-	-	-	-	-	-	-	100

TA – Teacher’s Assessment  
 CT – Class Test  
 ESE – End Semester Examination

Total Marks –850  
 Total Periods – 26

## FIRST YEAR Semester – I

### BI/BT-100 – Special Mathematics\*

(L: 3: T: 1)

**Max.Marks:100**

**Min.Marks:40**

\*This Course of Special Mathematics (**BI/BT 100**) is compulsory for student's having been admitted after passing (10+2) exam work Biology Subject. Students have to pass this course, however the marks obtained in this will not be counted for deciding the division of the student.

#### **Unit 1: Algebra**

Factorization, Quadratic equations, Binomial theorem, Exponential and logarithmic series.

#### **Unit 2: Trigonometry**

Trigonometrically Ratio of Allied angles, Trigonometrically Ratio of Compound angles, Conditional Identities, Relation between sides and angles of a Triangle, Inverse circular functions.

#### **Unit 3: Differential Calculus**

Derivatives, Application of Derivatives, Second order derivatives.

#### **Unit 4: Integration Calculus**

Integration as Inverse of differentiation, Integration by Substitution, Integration by Parts, Integration of Algebraic function, Integration by partial Fraction method Integration of Trigonometric functions.

#### **Unit 5: 2D Coordinate Geometry**

Cartesian Coordinates, Locus, Straight Line, Pair of Straight Lines, change of axes, Circle, Elementary Parabola & Ellipse.

#### **Reference:**

1. R.D. Sharma- Mathematics- (Class 11 and 12) Dhanpat Rai Prakashan
2. R.S. Agarwal- Mathematics- (Class 11 and 12) Bharti Prakashan

**BI/BT -101 – Mathematics I****(L: 3: T: 1)****Max.Marks:100****Min.Marks:40****Unit 1:**

Three dimensional geometry: Quadratic surfaces : Sphere : Plain section of sphere , intersection of sphere with straight line ,tangent plain & tangent Line of sphere , Cylinder , Cone and Central Conicods (in standard forms).

**Unit 2:**

Addition , Subtraction and Multiplication of Matrices , rank of matrix , Inverse of a matrix , Cramer's rule , Matrix method , Cayley-Hamilton theorem , Eigen values and Eigen vectors.

**Unit 3:**

Limit , Continuity , Derivatives , application of derivatives , Higher order derivatives , Successive differentiation , Leibnitz theorem for nth derivative , Taylor's theorem , Tangent & Normal , Radius of curvature , Asymptotes , Tracing of Curves.

**Unit 4:**

Differentiability of functions of two variables, Euler's theorem , Partial differentiation , Chain-rule , Jacobian , Taylor's theorem of two variables , Maxima and Minima of two functions.

**Unit 5:**

Methods of Integration, Indefinite Integral, Definite Integral, Gamma and Beta functions, Dirichlet's integral.

**Reference:**

1. B.S.Gareval - Higher Engineering Mathematics
2. Gaur&Kaul - Engineering Mathematics I
3. R.D.Sharma - Mathematics I

**BI/BT -102 – Engineering Chemistry I****(L: 3: T: 1)****Max.Marks:100****Min.Marks:40****Unit 1:**

Solution- Molarity, Molality, Normality, Mole Fraction, Colligative properties - Lowering in vapour Pressure, Depression in Freezing point, Elevation in Boiling point and Osmotic pressure.

**Unit 2:**

Kinetics and catalysis- Zeroth, 1<sup>st</sup>, 2<sup>nd</sup> & 3<sup>rd</sup> order of reaction. Arrhenius theory and collision theory of chemical reaction. Homogeneous and Heterogeneous catalysis. Enzyme catalyzed reactions.

**Unit 3:**

Stereochemistry- Configuration, R,S nomenclature Geometric isomerism with special evidence of allene and cyclic system cyclopropane. E&Z nomenclature. Chirality, Optical isomerism with example of Spiro compounds.

**Unit 4:**

Reaction Mechanism- Reaction intermediates (types, structure and stability) e.g. carbocation and carboanion involved reaction in cis and trans 2-butene.

**Unit 5:**

Coordination compounds- Nomenclature, ligands and types of ligands, Structure and bonding in coordination compounds, CFT and MOT of Octahedral and Tetrahedral complexes, Jahn Teller distortion (d<sup>9</sup> case).

**Reference:**

1. J. Huheey – Inorganic Chemistry
2. Jerry March – Advanced Organic Chemistry
3. Malik, Tuli & Madan – Some Selected Topics in Inorganic Chemistry
4. Atkins – Physical Chemistry Puri, Sharma & Pathania – A Text Book of Physical Chemistry

**BI/BT -103 – Engineering Physics I****(L: 3: T: 1)****Max.Marks:100****Min.Marks:40****Unit 1:**

**Interference:-** Coherence and coherent sources, Superposition of principle, Interference by division of wave-front- Young' s double slit experiment, Fresnel Biprism, Interference by division of amplitude – Thin Film, Newton rings, Michelson Interferometer

**Unit 2:**

**Diffraction:-** Fresnel and Fraunhofer types of diffraction, Fraunhofer diffraction- single slit , Diffraction grating - Wavelength Determination, Resolving power and dispersive power. Rayleigh criterion ,Resolving Power of optical instruments: Microscope, Telescope , Diffraction grating

**Unit 3:**

**Polarization:-** types of polarization, Nicol prism, Double refraction, elliptically and circularly polarized light, Brewster's law, Malus law, Quarter wave and half wave plates, Optical activity, specific rotations

**Unit 4:**

**Thermodynamics:-** Thermodynamics Processes–Reversible and irreversible process, cyclic process, Isothermal and adiabatic process, First Law of Thermodynamics, Applications of First law of thermodynamics, Second law of Thermodynamics, Maxwell's Thermo dynamical Relations, Applications of Maxwell's Thermo dynamical Relations, Maxwell Boltzmann distribution, Bose Einstein and Fermi Dirac statistics

**Unit 5:**

**Theory of relativity-**Inertial frame of reference , Non-inertial frame of reference, Michelson- Morley experiment, Einstein's special Theory of Relativity Lorentz Transformation, length contraction, time dilation, variation of mass with velocity, Equivalence of mass and energy.

**Reference:**

1. A.K. Ghatak - Optics
2. Dr. G.D. Ladiwala - Engineering Physics
3. D.S. Mathur - Mechanics
4. Haliday & Resnik - Modern Physics
5. Engineering Physics, S. CHAND Publ.

**BI/BT -104 – English**

**(L: 2: T: 1)**

**Max.Marks:100**

**Min.Marks:40**

**Unit 1:**

**Short Stories** - “The Gift of the Magi” by O. Henry; “The Fortune-Teller” by Karl Capek; “The Nightingale and the Rose” Oscar Wilde.

**Short Stories** - “Dr. Heidegger’s Experiment” by Nathaniel Hawthorne; “The Three Dancing Goats” by Anonymous; “The Accompanist” by Anita Desai.

**Unit 2:**

**Poems** - “Mending Wall” by Robert Frost; “This is Going to Hurt Just a Little Bit” by Odgen Nash; “Death and Leveler” by James Shirley; “Last Lesson of the Afternoon” by D. H. Lawrence; “Night of the Scorpion” by Nissim Ezekiel.

**Unit 3:**

**Short Plays and Essay** - “The Dear Departed” by Stanley Houghton; “Refund” by Fritz Karinthy; “Monkey’s Paw” by W. W. Jacobs.

**Unit 4:**

Grammar: - Words and sentences, verbs /tenses, Questions/question tags, model verbs, active and passive voice .infinitive, Adjective and adverbs, reported speech.

**Unit 5:**

Articles, prepositions verbs with preposition and adverbs, pronouns, relative clauses, condition

**Reference:**

1. Selection from English Literature, Ed. R.K .Lydia; Oxford university press.

**BI/BT -105 – Manufacturing Processes****(L: 2: T: 1)****Max.Marks:100****Min.Marks:40****Unit 1:**

Concept of engineering materials and manufacturing: Basic manufacturing processes; Casting process; tools and equipments, pattern materials, types and allowances, moulding sand; types, composition and properties, core sands and core making, casting defects, cleaning and fettling

**Unit 2:**

Welding fundamentals, edge preparation, Types of welded joints, gas welding process and equipments. Types of flames, Welding methods, oxyacetylene cutting, manual metal arc welding process, welding defects

**Unit 3:**

Hot and cold working processes: Forging operations, drop, horizontal and press forging, rolling, extrusion, wire drawing and tube drawing, tools and equipments used in the above operations, forging defects.

**Unit 4:**

Brief description of lathe, drilling, shaping, planning and milling machines

**Unit 5:**

Metal Cutting tools, Concept of metal cutting process, Grinding operation, Plane and cylindrical grinders, grinding wheels, Elementary concept of lapping and honing operation. Fitting hand tools, marking and measuring devices

**Reference:**

1. S.K. Hazra Chaudhary – Workshop Technology – Part I ,Part II
2. B.S. Raghuvanshi – Workshop Technology – Part I , Part II
3. P.C Sharma - Manufacturing Processes
4. W.A.J Chapman – Workshop Technology , Part I, part II , Part III

**BI/BT -106 – Electrical Engineering I****(L: 3: T: 1)****Max.Marks:100****Min.Marks:40****Unit: 1**

**Nature of Electricity and OHM'S Law:** Nature of electricity, Electric Current, Potential Difference, Potential, Resistance, Ohm's Laws, Laws of Resistance. Conductance and Conductivity. DC Circuits: series and parallel circuits, Current Distribution in Parallel circuits.

**Unit: 2**

**D.C. Networks:** Kirchoff 's Laws, Source Conversion, Voltage and Current divider Rule, Node Voltage and Mesh Current Analysis. Delta-Star and Star-Delta Transformations, Classification of Network Elements. Network Theorems- Superposition theorem, Thevenin's theorem.

**Unit: 3**

**Measurement of electrical quantities:** -Construction, Working principle, Merits and Demerits of Moving Coil and Moving iron type indicating instruments (voltage, current).  
Introduction to power and energy meters.

**Unit: 4**

**Single phase AC Circuits:** Generation of Single Phase AC Voltage, EMF Equation, RMS and Average Values. Sinusoidal and phasor representation of Voltage and Current: Single phase AC circuit-behavior of resistance, inductance and capacitance and their combination in series & parallel. Resonance in series parallel circuit.

**Unit: 5**

**Three phase A.C. Circuits:** Introduction of poly phase, Advantages of three phases over the single phase. Generation of three phase AC Voltage. Star-Delta connections, line and phase Voltage/Current relations, three phase power and its measurement.

**Reference:**

1. B.L. Theraja. "Fundamentals of electrical Engg. and Electronics", S. Chand & Co.
2. J.B. Gupta "Fundamentals of electrical Engg. and Electronics",

**FIRST YEAR**  
**Semester – II****BI/BT 201 – Mathematics II****(L: 3: T: 1)****Max.Marks:100****Min.Marks:40****Unit 1:**

Linear Differential Equations with constant coefficients , Euler-Cauchy equations , Solution of second order differential equations by change of variables Method of variation of Parameters , Equation of the form  $y'' = f(y)$  and their Applications , Ordinary Differential equations.

**Unit 2:**

Convergence and their tests (ratio , comparison , integral , root , logarithmic , higher ratio tests and Leibnitz test (without proof) Uniform Convergence and its properties , Weiestrass M – test.

**Unit 3:**

Group general property of groups, order and elements of a group, Permutation even & odd Permutation, Group of Permutation, Cyclic group Sub group, Normal sub group

**Unit 4:**

Addition and Subtraction of vectors , Scalar and dot product, Cross product.

**Unit 5:**

Differentiation of vectors , Gradient , Divergence , Curl and their Physical meaning , Differential operator and their Identities , Line and Surface integrals , Green's theorem in a plane , Gauss and Stokes theorem and their applications.

**Reference:**

1. B.S.Grewal “Higher Engineering mathematics”
2. Gaur & Kaul “Engineering mathematics II”

**BI/BT 202 – Electrical Engineering II****(L: 3: T: 1)****Max.Marks:100****Min.Marks:40****Unit 1:**

**Transformer:** Faraday's Law of Electromagnetic Induction, Construction and principle of operation of single phase transformer, EMF Equation, Voltage and Current relationship, phasor Diagram of Ideal transformer and equivalent circuit. Efficiency and O.C. & S.C. tests.

**Unit 2:**

**D.C. Machines:** Basic Principles of electromechanical energy conversion. Construction, Types and Basic principle of operation of DC machines. E.M.F. Equation, Magnetization and load characteristics, losses, efficiency and applications. Speed control of DC motors.

**Unit 3:**

**Three phase induction Motor:** -Construction, principle of operation, types and methods of Starting, Slip-torque characteristics, applications.

**Single-phase induction Motor:** principle of operation, methods of Starting, applications.

**Unit 4:**

**Three phase Synchronous Machines:** Construction, Basic principle of operation and application of synchronous motor.

**Magnetic Circuit:** Introduction of Magnetic Circuit, Magnetic field and magnetic force, Magnetic flux and Magnetic flux density.

**Unit 5:**

**Industrial Utilization:** Industrial Drives, Selection of Electric Motor, Motor for particular Services, Electric Heating: Resistance Heating (Direct Resistance Heating, Indirect Resistance Heating, Resistance Ovens and Furnaces), Induction Heating (Core type and Coreless Induction Furnace).

**Reference:**

1. B.L. Theraja. "Fundamentals of electrical Engg.and Electronics", S. Chand & Co.
2. J.B. Gupta "Fundamentals of electrical Engg. and Electronics",

**BI/BT 203 – Engineering Physics II****(L: 3: T: 1)****Max.Marks:100****Min.Marks:40****Unit 1:**

**Quantum Mechanics** - Wave particle duality phase velocity and group velocity, Heisenberg's Uncertainty principle and its Application, Wave function and its interpretation Schrödinger's wave equation, Particle in One-Dimensional box; Particle in Three-Dimensional box, One-Dimension harmonic oscillator.

**Unit 2:**

**Laser** - Introduction, Temporal and Spatial coherence, Einstein Coefficient, Population inversion, Basic principle and operation of a laser, Type of a laser-He-Ne Laser, Ruby Laser, Semiconductor Laser,

**Unit 3:**

**Band Theory of solids** - Energy Band, Energy Gap, classification of solids, Energy band Structure-Solid, conductor, semi conductor and Insulator, Fermi Dirac function, Extrinsic and Intrinsic semiconductors. Doping- Fermi Energy for doped and undoped semiconductors, the P-N Junction (Energy Band diagram with Fermi Energy)

**Unit 4:**

**Super conductivity** - Introduction of Superconductivity, Meissner effect, London penetration Depth, Flux Quantization, The BCS Theory, Type –I super conductor, Type- II Super conductor and its Application, Josephson effect.

**Unit 5:**

**Nuclear fission and fusion** - Nuclear fission- Introduction, fission Energy, Theoretical explanation of fission by liquid drop model, chain reaction –Atom bomb, Nuclear fusion – fusion process, Hydrogen bomb, source of energy of stars, Nuclear Reactor.

**Reference:**

1. A.K.Ghatak - Optics
2. Dr.G.D.Ladiwala - Engineering physics
3. D.S. Mathur - Mechanics
4. Ghatak and Lok Nathan - Quantum mechanics
5. Satya prakash - Quantum mechanics
6. S.O.Pillai - Solid state physics
7. D.C. Tayal - Nuclear physics
8. S.N.Ghosal - Nuclear physics

**BI/BT 204 – Fundamental of Biotechnology****(L: 3: T: 1)****Max.Marks:100****Min.Marks:40****Unit 1:**

**Introduction to Biotechnology:** Definitions, Historical perspectives, Scope and importance, Commercial potential, An interdisciplinary challenge, A Quantitative approach, Classical vs. Modern concepts, Manufacturing quality control, Product safety, Good manufacturing practices, Good laboratory practices, Marketing, Biotechnology in India and Global trends

**Unit 2:**

**Protein Structure and Engineering:** Introduction to the world of Proteins, 3-D Shape of Proteins, Structure Function relationship in Proteins, Purification of Proteins, Characterization of Proteins, Protein based products, Designing Proteins, Proteomics.

**Recombinant DNA Technology:** Introduction, Tools of rDNA Technology, Making Recombinant DNA, DNA Library, Introduction of Recombinant DNA into host cells, Identification of Recombinants, Polymerase Chain Reaction (PCR), DNA Probes, Hybridization Techniques, DNA Sequencing, Site-directed mutagenesis.

**Unit 3:**

**Genomics and Bioinformatics:** Introduction, Genome Sequencing Projects, Gene prediction, SNPs, comparative genomics, Functional Genomics, Sequences and Nomenclature, Information Sources, Analysis using Bioinformatics tools.

**Microbial Culture and Applications:** Introduction, Microbial Culture Techniques, Measurement and Kinetics of Microbial Growth, Scale up of Microbial Process, Isolation of Microbial Products, Strain Isolation and Improvement, Applications of Microbial Culture Technology, Bioethics in Microbial Technology.

**Unit 4:**

**Plant Cell Culture and Application:** Introduction, Cell and Tissue Culture Techniques, Applications of Cell and Tissue Culture, Gene Transfer Methods in Plants, Transgenic Plants with Beneficial Traits, Diagnostics in Agriculture and Molecular Breeding, Bioethics in Plant Genetic Engineering.

**Animal Cell Culture and Applications:** Introduction, Animal Cell Culture Techniques, Characterization of Cell Lines, Scale-up of Animal Culture Process, Applications of Animal Cell Culture, Stem Cell Technology, Bioethics in Animal Genetic Engineering.

**Unit 5:**

**Biotechnology and Society** - Public perception, Role of sciences, Engineering, Arts, Commerce, Patenting - Criterion for patents, Discovery vs Invention, Product and process patent, Reading a patent, National and International Patent Laws, Varietal protection, Patenting of biological systems, Ethical issues in agriculture and health care.

**Reference:**

1. Introduction to Biotechnology by P. K Gupta, Rastogi Publications
2. Biotechnology by Smith, Cambridge Press.

**BI/BT 205 – Engineering Chemistry II****(L: 2: T: 1)****Max.Marks:100****Min.Marks:40****Unit 1:**

Thermodynamics- Thermochemistry with numerical problems related to chemical reactions and equations. Entropy & Free Energy concept, Corrosion and fuel cells.

**Unit 2:**

Carbohydrates- General Structure and properties of carbohydrates. Monosaccharides (Pyranose & Furanose), Oligosaccharides (Sucrose) and polysaccharides (Starch and glycogen)

**Unit 3:**

Surface Chemistry- Adsorption, Chemisorptions Factors influencing adsorption, Langmuir isotherm, Freundlich isotherm BET Theory of Multilayer Adsorption, colloids, surfactants, Emulsions, Applications and importance of colloids,

**Unit 4:**

Aromatic electrophilic substitution, nucleophilic substitution and free radical substitution reactions with suitable examples.

**Unit 5:**

Organometallics - Metal carbonyls - structure and bonding, metal alkenes – complexes bonding and utility, metal ion in biological system with special reference to Cu and Fe.

**Reference:**

1. J. Huheey – Inorganic Chemistry
2. Jerry March – Advanced Organic Chemistry
3. Malik, Tuli & Madan – Some Selected Topics in Inorganic Chemistry
4. Atkins – Physical Chemistry
5. Puri, Sharma & Pathania – A Text Book of Physical Chemistry

**BI/BT 206 – Electronics****(L: 3: T: 1)****Max.Marks:100****Min.Marks:40****Unit 1:**

Semiconductors, Energy-Band Theory, Intrinsic and Extrinsic Semiconductors, Fermi Level in an Extrinsic Semiconductor, Hall effect, P-N Diode, Junction Diode, Junction Breakdown, Zener Diode

**Unit 2:**

Introduction of Bipolar Junction Transistor, Transistor Biasing, Working of Transistor, Configuration of Transistor : CB, CE, CC, Current Amplification Factors, Ebers-Moll Model, Transistor as an amplifier, Hybrid Model

**Unit 3:**

Rectifiers, Filter Circuits, R-C coupled and Transformer coupled amplifier, Push-Pull amplifier, Feedback circuits

**Unit 4:**

Introduction of Operational Amplifier, Basic Operational Amplifier Circuit, Block-Diagram of Op-amp, Differential Amplifier, Inverting and Non-inverting Amplifier

**Unit 5:**

R-C Oscillator, L-C Oscillator, Wein Bridge Oscillator, Crystal Oscillator, Multimeter: DVM, CRO and their applications

**Reference:**

1. Milliman Halkias Integrated Electronics Tata McGraw Hill
2. Boylestad Nasheliky Electronic Devices and circuit Theory Pearson Education
3. Mottershead Electronic Devices and circuits Prentice Hall India

**BI/BT 211 -Computer System & programming (Lab)****(L: 2: T: 0)****Max.Marks:100****Unit 1:**

Basic Computer Organization, Central Processing Unit, Data Representation, Number systems, Binary arithmetic, Introduction to Basic Input and Output Devices, Primary Memory & Secondary Memory, Various storage Units

**Unit 2:**

Fundamental of operating system, The idea of Program Execution at micro level, Elementary ideas on windows, Fundamental concept of programming, Introduction to c programming, Various data types, Conditional Statement, Loops, Arrays, Pointers, Structures,

**Unit 3:**

Basic Programming in C++, Object programming concept, Function Overloading, Dynamic data and Classes, Dynamic Binding and Virtual functions,

**Unit 4:**

Overview of DBMS, Basic DBMS terminology, Data Base system v/s file system, Architecture of a DBMS, Introduction to data models: entity relationship model, hierarchical model: from network to hierarchical, relational model, comparison of network, hierarchical and relational models,

**Unit 5:**

Data modeling using the Entity Relationship Model: ER model concepts, notation for ER diagram, mapping constraints, keys, Concepts of Super Key, candidate key, primary key, Introduction to SQL, Types of SQL commands

**Reference:**

1. Gear, C.W.” Computer Organization and Programming”, MC GrawHill
2. Mano, M. M.”Computer System Architecture, PHI
3. Tanenbaum, “Operating System Design & Implementation, PHI
4. Stalling, William,” Operating System” Maxwell McMillan International Editions
5. Rajaraman, V,”Introduction to Computer”
6. Korth, H. “Database Management System”
7. Venugopal, “Mastering in C++”

**SECOND YEAR**  
**Semester III****BI/BT 301 – Mathematics III****(L: 3: T: 1)****Max.Marks:100****Min.Marks:40****Unit 1:**

Solution in Series of second order Linear differential equations with polynomial coefficients , Bessel and Legendre's equation and their solutions , properties of Bessel functions and Legendre polynomials , Associated Legendre's functions.

**Unit 2:**

Fourier series , Half-range series , Harmonic analysis.

**Unit 3:**

Laplace transform of elementary functions , Shifting theorems , Transforms of derivatives , Differentiation and Integration of transform , Heavisides , unit step and Dirac delta functions , Solution of Ordinary Linear differential equations used Electric circuits and bending of beams.

**Unit 4:**

Fourier sine and cosine transform , Fourier integral formula , application of solution of boundary value problem , Z – transform , Linearity , Z – transform of elementary functions , Shifting theorem , Convolution theorem , Inversion of Z – transform.

**Unit 5:**

Probability , Mathematical Expectation , Binomial , Poisson and Normal distributions , Moments and Moment generating function.

**Reference:**

1. B.S.Grewal - Higher Engineering mathematics
2. R.S.Agraval - Mathematics I

**BI 302 –Introduction to Bioinformatics****(L: 3: T: 0)****Max.Marks:100****Min.Marks:40****Unit 1:**

Introduction to Bioinformatics, Finding out what Bioinformatics can do for you, Human genome project, major server of bioinformatics, database and the retrieval of DNA, protein, structure, genome and literature data, search tools Entrez and Swiss-PDB. PubMed/Medline, Retrieving Protein Sequence, Retrieving DNA Sequence, Using BLAST to compare protein/DNA sequence to Database

**Unit 2:**

Using Nucleotide Sequence Database, Sequence Analysis as a central problem in Bioinformatics, Reading into Gene and Genomics, Making Use of Gen bank, Using Gene centric database, Working with Whole Genome Database, Using Protein and Specialized Sequence Database, From Translated ORFs to Mature Proteins, Reading a SWISS-PROT Entry

**Unit 3:**

Working with a Single Protein Sequence, Doing Biochemistry on computer, Doing Primary Structure Analysis, Predicting POST-Translation Modification, Finding Domains in Protein, Working with a Single DNA Sequence, Catching error, Computing / Verifying a Restriction Map. Designing Primers, Analysis DNA Composition, finding Protein coding regions Assembly Sequence Fragments.

**Unit 4:**

Similarity Searches on Sequence Database, BLAST, Alignment, Comparing Two Sequence, Choosing Right Method for Pair-Wise alignment, Making Dot plot, Local & Global Alignment, Heuristic Searches, FASTA and BLAST algorithms. Multiple sequence alignment, making a multiple protein sequence, Alignment with ClustalW, Interpreting MSA Sequence

**Unit 5:**

Editing and Publishing Alignment, Getting MSA using the right Format, Using software to edit MSA online. Preparing MSA for publishing. Editing & Analyzing MSA, Exact string matching, applications to sequence pattern finding and genomics Sequence assembly, Dynamic programming Algorithm for Sequence alignment, Statistical significance of Sequence matches and application to finding Sequence similarity.

**Reference:**

1. Bioinformatics-A Beginner's Guide by Jean-Michel Claverie, Cedric Notredame,
2. Wiley dreamtech India Pvt.Ltd.
3. Bioinformatics sequence & Genome Analysis by David W. Mount, CBS Publisher & Distributors
4. Biological Sequence Analysis( Probabilistic Model Of Proteins & Nucleic Acids) by R.Durbin, S.Eddy, A.Krogh, G.Mitchison
5. Bioinformatics methods & Protocols-Stephen Misener, Stephen A.Krawetz, Humana Press.

**BI 303-Data Structure & C****(L: 3: T: 1)****Max.Marks:100****Min.Marks:40****Unit 1:**

**Introduction to Programming**-concept of algorithms; Flow-charts; Program coding and compilation, Linking and execution; Programming using C- Example of some simple C program, Concept of variables, program statements; C data types, C expressions, arithmetic operation, relational and logic operations; C assignment operation; scanf and printf

**Unit 2:**

**Fundamental Features in C**- C statements; conditional executing using if, else; switch and break statements; Concepts of loops in C using for, while and do-while, arrays; functions; passing arguments in the functions ; Pointers; passing arrays as arguments, structure and unions; defining C structures; File handling

**Unit 3:**

**Elementary Data Structure**- Basic data structures such as arrays and Strings; algorithm developments complexity; simple example of algorithm development; recursion; Linked list; circular and doubly linked list; representation and applications of linked list; stack and queues and their applications

**Unit 4:**

**Advance Data Structure Concept**- Trees: definitions and basic concepts; linked tree representation; AVL trees; B-trees; Graphs and their application; sequential and linked representation of graph – adjacency matrix; operations on graph, traversing a graph; Dijkstra’s algorithm for shortest distance; DFS and BFS;

**Unit 5:**

**Searching and sorting techniques**- hashing; use of various data structures for searching and sorting; Linear and Binary search; Insertion sort; Selection sort; Merge sort; Radix sort; Bubble sort; Quick sort; Heap Sort.

**Reference:**

1. Wirth Niclus, “Algorithms and Data structure Programs”, Prantice Hall International, 1978
2. Horwitz, E., and Sahani, S. “Fundamentals of Data Structures”, Computer Science Press,1978
3. Knuth, D. “Threat of Computer Programming” Vol. 1-2, Addision-Wesley,1970-80
4. Yashwant kanetkar, 2001. “Let us C”, BPB Publications, 2<sup>nd</sup> Edition,
5. Herbert Schildt, 2002.””C:The complete reference:”, Osbourne Mcgraw Hill, 4<sup>th</sup> Edition,
6. V. Raja Raman 1995. “Computer Programming in C”, Prentice Hall of India
7. R. B. Patel “Data Structure”
8. Kernighan & Ritchie, “C Programming Language”, PHI
9. J.B.Dixit, “Fundamental of Computers and programming in C”

**BI/BT 304 – Cell Biology****(L: 3: T: 0)****Max.Marks:100****Min.Marks:40****Unit 1:****The Cell:** A macromolecular assembly, cellular compartmentalization, organeller Architecture.**The Nucleus:** Chromosomal DNA and its Packaging, The Global Structure of Chromosomes, Chromosome Replication, RNA Synthesis and RNA Processing, The Organization and Evolution of the Nuclear Genome.**Cytoskeleton:** The Nature of the Cytoskeleton, Intermediate Filaments, Microtubules, Cilia and Centrioles, Actin Filaments, Actin-binding Proteins, Muscle**Unit 2:****Cell Junctions, Cell Adhesion, and the Extracellular Matrix :** Cell Junctions, Cell-Cell Adhesion, The Extracellular Matrix of Animals, Extracellular Matrix Receptors on Animal Cells- the Integrins, The Plant Cell Wall**Membrane Structure, Transport of Molecules and Membrane Excitability:** The Lipid Bilayer, Membrane Proteins, Principles of Membrane Transport, Carrier Proteins and Active Membrane Transport, Ion channels and Electrical Properties of Membranes**Unit 3:****Protein Sorting and Vesicular Trafficking in the Cell:** The Compartmentalization of Higher Cells, The Transport of Molecules into and out of the Nucleus, The Transport of Proteins into Mitochondria and Chloroplasts, Peroxisomes, The endoplasmic reticulum., Transport from the ER through the Golgi Apparatus, Transport from the Trans Golgi Network to Lysosomes, Transport from the Plasma Membrane via Endosome: Endocytosis, The Molecular Mechanisms of Vesicular Transport and the Maintenance of Compartmental Diversity.**Cell Signaling:** General Principles of Cell Signaling, Signaling via G-Protein-linked Cell- Surface Receptors, Signaling via Enzyme-linked Cell-Surface Receptors, Kinase Receptors, Structural Features of Trans-membrane Receptors, Hormone Receptor Interaction, Two-component signaling, Second messengers.**Unit 4:****Cell Cycle and Division:** The General Strategy of the cell Cycle, The Mechanics of Cell Division, The Early Embryonic Cell Cycle, Cell- Cycle control in Yeasts and Multicellular Animals.**Unit 5:****Cancer:** Cancer as a Microevolutionary Process, Tumor cells, Proto-oncogenes and viral oncogenes, Tumor suppressor genes**Reference:**

1. Albert et.al. John Wiley & Sons- Molecular Biology of Cell
2. Cooper. ASM Press -The Cell
3. Karp. John Wiley & Sons -Cell and Molecular Biology

**BI/BT 305 – Bio molecules & Metabolism****(L: 3: T: 1)****Max.Marks:100****Min.Marks:40****Unit 1:**

**Molecular basis of life:** Introduction to biochemistry, Nature & scope of biochemistry, Goals of Biochemistry, Biomolecules and their evolution, Water: weak interaction in aqueous systems, Ionization of water, weak acids, and weak bases, buffering against pH changes in biological systems, water as a reactant. **Enzymes:** Introduction, Nomenclature & classification, Enzyme Kinetics, Michaelis-Menten Equation, Biological role of Enzymes.

**The Energetics of life:** Energy, Heat, and Work, Internal energy and the state of the system, The first law of Thermodynamics, Entropy and the second law of Thermodynamics, Free energy, Relationship between standard free energy change & equilibrium constant.

**Unit 2:**

**Carbohydrates:** General structure of carbohydrates, structure and properties of monosaccharides, biological roles of monosaccharides, structure and functions of oligosaccharides & polysaccharides. Clinical aspects, Analysis of carbohydrates.

**Carbohydrate Metabolism:** Glycolysis, Citric Acid cycle, Electron Transport Chain Oxidative phosphorylation, Photosynthesis: Chloroplast, Dark and Light reaction, Gluconeogenesis, Glycogenesis

**Unit 3:**

**Lipids:** Introduction, General structure & function, Fatty acids, Classification of Fatty acids, Classification of Lipids, Inherited Human diseases resulting from abnormal accumulations of membrane lipids.

**Lipid Metabolism:** Digestion, Mobilization, and Transport of fatty acids,  $\beta$  – oxidation of fatty acids, Oxidation of even chain saturated fatty acids, Oxidation of unsaturated fatty acids, Oxidation of odd- chain fatty acids, Fatty acid oxidation in peroxisomes, Biosynthesis of fatty acids, Biosynthesis of, triacylglycerols, Biosynthesis of membrane lipids.

**Unit 4:**

**Proteins:** Introduction to Proteins, Amino acids & Peptides, General properties of Amino acids & Peptides, Protein classification, Overview of Protein structure, Biological role of Proteins, General properties of Proteins, Dynamics, specificity and Techniques. Structural proteins: actin myosin, muscle contraction.

**Protein Metabolism:** Protein degradation, Pathways amino acid degradation, Nitrogen excretion and the urea cycle, Overview of Nitrogen metabolism, Biosynthesis of amino acids, inborn errors of metabolism.

**Unit 5:**

**Nucleic acids:** Introduction, Chemistry of Nucleic Acids, Types of Nucleic Acids, Biological role of Nucleic Acids.

**Nucleic Acid Metabolism:** Degradation and biosynthesis of Nucleic acids, De Novo synthesis of purines and pyrimidines, Salvage pathways of purines and pyrimidines.

**Reference:**

1. Donald Voet, Judith G Voet. Charoother W. Prolt, Fundamental of BioChemistry , John – Wiley & Sons
2. David L Nelson Michrel M.Cox – Lehninger Principles of Biochemistry , W.H Freeman and Company

**BI/BT 306 – Microbiology****(L: 3: T: 0)****Max.Marks:100****Min.Marks:40****Unit 1:**

Basics of microbial existence, classification and nomenclature, isolation and identification methods.

**Unit 2:**

Bacteria, Archeobacteria, Fungi, Viruses -Structural organization and multiplication of microorganisms, cell wall, Gram positive, Gram negative.

Nutritional Requirements, Autotrophic, heterotrophic bacteria, Growth, Growth curve, batch and continuous culture of microbes.

**Unit 3:**

Production of primary and secondary metabolites, Screening of new metabolites, Strains used in screening, test systems, metabolites genes and function

**Unit 4:**

Preservation of food, food additives and supplements. Chemical and physical, sterilization method, Antimicrobial agents, Antibodies Sensitivity.

**Unit 5:**

Commercial process- Biofertilizers, Biopesticides, Biosensors. Types of Biosensors, production and used of the Biopesticides.

**Reference:**

1. Prescott, Harley and Kleir , Microbiology , McGraw Hill International Edition
2. Hans G Scrlrgel , General Microbiology , Cambridge university Press

**BI 307-Internet & Networking fundamentals****(L: 3: T: 1)****Max.Marks:100****Min.Marks:40****Unit-1**

Internet: Internet Accounts, Telephone, Cable and Satellite connections, Dial up networking, setting up a dial up connection. high speed connection (ISDN, ADSL and Cable modems), Networking Essentials (Lease Line, Routers, Modems), Intranets, E-mail concepts (receiving, sending and receiving Secure E-mail, chatting and conferencing, E-mail mailing list, Newsgroup, IRC, ICQ, Yahoo Pager, Voice mail and Video conferencing.

**Unit-2**

World Wide Web : Elements of the Web, Web browser, viewing pages with a browser, using a browser for Mail, News and chat, Security and Privacy issues (cookies, firewalls, executable Applets and scripts, blocking system), Netscape navigator and Communicator and features therein Internet Explorer and features therein, Lynx, Opera finding an installing Players, Plug-Ins and Active controls.

**Unit-3**

Network architecture, configuring network, network strategies, networks types, LAN, MAN and WAN [Basic concepts, Line configuration, topology, transmission mode, identify key components of network, categories of network, differentiating between LAN, MAN, WANS and Internet

**Unit-4**

Introduction to TCP/IP [Understand the TCP/IP Protocol Suite, its history and modification processes compare TCP/IP to the Open Systems Interconnection (OSI) reference model, TCP/IP applications such as FTP, Telnet, DNS, DHCP, Boot, etc.

**Unit-5**

The OSI model, the physical layer (bandwidth limited signals, transmission media, wireless transmission), the data link layer, error detection and correction, data link protocols, the medium access sub layer.

**Reference:**

1. M.L. Young: Internet Millennium Edition, Tata Mc Graw Hill.
2. Harely Hahn: The Internet, Tata Mc Graw Hill.
3. G. Robertson : Hands on HTML, BPB Publications.
4. D.A. Tauber, B. Kienan: Microsoft From Page 2000, BPB Publications.
5. Joel Sklar : Principles of Web Design, BPB Publications.
6. Stephen W. Active Server Pages, Techmedia.
7. Andrew S. Tanenbaum, Computer Networks, Prentice Hall
8. Behrouz A forouzan, TCP/IP, Tata Mc Graw Hill Pub. Co.
9. DE Corner and DL Stevens, Internet working with TCP/IP Volume I-III, Prentice Hall of India.
10. Wright and Stevens, TCP/IP Illustrated, Pearson Education Asia.
11. Karanjit S. Siyan, Inside TCP/IP, Techmedia.
12. Minasi, Mastering LAN, BPB Publications.
13. Minoli, Internet, Intranet Engineering, Tata Mc Graw Hill Pub. Co. Ltd.

## **SECOND YEAR**

### **Semester IV**

#### **BI/BT 400 - Languages Lab\***

**(L: 3: T: 1)**

**Max.Marks:100**

**Min.Marks:40**

\*This Course of Language Lab (BI/BT 400) is compulsory, Students have to pass this course, however the marks obtained in this will not be counted for deciding the division of the student.

#### **UNIT -I**

Phonetics symbols and transcription

#### **UNIT -II**

Listening Skills and comprehension

#### **UNIT -III**

Conversation practice, perfecting English sounds, pronunciation, stress and intonation etc.

#### **UNIT -IV**

Vocabulary building, synonyms and antonyms, one word for many words commonly misspell and mispronounced

#### **UNIT -V**

Practice of Seminar presentation, Group discussion and Interview skills.

**BI/BT 401 – Genetics****(L: 3: T: 1)****Max.Marks:100****Min.Marks:40****Unit 1:**

**Introduction-**The relationship between genes and traits; Reproduction as the basis of heredity; Overview of cell division & chromosomes: Mitosis, Meiosis and homologous pairing, Mitotic chromosome, Polytene chromosome & Lampbrush chromosome, gametogenesis.

**Mendelian principles of genetics-**Mendel's experiments; Mendel's laws of inheritance Monohybrid cross; Demonstration of genetic segregation; The dihybrid cross; Trihybrid cross

**Unit 2:**

**Gene interactions-**Incomplete dominance; Codominance, Epistasis, Complementary genes; Duplicate genes; Polymeric genes; Modifying genes.

**Quantitative or Polygenic inheritance:** Inheritance of kernel color in wheat; Corolla length in tobacco; Skin color inheritance in man; Transgressive and regressive variations.

**Linkage and crossing over:**Morgan's work on *Drosophila* ; Crossing over; The three point cross; Double crossing over; Cytological basis of crossing over; Sex linkage; Recombination in *Neurospora* ; Construction of genetic and physical maps; Gene mapping in fungi

**Unit 3:**

**Mutations:** Chromosomal changes and gene mutations: Variations in chromosome number- Euploidy; Artificial induction of polyploidy; Aneuploidy. Variations in chromosome structure : Deletion or deficiency; duplication; translocation; Inversion; B- chromosomes.

Detections of spontaneous mutations; Cytologically visible gene mutations; Mutable genes; Induction of mutations; Ionizing radiation; UV radiation; Chemicals as mutagens; Reverse mutations; Environmental mutagens and carcinogens

**Unit 4:**

**Population genetics:** Genes and genotype frequencies; The Hardy- Weinberg Law; Non- random mating; Variation in populations; Changes in gene frequencies in populations.

**Unit 5:**

**Genetic disorders and genetic counseling:** The human Chromosome complement; Chromosomal anomalies and human disorders; Tracing the gene in family – pedigree studies; Polygenic disorders and multifactorial inheritance; Genetics of human metabolic disease; Some complex traits in families; Genetics of the hemoglobins; Amniocentesis; Somatic cell hybrid and gene mapping; Immunogenetics. Application of genetics in agriculture and medicine.

**Reference:**

1. Monroe W, Strickberger, Genetics , Prentice Hall of India Private Ltd., New Delhi.
2. Klug and Cummings Concept of Genetics Pearson Education Publication , Patparganj, New Delhi

**BI/BT 402 – Molecular Biology****(L: 3: T: 1)****Max.Marks:100****Min.Marks:40****Unit 1:**

**Structure and properties of nucleic acids:** Models of DNA structure; RNA structure; Physical, Chemical, Spectroscopic Nuclear & Organelle Genomes.

**Genome Complexity:** C value paradox, cot analysis, Repetitive DNA, Satellite DNA, Pseudo genes, Synteny.

**Gene Organization:** split genes, Overlapping genes, Transposons & Retrotransposon, Gene Clusters.

**Chromosome Organization:** Histones, Non- Histones, Nucleosomes, Chromatin, Chromosome structure in prokaryotes & eukaryotes

**Unit 2:**

**DNA Replication:** DNA Replication in prokaryotes and eukaryotes, d- loop & rolling circle replication, Mode of replication, enzymes and accessory proteins, Telomere replication

**Unit 3:**

**Transcription and mRNA Processing:** transcription process in eukaryotes and prokaryotes; Initiation, Elongation & Termination of transcription. Transcription factors, regulation of transcription. Types of RNAs. RNA processing and RNPs, Spliceosome, mechanism of splicing of rRNA, tRNA & mRNA, Nuclear export and stability of mRNA Capping, Polyadenylation, Splicing.

**Translation:** Genetic code, degeneracy of genetic code, Mechanism of Prokaryotic and eukaryotic translation, co and post translational modifications of proteins. Translational control, Regulation of gene expression in prokaryotes & eukaryotes

**Unit 4:**

**Regulation of Gene Expression:** General aspects of regulation in prokaryotes and eukaryotes, the operon, lac & trp operons; DNA Methylation; Tissue- sp. & developmental stage sp. Expression of genes. Promoter, enhancer, Operon model, Tumor suppression gene, Gene silencing, DNA binding proteins, Zink finger motif and leucine zipper.

**Unit 5:**

**Ribozymes:** Antisense and ribozymes, Antisense molecule, types & structure of ribozyme, Strategies for ribozyme technologies.

**Genome Sequencing:** Genome sizes, Organelle genome, strategies for sequencing genome, methods of sequencing.

**Reference:**

1. William H.Elliott, Daphne c.Elliottl Biochemistry and Molecular Biology , Oxford University Press
2. Robert E.Weaver ,Moleculer Biology , McGraw Hill

**BI/BT 403 – Bio Physics****(L: 3: T: 1)****Max.Marks:100****Min.Marks:40****Unit 1:**

Chemical bonding- Ionic bond, covalent bond, energy changes, co-ordinate bond, Werner's theory, hydrogen bonding, Vander waal's forces, nonbonded and dipolar interaction and hydrophobic interaction, conjugation and conformation.

**Unit 2:**

General structure of carbohydrates, protein and polypeptides. primary secondary, tertiary and quaternary structure, Ramchandran's plot, conformational analysis of proteins, reverse folding of protein.

**Unit 3:**

Nucleic acid- structure of DNA and RNA, backbone torsional angle, base pairing and base stacking, types of DNA-A DNA, B DNA, Z DNA, types of RNA-m-RAN, t-RNA, r-RNA, helix to coil transition.

**Unit 4:**

Membrane structure and transporation of molecules across membrane, the nervous system, nerve impulse generation, cell contractility and motility, muscle contraction, fluidity and donnan effect.

**Unit 5:**

Radiation biophysics-ionising radiation, radiation sources, interaction of radiation with matter, measurement of radiation (dosimetry), radioactive isotopes. RIA, autoradiography, biological effects of radiation, effect of radiation on living system, radiation therapy.

**Reference:**

1. Donald Voet, Judith G.Voet, Charlott W pratt Fundamentals of Biochemistry, John Wiley & Sons
2. R.S Khandpur, Hand book of Biomedical Instrumentation, Tata McGraw Hill Publication

**BI/BT 404 – Instrumental Methods of Analysis****(L: 3: T: 1)****Max.Marks:100****Min.Marks:40****Unit 1:**

Introduction to process variables , Direct and Inferential measurement , on and off line measurement , Static and Dynamic characteristics of instruments and their general classification , Error , accuracy , Repeatability , Drift , Threshold , Zero – stability etc., Interpretation of performance specification of transducers.

**Unit 2:**

Working principle of instruments, Classification of sensors and transducers based on their principle of measurement, Building block of an instrument – transducer, Amplifier, Single conditioner, Single transmitter, Data acquisition. , I/O devices (general working principle only)

**Unit 3:**

Instrumentation Systems , working principle of transducers/instruments employed for the measurement of Flow , Level, Pressure, Temperature , Density , Viscosity , Ph , Radiation , Composition , Humidity , Advantages and disadvantage , Preparation of instrumentation diagrams , Instrumentation diagrams , Instrumentation of important equipments like Distillation column , Heat exchanger , etc.

**Unit 4:**

Construction and characteristics of final control elements, Introduction to Pneumatic, Hydraulic and Electronic controllers, Pneumatic control valves, Characteristics and sizing, motorized valve etc.

**Unit 5:**

Signal transmission and Telemetry, sampling, Multiplexing, Modulation and Demodulation, Basic principle of DAC and ADC, Pneumatic and Electronic Transmitter and their Advantage and Disadvantage.

**References :**

1. A course in Electrical and Electronic measurement and Instrumentation ; A.K Sawhvey , Dhanpal Rai & sons, Delhi;
2. A course in Electrical and Electronic measurement and Instrumentation ;J.B Gupta; S.K Kataria & Sons; Delhi
3. Mechanical Measurement; D.S Kumar; S.K Kataria & Sons.
4. Mechanical Measurement; R.K Jain; Khanna Publication

**BI 405 – Computational Biology****(L: 3: T: 1)****Max.Marks:100****Min.Marks:40****Unit 1:**

Introduction to Sequence Alignment, Significance of Sequence Alignment, Types of Sequence Alignment

**Unit 2:**

Pair wise Sequence Alignment, Identity &amp; Similarity, Dotplot, Local Alignment: Smith-Waterman Algorithm, Global Alignment: Needleman &amp; Wunsch Algorithm, Dynamic Programming, Matrices: PAM &amp; BLOSUM

**Unit 3:**

Multiple Sequence Alignment (MSA), Introduction, the Consensus &amp; Conserved sequences, Motivations for MSA, approaches to Multiple Sequence Alignment: Dynamic Programming Approach, Progressive alignment, Iterative alignment, and Statistical modeling.

**Unit 4:**

Phylogenetic Analysis, Introduction to Phylogeny &amp; the Theory of Recapitulation

Introduction to Phylogenetic &amp; Terms for Groups of Organisms, Types of Phylogenetic Trees, Methods of constructing Phylogenetic trees: Distance-based methods, Parsimony-based methods &amp; Character-based methods

**Unit 5:**

BLAST &amp; FASTA, Introduction to Hidden Markov Model.

**Reference:**

1. Bioinformatics: A practical guide to the analysis of genes and proteins A.D. Baxevanis and B.F.F. Ouellette (Eds). 2002 John Wiley and Sons.
2. Bioinformatics: Sequence and Genome Analysis by D.W. Mount, 2001, Cold Spring Harbor Laboratory Press.
3. Introduction to Bioinformatics by T.K. Attwood & D.J. Parry-Smith, 2006, Pearson Education, Low Price Edition.
4. Fundamental Concepts of Bioinformatics by Dan E. Krane, Michael L. Raymer,
5. Bioinformatics A Beginner's Guide by Claverie

**BI/BT 406 – Technical Communication****(L: 3: T: 1)****Max.Marks:100****Min.Marks:40****Unit 1:**

Introduction to Communication- Definition, Importance and nature of Business communication – Communication Models – Process of Communication; Barriers and Gateways in communication; Developing Effective Communication skills. Different types of communication like letters, memos, reports, fax, email, presentations, telephone, and multimedia, choosing the means of communication, stages in communication cycle, communication systems.

**Unit 2:**

Written Communication - I -*Writing Techniques*: Rules of good writing, adaptation and selection of words, masculine words, writing with style- choosing words with right strength and vigour, using a thesaurus, writing effective sentences, developing logical paragraphs, overall tone, drafting, editing and finalizing the business letters – Commercial letters; Preparation of Office Order, Memo, Indents; Recent Developments in Communication Technology; Do's and don'ts of Business writing; Legal aspects of Business communication

**Unit 3:**

Written Communication – II-*Recruitment and employment correspondence*: Application letter, curriculum vitae, interview, references, offer of employment, job description, letter of acceptance, letter of resignation.

*Internal communications*: memoranda, reports: types of reports, formal reports and informal reports, meetings, documentation.

*External communications*: Public notices, invitations to tender bid, auction, notices, etc; *Report writing*: planning, technique of writing a report, characteristics of business reports, common types of reports, purposes of reports; Writing Business reports

**Unit 4:**

Persuasive messages-Planning the persuasive message, common types of persuasive requests, principles of persuasive communication. Effective communication and impact of information technology, Oral communication: nature and significance; Written and oral communication presentation of Business Reports; Public speaking and negotiations.

**Unit 5:**

Reformulating and summarising-What is a summary? Using synonyms & antonyms, reducing phrases, guidelines for writing summaries, business summaries. *Comprehension*: using a dictionary, grammatical precision, phonetics, contextual clues, guidelines for comprehension

**Reference:**

1. Sharma R.C.and Mohan K “Business report Writing and Correspondence” Tata McGraw-Hill, New Delhi
2. Lesikar R V and Pettit Jr J D- *Business Communication: Theory and Application* (Tata McGraw-Hill, 2002)
3. Tayler Shinley - *Communication for Business* (Pearson Education, 2002)
4. Bovee C L et al- *Business Communication Today* (Pearson Education, 2002), New Delhi
5. Hargie O et al- *Communication Skills for Effective Management* (Palgrave, 2004)
6. T N Chhabra, Bhanu Ranjan – *Business Communication* (Sun India, 2004)
7. P.D. Chaturvedi – *Business Communication* (Pearson Education)
8. Meenakshi Raman-*Technical Communication-* (Oxford University Press)
9. Murphy H.A. and Peak C.E., “Effective Business Communication” 2<sup>nd</sup> Ed. Tata McGraw-Hill, New Delhi
10. Pearce C.g. “Business Communications; Principles and Applications” 2<sup>nd</sup> Ed. John Wiley, New York
11. R.K.Madhukar, *Business Communication and Customer Relations*, Vikas Publishing House, 2001
12. Krishna Mohan, Meera Banerji: *Developing Communication Skills*, Macmillan India Ltd., 2002
13. Shirley Taylor, *Communication for Business*, Pearson Education 1999

## THIRD YEAR

### Semester V

#### BI/BT 501 – Management Concepts and Practices

(L: 3: T: 1)

**Max.Marks:100**

**Min.Marks:40**

#### Unit 1:

Introduction to management; Evolution of Management thoughts Management processes and functions. Understanding organizational design and structure.

#### Unit 2:

Marketing: The concept of marketing mix; mix of product policy and design. Pricing. Choice of marketing intermediates. Methods of physical distribution. Uses of personal selling. Advertising and sales promotion. Introduction to marketing research and marketing organization.

#### Unit 3:

Finance : finance function. Concept, scope and its relationship with other functions. Tools of financial analysis (funds and cash flow analysis, ratio analysis) Risk-return-trade off. Financial forecasting. Estimation and management of working capital.

#### Unit 4:

Manufacturing: operations planning and control. Management of supply chain; Introduction to materials management; Systems and procedure of inventory management planning and procurement of materials.

#### Unit 5:

*Quality management*- Concept and definition of quality, quality cost, statistical quality control, control charts, acceptance sampling, Maintenance types and cost. *Strategy*:- firm and its environment: Strategies for growth and diversification: process of strategic planning

#### Reference:

1. L.M. Prasad: Principles & Practices of Management
2. J.S.Chandan, Management Concepts and Strategies, Vikas Publishing House, 2002.
3. Koontz, Essentials of Management, Tata McGraw-Hill, 5<sup>th</sup> Edition, 2001
4. Koontz, Wehrich & Aryasri, *Principles of Management*, TMH, New Delhi, 2004
5. Jain & Sharma “Functional Management”
6. R. L. Nolkha “Functional Management”, Adarsh Prakashan
7. R.D. Agarwal “Organisation & Management”
8. Gandhi J.C. “Marketing: A Managerial Introduction” Tata McGraw Hill, New Delhi
9. Kotler Philip, ‘Marketing Management’, 11<sup>th</sup> Ed., Pearson Education (Singapore) Pvt. Ltd., New Delhi, 2003.
10. Kotler & Armstrong; *Principles of Marketing Management*, Prentice hall India, 2003.
11. Pandey, I.M.; *Financial Management*, Vikas Publishing House, 8<sup>th</sup> Edition, 2001.
12. M.D. Agrawal & N.P. Agrawal “Financial Management” Ramesh Book Depot, Jaipur.
13. Chary, S N. *Production and Operations Management.*, Tata McGraw Hill, 2002
14. Elwood S. Buffa, Rakesh K. Sarin, Modern Production and Operations Management, John Wiley & Sons, NY
15. Ansoff, H Igor. *Implanting Strategic Management*. Englewood Cliffs, New Jersey, Prentice Hall Inc., 1984
16. Kazmi A. “Business Policy and Strategic Management” Tata McGraw-Hill, New Delhi

**BI/BT 502 – Genetic Engineering****(L: 3: T: 1)****Max.Marks:100****Min.Marks:40****Unit 1:**

Introduction and historical background; Restriction and modifying enzymes; Cloning vectors: Plasmids, phage cosmids, phasmid, YAK, eukaryotic vectors.

**Unit 2:**

Isolation, purification and characterization of DNA and RNA; construction of genomic and cDNA libraries.

**Unit 3:**

Synthesis and labeling of DNA and RNA probes, random primer, nick translation, End labeling; Screening of cDNA and genomic libraries, hybridization probe methods; antibody screening; Gene cloning.

**Unit 4:**

Polymerase chain reaction for DNA amplification, Modification of polymerase chain reaction; DNA sequencing; Maximum-Gilbert, Sanger's and Automatic method; Site directed mutagenesis.

**Unit 5:**

Genetically modified organism; Risk assessment, biosafety regulations and guidelines.

**Reference:**

1. Brown T.A Gene cloning and Analysis Black well Science Limited
2. James D.Watson and Gilmar , Recombinant DNA W.H Freeman and company NewYork

**BI/BT 503 – Biochemical Engineering****(L: 3: T: 1)****Max.Marks:100****Min.Marks:40**

## UNIT-1

Introduction to Biochemical Engineering: Conventional chemical processes and biochemical processes-an overview of industrial biochemical processes with typical examples, comparing chemical and biochemical processes, development and scope of biochemical engineering as a discipline, application of biochemical engineering.

Introduction to Biochemistry : Lipids, Sugar and Polysaccharides, DNA and RNA (Building blocks, and energy carrier, co- enzymes, biological information storage DNA and RNA), Amino acids into proteins (amino acids building blocks and polypeptides, protein structure),Hybrid biochemicals , The hierarchy of cellular organization.

## UNIT -2

Metabolism and Energetics: Thermodynamic principals, metabolic reaction Coupling: ATP and NAD, Carbon catabolism, Respiration ( TCA cycle, Respirative chain) Photosynthesis (Light harvesting, electron transport and potophosphorylation,) Biosynthesis (Synthesis of small molecules, macromolecules synthesis) Transport across cell membranes, Metabolic organization and regulation, End products of metabolism, Stoichiometry of cell growth and product formation.

## UNIT -3

Kinetics of biochemical reaction and microbial fermentation: Ideal reractors for kinetics Measurements( Ideal batch reactor, continuous – flow stirred- tank reactor) Kinetics of balanced growth, Transient growth kinetics, Structured kinetic models, Product formation kinetics, Segregated kinetic models of growth and product formation, Thermal death kinetics of cells and spores.

Product Recovery Operations- Recovery of Particulates: Cells and Solid Particles, Product isolation, Precipitation, Chromatography and Fixed –Bed Adsorption: Batch Processing with Selective Adsorbates, Membrane Separation, Electrophoresis, Combined Operations (Immobilization, whole broth Processing, Mass Recycle), Product Recovery Trains. Immobilized –Enzyme Technology, Immobilized Enzyme Kinetics.

## UNIT-4

Heat and mass transfer in biochemical processes, Gas-liquid mass transfer in cellular system (Basic mass-transfer concepts, rates of metabolic oxygen utilization) Determination of oxygen transfer rates, Mass transfer for freely rising or filling bodies, forced convection mass transfer, Mass transfer across free surfaces, Non-Newtonian fluids, scaling of mass transfer equipment, heat transfer, sterilization of gases and liquids by filtration.

## UNIT-5

Design and Analysis of Bioreactors - Ideal bioreactors, Reactor Dynamics, Reactors with Nonideal mixing, sterilization reactor, Immobilized Biocatalysts, Multiphase Bioreactors,

Fermentation technology, Animal and Plant cell Reactor Technology.

Instrumentation and Control- Physical and Chemical Sensors for the Medium and Gases,

On-Line Sensors for cell properties, Off-Line Analytical Methods, Computers and Interfaces, Data Analysis, Process Control, Advanced Control Strategies.

**BI 504 – Comparative Genomics & Proteomics****(L: 3: T: 1)****Max.Marks:100****Min.Marks:40****Unit-1**

Comparative Genomics: Introduction, functional genomics, structural genomics, Genome sequencing projects, history of genome sequencing. Completed genomes: virus, Bacteria, Archea, Fungi, Parasites, Human genome project.  
Genomic Databases: UCSC, NCBI, ENSEMBL.

**Unit-2**

Computational approaches in comparative Genomics, Introduction, Algorithms for Aligning large-scale data, viewing precomputed Genomic Alignments. Generating genomic alignments, Applying Gene prediction to comparative analysis, phylogenetic footprinting.

**Unit-3**

Comparative genomics& genome analysis: compositional measures,transposable elements ,sequence organization with in chromosomes. Gene prediction methods: ab initio methods, comparative methods, Genome analysis.

**Unit-4**

Proteomics: Introduction, protein domains & motifs, protein pattern, gene ontology consortium, High through put protein analysis, MALDI-TOF. Proteome analysis: cluster analysis, between proteome comparision to identify ortholog gene family & domains, horizontal gene transfer.

**Unit-5**

Major protein identification programs: Mascot, Protein prospector, GFS. Comparative Proteomic methods: Computational analysis, Multiple gels, 2d-gel databases, protein arrays.

**Reference:**

1. Computational genome analysis: Richard C. Deonier, Simon Tavare, Michael S. Waterman; Springer publication.
2. Bioinformatics & Functional Genomics: Jonathan Pevsner; Wiley Liss Publication.
3. Bioinformatics: A practical guide to the analysis of genes & proteins: Andreas D. Baxevanis, B.F. Francis; Wiley Publication.
4. Bioinformatics: David W Mount; CBS Publication
5. Introduction to computational Biology.An evolutionary approach: Bernard Haubold, Thomas Wieche; Birkhauser publication.

**BI/BT 505 – Immuno Technology****(L: 3: T: 1)****Max.Marks:100****Min.Marks:40****Unit 1:**

Introduction: Innate and acquire immunity, active, passive and adoptive immunization, clonal selection theory, humoral and cellular immunity, Regulation of immune response. Cellular responses; Activation and function of T and B cells, general properties and functional categories of cytokines, therapeutic and diagnostic exploitation of cytokines and cytokine receptors.

**Unit 2:**

Major Histocompatibility Complex (MHC) in the human response, infection and immunity; Host defense against various classes of pathogen, mechanism by which pathogen invade immune responses, active and passive immunization, preparation of human immune serum globulins.

**Unit 3:**

Transplantation and tumor immunology; Relationship between donor and recipient, role of MHC molecules in Allograft rejection, Bone marrow and Hematopoietic stem cell transplantation, Tumor antigen, categories of tumor antigen, tumor immunoprophylaxis.

**Unit 4:**

Autoimmunity: Criteria and causes of autoimmune diseases Autoimmune hemolytic anemia, myasthenia gravis, systemic lupus erythematosus, multiple sclerosis, rheumatoid arthritis.

**Unit 5:**

Applied immunology: Antigen and antibody interactions, Affinity and Avidity, Agglutination and precipitation reactions, Immunoassays Immunofluorescence, Fluorescence-Activated Cell-Sorting Analysis Microarrays to assess gene expression.

**Reference:**

1. Roitt I , Male David , Brostoff and Broth B, Immunology , Morby Elsevier Limited , International Edition
2. Kuby , Immunology , W.H Fruman and company , New York

**BI 506 – Structural Bioinformatics****(L: 3: T: 1)****Max.Marks:100****Min.Marks:40****Unit-1**

Introduction to structural Bioinformatics: structural Bioinformatics, relation of structural Bioinformatics with Bioinformatics. Challenges in structural Bioinformatics.

Fundamentals of protein structure: Primary structure, secondary structure, tertiary structure, protein fold, Domain motif. Biochemical & structural classification of fold.

Fundamentals of nucleic acid structure: DNA & RNA, base pair geometry; propeller twist, buckle, cup, inclination, helical twist, roll, slide, phase angle of pseudorotation. DNA duplexes, DNA quadruplexes, RNA duplexes, mismatched & bulged RNA, Ribozymes.

**Unit- 2**

Macromolecular structure determination:

X-ray crystallography, High throughput structure determination, heavy atom location & computation of experimental phases, Density modification, molecular replacement, map interpretation, validation, challenges to automation.

NMR spectroscopy: Physical bases for biomolecular NMR spectroscopy, NMR experiments, NMR bioinformatics, NMR screening methods, Sample preparation for NMR, processing & analyzing NMR data, Validation of structural models.

Electron microscopy: Electron optics & image formation, 3dimensional reconstruction, Molecular visualization: Visualization software, Web based visualization softwares.

**Unit- 3**

Structural databases: PDB, mmCIF, PDB data processing, NDB, BMCD, CSD, MMDB, DSSP, MSD, ReliBase, PKR, MolMovDB, SCOP, CATH.

**Unit- 4**

Structural & functional assignment: Secondary structure assignment, identifying structural domains in proteins, inferring protein function from structure.

Protein interactions: Prediction of protein – protein interaction from evolutionary information, electrostatic information.

**Unit- 5**

Structure prediction: CASP & CAFASP experiments & their findings, Homology modelling, fold recognition methods, ab initio method, secondary structure prediction, membrane helices & accessibility.

**Reference:**

1. Structural Bioinformatics
2. Genomes to drugs; volume 1 & 2

**BI 507 – Operating Systems****(L: 3: T: 1)****Max.Marks:100****Min.Marks:40****UNIT-I**

Necessity of and Operating system. Operating system terminology, Evolution of Operating Systems (multiprogramming systems, batch systems, timesharing system, Process control and Real-time system). Factors in OS Design (performance protection and security, correctness, maintainability application integration, portability, and interoperability).

**UNIT-II**

Device Management, Scheduling Mechanisms, Memory Management, Information Management, Dead Locks

**UNIT-III**

Disk operating systems (DOS) , • Introduction, History & versions of DOS , DOS basics- Physical structure of disk, drive name, FAT, file & directory structure and naming rules, booting process, DOS system files, DOS commands : Internal - DIR, MD, CD, RD, COPY, DEL, REN, VOL, DATE, TIME, CLS, PATH, TYPE etc. ,External - CHKDSK, XCOPY, PRINT, DISKCOPY, DISKCOMP, DOSKEY, TREE, MOVE, LABEL, APPEND, FORMAT, SORT, FDISK, BACKUP, EDIT, MODE, ATTRIB, HELP, SYS etc , Executable V/s Non executable files in DOS.

**UNIT-IV**

Windows, Hardware requirements of Windows. Windows concepts, Advanced Features of Windows , Managing Hardware & Software - Installation of Hardware & Software, Using Scanner , System Tools - Backup, Character map, Clipboard Viewer, Disk Defragmenter, Drive Space, Scandisk, System Information, System Monitor, Drive converter (FAT 32) , Accessibility Features of Windows. , Sharing Information between Programs Understanding OLE, Embed/Link Using Cut and Paste, Embed/Link Using Insert Object, Manage Embedded/Linked Object ,Windows NT ,Network concept and components ,Windows NT features & capabilities , Hardware requirements of Windows NT

**UNIT-V**

Linux , History & Features of Linux , Linux Structure , File system of Linux , Hardware requirements of Linux , Various flavours of Linux , Program & Process , Process creation and process identifiers , Functions of profile and login files in Linux , Linux kernel ,Multi-user features of Linux ,Login and logout from Linux system , Linux commands - bc, cal, cat, cd, chgrp, chmod, chown, clear, cmp, copy, date, find, ps, kill, ls, mail, mkdir, more, mv, rm, rmdir, tty, wc, who, whois, grep, write, telnet. , Pipeline concepts ,Using floppy and cdrom in linux. vi editor

**References:-**

1. Gary Nutt: Operating Systems-A Modern Perspective (Second Edition), Pearson Education, 2000.
2. D.M. Dhamdhere: Systems Programming and Operating Systems (Second Edition), Tata Mc-Graw Hill Publishing Company Limited, 2000.
3. Stuart e. Madnick, John J. Donovan: Operating Systems, Tata Mc-Graw Hill Publishing Company Limited, 2000.
4. Achyut S. Godbole: Operating Systems, Tata Mc-Graw Hill Publishing Company Limited, 2000.
5. Harvey M. Deitel, Operating Systems, Pearson Education, 2001.
6. Tanenbaum A.S., Modern Operating Systems, PHI Pub.
7. Ritchie: Operating Systems, BPB Publications.
8. DOS Quick reference by Rajeev Mathur, Galgotia Publications
9. Linux Complete by BPB Publications
10. Peter Norton Complete Guide to Linux by Peter Norton, Techmedia Publications
11. Level Module M 1.1 Information technology by Khanna Book Publications, New Delhi
12. Learning Windows 98 step by step by Rajeev Mathur, BPB Publication

## THIRD YEAR

### Semester VI

#### BI/BT 601 – Economics

(L: 3: T: 1)

**Max.Marks:100**

**Min.Marks:40**

#### Unit 1:

Basic Economic Concepts; *Market Demand & Production Analysis for Decision Making*: Objectives of demand analysis and determinants of demand; Law of Demand, Elasticity of demand and its measurement methods; Importance in decision-making; Demand forecasting methods demand functions,

#### Unit 2:

Theory of production - Production concepts and analysis; Production function; Characteristic of various factors of production; Laws of production – Law of Variable Proportion and Returns to Scale; Cost concepts and analysis; Different types of cost, short-run and Long-run Average costs curves and its analysis; Break-even analysis.

#### Unit 3:

Market Structure; Pricing Decision: Pricing and output decision under perfect and imperfect competition, oligopoly and monopoly, pricing methods products line pricing, specify pricing problems, price discrimination, price forecasting. Economic Appraisal Techniques;

#### Unit 4:

Concepts in International Trade - need, importance, process and problems; Money; & Capital Markets; Banking- Definition of banker and customer; general and special relationship, termination of relationship, pass book, types of accounts and their operations;

#### Unit 5:

Business Cycles; Inflation; Balance of Payments and Exchange rate determination;; Government Budgeting and Related Fiscal Concepts: Indian Industries.

#### Reference:

1. Diwedi, D.N.; *Managerial Economics*, Vikas Publishers, 2003.
2. Dwivedi, D.N.; *Microeconomics: Theory and Applications*, Pearson Education, 2003.
3. Rajkumar and Kuldeep Gupta “Managerial Economics”
4. Chaturvedi, D.D. and S. L. Gupta; *Managerial Economics*, Brijwasi Publishers, 2003.
5. Mote V.L. & Gupta G.S.: *Managerial Economics- Concept and cases*. Tata Mc Graw Hill, New Delhi.
6. Ozha BL ‘International trade and finance’ Adarsh Prakashan, Jaipur
7. Rangaragam C. & Dholakia H. *Macroeconomics*, Mc Graw Hill, New Delhi.
8. Varshney R.L. & Maheshwarin K.L.: *Managerial Economics*, Sultan Chand & Sons, New Delhi.
9. Mehta, P. L.; *Managerial Economics*, Sultan Chand & Sons., 2003.
10. Koutsoyiannis, A.; *Modern Micro Economics*, Macmillan Press Ltd., 2003.
11. Peterson, Lewis; *Managerial Economics*, 4<sup>th</sup> Pearson Education, 2002.
12. M.L. Seth--Principles of Economics, Laxmi Narain Agarwal, Agra.
13. M.L. Jhingan--Principles of Economics, Vikas, New Delhi.
14. Paul A. Samuelson--Economics, McGraw Hill International, New York.
15. N.D. Mathur--Business Economics, Shivam Book House (p) Ltd., Jaipur.
16. D.M. Mitthani--Fundamental of business and Managerial economics-Himalaya Publishing House, Bombay.

**BI 602 – Data mining & Dataware Housing****(L: 3: T: 1)****Max.Marks:100****Min.Marks:40****UNIT-I**

Introduction to Data Mining: Motivation and importance, what is Data Mining, Relational Databases, Data Warehouses, Transactional Databases, Advanced Database Systems and Advanced Database Applications, Data Mining Functionalities, Interestingness of a pattern Classification of Data Mining Systems, Major issues in Data Mining.

**UNIT-II**

Data Warehouse and OLAP Technology for Data Mining, What is a Data Warehouse? Multi-Dimensional Data Model, Data Warehouse Architecture, Data Warehouse Implementation, Development of Data Cube Technology, Data Warehousing to Data Mining, Data Preprocessing Why Pre-process the Data? Data Cleaning, Data Integration and Transformation Data Reduction, Discretization and Concept Hierarchy Generation

**UNIT-III**

Data Mining Primitives, Languages and system Architectures Data Mining Primitives: What defines a Data Mining Task? A Data Mining query language Designing Graphical Use Interfaces Based on a Data Mining Query language Architectures of Data Mining Systems, Concept Description, Analytical Characterization: Analysis of Attribute Relevance, Mining Class Comparisons: Discriminating between different Classes, Mining Descriptive Statistical Measures in large Databases

**UNIT-IV**

Mining Association rule in large Databases, Association Rule Mining, Mining Single -Dimensional Boolean Association Rules from Transactional Databases, Mining Multilevel Association Rules from Transaction Databases, Mining Multidimensional Association Rules from Relational Databases and Data Warehouses, From Association Mining to Correlation Analysis, Constraint-Based Association Mining

**UNIT-V**

Classification and prediction Concepts and Issues regarding Classification and Prediction, Classification by Decision Tree Induction, Bayesian Classification, Classification by Back propagation, Classification Based on Concepts from Association Rule Mining, Other Classification Methods like k-Nearest Neighbor Classifiers, Case-Based Reasoning, Generic Algorithms, Rough Set Approach, Fuzzy Set Approaches, Prediction, Classifier Accuracy.

**References:**

1. Data Mining Concepts and Techniques, Jiawei Han and Micheline Kamber, Morgan Kaufman Publications
2. Introduction to Data Mining, Adriaan, Addison Wesley Publication
3. Data Mining Techniques, A.K.Pujari, University Press

**BI 603 – Computer Networking****(L: 3: T: 1)****Max.Marks:100****Min.Marks:40****UNIT-I**

DATA COMMUNICATIONS : Multiplexing, Signaling, Encoding & Decoding, Error Detection & Recovery, Flow Control, Sliding Window, Congestion Management. COMMUNICATION NETWORKS : Introduction to networking, OSI Model for Networking, Internet, ATM, Network Components ( Cables, Hubs, Bridges, Switches, Routers), Network Topologies, Shared Medium, Peer to Peer, Hybrid Technology

**UNIT-II**

**NETWORK TECHNOLOGIES:** Local Area Network Technologies, Ethernet Technologies, Ethernet Versions, Token Ring Technologies, Wide Area Network Technologies (Frame Relay, SMDS, ISDN, SONET, PPP, HDLC, LLC), Wireless Networks (Radio Frequencies, Microwave Frequencies, Infrared Waves)

**UNIT-III**

MULTIPLE ACCESS : Design Issues, Distributed & Centralized Design, Circuit Mode & Packet Mode Design, Implementation Issues, Performance Considerations, Base Technology (FDMA, TDMA, CDMA, Centralized Access, Circuit Mode Access, Poling or Packet Mode Access, Reservation Based Access), Distributed Access (decentralized polling, CSMA, CSMA/CA, CSMA/CD, Busy Tone Multiple Access & Multiple Access Collision Avoidance, Token Passing, ALOHA, Slotted ALOHA, Reservation ALOHA), Hardware Addressing

**UNIT-IV**

SWITCHING : Circuit Switching (Time Division switching, Space division switching, time space switching, time space time switching), Packet Switching (Port Mappers, Blocking, ATM Switching, Switching Fabric (Crossbar, Broadcast, Switching Fabric Elements), Bridges (Transparent bridges, Spanning Tree Algorithm, Virtual LANS), Switches. NAMING & ADDRESSING : Hierarchical Naming, Addressing, Telephone Networks, Internet, IPv4, Sub netting Ipv4 Networks, Private Networks, Asynchronous Transfer Mode, Name Resolution, Address Resolution Protocol (Arp), RARP

**UNIT-V**

ROUTING : Routing Information, Routing Protocols, Hierarchical Routing, Multicast Routing. SERVICES & APPLICATIONS : File transfer protocol, TFTP, Domain Name System, DHCP, SNMP, Electronic Mail, WWW, HTML, HTTP, RPC & Middleware. SECURITY : Threats, Encryption/Decryption, Firewalls, IP Security, Web Security, E-Mail Security.

***References:-***

1. Andrew S. Tanenbaum, Computer Networks, Prentice Hall
2. Behrouz A forouzan, TCP/IP, Tata Mc Graw Hill Pub. Co.
3. DE Corner and DL Stevens, Internet working with TCP/IP Volume I-III, Prentice Hall of India.
4. Wright and Stevens, TCP/IP Illustrated, Pearson Education Asia.
5. Karanjit S. Siyan, Inside TCP/IP, Techmedia.
6. Minasi, Mastering LAN, BPB Publications.

**BI 604 – Numerical Analysis & Optimization Techniques****(L: 3: T: 1)****Max.Marks:100****Min.Marks:40****Unit 1**

Matrices & Linear System of Equations:-Introduction, Basic Definitions,(Definition, Row & Column Matrices, Transpose of a Matrix, Inverse of a Matrix, Rank of a Matrix, Elementary Transformation of a Matrix, Echelon form of the Matrix), Solution of Linear systems of equations (Matrix Inversion Method/Gauss-Jordan, Gaussian elimination Method, Cramer's rule), Iterative Methods (Gauss Seidel Method ) eigen value problem (Cayly- Hamilton Theorem, Power Method)

**Unit 2**

Solution of Algebraic & Transcendental Equations:-Introduction, Bi – Section Method, Iteration Method, Method of False Position, Newton - Raphson Method ( Generalized Newton's Method ) ,Interpolation & Curve Fitting:- Basic Definitions(Forward Differences, Backward Difference, Central Difference, Difference of Polynomial ) Newton's Formula for Interpolation, Curve Fitting techniques ( Method of least squares )

**Unit 3**

Numerical Differentiation and Integration:- Numerical Differentiation based on Interpolation formulae, Numerical integration based on interpolation formula ( Trapezoidal Rule , Error in Trapezoidal Rule), Simpson's one third Rule ( $1/3^{\text{rd}}$  Rule ), Simpson's three-eight Rule (  $3/8^{\text{th}}$  Rule ), Romberg Integration, Numerical Solution of Ordinary Differential Equations:- Basic Definitions, Taylor Series Method, Euler's Method, Modified Euler's Method, Runge- Kutta Methods.

**Unit 4**

Optimization Techniques, Graphical & Simple Method:- Scope of Operation Research, Phases of O.R., Methodology of O.R., The structure of Mathematical Model,Linear Programming ( Graphical Analysis, Graphical Method to solve the LPP, The Standard form of LPP, Solution of the LPP, Simple Method, Simplex Algorithm, Penalty cost Method or Big-M Methods, Two phase Method),

**Unit 5**

Transportation Problem:- Transportation algorithm, Initial Bank Solution, Test for Optimality, Improving the solution, Degenerag Assignment Problem – solution by Hungarian Method ,Project Scheduling & PERT- CPM :- Difference between PERT & CPM, PERT/CPM Network Components & Precedence relationships, Critical path Calculations Determination of Critical Path, Determination of Floats, Project Management – PERT

**References:-**

1. Introductory Methods of Numerical Analysis by S.S.Sastry
2. Numerical Methods – E Balagurusamy
3. Numerical Methods in Engineering Science- Dr. B.S. Grewal
4. Computer Oriented Numerical Methods – V.Rajaraman
5. Operation Research an Introduction, 4<sup>th</sup> Edition – Homdy A. Taha, Macmillan Publishing Company
6. Operation Research Theory & Applications – J. K. Sharma, Macmillan India Ltd.
7. Problems in Operation Research ( Methods & Solutions) – P.K. Gupta, ManMohan – Sultan Chand & Sons Publishers
8. Theory & Problems of Operation Research – Richard Bron Soon Schaum's Outline Series

**BI/BT 605 – Environmental Studies & Disaster Management****(L: 3: T: 1)****Max.Marks:100****Min.Marks:40****Unit 1:**

*Environment:* Definition, scope and importance; Concept of an *Ecosystem:* Structure and function of an ecosystem; Producers, consumers and decomposers; Energy flow in the ecosystem; Ecological succession; Food chains, food webs and ecological pyramids; Introduction, types, characteristic features, structure and function of the following ecosystem: (a) Forest ecosystem (b) Grassland ecosystem (c) Desert ecosystem (d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans)

**Unit 2:**

*Biodiversity and Its Conservation:* Introduction, definition: genetic, species and ecosystem diversity; Biogeographical classification of India; Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values; Biodiversity at global, National and local levels; India's Hot-spots of biodiversity; habitat loss, poaching of wildlife, man-wildlife conflicts; Endangered and endemic species of India; Conservation of biodiversity; *Renewable and non-renewable resources:* Defining resources, classification of resources, soil and land degradation, economic development and resources use, natural resources accounting.

**Unit 3:**

*Environmental Pollution:* Definition; Causes, effects and control measures of Air pollution; Water pollution; Soil pollution; Marine pollution; Noise pollution; Thermal pollution; Nuclear hazards; Solid waste management: Causes, effects and control measures of urban and industrial wastes; Consumerism and waste products; Role of an individual in prevention of pollution. *Indian Environmental laws:* Introduction to Environment Protection Act; Air (Prevention and Control of Pollution) Act; Water (Prevention and Control of Pollution) Act; Wildlife Protection Act; Forest Conservation Act; Issues involved in enforcement of environmental legislation; Public awareness.

**Unit 4:**

*Natural Disasters:* Floods, earthquakes, cyclones, land slides, disaster management; Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Forest: Forest degradation and management, Hazard based environmental issues, Fast depletion of forest resources and their regeneration, environmental issues related to Mega Hydroelectric Projects

**Unit 5:**

From unsustainable to sustainable development; Urban problems related to energy; Water conservation, rain water harvesting, watershed management; Resettlement and rehabilitation of people; its problems and concerns; Case studies; Environmental ethics: Issues and possible solutions; Wasteland reclamation.

**Reference:**

1. Gupta N.C.; *Social Auditing of Environmental Law in India*, edited book, New Century Publications, Delhi
2. Divan, Shyam and RosenCeranz; *Armin. Environmental Law and Policy in India, Cases, materials and statutes*, second edition, Oxford University Press, 2001.
3. Uberoi, N.K.; *Environmental Management*, Excel Books, New Delhi, 2000.
4. Agarwal, A, Narain; *S. State of India's Environment*, Published by Centre for Science and Environment, ND,
5. Ambasht, RS and PK Ambasht; *Environment and Pollution-An Ecological Approach*, third edition, CBS Pub.
6. Joseph, Casio, Woodside, Gayle and Mitchell, Philip.; *ISO 14000 guide- The new Environmental Management Standards*, McGraw Hill, New York, 1996.
7. Titenberg, Tom.; *Environmental and Natural Resource Economics*, Harper Collins College Publishers, 1996.

**BI 606 – Biological Database & Their Management****(L: 3: T: 1)****Max.Marks:100****Min.Marks:40****UNIT-I**

Introduction to database system: A historical perspective, File systems v/s DBMS, advantage of a DBMS. Data abstraction, models, instances and schemes, Data independency, Data definition and manipulation language, Database manager, administration and users, over all system structure.

**UNIT-II**

Entities and entity sets relationships and relationship sets, Attributes mapping, Key, E-R diagram and its conversion to tables. Design of an E-R database schema, Structure of relational Database, The relational algebra, the tuple and domain relational calculus modification of database and views.

**UNIT-III**

Data Normalization ,Data independence , Example of www/Internet Based DB interface , DBMS as Software , Data Dictionary, Interactive SQL : SQL commands ,Constraints, Computations on Table Data; Arithmetic Operators; Logical Operators; Comparison Operators; Range Searching; Pattern Searching; Oracle Function; Number Functions; Group Functions; Scalar Functions; Data Conversion Functions; Manipulating Dates in SQL ; Character Functions; Joins, Sub Queries; Set Operators; Views and Indexes .

**UNIT-IV**

Biological Databases and its Introduction, Functioning, Types of Biological Databases, Primary Sequence Databases(Nucleic Acid DB(NCBI, DDBJ, EMBL, GenBank),Protein DB(PIR,MIPS,Swissport,rEMBL,NRL-3D)),Composite protein DB (NRDB,OWL)

**UNIT-V**

Structure Classification Database (SCOP, CATH), Specialized Genomic Resources(SGD, TDB, ACeDB), Prosite, Pfam, Prodom, Ensembl, PlasmoDB, GDB

**Reference:**

1. Fundamental Concepts of Bioinformatics by Dan E. Krane, Michael L. Raymer
2. Bioinformatics A Beginner's Guide by Claverie
3. Database Management System by Post, Tata McGraw-Hill
4. SQL Server 2000: The Complete Reference, Tata McGraw-Hill
5. SQL: The Complete Reference by Groff, Tata McGraw-Hill
6. Elmisry Nawathy, "Introduction to Database Systems", Pearson Education India
7. Elmasri & Navathe, *Fundamentals of Database Systems*, Addison Wesley
8. Naveen Prakash, Introduction to Database Management", TMH, 1993.

**BI 607 –Cheminformatics****(L: 3: T: 1)****Max.Marks:100****Min.Marks:40****UNIT-I**

Cheminformatics Theory , Introduction , Chemo- versus Bioinformatics , Scientific Origins , Fundamental Concepts Molecular descriptors & chemical spaces, Chemical spaces & molecular similarity , Molecular similarity & dissimilarity & diversity , Modification & simplification of chemical spaces, Compound Classification , cluster analysis , partitioning Support vector machines.

**UNIT-II**

Similarity Searching, structural queries & Graphs, Pharmacophores, Fingerprints, Machine learning Methods, Genetic Algorithms, Neural networks.

**UNIT-III**

Library Design , Diverse libraries , Diversity estimation , Multi – Objective design , Focused libraries , Quantitative Structure – Activity relation analysis , Model building , Model evaluation , 3D – QSAR, 4D – QSAR, Probabilistic methods , Virtual Screening & Compound Filtering , Biologically active compounds , Virtual & High – throughput screening , Filter functions,

**UNIT-IV**

From theory to Practice, Database design, Compound selection for medical chemistry, Computational hit identification.

**UNIT-V**

Practice & Products of Cheminformatics

**Reference:**

1. Cheminformatics theory , Practice & Products – Barry A Bunin, Jurgen Bajorath, Brian siesel , Guillermo Morales Springer Publication

## **FOURTH YEAR Semester VII**

### **BI 701 – Drug Designing & Discovery**

**(L: 3: T: 1)**

**Max.Marks:100**

**Min.Marks:40**

**Unit 1:**

Introduction, Traditional vs. rational drug discovery, Steps in drug discovery, Target identification/validation, Hit (pre-lead) identification, Lead optimization, Pre-clinical development, Clinical candidate, Clinical trials

**Unit 2:**

Issues in Drug Discovery, Development Considerations. Clinical Trials, Market Segments, Patient Compliance Issues, Protection

**Unit 3:**

Pharmacodynamics & pharmacokinetics, *SAR & Molecular Modeling*, (Quantitative) Structure-Activity Relationships (Q)SAR

**Unit 4:**

Molecular Modeling, Examining and interpreting structural data, Structure classification schemes (CATH, SCOP), Secondary structure assignment, Structure comparison and alignment, Domain assignment, Functional assignment from structure, Protein Docking

**Unit 5:**

Protein Structure Prediction, Comparative Assessment of protein Structure Prediction (CASP), Comparative modeling Fold recognition, Ab-initio structure prediction

**BI 702 – Bioinformatics Algorithm****(L: 3: T: 1)****Max.Marks:100****Min.Marks:40****Unit-1**

Algorithms & Complexity: Definition of algorithm, Biological VS computer algorithm, Recursive algorithms, Iterative algorithm, Fast & slow algorithm, Big-O notation. Algorithm design techniques: Tractable VS Intractable problems, Molecular Biology primer. Exhaustive search: Impractical restriction mapping algorithm, Practical restriction mapping algorithm, profile, motif finding, finding median string.

**Unit-2**

Greedy Algorithm: Genome rearrangements, sorting by reversals, approximation algorithms, Break points, Greedy approach to motif finding. Dynamic programming algorithms: Manhattan Tourist problem, Edit distance & alignments, longest common subsequences, global sequence alignment, Scoring alignments, local sequence alignment, Alignment with gap penalties. Gene prediction: Statistical approaches, similarity based approaches, spliced alignment.

**Unit-3**

Divide & conquer Algorithms: Divide-and-conquer approach to sorting, Space-efficient sequence alignment, Block alignment & the four –Russians speed up, Constructing alignments in sub quadratic time. Graph Algorithms: Graphs & genetics, DNA sequencing, Shortest superstring problem, DNA arrays as an alternative sequencing technique, sequencing by hybridization, SBH as a Hamiltonian path problem & Eulerian path problem, Fragment assembly in DNA sequencing, Protein sequencing & identification, Peptide sequencing problem, spectrum graphs, spectral convolution, spectral alignments.

**Unit-4**

Combinatorial pattern matching: Repeat finding, Hash tables, Pattern matching, keyword trees, suffix trees, Heruristic similarity, search algorithm. Clustering & trees: Gene expression analysis, Hierarchical clustering, K-mean clustering, Clustering & corrupted cliques, evolutionary trees, Distance-Based tree reconstruction, Hierarchical clustering character based tree reconstruction, small parsimony problem & large parsimony problem.

**Unit-5**

Hidden Markov Models: Hidden Markov models, decoding algorithm, HMM parameter estimation, profile HMM alignment. Randomized Algorithms: Gibbs sampling, Random projections.

**Reference:**

1. An Introduction to Bioinformatics Algorithms: Neil C. Jones and Pavel A. Pevzner.

**BI/BT 703 – Bio safety, Ethics, Patenting and IPR****(L: 2: T: 1)****Max.Marks:100****Min.Marks:40****Unit 1:**

Introduction; Genetic engineering; safety, social, moral and ethic consideration; Environmental ethics cell research;  
**WTO:** As an international agency controlling trade among nations. WTO with reference to biotechnological affairs, TRIPs.

**General Introduction:** Patent claims, the legal decision – making process, ownership of tangible and intellectual property.

**Unit 2:**

**Basic Requirements of Patentability** Patentable subject matter, novelty and the public domain, non obviousness.

**Special issues in Biotechnology Patents** Disclosure requirements, Collaborative research, Competitive research, plant.

**Unit 3:**

**Plant biotechnology** Indian patents and Foreign patents, Plant variety protection act, The strategy of protecting plants.

**Patent Litigation** Substratitive aspects of patent litigation, Procedural aspects of patent litigation, different Doctrines, Recent Developments in Patent System and Patentability of biotechnological inventions.

**Unit 4:**

**Unit 4:** public acceptance and safety of new biotechnology food; Agro biodiversity and donor policies;**IPR issues in Indian Context** Role of patent in pharmaceutical industry, computer related innovations.

**Unit 5:**

Patents, copyrights, Trademark; Salient features: patent Act( 1970), Patent (Amendments) Act (2002) different types of patent and Filling and processing of Application for Patents; Biopiracy and Biocolonialism

**Case studies** Rice, Haldi, neem, etc. and challenges ahead

**Reference:**

1. The law and strategy of Biotechnological patents by Sibley. Butterworth publications.
2. Intellectual property rights – Ganguli – Tat McGraw-Hill
3. Intellectual property right – Wattal – Oxford Publishing House.

**BI 704 – Bio Mark-up Language****(L: 3: T: 1)****Max.Marks:100****Min.Marks:40****Unit-1**

Introduction: Overview of Perl, Advantages of Perl, programming strategies. Sequence & strings: Representing sequence data, a program to store a DNA sequence, concatenating DNA fragments, Perl documentation, calculating reverse complement in Perl, Proteins, files & arrays, Reading proteins in files, advance array operation.

**Unit-2**

Command & interpretation, Comments, scalar values, string numbers, scalar variables, assignment, statements & blocks, basic operators, arithmetic operators, bitwise operators, String operators, file test operators. Conditionals & logical operators: true & false, logical operators, using logical operators for control flow, if statement, binding operators, chop & chomp operators.

**Unit-3**

Perl regular expressions: metacharacters, capturing matched patterns, metasymbols, pattern modifiers, Perl debugger, constructing Regexp in the Debugger, Setting break point in code, setting conditional break points, sub routines, useful debugger, Regex pattern comments, match quatifiers, beginning of pattern anchors.

**Unit-4**

Perl control statement: Perl control structures, if statement, if-else, if-elsif, if-elsif-else, unless modifier, while loop, until loop, for loop, foreach loop. Maneuvering flow through loops: last, next, redo. Scoping of variables: my & local. BioPerl, program to simulate DNA mutation, Generating random DNA, Analyzing DNA, Translating DNA into Proteins, Reading frames, BLAST.

**Unit-5**

File I/O: opening files, File modes, File test operators, accessing files, extracting file information, deleting files, accessing directories, CWD module, System function Perl subroutines & function: Subroutines & subroutine parameters, Perl built in fuction, index fuction, rindex function, substring function.

**Reference:**

1. Beginning Perl for Bioinformatics: James Tisdall; O'Reilly publication.
2. Perl programming for Bioinformatics: Harshwardan P Bal; tata McGraw Hill.

**BI 705 – Java & Web Technology****(L: 3: T: 1)****Max.Marks:100****Min.Marks:40****UNIT-I**

Java Programming: Data types, control structured, arrays, strings, and vector, classes (inheritance, packages, exception handling), Constants, Variables, Data types, Operators, arithmetic expression. Type conversion in expressions, Mathematical Functions, decision control structure, loop control structure, Classes, Objects and Methods, Boolean Methods, void Methods, Overloading, Nesting of Methods, Constructors, Class Invariants, Composition, Recursive. Classes, extending a class,

**UNIT – II**

Overriding Method, Inheritance versus compositions, Class hierarchies, Arrays and Vector, String Arrays, Wrapper Classes, Defining, extending and implementing interfaces, accessing interface variables, Graphics, Managing Layouts

**UNIT – III**

Java applets, AWT controls (Button, Labels, Combo box, list and other Listeners, menu bar), layout manager, string handling (only main functions), Thread and exceptions

**UNIT - IV**

Networking (datagram socket and TCP/IP based server socket), event handling, Drivers in java, JDBC, ODBC connectivity Event driven programming.

**UNIT-V**

Information Files Creation; Web Server; Web Client/Browser (Understanding how a Browser communicates with a Web Server); Hyper Text Markup Language (HTML) (HTML Tags, Paired Tags); Commonly used HTML Commands, Lists ,Adding Graphics to HTML Documents, Dynamic HTML, Tables, Frames, Introduction to XML

**References:-**

1. C. Thomas Wu, an Introduction to OOP with Java, Mc Graw Hill.
2. Timothy Wood, An Introduction to Object Oriented Programming, Addison Wesley.
3. Deitel and Deitel, Java, How to Program, Pearson Education Asia.
4. Cay S. Horstmann and Gary Cornell, Core Java, Pearson Education Asia.
5. E. Balaguruswamy, Programming with Java, Tata McGraw Hill.
6. Zukowski: Mastering Java 2, BPB Publications.
7. Herbert Schliidt, Java 2, Tata Mc Graw Hill.

**BI 706 – System Biology****(L: 3: T: 1)****Max.Marks:100****Min.Marks:40****UNIT-I**

Modeling Natural system, Kinds of model-Statistical modeling –testing for differences, association and regression, time series analysis, Kinetic modeling, System theory, differential equations, dynamic system theory, dealing with uncertainty.

The organization of living cells, structural organization, functional organization-signaling by G-protein-linked receptors, signaling by tyrosine kinase receptors, interactions – and pathway maps, Temporal aspects.

Cell Chemistry, Cell signaling, Experimental techniques, measurement of enzyme kinetics, considerations for modeling, and the dynamic proteome,

**UNIT – II**

Biochemical Reaction Kinetics-differential vs. difference equation, biochemical reaction modeling, elementary reactions-monomolecular reactions, bimolecular reactions, trimolecular reactions, complex reactions, consecutive, autocatalytic reactions, Material to enzyme kinetics, Activation and deactivation of proteins.

Stochastic Modeling and simulation-motivation, probability as a measure chance, random variables, random vectors, expectations, Markov process-CTMC, Stochastic realizations: Gillespie algorithm, Kolmogorov differential equation, Karamers - Moyal expansion :Fokker-Plank and Langevin equation, Stochastic vs. deterministic framework

**UNIT – III**

Modelling of cell communication-pathways as dynamic system, receptor modeling, dynamic modeling of biochemical networks,S-system,Heinrich model,MAP Kinase pathway,The Ras / Raf/ MEK/ERK pathway, Module and control Mechanism-linear module,hyperbolic module, sigmoidal module, robust or adaptive module, feedback system

**UNIT - IV**

Cell Cycle Modeling-An overview of the cell, Mitosis, S-phase, The Cell-Control system, cell cycle and cell growth, model system to study the cell-cycle control system, modeling the cell cycle of yeast, Molecular components of the yeast cell cycle, MPF's enemies and friends, feedback loops, surveillance mechanism, checkpoints, Mathematical model, Numerical Simulations, Wild – type cells, mutations

**UNIT-V**

Metabolic Control Analysis, Fundamentals, Control and regulation, Parameters and variables, control coefficients, flux control coefficients, concentration control coefficients, the summation theorem, number of summation theorems, metabolic control analysis and rate – determining step, elasticity coefficients, elasticity coefficients for metabolites, elasticity coefficients for parameters, the connectivity theorem, using the summation and the connectivity theorem, matrix methods, control coefficients in an unbranched pathway, control coefficients in a branched pathway, response coefficients, limits of metabolic control analysis, elasticity coefficients for specific rate laws, Michaels – menten equation, reversible Michaels – menten equation, hill equation, s-systems, elasticity calculus.

**References:-**

1. Uri Alon. An Introduction to System Biology. Mathematical and Computational Biology Series. Chapman & Hall/CRC, First edition
2. T.A.Brown Genomes, Scientific Publishers
3. C.W. Gardiner. Hand of stochastic Models. Springer
4. B.O. Palsson "System Biology" Cambridge University Press
5. K. Wilson and J. Walker. Principles and Techniques of Practical Biochemistry. Cambridge University Press

## **FOURTH YEAR**

### **Semester VIII**

#### **BI 801 – Information Protection and Security**

**(L: 3: T: 1)**

**Max.Marks:100**

**Min.Marks:40**

#### **UNIT-I**

Introduction to Cryptography: Introduction To Security: Attacks, Services & Mechanisms, Security, Attacks, Security Services. Conventional Encryption: Classical Techniques, Conventional Encryption Model, and Steganography, Classical Encryption Techniques.

#### **UNIT-II**

Modern Techniques: Simplified DES, Block Cipher Principles, DES Standard, DES Strength, Differential & Linear Cryptanalysis, Block Cipher Design Principles, Block Cipher Modes of Operation.

#### **UNIT-III**

Conventional Encryption Algorithms: Triples DES, Blowfish, International Data Encryption Algorithm, RCS, CAST-128, RC2 Placement & Encryption Function, Key Distribution, Random Number Generation, Placement Of Encryption Function. Public Key Encryption: Public-Key Cryptography: Principles of Public-Key Cryptosystems, RSA Algorithm, Key Management, Fermat's & Euler's Theorem, Primality, The Chinese Remainder Theorem.

#### **UNIT-IV**

Hash Functions: Message Authentication & Hash Functions: Authentication Requirements, Authentication Functions, Message Authentication Codes, Hash Functions, Birthday Attacks, Security Of Hash Function & MACS, MD5 Message Digest Algorithm, Secure Hash Algorithm (SHA), Digital Signatures: Digital Signatures, Authentication Protocol, Digital Signature Standard (DSS), Proof Of Digital Signature Algorithm.

#### **UNIT-V**

Network & System Security: Authentication Applications: Kerberos X.509, Directory Authentication Service, Electronic Mail Security, Pretty Good Privacy (PGP), S / Mime, Security: Architecture, Authentication Header, Encapsulating Security Payloads, Combining Security Associations, Key Management, Web Security: Secure Socket Layer & Transport Layer Security, Secure Electronic Transaction (Set), System Security: Intruders, Viruses, Firewall ,Design Principles, Trusted Systems.

**BI 802 – Machine Learning Approach****(L: 3: T: 1)****Max.Marks:100****Min.Marks:40****UNIT-I**

Concept of intelligence, Artificial intelligence, definition turning test, areas of application. Search techniques, state space, Production rules, problem characteristics, production system ,characteristic, depth first, breadth first search methods and their analysis, Heuristic search method, generate and test, hill climbing, best first method, graph search, AND OR search methods, constraint satisfaction, backtracking. Introduction to list and string processing and dynamic databases concept of knowledge, characteristics and representation schemes, Logic, propositional and predicate calculus, resolution, semiatics nets, frames, conceptual dependency, scripts Monotonic reasoning,

**UNIT-II**

Logical reasoning induction, natural deduction. No monotonic reasoning – default reasoning minimalist reasoning, statistical reasoning –Baye’s theorem, certainty factors, dempster shafer theory, Fuzzy logic. Concept of learning, inductive and deductive. Knowledge acquisition, rote learning, discovery, analogy. Concept of expert system, need for an expert system, Component and categories of an expert system, need for an expert system, Stages in the development of an expert system.

**UNIT-III**

Neural Network , Neural Processing , The Rise of Neuro Computing , , Biological Neural Networking , Perceptron model , Linear separability and XOR problem, Two & Three layered neural nets , Back propagation – convergence, Hopfield nets , neural net learning , Application ,

**UNIT-IV**

Fuzzy system: Definition of a fuzzy set, Fuzzy relation, Fuzzy Function, Fuzzy measures, Fuzzy reasoning, Application of Fuzzy system, Artificial Neural Networks, Basic Building Blocks of Artificial Neural networks, Application of Neural networks in Bioinformatics.

**UNIT-V**

Fuzzy logic Controlled genetic Algorithms, Soft computing tools, Problem Description of optimum Design, Fuzzy Constraints, Illustrations, GA in Fuzzy logic Controller Design, Fuzzy Logic Controller, FLC-GA Based structural Optimization, Application, Matlab-An Overview.

**References:-**

1. Neural Networking , Fuzzy Logic and Genetic Algorithms – S. Rajasekaram & G.A Vijayalakshmi Pai

**BI 803 – Project****(P: 16)****Max.Marks:400****Min.Marks:40**

The project work will be spread in the seventh and eight semesters. The topic of the project will be approved by the Head of the Department and the entire project work will be carried out under the guidance of a department project supervisor approved by the Head of the Department. The nature of the project work will consist of varying properties of designing, fabrication, testing and analysis of result. The project topic can also be taken from a live industrial problem. The report of the completed project shall be signed by the guide and submitted to the Head of the Department on or the working day of the eight semesters. The evolution of the project will be done by the board consisting of an internal and an external examiner.